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Work-Related Coping Behavior and Experience Patterns and Their Application in the Central European Educational Context

Habilitation Thesis

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I hereby declare that I wrote the habilitation thesis by myself only using publication resources that are properly cited.

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Introduction

Education is the foundation of societal development, but it is teachers who determine its quality and effectiveness, serving as key mediators in transmitting knowledge to younger generations and fostering the development of their competencies (Kuru, 2022). Coping with the high academic demands of teacher education and the multifaceted professional demands of teaching requires the development of individuals who are engaged, resilient, and psychosocially healthy. Teacher burnout, along with other mental and physical health issues, can have profoundly negative consequences—not only for the teachers themselves but also for their students. Research has shown that occupational health impairments in teachers are associated with a decline in the quality of education, as well as with reduced academic achievement, motivation, and well-being among their students (Kidger et al., 2016; Klusmann et al., 2006; Madigan & Kim, 2021). In Germany, as in many other European countries, teacher occupational health is seriously impaired, as reflected in alarming rates of psychosomatic conditions, disability leave, and early retirement (Hillert & Schmitz, 2004). In response to this critical state of teacher occupational health, the German psychologist Uwe Schaarschmidt and his research team at the University of Potsdam conducted the Potsdam Teacher Study (*Potsdamer Lehrerstudie*). Within the framework of this project, more than 20,000 teachers and 8,000 professionals from other occupational groups were involved, leading to the development and validation of a preventive diagnostic tool designed to identify individuals at risk of burnout and other occupational health problems at an early stage. The resulting concept, together with its corresponding homonymous inventory, was labeled *Arbeitsbezogenes Verhaltens- und Erlebensmuster* (AVEM; work-related coping behavior and experience patterns) and aims to diagnose characteristic styles of dealing with occupational demands, as reflected in specific patterns of work-related behavior and experience. The primary output of the assessment inventory is the assignment of an individual to one of four distinct work-related patterns, two of which are considered healthy, while the remaining two represent risk patterns indicating vulnerability to occupational health problems (Kieschke & Schaarschmidt, 2008; Schaarschmidt, 2005; Schaarschmidt & Fischer, 2008; Schaarschmidt & Kieschke, 2007).

Since the initial introduction of the AVEM inventory at the turn of the millennium, nearly a quarter of a century has passed, during which several hundred studies have provided empirical follow-up evidence on the AVEM framework and its applications. A substantial body of AVEM research has been conducted within the original educational context, focusing on teachers and teacher education students (e.g., Bauer et al., 2006; Zimmermann et al., 2012) as

well as higher education lecturers (Sharaf & Taha, 2019; Thielmann et al., 2021). Beyond education, the AVEM framework has also been applied to a range of other occupational groups and to students preparing for these professions. These include healthcare professionals, such as nurses, physicians, and paramedics (e.g., Korbus et al., 2023; Mroczek et al., 2017); uniformed services, including soldiers, police officers, and prison staff (e.g., Basińska et al., 2007; Shvets et al., 2020; Zawadzka, 2022); and various other occupations, including entrepreneurs (Voltmer, Spahn, et al., 2011), pastors (Voltmer, Thomas, et al., 2011), locomotive engineers (Goncharevich et al., 2015), drivers (Horoszkiewicz, 2011; Horoszkiewicz & Korchut, 2019), and employees in financial services (Voltmer et al., 2018). The vast majority of AVEM studies have been conducted with German-speaking samples; however, research involving culturally distinct populations is also available. Among these, the most frequent applications of the AVEM inventory have been carried out in Poland (e.g., Mroczek et al., 2017; Napora et al., 2017). Additional studies have been conducted in Ukraine (e.g., Böckelmann et al., 2024; Lalymenko et al., 2020; Thielmann et al., 2021), Russia (e.g., Goncharevich et al., 2015; Mikhailova, 2017), Turkey (e.g., Gençer et al., 2010), Iran (e.g., Kalani, Asanjarani, et al., 2024), Egypt (e.g., Sharaf & Taha, 2019), and Indonesia (e.g., Qudsyi et al., 2019). More recent extensions beyond these cultural contexts have been undertaken in the Czech Republic and Slovakia, led by the author of this thesis (see Mašková, Beer, et al., in press [Study 5]).

The overarching aim of this thesis is to familiarize the reader with the AVEM concept, which remains relatively unknown outside German-speaking countries, largely due to its limited accessibility. The official version of the AVEM inventory is available in German, and although an English translation exists, it has not yet been formally validated. Moreover, most original sources by Schaarschmidt and colleagues are available only in German. Research conducted in other countries is also often published in local languages, for example Polish studies published in Polish, and in local outlets that are not indexed in major international databases, which further limits its accessibility. Accordingly, the introductory part of this thesis aims to summarize and integrate the most important evidence on AVEM and to make it accessible to an international readership. For this reason, the thesis is written in English. The core of this thesis consists of six studies, each of which specifically addresses key gaps and limitations in current AVEM research—most notably the limited accessibility of existing sources and the strong cultural restriction to German-speaking populations. The overall focus of this thesis is on the educational context, which appears to be of particular relevance in AVEM research. The AVEM framework was originally developed within this context, and both the

original and subsequent studies consistently indicate the highest levels of vulnerability among educational populations relative to other occupational groups, as discussed throughout the thesis.

The Concept of AVEM

The concept of AVEM is grounded in a resource-oriented approach that reflects a positive conception of health, most prominently articulated in Antonovsky's salutogenic model (Antonovsky, 1987). From this perspective, the focus shifts away from pathogenic factors toward the conditions that help sustain and promote health. Central to this approach is the availability and effective use of coping resources when individuals are faced with demanding or stressful occupational requirements. The development of AVEM was also largely influenced by the core idea of the Type A behavior concept by Friedman und Rosenman (1974), namely that the individual way of coping with occupational demands plays a decisive role in health-related outcomes. Building on a critical engagement with the Type A behavior concept, Schaarschmidt and colleagues formulated a more complex framework comprising three key domains (described in the following section) that should not be evaluated in isolation, but rather in terms of their interaction with one another in order to enable health-related assessment. In sum, AVEM emphasizes the active role of the individual in dealing with occupational demands, recognizing that people are not merely passive recipients of stressors. Rather, through their characteristic patterns of behavior and experience and by mobilizing personal resources, they actively shape their experience of work-related stress. At the same time, AVEM takes into account occupational factors and working conditions that may either enable or constrain the development and effective use of these resources. In this respect, AVEM postulates that personality-specific patterns of behavior and experience are crucial for long-term health development, with work-related factors mediating the relationship between individual characteristics and health outcomes. Accordingly, AVEM assessments provide information both on the personal prerequisites individuals bring with them into the workplace and apply in dealing with occupational demands and on the consequences of prior work-related strain. The authors argue that a central aim of the AVEM concept is the early identification of risks manifested in maladaptive patterns of work-related coping and experience. Early detection enables the timely implementation of preventive measures aimed at reducing health-risk patterns and strengthening health-promoting ones through the enhancement of individual resources and the improvement of work-related conditions (Kieschke & Schaarschmidt, 2008; Schaarschmidt, 2005; Schaarschmidt & Fischer, 2008; Schaarschmidt & Kieschke, 2007).

The AVEM Inventory

The concept of AVEM is assessed by the homonymous inventory, which was developed within the framework of classical test theory. An initial pool of 121 items was generated based on the conceptual assumptions outlined in the preceding section. Item selection aimed to retain items that best captured the theoretical construct, demonstrated favorable psychometric properties, and ensured an appropriate balance between test economy and measurement precision. Through successive factor-analytic procedures, items with low factor loadings or substantial cross-loadings were eliminated, resulting in a final set of 66 items comprising 11 scales. This factor structure was subsequently replicated in large cross-occupational samples, supporting the robustness of the instrument. In addition, a short form of the AVEM was developed to provide a more economical measure while preserving strong psychometric properties. The short form retains the original structure of 11 scales, each represented by four items (44 items in total), and is intended primarily for research applications. For both versions, items are answered on a five-point Likert-type scale: 1 = *I strongly disagree*, 2 = *I somewhat disagree*, 3 = *I am in the middle*, 4 = *I somewhat agree*, 5 = *I strongly agree*. Factor-analytic results supported the conceptually defined structure of the AVEM by showing that the 11 scales can be meaningfully assigned to three overarching domains referring to professional commitment (work engagement; *Arbeitsengagement*), coping capacity (resilience; *Widerstandskraft*), and subjective well-being (emotions; *Emotionen*). Each of these domains has specific relevance for health-related assessment and represents both a central prerequisite and an expression of health (Schaarschmidt & Fischer, 2008):

1. Professional commitment includes the scales of subjective significance of work, professional ambition, tendency to exert, striving for perfection, and emotional distancing. This aspect is central with respect to health as it reflects experienced meaning and an active orientation toward life. However, it should not be understood in terms of "the more, the better." Rather, optimal engagement is characterized by a balanced and goal-directed investment of effort that is aligned with individual priorities. Within this domain, high levels of perceived significance of work and professional ambition should be accompanied by a clearly expressed but non-excessive willingness to exert effort, as well as by a preserved ability to psychologically distance oneself from everyday work demands. Within the AVEM framework, this ability to distance oneself is considered a key resource for effectively managing occupational stress (Schaarschmidt & Fischer, 2008).

2. Coping capacity includes the scales of resignation tendencies, offensive coping with problems, and balance and mental stability. These characteristics are emphasized as health-relevant across various theoretical frameworks. In this respect, Schaarschmidt and colleagues refer to Scheier and Carver (1992), who highlighted the positive influence of an optimistic life orientation on psychological and physical well-being. Similarly, Antonovsky's concept of the sense of coherence (1987), as well as theories of self-efficacy (Bandura, 1977) and hardiness (Kobasa, 1982), assign a central health-promoting role to the subjective experience of problem-solving capacity, which in turn promotes the use of effective strategies of coping with demands (Schaarschmidt & Fischer, 2008).

3. Subjective well-being includes the scales of satisfaction with work, satisfaction with life, and experience of social support. This domain represents both a central prerequisite and a direct expression of health (Schaarschmidt & Fischer, 2008). This is particularly evident in the case of social support, a core concept in health psychology, which is regarded both as a protective factor in the face of stress and as a direct expression of well-being and psychological health (Schwarzer & Leppin, 1989).

The structure of the AVEM inventory is displayed in Table 1.

Table 1

The Structure of the AVEM Inventory

Dimension/Scale	Scale description	Sample item
Professional commitment		
Subjective significance of work	Value of work in personal life	I need work like the air I breathe
Professional ambition	Striving for career advancement and success	Professional success is an important aim in my life
Tendency to exert	Preparedness to exert personal strengths to accomplish tasks	I tend to overwork
Striving for perfection	Demand for quality and reliability of one's own performance at work	My work should always be faultless
Emotional distancing	Ability to mentally rest from work	After work I can switch off easily
Coping capacity		
Resignation tendencies	Tendency to become reconciled to failures and to give up easily	Failures at work can easily discourage me
Offensive coping with problems	Active and optimistic attitude towards challenges and arising problems	Lack of success doesn't bring me down, but makes me try even harder

Dimension/Scale	Scale description	Sample item
Balance and mental stability	Experience of mental stability and inner balance	I can be calm and collected in almost all situations
Subjective well-being		
Satisfaction with work	Satisfaction with professional accomplishments	My professional achievements are obvious
Satisfaction with life	Satisfaction with the entire life situation also beyond the job	By and large, I am happy and content
Experience of social support	Confidence in the support of close persons, sense of social security	I have the full support of my family

Note. Adapted from *Risk and protective factors of vulnerability to burnout and occupational health issues in university students: Is being excellent an advantage?* by Mašková (2024), *Current Psychology*, 43, 26919–26939.

The Four Patterns

The full diagnostic potential of the instrument is achieved when the interrelations among its dimensions are considered beyond the level of individual scales, forming four profiles that reflect more complex patterns of work-related behavior and experience relevant to occupational health. Of the four patterns described in detail in the following section, two are not associated with significant health risks (patterns G and S), whereas two are considered health-threatening risk patterns (patterns A and B). These patterns were originally identified through cluster analyses conducted on a large sample (n = 1,589) in 1996, yielding a stable four-pattern solution that was subsequently replicated in a larger sample collected in 2003 (n = 4,793), thereby confirming the robustness of the pattern structure. It should be noted that these samples comprised exclusively German and Austrian participants (Schaarschmidt & Fischer, 2008). The replicability of the four work-related patterns has since been examined in additional samples using different analytical approaches. In studies of German (Klusmann et al., 2006) and Iranian teachers (Kalani, Asanjarani, et al., 2024), replication was tested using cluster analysis, whereas latent profile analysis (LPA; see Study 5) was applied in research on German teachers (Menge, 2025; Menge & Schaeper, 2019) and teacher education students (Fischer et al., 2018; Künsting et al., 2012). All studies—including one LPA study based on only eight AVEM scales (Klusmann et al., 2008)—confirmed the original four-pattern structure.

At the individual level, the degree of fit between a person's profile and the four cluster-analytically derived reference profiles can be determined. This assessment of profile similarity is based on discriminant functions obtained through discriminant analysis. Pattern assignment is conducted using scoring software, which calculates the probabilities of an individual's

membership in each of the four patterns (G, S, A, and B). Depending on the level of assignment probability, five degrees of pattern expression can be distinguished. Assignment probabilities exceeding 95% indicate a full pattern expression, in which case the individual may be regarded as a prototypical representative of the pattern. Further levels include accentuated (> 80% and ≤ 95%), tendential (> 50% and ≤ 80%, with no second pattern exceeding 30%), combined (two patterns > 80%, with the weaker pattern exceeding 30%), and non-classifiable (no clear pattern assignment). In most empirical studies, tendential pattern expression is reported, as it represents the default outcome of the scoring system (Schaarschmidt & Fischer, 2008).

Pattern Characteristics

In the following subsections, we present the conceptually defining characteristics of the patterns, as well as empirically driven evidence derived from studies that have utilized the AVEM typology since its development. Although the focus of this thesis is on educational contexts, the limited number of available studies necessitates drawing on findings from a range of occupational settings, which together provide a more comprehensive picture of pattern characteristics. Likewise, as some pattern-related differences are less generic and more context-specific, these mini-reviews are restricted to the most consistent pattern correlates, supported by selected key findings of high theoretical or practical relevance. These findings are subsequently integrated to familiarize the reader with the most salient aspects of the patterns.

Pattern G

Conceptual Foundations of Pattern G. Pattern G stands for *Gesundheit* or *good health*. This pattern indicates a health-promoting work-related attitude and represents the desirable work-related pattern associated with good health. It is characterized by high, but not excessive, professional commitment, with the strongest manifestation in professional ambition and slightly above-average levels of subjective significance of work, tendency to exert, and striving for perfection. Importantly, despite this high level of engagement, the ability to maintain distance from work (emotional distancing) is well preserved. This indicates that G-type individuals are able to prevent the intrusion of professional problems into their leisure time and to relax easily. Coping capacity further underscores this healthy attitude toward work, as reflected in the lowest levels of resignation tendencies and the highest levels of offensive coping with problems and balance and mental stability relative to the other patterns. Similarly, G-type individuals show the highest levels on the scales related to subjective well-being, namely satisfaction with work, satisfaction with life, and experience of social support (Kieschke &

Schaarschmidt, 2008; Schaarschmidt, 2005; Schaarschmidt & Fischer, 2008; Schaarschmidt & Kieschke, 2007).

Empirical Evidence on Pattern G. Among working populations, pattern G occurs more frequently among younger workers (Adams et al., 2016; Bartosiewicz et al., 2022; Hofmann & Kohlmann, 2019; Korbus et al., 2023; Schulz et al., 2011) and among individuals who are married or in stable partnerships (Bauer et al., 2006; Kalani, Asanjarani, et al., 2023). In addition, individuals assigned to pattern G report the most favorable perceptions of their work environment, including positive evaluations of colleagues and supervisors (Korbus et al., 2023) as well as greater perceived opportunities for professional development (Adams et al., 2016). Conversely, they report comparatively low levels of perceived workplace bullying (Adams et al., 2016; Góralewska-Słońska, 2019) and work overload (Schulz et al., 2011). With respect to work-related investment, the evidence consistently indicates that pattern G is associated not only with high levels of engagement and work- or study-related motivation but, importantly, with motivation of optimal quality. In this regard, G-type workers and students exhibit the highest levels of work engagement, reflected in vigor, dedication, and absorption (Meiseneder, 2015; Voltmer et al., 2018), high and positive professional and organizational commitment (Albisser & Kirchhoff, 2007; Obst & Kötter, 2020; Olszewski, 2017; Rothland, 2011; Seibt & Hager, 2019), and increased levels of autonomous study- and career-related motivation grounded in intrinsic and altruistic motives. In contrast, pattern G is associated with low levels of controlled motivation (Künsting et al., 2012; Mašková et al., 2022 [Study 4]; Reichl et al., 2014; Rothland, 2011), with occasional evidence of comparatively increased external career motives, such as the perceived importance of high income and promotion prospects (Hager & Seibt, 2017). Consistent with this motivational profile, pattern G is also consistently linked to the highest levels of job and study satisfaction (Bartosiewicz et al., 2022; Rothland, 2011; Rumpler, 2013; Schulz et al., 2011; Voltmer et al., 2018). Beyond motivational aspects, pattern G is also characterized by favorable affective functioning, reflected in a combination of high positive and low negative affectivity (Hofmann & Kohlmann, 2019) and well-developed emotional regulation (Hofmann et al., 2022). With regard to personality traits associated with pattern G, the literature presents a consistent picture of comparatively low levels of neuroticism, accompanied by high levels of extraversion and conscientiousness (Basińska & Dreas, 2011; Lüftenegger et al., 2017; Muszalska et al., 2007; Reichl et al., 2014; Römer et al., 2017). In addition, pattern G has been linked to a broad range of adaptive characteristics and personal resources, showing comparatively the highest levels of self-efficacy (Bartosiewicz et

al., 2022; Bauer, 2019; Meiseneder, 2015), sense of coherence (Basińska et al., 2011; Sharaf & Taha, 2019), religiosity and spirituality (Gander et al., 2012; Voltmer, Thomas, et al., 2011), as well as the majority of character strengths assessed using the Values in Action Inventory of Strengths (Gander et al., 2012). Evidence further indicates that G-type individuals have the highest potential to deliver high-quality work outcomes and closely approximate optimal professional functioning. In this respect, they display the highest levels of work ability (Voltmer et al., 2018), as well as beliefs, expectations, interests, and competencies relevant to the profession already during (teaching-focused) university studies (Albisser & Kirchhoff, 2007; Deiglmayr et al., 2018; Kaub et al., 2014; Meier, 2015). Importantly, G-type teachers deliver instruction of comparatively the highest quality, characterized by an appropriate interaction tempo, strong support for students' cognitive autonomy, high social orientation, and a strong sense of perceived fairness among students (Klusmann et al., 2006). Similarly, G-type physicians exhibit the highest levels of general social competence (Mroczek et al., 2017), and G-type soldiers show the highest levels of emotional intelligence (Basińska et al., 2007). Regarding coping strategies and stress experience, G-type individuals predominantly use adaptive coping strategies, such as active and problem-oriented coping, positive thinking, and help-seeking, while showing a decreased tendency to use dysfunctional and health-threatening coping behaviors, such as smoking or alcohol use (Afshar et al., 2022; Albisser & Kirchhoff, 2007; Basińska & Andruszkiewicz, 2010; Jäger, 2017; Voltmer, Thomas, et al., 2011; Voltmer, Köslich-Strumann, Voltmer et al., 2021). Accordingly, pattern G is consistently associated with low levels of stress (Afshar et al., 2022; Korbus et al., 2023; Thielmann et al., 2022; Voltmer, Köslich-Strumann, Walther et al., 2021; Wollesen et al., 2017). G-type individuals also exhibit good physical health (Albisser & Kirchhoff, 2007; Hamdan, 2012; Korbus et al., 2023; Voltmer, Thomas, et al., 2011; Voltmer et al., 2012; Voltmer, Köslich-Strumann, Walther et al., 2021) and generally display the lowest levels of mental health symptoms, including anxiety, depression, and other psychiatric symptoms (Bauer et al., 2006; Kalani, Maleki Hosseinzadeh, et al., 2023; Obst & Kötter, 2020; Voltmer, Thomas, et al., 2011, Voltmer et al., 2012; Voltmer, Köslich-Strumann, Walther et al., 2021).

Synthesis and Integrative Conclusions. As originally conceptualized by Schaarschmidt and colleagues, pattern G is characterized by high, but not excessively high, professional commitment. Subsequent empirical findings meaningfully extend this conceptualization by demonstrating that such strong yet well-regulated engagement in pattern G is predominantly underpinned by autonomous motivation, grounded in intrinsic interest and

altruistic orientations. From the Self-Determination theory (SDT; see Study 4) perspective, this motivational quality is central not only to a better understanding of the nature of the pattern but also to further underscoring its health-promoting character. Because effort is experienced as self-endorsed and meaningful rather than externally imposed, high engagement in pattern G does not escalate into chronic strain or resource depletion; instead, autonomous motivation supports sustained engagement while simultaneously protecting well-being and both physical and mental health (Ryan & Deci, 2017). Coping capacity in pattern G is high and, as consistently confirmed by empirical evidence, predominantly based on adaptive coping strategies. Importantly, empirical findings further enrich this picture by demonstrating that G-type individuals not only exhibit effective coping behaviors but also possess a wide range of well-developed adaptive characteristics and personal resources. Alongside interpersonal resources—high levels of perceived social support, which are conceptually integral to this pattern—G-type individuals appear to draw on substantial internal resources, such that resilience in pattern G is structurally supported and embedded in a broader configuration of motivational, personal, and interpersonal resources. The high level of subjective well-being is further supported by empirical findings demonstrating high levels of study and job satisfaction, as well as a predominance of positive affectivity. Empirical evidence also shows low levels of stress and indicates that G-type individuals are in good physical and mental health. Indeed, across empirical studies, hardly any unfavorable or controversial characteristics are observed, collectively forming a picture of an ideal (future) professional who is genuinely motivated, resilient, emotionally positive, and healthy. Thus, it is unsurprising—and empirically supported—that such professionals possess a strong potential to thrive. Moreover, in professions grounded in close interpersonal interaction, such as teaching, they are also likely to foster the thriving of others, both educationally and emotionally. In other professional contexts, this potential is reflected in the delivery of high-quality outcomes across a range of domains. Some characteristics that tend to co-occur with pattern G also emerge from the integrated evidence, including younger age, being in a stable relationship, and experiencing a favorable work environment. However, given the predominantly cross-sectional nature of the reviewed studies, it remains unclear whether these characteristics function as protective factors against the development of less desirable patterns, or whether they instead reflect selection effects—for example, whether individuals with a G-type profile are more likely to maintain close relationships or to select and remain in work environments that they experience as supportive and satisfying.

In sum, pattern G reflects a resource-rich pattern in which high engagement grounded in autonomous motivation, effective coping, and well-being not only co-occur but are likely to reinforce one another, contributing to the maintenance of health and high-quality professional performance.

Pattern S

Conceptual Foundations of Pattern S. Pattern S stands for *Schonung* or *sparing personal investment at work*. A distinguishing characteristic of pattern S is the restriction of work-related efforts to the bare minimum. This is reflected in the lowest levels of professional commitment (including subjective significance of work, professional ambition, tendency to exert, and striving for perfection) relative to the other patterns, alongside the highest levels of emotional distancing from work. However, this reduced work engagement should not be interpreted as a consequence of resignation, as coping capacity is satisfactory. This is indicated by average to slightly above-average levels of resignation tendencies, offensive coping with problems, and balance and mental stability. Likewise, pattern S is marked by a positive level of subjective well-being, with average to slightly above-average levels of satisfaction with life, satisfaction with work, and experience of social support, although satisfaction with work tends to be comparatively lower than satisfaction with life. Taken together, the characteristics of pattern S suggest that subjective well-being is primarily derived from sources outside of work rather than from work itself. From an occupational health perspective, pattern S is not health-threatening; however, it may be problematic with regard to professional motivation. From a developmental perspective, pattern S can be understood as the outcome of prolonged exposure to specific work conditions. In this respect, it may either result from insufficient professional challenge or develop as a self-protective attitude in response to unfavorable working conditions, including excessive emotional demands or a psychosocially adverse work environment. In such cases, family life and leisure activities gain subjective significance, while work becomes less central (Kieschke & Schaarschmidt, 2008; Schaarschmidt, 2005; Schaarschmidt & Fischer, 2008; Schaarschmidt & Kieschke, 2007).

Empirical Evidence on Pattern S. Across populations, pattern S is strongly associated with male gender (e.g., Bauer et al., 2006; Mroczek et al., 2017; Römer et al., 2013; Rothland, 2011; Zimmermann et al., 2012). With regard to additional background characteristics, evidence from student populations indicates that pattern S occurs more frequently among individuals who receive higher levels of financial support (Afshar et al., 2022; Rumpler, 2013), whose

parents have attained higher education degrees (Mašková et al., 2025; Rumpler, 2013), and who possess higher levels of cultural capital (Cramer, 2012). With respect to work-related investment, there is consistent evidence of very low engagement and motivation, with motivation also characterized by a lack of autonomous quality. S-type individuals exhibit low (Voltmer et al., 2018) or even the lowest levels of work engagement (Meiseneder, 2015), which is also reflected in the lowest number of hours devoted to both study and work (Mašková & Beer, 2024; Mašková, Szatkowska et al., in press; Rumpler, 2013), low levels of commitment to the profession and organization (Obst & Kötter, 2020; Rothland, 2011; Seibt & Hager, 2019), and a pronounced tendency toward work avoidance (Cramer, 2012). Pattern S is consistently associated with decreased levels of autonomous study- and career-related motivation (Künsting et al., 2012; Mašková et al., 2022 [Study 4]; Nurtdinova, 2025; Reichl et al., 2014), whereas findings on controlled motivation are mixed and appear to be context-dependent. For example, in Czech academics and German students, neither controlled nor autonomous motives were salient (Nurtdinova, 2025; Rothland, 2011). In contrast, studies of Polish teachers report the presence of extrinsic motivation in the form of salary considerations (Olszewski, 2017), while among Czech and Polish teacher education students, career choice motivation related to the low difficulty of the study program was increased, whereas motivation related to extrinsic rewards associated with the teaching profession was decreased (Mašková, Szatkowska et al., in press; Stodolovská, 2025). This motivational profile is also reflected in career-related orientations within workplace contexts, in that S-type individuals attach less importance to promotion prospects and a sense of responsibility (Seibt & Hager, 2019), which is closely associated with lower motivation for, and a lower likelihood of holding, leadership positions (Bartosiewicz & Łuszczki, 2024; Mašková & Beer, 2024; Seibt & Hager, 2019). However, the link between pattern S and study and job satisfaction is less straightforward, with some studies reporting relatively high average levels of satisfaction (Albisser & Kirchhoff, 2007; Schulz et al., 2011), while others suggest that S-type individuals are among the least satisfied (Bartosiewicz et al., 2022; Napora et al., 2017). In terms of personality traits, high levels of agreeableness—exceeding those observed in pattern G—emerge as a distinguishing characteristic of pattern S; a tendency toward low scores on self-consciousness is also salient (Basińska & Dreas, 2011; Cramer, 2012; Reichl et al., 2014). Pattern S has also been positively linked to some adaptive characteristics and personal resources, such as optimism (Mróz, 2014), self-esteem and self-confidence (Voltmer, Spahn, et al., 2011), and forgiveness (Gander et al., 2012), although these tend to be slightly lower in magnitude compared to pattern G. In terms of professional functioning, while the low engagement characteristic of pattern S translates into the smallest

gains in pedagogical knowledge during teacher education (Römer et al., 2017), the instructional quality delivered by S-type teachers can be characterized as mediocre—lower than that of G-type teachers, but still higher than that observed among B-type teachers (Klusmann et al., 2006). With regard to coping and stress experience, S-type individuals generally tend to use adaptive coping strategies more frequently and dysfunctional coping strategies less frequently (Afshar et al., 2022; Albisser & Kirchhoff, 2007; Jäger, 2017; Napora et al., 2017; Voltmer, Thomas, et al., 2011; Voltmer, Köslich-Strumann, Voltmer et al., 2021). However, these tendencies are less pronounced than those observed in pattern G, and occasional contradictory findings have been reported, such as lower levels of positive religious coping among pastors (Voltmer, Thomas, et al., 2011) or reduced use of task-oriented coping among teacher education students (Albisser & Kirchhoff, 2007). Nevertheless, pattern S is consistently associated with low levels of stress (Afshar et al., 2022; Thielmann et al., 2022; Voltmer, Köslich-Strumann, Walther et al., 2021), which in some studies focusing on healthcare professionals were even slightly lower than those observed in pattern G (Korbus et al., 2023; Wollesen et al., 2017). Likewise, S-type individuals exhibit good physical health (Korbus et al., 2023; Voltmer, Thomas, et al., 2011; Voltmer, Köslich-Strumann, Walther et al., 2021), which in several student samples was even slightly better than that observed in G-type individuals (Albisser & Kirchhoff, 2007; Hamdan, 2012; Voltmer et al., 2012). They also display generally good mental health, reflected in low levels of anxiety, depression, and other mental health symptoms (Bauer et al., 2006; Kalani, Maleki Hosseinzadeh, et al., 2023; Obst & Kötter, 2020; Voltmer, Thomas, et al., 2011; Voltmer et al., 2012; Voltmer, Köslich-Strumann, Walther et al., 2021).

Synthesis and Integrative Conclusions. The conceptually defining characteristic of pattern S is very low professional commitment combined with pronounced emotional distancing from work and work-related problems. Empirical evidence closely aligns with this original conceptualization and further enriches it by demonstrating that neither autonomous nor controlled forms of work-related motivation tend to dominate the motivational profile of S-type individuals. Although in some contexts occasional extrinsic motives may become salient, the overall motivational profile is characterized by marked disengagement from work and study activities. Importantly, pattern S has not been linked to amotivation (Nurtdinova, 2025). Within SDT, amotivation refers to a state in which individuals do not act at all or act without intention and is typically associated with feelings of helplessness and inadequacy (Ryan & Deci, 2017). Pattern S does not exhibit these features; rather, its motivational profile is more appropriately understood in terms of low motivational salience than as amotivational. In such a mode,

individuals neither benefit from the energizing effects of autonomous motivation nor incur the psychological costs associated with controlled motivation, which may help explain the relatively stable health and low stress levels observed in this pattern (Ryan & Deci, 2017). The low salience of motivation, regardless of its quality, is theoretically intriguing, as it raises the question of what sustains continued participation in education and employment among S-type individuals. In the absence of a deeper understanding of these processes, it can be speculated that, for pattern S, work and study participation is primarily maintained by normative expectations and/or pragmatic reasoning. Such reasoning may be driven by the avoidance of heightened effort—for example, pursuing higher education may be perceived as less demanding than full-time employment—or by the avoidance of psychological strain, insofar as working with minimal investment may be experienced as less emotionally demanding than confronting the practical or relational difficulties associated with not working.

Overall, S-type individuals tend to cope adequately. Unlike pattern G, however, findings regarding the effectiveness of coping strategies in pattern S are not entirely consistent, and some contradictory results have been reported. Taken together, this evidence is fully consistent with the original conceptualization of pattern S as characterized by sufficient coping capacity, albeit clearly less pronounced than that observed in pattern G. S-type individuals also possess various personal resources that may further support their coping capacities. Although these resources tend to be less pronounced and less diverse than those observed in G-type individuals, they nevertheless appear sufficient to support the overall coping capacity characteristic of pattern S. With respect to well-being indicators, evidence regarding study and job satisfaction is mixed. However, this ambiguity supports the notion that subjective well-being in pattern S is primarily derived from contexts outside work and study. By contrast, perceived stress levels are consistently very low and are accompanied by low levels of physical health complaints—which in some contexts are even lower than those observed in pattern G—as well as low levels of mental health symptoms. Importantly, these low stress levels are likely to reflect less the presence of particularly strong coping capacity and more pronounced psychological detachment from work and work-related problems. In this respect, reduced emotional investment may make demands less salient or less threatening, which in turn may limit stress responses and reduce the need for intensive coping. An additional finding that further enriches the overall picture is the relatively high level of agreeableness, which appears to constitute another distinguishing characteristic of pattern S. This personality trait is closely tied to motives aimed at maintaining positive interpersonal relationships and typically manifests in social adjustment, conflict

avoidance, and the prioritization of social harmony over achievement striving or personal agency (Jensen-Campbell & Graziano, 2001). This profile aligns well with the nature of pattern S, particularly with respect to the reduction of interpersonal stress through conflict avoidance, and suggests that the stress-reducing tendencies characteristic of pattern S are likely not confined to the work context but may also extend to the personal domain. Taken together, the mechanisms described above that contribute to stress reduction are fully consistent with Schaarschmidt's original proposition regarding the self-protective nature of pattern S. Under certain circumstances, this self-protective mode may emerge as an adaptive response to highly stressful and emotionally demanding work environments, as illustrated by the increasing prevalence of pattern S over the course of professional careers in healthcare, as discussed later. However, the present integration also suggests an additional pathway that may help explain the occurrence of pattern S already prior to entry into the profession. Specifically, in some students, pattern S may be facilitated by a relatively advantaged socioeconomic family background, which translates into sufficient financial support and satisfactory material conditions during higher education, with an expected continuation thereafter. Such conditions may substantially reduce the level of effort required to maintain an adequate standard of living, thereby reducing the necessity for strong work- or study-related investment and contributing to the emergence of the characteristic features of pattern S.

Regarding professional outcomes, both the defining characteristics of pattern S and available empirical evidence suggest that, in professions involving a high degree of interpersonal interaction—such as teaching—S-type individuals are likely to be evaluated sufficiently favorably. In the teaching profession in particular, S-type individuals may become "good enough" teachers despite their comparatively lower engagement. This outcome is likely to be supported primarily by their high levels of agreeableness, a trait associated with warmth, empathy, and a cooperative interpersonal style, which may make them likable to pupils and contribute positively to students' emotional well-being. Such qualities may be especially relevant in certain educational contexts, for example when working with younger pupils, where relational and emotional aspects of teaching play a central role. By contrast, in professions that place greater emphasis on tangible performance outcomes and/or productivity, the characteristic features of pattern S are less likely to translate into high levels of professional effectiveness.

In sum, pattern S can be understood as a self-protective pattern whose defining features—low professional commitment, psychological detachment, and sufficient coping capacity reinforced by adaptive personal resources—jointly contribute to stress reduction and

enable stable physical and mental health, despite limited engagement in work and study contexts.

The Hidden Risk Linked to Pattern S. Generally, pattern S has received less attention in the literature, likely due to its low-stress and health-preserving character, which does not call for immediate intervention from an occupational health perspective. Nevertheless, an often overlooked risk associated with pattern S concerns retention, particularly in terms of sustained attachment to the profession and long-term engagement within organizations, alongside other challenges that may arise from motivational deficits translating into low professional and organizational commitment. At this point, it is important to stress the relevance of this issue for teacher education. For example, our findings from Czech and Polish teacher education students indicate that S-type students were less likely to choose teacher education due to beliefs in their teaching abilities, interest in their selected teaching subjects, or extrinsic rewards associated with the profession. They also reported low certainty that teaching was the right career choice for them. Instead, their primary motivation for entering teacher education was the perceived low difficulty of the study program (Mašková, Szatkowska et al., in press; Stodolovská, 2025). This evidence may be complemented by findings on teaching profession–related beliefs among German teacher education students, who perceived teaching as a profession that does not require high levels of expertise and is rather an undemanding career (Rothland, 2011). These integrated findings have important theoretical and practical implications. Specifically, the evidence suggests that S-type teacher education students—consistent with their low-stress, low-effort orientation—are primarily driven by one of two motives. First, some may be attracted by the perceived manageability of the study program and intend from the outset to use the degree in occupational fields outside teaching. Second, others may enter teacher education based on the perception of teaching as an undemanding profession; however, this belief is likely to be challenged and potentially revised once they gain first-hand experience with teaching demands, either during practical placements or after entering the profession. The latter assumption may be supported by follow-up data from a cohort of teacher education students at the University of South Bohemia, assessed in their first year of study (Mašková et al., 2022 [Study 4]) and again in their final year (Stodolovská, 2025). These data suggest that the distribution of AVEM patterns was differentially affected by attrition: while the proportions of pattern G and pattern B remained largely stable, the proportion of pattern S decreased by approximately 7%. Taken together, these findings indicate that S-type teacher education students may have an increased likelihood of either never entering the teaching profession or leaving it shortly after

encountering its demanding nature. Importantly, these findings point to the need for more detailed qualitative investigation, which could help contextualize these attrition patterns and support the design of targeted interventions aimed at strengthening professional commitment among S-type individuals already at the beginning of teacher education.

Pattern A

Conceptual Foundations of Pattern A. Pattern A stands for *Anstrengung* or *ambitious*. The main characteristic of this pattern is excessive professional commitment, reflected in the highest scores on the relevant scales in this domain compared with the other patterns, with the exception of professional ambition, which is high but not as pronounced as in pattern G. Accordingly, subjective significance of work, tendency to exert, and striving for perfection are elevated, whereas ability to distance oneself from work shows the lowest level relative to the other patterns. This indicates that A-type individuals experience the greatest difficulty in detaching from work-related problems. Importantly, this excessive engagement is accompanied by reduced coping capacity and subjective well-being. Although offensive coping with problems remains relatively high, there is also a pronounced tendency toward resignation, along with markedly low internal balance and mental stability. While satisfaction with work is above average, it is not as high as in pattern G despite the higher level of professional commitment. In contrast, satisfaction with life and the experience of social support tend to be average to below average. According to Schaarschmidt, the mismatch between effort and the emotional benefits it brings to the individual closely resembles the concept of occupational gratification crisis. This theoretical model describes an imbalance between strong work investment and adequate rewards, including not only material rewards but also non-material ones such as career opportunities, job security, and social recognition. The imbalance is further maintained and intensified by individual characteristics, particularly a tendency toward overinvestment in work combined with low detachment. Such a constellation triggers stress reactions and, over the long term, increases the risk of stress-related illness, especially cardiovascular disease (Siegrist, 2015). Likewise, Schaarschmidt points to the resemblance between risk pattern A and the concept of Type A behavior as originally described by Friedman and Rosenman (1974), who demonstrated its close association with the development of cardiovascular disease. A key characteristic of Type A behavior is excessive work engagement driven by the striving to accumulate the maximum number of achievements within the shortest possible time, accompanied by constant self-imposed time pressure, pronounced competitiveness, and an inability to relax and psychologically detach from work-related demands. More recent work on

Type A behavior emphasizes the illness-provoking role of negative emotional experiences—such as anger, hostility, and depressive symptoms—that accompany these behavioral manifestations (Richter et al., 2017; Schröder, 1992, as cited in Schaarschmidt, 2005). In line with this updated conceptualization, the combination of excessive engagement and reduced subjective well-being observed in pattern A provides the basis for its designation as risk pattern A in reference to Type A behavior (Kieschke & Schaarschmidt, 2008; Schaarschmidt, 2005; Schaarschmidt & Fischer, 2008; Schaarschmidt & Kieschke, 2007).

Empirical Evidence on Pattern A. Pattern A tends to occur more frequently among women (Afshar et al., 2022; Aouil et al., 2011; Rothland, 2011; Voltmer, Spahn, et al., 2011; Zimmermann et al., 2012). With regard to other background characteristics, pattern A has been associated with indicators of socioeconomic disadvantage (Cramer, 2012), including a lack of financial support among students (Rumpler, 2013) as well as low income and multiple jobholding among workers (Aouil et al., 2011; Mašková & Beer, 2024). In terms of work-related investment, pattern A has been linked to high levels of work engagement, reflected in vigor, dedication, and absorption, although these levels are generally lower than those observed in pattern G (Meiseneder, 2015; Voltmer et al., 2018). In addition, pattern A is associated with the highest number of hours devoted to both study and work (Mašková & Beer, 2024; Mašková, Szatkowska et al., in press; Rumpler, 2013), as well as high levels of professional and organizational commitment, irrespective of the quality of organizational commitment (Obst & Kötter, 2020; Rothland, 2011; Seibt & Hager, 2019). Findings across populations consistently indicate that A-type individuals are predominantly driven by controlled forms of motivation (Nurtdinova, 2025; Reichl, 2014), which are occasionally combined with intrinsic motives (Künsting et al., 2022; Olszewski, 2017). Altruistic motivation was also evident, but predominantly expressed through idealistic, high-impact goals, such as choosing teacher education to promote social equity or to contribute to society at large (Rothland, 2011). Against this high-investment motivational profile, evidence regarding job and study satisfaction is mixed. Across samples, levels of job and study satisfaction tend to range from high (Bartosiewicz et al., 2022; Künsting et al., 2012) to reduced satisfaction (Menge & Gerick, 2026; Schulz et al., 2011). With respect to personality traits, A-type individuals tend to score high on neuroticism—although not as high as B-type individuals—and on conscientiousness (Lüftenegger et al., 2017; Künsting et al., 2012; Römer et al., 2017). In addition, A-type individuals generally exhibit low levels of adaptive characteristics and personal resources, such as sense of coherence (Basińska et al., 2011; Sharaf & Taha, 2019) as well as self-esteem and

self-confidence (Voltmer, Spahn, et al., 2011), although these levels are typically higher than those observed in pattern B. Notable exceptions have been reported for selected character strengths: A-type individuals score relatively high—though still below G-type individuals—on strengths related to restraint, such as persistence, and on intellectual strengths, such as curiosity (Gander et al., 2012). Although the high level of investment translates into the greatest gains in pedagogical knowledge during teacher education (Römer et al., 2017), the instructional quality delivered by A-type teachers tends to be low to mediocre, albeit still higher than that observed among B-type teachers (Klusmann et al., 2006). Similarly, reduced levels of empathy among A-type medical students may indicate potential limitations in future professional performance, particularly given the highly interactional nature of physicians' work (Kötter et al., 2021). With regard to coping and stress experience, pattern A is associated with a reduced use of adaptive coping strategies and an increased reliance on dysfunctional coping strategies, although these tendencies are generally less pronounced than those observed in pattern B (Afshar et al., 2022; Jäger, 2017; Napora et al., 2017; Voltmer, Thomas, et al., 2011; Voltmer, Köslich-Strumann, Voltmer et al., 2021). A notable exception has been reported among Polish nurses, where A-type individuals showed increased use of positive thinking and direct action (Basińska & Andruszkiewicz, 2010). Pattern A is consistently associated with high levels of stress (Afshar et al., 2022; Korbus et al., 2023; Thielmann et al., 2022; Voltmer, Köslich-Strumann, Walther et al., 2021; Wollesen et al., 2017). Moreover, subjective psychological burden tends to exceed that observed in pattern B, either overall (Aster-Schenck et al., 2010) or in specific domains, such as social obligations, daily time management, work–life balance, and partnership-related difficulties (Schröder & Kieschke, 2006). During the COVID-19 pandemic, A-type individuals also reported the highest levels of fear of contagion and perceived the strongest negative impact of the pandemic across multiple areas of life (Voltmer, Köslich-Strumann, Walther et al., 2021). Likewise, physical health among A-type individuals tends to be compromised. Although in most samples A-type individuals do not exhibit levels of physical health impairment as severe as those observed in B-type individuals (Albisser & Kirchhoff, 2007; Hamdan, 2012; Voltmer, Thomas, et al., 2011; Voltmer et al., 2012; Voltmer, Köslich-Strumann, Walther et al., 2021), some exceptions have been reported in the literature. For example, particularly high proneness to musculoskeletal complaints or sensory integration disorders has been observed among healthcare professionals with pattern A (Korbus et al., 2023; Skonieczna-Żydecka et al., 2015). A-type individuals also tend to exhibit poor mental health, reflected in elevated levels of psychological distress and mental health symptoms (Bauer et al., 2006; Kalani, Maleki Hosseinzadeh, et al., 2023; Obst & Kötter, 2020; Voltmer, Thomas, et al., 2011; Voltmer et al.,

2012; Voltmer, Köslich-Strumann, Walther et al., 2021). Finally, empirical findings regarding A-type individuals' willingness to engage in health-related optimization are inconsistent. While some studies report reduced interest in health-promoting strategies (Wolf et al., 2007), others indicate increased interest in stress management and a certain willingness to seek psychological support (Aouil et al., 2011; Buss, 2002).

Synthesis and Integrative Conclusions. The defining characteristic of this pattern is very high professional commitment, expressed in excessive engagement in work- and study-related activities. Empirical evidence further specifies the underlying motivational constellation, indicating a predominance of controlled motivation alongside the presence of autonomous motivation, which, however, appears to be less salient. Likewise, altruistically framed yet overly ambitious and demanding goals and aspirations—such as enhancing social equity or making social contributions—appear to be driven primarily by controlled forms of motivation rather than by self-endorsed values. Based on peripheral findings from Czech samples (Mašková et al., 2022 [Study 4]; Nurtdinova, 2025), it can be further theorized that introjected regulation predominantly shapes the motivational profile of pattern A. This form of motivation is only partially internalized and generates heightened internal pressure to pursue behaviors aimed at maintaining self-worth or avoiding feelings of guilt and shame. While introjected regulation can sustain high effort and persistence over time, even in the absence of external rewards or sanctions, it comes at the cost of depleted vitality, increased stress, and undermined overall well-being (Ryan & Deci, 2017). This motivational constellation aligns well with the overall health-undermining profile of pattern A. In this respect, coping capacity is limited, while adaptive characteristics and personal resources are scarce. The most salient personal resources are related to restraint and intellectual orientation, which, however, are more likely to perpetuate high engagement under pressure than to foster resilience or protect well-being. Accordingly, stress levels are elevated, and both physical and mental health tend to be impaired. Alongside theoretical considerations pointing to an imbalance between strong investment and inadequate rewards, empirical evidence lends further support to this interpretation. Despite high levels of engagement and the comparatively greatest number of hours devoted to work or study, effort does not tend to translate into more tangible outcomes. This is reflected, for example, in student samples, where individuals classified as A-type do not achieve better grades, are not more likely to meet criteria of educational excellence, nor are they more frequently perceived as excellent by teachers (Mašková, 2024 [Study 3]). Similarly, among A-type teachers, high engagement is not associated with superior work-related

outcomes, as their instructional quality tends to be rated as low to mediocre by their pupils. This mismatch is also apparent in subjective assessments of study and job satisfaction, which tend to yield mixed and frequently negative results. Decreased satisfaction may largely be reinforced by an effort-inappropriate low experience of success at work, potentially placing A-type individuals in a state of chronic frustration. However, at least in professions that require high levels of interpersonal interaction and well-developed emotional-regulatory and interactional capacities—capacities that extend beyond the performance-driven orientation characteristic of A-types—a lack of success is hardly surprising. It may, however, be worth investigating levels of experienced success in professions where success is defined by more tangible, quantitatively measurable outputs, as A-type individuals may perform more favorably in such contexts. Although the overall profile of pattern A is predominantly unfavorable, there are some partially encouraging findings suggesting the presence of at least limited personal resources, as well as scarce but existing evidence of positive coping strategies in certain contexts. Similarly encouraging is the observed openness toward psychological support, which renders this pattern relatively malleable and potentially responsive to intervention efforts.

Empirical evidence also points to possible mechanisms underlying assignment to pattern A, with unsatisfactory material circumstances emerging as a potential contributing factor. We argue that among some students, limited financial support—likely linked to family backgrounds characterized by restricted material resources—may necessitate intensive paid work alongside studies in order to cover basic living expenses, thereby promoting the overcommitment characteristic of pattern A. At the same time, this externally imposed pressure may be further reinforced by internalized and/or parental expectations to study intensively in order to secure a "better future", which can be theoretically interpreted as shifting motivational regulation toward pressure-driven, rather than value-based, engagement, consistent with introjected regulation. Over time, this constellation may stabilize high effort combined with limited recovery, which is characteristic of pattern A. Viewed from this perspective, the origins of pattern A may contrast with those of pattern S, as discussed earlier. Likewise, among some workers, characteristics of pattern A may be facilitated by unsatisfactory pay, which can necessitate multiple jobholding. This situation may place individuals under sustained external pressure and gradually promote overcommitment as a means of securing basic living expenses, while simultaneously constraining recovery and depleting personal resources and coping capacities, a configuration consistent with pattern A. Although empirical support for this hypothesis remains limited, a similar mechanism may partly explain the higher prevalence of pattern A among women. In

many European contexts, the combination of paid work and family responsibilities may lead to persistently high demands, which can promote sustained overinvestment and pressure-driven engagement, especially when fulfilling these roles is closely tied to social expectations or self-worth. This, in turn, may increase the likelihood of a configuration consistent with pattern A.

In sum, the defining feature of pattern A is overcommitment and very high engagement grounded predominantly in controlled forms of motivation. Psychological detachment from work is very low, combined with impaired coping capacity and poor physical and mental health. An imbalance emerges between high engagement and both objective work-related outcomes and subjective work- and study-related satisfaction.

Pattern B

Conceptual Foundations of Pattern B. Pattern B stands for *Burnout*. This pattern is characterized by uniformly low manifestations across the relevant areas. Professional commitment is generally low, although not as low as in pattern S, with low scores for subjective significance of work and professional ambition, average to above-average tendency to exert, and below-average levels of striving for perfection and emotional distancing. Thus, although low engagement is a shared characteristic with pattern S, the reduced engagement is not accompanied by increased, but rather by limited, ability to distance oneself from work. Although emotional distancing is not as low as in pattern A, reduced coping capacity and diminished subjective well-being are markedly more pronounced by comparison. The difference between the risk patterns is most pronounced in the area of coping capacity, where pattern B shows the highest tendency toward resignation and the lowest levels of offensive coping with problems, as well as in the area of subjective well-being, where satisfaction with work and life is lowest. In sum, the profile is primarily characterized by resignation, reduced motivation, diminished resilience, experience of excessive challenge, and dissatisfaction. These characteristics mimic the symptoms in the late stages of the burnout syndrome, which is referred to in the designation B (Kieschke & Schaarschmidt, 2008; Schaarschmidt, 2005; Schaarschmidt & Fischer, 2008; Schaarschmidt & Kieschke, 2007). Indeed, the typical manifestations of pattern B reflect the symptoms that have been common for various definitions of burnout, i.e. reduced work engagement, deterioration of well-being, and inability to cope effectively (Guseva Canu et al., 2021). However, as widely agreed upon in the literature, burnout is a gradually developing process, involving both an increase in symptom severity and a growing diversity of symptoms (Burisch, 2006), and a typical starting point for burnout is strong initial

motivation marked by enthusiasm, idealism, involvement, and commitment (Schaufeli & Enzmann, 1998). From a developmental perspective, the burnout process may be mirrored by a transition from pattern A to pattern B. Although this transition is the most frequent one, transitions from pattern S to pattern B are also common, as is the occurrence of pattern B already at professional entry (and, as presented throughout this thesis, pattern B is increasingly prevalent even at entry into higher education). Moreover, this pattern may occasionally occur in an episodic manner, particularly in connection with major life events (Schaarschmidt & Fischer, 2008). Thus, pattern B should not be fully equated with burnout. Although the AVEM inventory has been listed as one of the alternative measures of burnout available for German-speaking populations—since it assesses burnout-like constructs, with pattern A reflecting an "active" burnout and pattern B a "passive" burnout in later stages (Burisch, 2006)—Schaarschmidt and colleagues did not intend it to function as a burnout measure. Instead, pattern B is referred to in the literature as an indicator of increased risk for burnout development or of burnout proneness (or vulnerability) (e.g., Künsting et al., 2012).

Empirical Evidence on Pattern B. With respect to background characteristics, although the associations are less consistent, pattern B tends to occur more frequently among women (Bauer et al., 2006; Künsting et al., 2012; Seibt & Hager, 2019; Voltmer, Spahn, et al., 2011; Zimmermann et al., 2012). In student samples, some evidence indicates links to disadvantaged socioeconomic conditions, including low socioeconomic status (Cramer, 2012), limited financial support (Afshar et al., 2022; Rumpler, 2013), and parental education. Although this relationship does not appear to be linear, the lowest proportion of B-type students was observed among those whose parents had higher education, whereas the highest proportion was found among students whose parents—particularly fathers—had elementary education (Rumpler, 2013). With respect to work environment factors, individuals assigned to pattern B report the least favorable perceptions of their workplace climate (Korbus et al., 2023) and show an increased exposure to workplace bullying (Adams et al., 2016; Góralewska-Słońska, 2019). In terms of work-related investment, B-type individuals exhibit low levels of work engagement and professional commitment (Albisser & Kirchhoff, 2007; Obst & Kötter, 2020; Rothland, 2011), alongside high levels of organizational commitment primarily driven by extrinsic factors (Seibt & Hager, 2019). They consistently show decreased autonomous motivation (Nurtdinova, 2025; Mašková et al., 2022 [Study 4], 2025), alongside increased controlled motivation predominantly driven by extrinsic motives (Reichl et al., 2014; Olszewski, 2017). A recurrent observation among B-type teachers and teacher education students is that teaching was not their

preferred choice (Mašková, Szatkowska et al., in press), but was instead chosen accidentally (Olszewski, 2017) or as a fallback career due to a lack of other available options (Rothland, 2011). Consistent with this motivational and career-related profile, pattern B is generally linked to the lowest levels of job and study satisfaction (Menge & Gerick, 2026; Rothland, 2011; Rumpler, 2013; Schulz et al., 2011; Voltmer et al., 2018). The emotional experience of B-type individuals is characterized by a combination of low positive and high negative affectivity (Hofmann & Kohlmann, 2019) and reduced emotional regulation (Hofmann et al., 2022). With respect to personality traits, a distinguishing characteristic of pattern B is very high levels of neuroticism, alongside very low levels of extraversion and conscientiousness (Basińska & Dreas, 2011; Lüftenegger et al., 2017; Muszalska et al., 2007; Reichl et al., 2014; Römer et al., 2017). In addition, B-type individuals consistently exhibit the lowest levels of various adaptive characteristics and personal resources, including self-efficacy (Bartosiewicz et al., 2022; Bauer, 2019; Meiseneder, 2015), sense of coherence (Basińska et al., 2011; Sharaf & Taha, 2019), religiosity and spirituality (Gander et al., 2012; Voltmer, Thomas, et al., 2011), optimism (Mašková et al., 2025; Mašková, Szatkowska et al., in press; Mróz, 2014), as well as the majority of character strengths assessed using the Values in Action Inventory of Strengths (Gander et al., 2012). All of the above-mentioned adverse characteristics are also reflected in problematic professional functioning. B-type individuals display low levels of work ability (Voltmer et al., 2018); B-type teacher education students tend to lack beliefs, expectations, interests, and competencies necessary for the teaching profession (Albisser & Kirchhoff, 2007; Deiglmayr et al., 2018; Kaub et al., 2014; Meier, 2015); and, as teachers, they tend to deliver instruction of the lowest quality (Klusmann et al., 2006). Similarly, B-type medical students tend to show low levels of empathy (Kötter et al., 2021), and as physicians, they exhibit low levels of competence in intimate professional interactions (Mroczek et al., 2017). Reduced suitability for high-quality professional performance is further underscored by the comparatively lowest levels of emotional intelligence observed among B-type soldiers (Basińska et al., 2007). With regard to coping and stress experience, pattern B is consistently associated with the lowest use of adaptive coping strategies and the highest reliance on dysfunctional coping strategies (Afshar et al., 2022; Albisser & Kirchhoff, 2007; Basińska & Andruszkiewicz, 2010; Jäger, 2017; Voltmer, Thomas, et al., 2011; Voltmer, Köslich-Strumann, Voltmer et al., 2021). In addition, pattern B is consistently linked to the highest levels of stress across populations (Afshar et al., 2022; Korbus et al., 2023; Thielmann et al., 2022; Voltmer, Köslich-Strumann, Walther et al., 2021; Wollesen et al., 2017). Likewise, physical health among B-type individuals tends to be the most impaired (Albisser & Kirchhoff, 2007; Hamdan,

2012; Voltmer, Thomas, et al., 2011, Voltmer et al., 2012; Voltmer, Köslich-Strumann, Walther et al., 2021). A similar pattern is observed for mental health, with B-type individuals consistently showing the highest levels of anxiety, depression, and other mental health symptoms (Bauer et al., 2006; Kalani, Maleki Hosseinzadeh, et al., 2023; Obst & Kötter, 2020; Voltmer, Thomas, et al., 2011; Voltmer et al., 2012; Voltmer, Köslich-Strumann, Walther et al., 2021). Notably, B-type individuals tend to show the lowest interest in stress management (Buss, 2002) and are least likely to seek psychological support, such as consulting a mental health professional (Aouil et al., 2011).

Synthesis and Integrative Conclusions. Pattern B is associated with the least favorable characteristics among the four patterns. It is characterized by very low professional commitment, which empirical evidence consistently links to exclusively controlled forms of motivation, with little to no presence of autonomous motives. This is particularly evident in teacher education, where career choice motivation among B-type individuals appears especially problematic. Rather than being guided by genuine interest in the profession or by personally endorsed values, the choice of study often reflects a "last-resort" decision, driven by external circumstances such as limited alternatives. From the SDT perspective, such a last-resort decision likely reflects low satisfaction of the need for autonomy, under conditions in which controlled motivation typically predominates. The broader profile of pattern B is consistent with the well-documented consequences of controlled motivation. Because engagement is not grounded in self-endorsed values or interest, controlled motivation often fails to sustain involvement over time and is associated with lower-quality functioning and compromised well-being (Ryan & Deci, 2017). Coping capacity is very low, with a predominance of maladaptive coping strategies, and there are hardly any personal—or interpersonal—resources, as reflected in insufficient social support, available to help individuals cope with demands. This reflects a state of pronounced resource depletion, which makes the overall picture of low coping capacity particularly concerning. Stress levels are high, and both physical and mental health tend to be impaired. Individuals are highly dissatisfied and display a predominantly negative emotional tone. It is therefore unsurprising that professional suitability, as well as work-related outcomes, tend to be poor, especially in fields with high levels of interpersonal interaction, as B-type individuals clearly lack critical socio-emotional resources, particularly emotional intelligence and its core components, such as empathy and emotional regulation. It is also hard to imagine a professional domain in which work-related outcomes would not be impaired by low engagement and overall resource depletion. However, among students, the relatively

comparable levels of academic achievement observed across patterns may be interpreted as a relative "success," given the otherwise adverse characteristics of pattern B (Mašková, 2024 [Study 3]). Among the most concerning findings is the reduced willingness of individuals assigned to pattern B to engage in psychological treatment, which may create a paradoxical situation in which interventions fail to reach those who need them most (this issue is discussed further in the General Discussion).

With respect to the origins of pattern B, there is some evidence suggesting that, among certain students, an overall unfavorable family background may underlie assignment to this pattern. Although the available evidence remains limited, it can be speculated that, unlike in pattern A, not only material disadvantage but also a broader set of adverse conditions may be involved—conditions that could negatively affect socio-emotional development during formative years. In workplace contexts, there is evidence pointing to adverse working conditions, such as bullying, and the burnout-like state associated with pattern B may represent a consequence of negative or even traumatizing work experiences. However, in the absence of longitudinal evidence, it cannot be ruled out that characteristics brought into the workplace by B-type individuals may increase their exposure to such negative experiences, or that B-type individuals may be more sensitive to interpersonal difficulties, perceiving and evaluating them more negatively than would be suggested by objective assessments.

In sum, pattern B represents a resource-depleted pattern characterized by low professional commitment grounded in controlled motivation. Weak coping capacity, limited personal and interpersonal resources, and compromised well-being co-occur, resulting in impaired physical and mental health, as well as low professional suitability and unfavorable work-related outcomes.

Pattern B as a Burnout Vulnerability Indicator. The main conceptual challenge in interpreting pattern B lies in clarifying its relationship to burnout. Specifically, it remains unclear to what extent pattern B overlaps with burnout and, if it cannot be equated with burnout, what type of risk constellation it represents. On the one hand, pattern B exhibits manifestations resembling late-stage burnout, and transitions into pattern B most often occur from pattern A, consistent with the burnout developmental process. On the other hand, frequent transitions from the unambitious pattern S and the substantial prevalence of pattern B already before career entry deviate from the conventional conceptualization of burnout as a process emerging primarily from prolonged excessive work engagement. In this respect, available cross-sectional findings

suggest that the association between pattern B and burnout symptoms assessed with the Maslach Burnout Inventory (MBI) is relatively weak, as reflected by Pearson correlation coefficients below .50 and by the finding that individuals with a full expression of pattern B typically report only "occasional burnout symptoms" (Thielmann et al., n.d.). Taken together, while conceptual similarities between the two constructs exist and pattern B may overlap with burnout in some individuals, pattern B neither conceptually nor empirically constitutes burnout.

Although further research is needed to clarify how pattern B overlaps with burnout or other related constructs and to better understand its developmental pathways, available evidence suggests that pattern B can be regarded as an indicator of vulnerability to burnout and other occupational health problems, representing a high-risk state for the long-term development of burnout. From a theoretical perspective, the key underlying mechanism of pattern B–related vulnerability may lie in a lack of coping capacities or the predominance of ineffective coping strategies. In this regard, ineffective coping appears to play a dual role: it is both a symptom of burnout (e.g., You, 2015) and a precursor to its development. Evidence for its antecedent role is provided, for example, by Tartas et al. (2016), who demonstrated that low levels of active coping and high resignation tendencies at the beginning of medical education predicted physician burnout over a 10-year period. As grounded in the transactional theory of stress, stress arises when individuals encounter demands that tax or exceed their perceived ability to manage them. The resulting accumulation of stress, in turn, endangers mental and physical health and increases the likelihood of burnout development (Lazarus & Folkman, 1984). An additional aggravating factor characteristic of pattern B is a state of severely depleted resources, including diminished personal and adaptive capacities, insufficient social support, and reduced emotional resources such as positive affect and satisfaction. This condition is further exacerbated by low work engagement, which limits individuals' ability and motivation to actively restore depleted resources. From the perspective of the Conservation of Resources theory and the Job Demands–Resources model of occupational health, such a state is likely to trigger loss spirals. Already depleted resources reduce individuals' capacity to prevent further losses, thereby increasing stress. This process may initiate self-reinforcing cycles in which accumulating demands are ineffectively coped with, leading to heightened perceptions of overload and further resource loss, for example through fewer experiences of success and declining self-efficacy. If an already stressed individual is exposed to sustained stressful conditions—as is characteristic of both higher education and teaching professions—this

accumulation of stress is highly likely to translate into burnout, as well as other mental and physical health problems (Bakker & de Vries, 2021; Hobfoll et al., 2018).

Factors Influencing Pattern Distribution

Profession-Related Pattern Differences

Profession plays an important role in pattern distribution, as already postulated in the initial work by Schaarschmidt and colleagues. In their investigations of pattern distributions across occupational groups, teachers emerged as the most vulnerable professional group, with risk patterns prevailing over the healthy pattern. In this seminal work, Schaarschmidt and colleagues reported that approximately 60% of German teachers were assigned to the risk patterns, with an almost equal distribution between pattern A and pattern B (Schaarschmidt, 2005). More recent empirical findings clearly confirm that educators, as a broader professional group, tend to be among the most vulnerable, although this association appears to be moderated by country. In this respect, teachers from non-European countries—such as Turkey, Iran, and Russia—predominantly displayed healthy patterns, particularly pattern G (Gençer et al., 2010; Kalani, Asanjarani, et al., 2024; Kiremitci & Gençer, 2014; Mikhailova, 2017). In contrast, European teachers showed a reversed trend, with risk patterns prevailing over healthy ones (Bartosiewicz et al., 2022; Voltmer et al., 2007). Within the broader field of education, higher education lecturers appear to be among the most vulnerable professional groups, showing a pronounced tendency toward the risk pattern A (Lalymenko et al., 2020; Stukalkina, 2021; Sharaf & Taha, 2019; Thielmann et al., 2021). In contrast, special school staff tend to be among the least vulnerable within this field, exhibiting comparatively high proportions of healthy patterns, particularly pattern S (Adams et al., 2016). Professional differences in the prevalence of risk patterns are already evident during university studies. Although comparisons are less straightforward due to the limited number of studies including students from different professional fields and those conducted outside German-speaking populations, it has been clearly shown that teacher education students display risk patterns more frequently than medical students (see Mašková, 2023 [Study 2]). In line with these findings, healthcare professionals tend to display a higher proportion of healthy patterns compared to those working in education. Within European contexts in particular, paramedics stand out as the professional group in which the healthy pattern G most consistently prevails (Bartosiewicz & Łuszczki, 2024; Mroczek et al., 2017; Muszalska et al., 2007; Schnell et al., 2023; Thielmann et al., 2022). Although consistent data on professional groups beyond education and healthcare are scarce, the most

favorable pattern distributions reported to date were observed among Polish drivers, 73% of whom displayed healthy patterns (Horoszkiewicz, 2011), as well as among German police officers (Voltmer et al., 2007) and employees in the financial services sector (Voltmer et al., 2018), with 66% of participants in both samples assigned to healthy patterns.

Cross-Country Pattern Differences

Although the vast majority of studies were conducted in Germany, which makes cross-country comparisons of pattern distributions less straightforward, several tendencies nonetheless emerge. As discussed in the previous section, respondents from non-European countries generally tend to exhibit a higher prevalence of healthy patterns than their European counterparts (Gençer et al., 2010; Kalani, Asanjarani, et al., 2024; Kiremitci & Gençer, 2014; Mikhailova, 2017). However, because data on pattern distributions from non-European countries mainly concern teachers, broader country-level generalizations are largely not possible. At the European level, by contrast, indications of an East–West differentiation in pattern distribution can be observed, although further empirical evidence is still needed. Overall, compared with German-speaking samples (i.e., from Germany, Austria, and Switzerland), participants from Eastern European countries tended to show a higher prevalence of risk patterns—particularly pattern A—alongside a lower prevalence of healthy patterns, especially pattern S. This tendency was evident among Polish medical professionals (Mroczek et al., 2017; Muszalska et al., 2007) and teachers (Bartosiewicz et al., 2022), as well as among Ukrainian physicians, police officers, and higher education teachers (Böckelmann et al., 2024; Shvets et al., 2020; Thielmann et al., 2021). Strikingly, such tendencies were already apparent in the initial AVEM investigations conducted by Schaarschmidt and colleagues. Based on data collected between 1995 and 2002, these studies revealed the above-described tendency—namely, a pronounced inclination toward pattern A at the expense of pattern S—among teachers from German federal states that had formerly been part of the Eastern Bloc. This tendency was even more pronounced among teachers from Russia, Poland, and Czechia, where pattern A clearly emerged as the dominant pattern (Schaarschmidt, 2005). Notably, these East–West differences appear to persist, albeit in a less pronounced form, even more than 30 years after these foundational findings and therefore warrant further systematic investigation.

Pattern Stability and Temporal Change

In this section, we review the temporal stability of work-related patterns, focusing on their persistence and natural transitions over time in the absence of targeted intervention. From

the perspective of the individual AVEM scales, Schaarschmidt and colleagues reported test–retest reliability estimates based on data from several large samples of German teachers and nurses followed over periods of two to four years. The test–retest coefficients indicated moderate stability of the AVEM scales (ranging from .33 to .76), with balance and mental stability showing the highest coefficients and life satisfaction the lowest. In addition, the authors examined the stability of pattern assignment in a three-year follow-up study of 427 individuals, including teachers, nurses, entrepreneurs, managers, and teacher education students. In this respect, assignment to pattern G remained stable for 55% of individuals initially classified in this pattern. Among the remaining participants, 28% transitioned to pattern S, 12% to pattern A, and 5% to pattern B. Pattern S showed a stability rate of 52%, with 24% of individuals transitioning to pattern G, 7% to pattern A, and 17% to pattern B. Pattern A remained stable in 59% of cases, while 12% transitioned to pattern G, 10% to pattern S, and 19% to pattern B. Pattern B exhibited the lowest stability, with 46% of participants remaining in this pattern, whereas 11% transitioned to pattern G, 29% to pattern S, and 14% to pattern A. Overall, the findings indicate that AVEM patterns combine moderate stability with a substantial degree of malleability, likely driven primarily by situational and contextual factors. Spontaneous transitions may occur in both directions—toward less desirable as well as more desirable patterns. Importantly, the authors report that such changes were largely confined to tendential pattern assignments, whereas full pattern assignments (≥ 95%) showed only rare changes (Schaarschmidt & Fischer, 2008).

Nevertheless, a different picture emerged when analyzing a teacher subsample separately (n = 134). In this group, pattern stability over the three-year follow-up was generally higher, and when pattern changes occurred, they predominantly reflected transitions toward less desirable patterns. Specifically, pattern G remained stable in 50% of individuals, whereas 28% transitioned to pattern A. Pattern S showed high stability, with 73% of individuals remaining in this pattern and 20% transitioning to pattern B. Pattern A remained stable in 55% of cases, while 26% transitioned to pattern B. Pattern B exhibited the highest stability, with 74% of individuals remaining in this pattern and 12% transitioning to pattern S (Schaarschmidt, 2005). Further empirical evidence confirms that pattern change tends to be more profession-specific than generic. In this respect, pattern distribution during teacher education appears relatively stable, with only a slight increase in pattern S observed over a four-year follow-up (Grözinger & Föster, 2016). By contrast, after entry into the teaching profession, a gradual increase in risk patterns at the expense of healthy patterns has been reported (Schaarschmidt, 2005). In contrast, a six-

year longitudinal study of medical students reported a much more pronounced increase in pattern S, accompanied by decreases in patterns G and A (Voltmer, Köslich-Strumann, Voltmer et al., 2021). Although evidence on pattern change across physicians' careers remains limited, a longitudinal study of nurses suggests a comparable career-related trend among healthcare professionals, characterized by gradual increases in pattern S and decreases in risk patterns (Voltmer et al., 2013).

In sum, pattern change appears to be highly profession-specific, a fact that should be taken into account in future research. The available evidence points to a heightened vulnerability among teachers—at least in comparison to healthcare professionals—not only in terms of an initially less favorable pattern distribution already observable during teacher education, but also with regard to a greater tendency to transition toward risk patterns over time.

Intervention-Induced Changes in Pattern Distribution

In this section, we report and summarize findings from studies that examined the effects of different types of interventions on pattern assignment across different participant target groups. In one of the earliest systematic investigations of intervention-related pattern change, Schaarschmidt and Fischer (2008) report results from a 3-year follow-up of 176 individuals (drawn from a larger sample of occupational groups identical to the 427 individuals described in the previous section) who, in the meantime, had undergone some type of psychological intervention lasting at least six weeks. At the group level, the proportion of participants classified in pattern G increased by approximately 11 percentage points post-intervention, whereas the proportions of pattern S, pattern A, and pattern B decreased by about 1, 6, and 4 percentage points, respectively. Inter-individual pattern stability was highest for pattern G (83%), followed by pattern S (57%), pattern B (46%), and pattern A (34%), with transitions most frequently occurring toward pattern G across all initial patterns. Comparisons with inter-individual pattern stability in non-intervened individuals suggest that pattern S and—particularly—pattern B exhibit similar levels of stability irrespective of intervention exposure, pointing to limited responsiveness to intervention. By contrast, pattern G tended to stabilize under intervention conditions, whereas pattern A appeared comparatively more susceptible to change.

Schaarschmidt and colleagues further reported intervention-related pattern changes following the *Potsdam Training Model* program for teachers and teacher education students (Schaarschmidt & Kieschke, 2007). This group-based program comprised seven thematic

modules: (1) AVEM diagnostics with individualized feedback, (2) analysis of personal stress sources, (3) training in stepwise problem-solving strategies, (4) time and self-management, (5) development of social-communicative skills, (6) goal setting and goal planning, and (7) relaxation techniques. The intervention was delivered either in a weekly format or as an intensive block program. Among in-service teachers who participated in the program (n = 103), the proportion of participants classified in pattern G increased by approximately 5 percentage points and pattern S by about 9 percentage points, whereas pattern A decreased by about 9 percentage points and pattern B by about 6 percentage points. Among early-career teachers in the second phase of teacher training (*Referendariat*; n = 98), the proportion of participants classified in pattern G increased by approximately 11 percentage points, pattern S increased slightly by about 2 percentage points, whereas pattern A decreased by about 2 percentage points and pattern B by about 11 percentage points. The strongest effects were observed among teacher education students (n = 366), with the proportion of participants classified in pattern G increasing by approximately 11 percentage points and pattern S by about 13 percentage points, whereas pattern A decreased by about 9 percentage points and pattern B by about 15 percentage points. From an individual-level perspective, the healthy patterns in this sample showed relatively high stability, with inter-individual stability rates of 75% for pattern G and 84% for pattern S. In contrast, the stability of the risk patterns was markedly lower, with inter-individual stability rates of 39% for pattern A and 28% for pattern B, indicating a high susceptibility of these patterns to intervention-induced change. For teacher education students, an alternative intervention program was developed by Çelebi et al. (2014). The eight-week program *Strengthened for the Teaching Profession* was based on the formulation of individual, profession-related developmental goals derived from a prior self-assessment of personal strengths and weaknesses. Participants (n = 164) systematically worked toward these goals using a structured action plan, documented their progress in a learning diary, and reflected on goal attainment during follow-up sessions. In the combined strengths–weaknesses intervention group, inter-individual pattern stability was highest for pattern G (73%), followed by pattern S (65%) and pattern B (31%), and was lowest for pattern A (10%). At the group level, the proportion of participants classified in pattern G increased substantially by 28 percentage points, whereas pattern S decreased by 4 percentage points. In contrast, reductions were observed for the risk patterns A and B, both of which declined by 12 percentage points. Although broadly comparable pattern transitions emerged at the level of aggregated healthy (G and S) versus risk (A and B) patterns when contrasted with the Potsdam Training Model, the Strengthened for the Teaching Profession program yielded a more pronounced increase in

pattern G among teacher education students, suggesting that this intervention may be particularly well suited for this target group (Çelebi et al., 2014; Schaefer, 2012).

Evidence is also available for intervention programs targeting other populations. For the healthy general population (n = 72), a self-paced online intervention program lasting approximately six weeks was developed, drawing on cognitive-behavioral principles, salutogenesis, positive psychology, and self-efficacy theory (Weber, 2014). From an intra-individual perspective, pattern G showed low stability, with only 14% of participants remaining in this pattern; the most frequent transition occurred toward pattern S (43%). In contrast, pattern S was highly stable, with 83% of participants remaining in this pattern, with transitions occurring only infrequently. Pattern A exhibited comparatively low stability, with 37% remaining in this pattern; the most frequent transition was toward pattern B (30%). Pattern B, in turn, showed moderate stability, with 63% of participants remaining in this pattern, with transitions most frequently occurring toward pattern S (26%). At the group level, changes in pattern distribution indicated an increase of approximately 2 percentage points in pattern G and 14 percentage points in pattern S, accompanied by a marked decrease of about 16 percentage points in pattern A and a slight decrease of about 1 percentage point in pattern B. Another intervention targeting a healthy adult population (n = 69) involved a six-week eurythmy therapy program comprising rhythm-based whole-body movements coordinated with breathing, complemented by spatial, speech-sound, and simple movement exercises, and concluding with brief meditative movement sequences (Kanitz, 2011). At the group level, 24% of participants initially assigned to one of the risk patterns transitioned to one of the healthy patterns over the course of the intervention. Further evidence is available from specialized intervention programs targeting psychosomatic patients undergoing treatment in inpatient clinical settings. In this respect, Koch et al. (2006) evaluated a 16-hour, job-focused group therapy program delivered within a cognitive-behavioral inpatient treatment setting among psychosomatic inpatients (n = 109). Following the intervention, the proportion of participants classified in pattern G increased by approximately 2 percentage points and pattern S by about 15 percentage points, whereas pattern A decreased by around 4 percentage points and pattern B by about 14 percentage points. Schaarschmidt (2005) reported results from a comparable intervention—a standard inpatient rehabilitation program—conducted in a rehabilitation clinic and based on data from 84 in-service teachers. Following the intervention, the proportion of participants classified in pattern G decreased by approximately 4 percentage points, whereas pattern S increased by about 15 percentage points; pattern A decreased by around 4 percentage points and pattern B by about 7 percentage points. In teachers (n = 126), very similar results were observed following a

sabbatical year, defined as one full school year free from teaching duties. By the end of the sabbatical, the proportion of teachers classified in pattern G increased by approximately 1 percentage point and pattern S by about 10 percentage points, whereas pattern A decreased by around 4 percentage points and pattern B by about 6 percentage points. These changes were largely maintained six months after the end of the sabbatical (Rothland, 2013).

In sum, intervention-induced pattern changes indicate that work-related patterns are largely malleable, implying a substantial degree of correctability of the risk patterns. Across nearly all intervention conditions, healthy patterns tend to increase, while risk patterns tend to decrease. The susceptibility of individual patterns to change, however, differs markedly, and intervention effects depend to a large extent on the target population, whereas the type of intervention appears to play a lesser role—although no firm conclusions can be drawn given the substantial heterogeneity of intervention designs. Across populations, pattern A exhibits comparatively low stability under intervention and frequently transitions directly to pattern G, suggesting a high responsiveness to intervention. In contrast, pattern B tends to be less responsive to intervention, showing high levels of stability across mixed occupational samples, in-service teachers, and psychosomatic patients. Likewise, pattern S emerges as the most stable pattern across occupational groups and also as a frequent transition target for individuals originally assigned to other patterns, as reflected in the pronounced post-intervention increases in pattern S at the group level. This constitutes an important observation, pointing to a gap in current intervention designs, which are primarily aimed at correcting risk patterns. Although pattern S is generally considered healthy, it is associated with specific, often overlooked risks (as discussed in the respective section). Accordingly, the lack of targeted and effective interventions addressing pattern S also warrants attention. From a population perspective, students clearly emerge as the most responsive group, showing the largest increases in pattern G and—unlike other populations—a comparatively low stability of pattern B, resulting in its most pronounced decrease.

Integrative Summary of Evidence Specific to the Educational Context

The research evidence provides a relatively consistent picture of professionals in education as showing the overall riskiest profile in the European context, especially in countries of the former Eastern Bloc. Compared with other professional groups, they tend to display the highest proportion of risk patterns, a tendency that is already apparent during teacher education, that is, even before entry into the profession. Moreover, teachers tend to transition toward risk

patterns more frequently than other occupational groups. Although findings on intervention-related correction of risk patterns are generally encouraging, outcomes indicate only modest improvements among in-service teachers. In contrast, during teacher education the malleability of risk patterns appears to be substantial when interventions are implemented at this stage. Given the preventive focus of the AVEM diagnostic instrument, teacher education students represent a particularly important target group for future research aimed at informing preventive efforts.

Current Gaps and Limitations in AVEM Research

While AVEM has proven to be a valuable and widely applied instrument, several conceptual, methodological, and empirical gaps remain in AVEM research that need to be addressed in future studies. First and foremost, AVEM's potential is constrained by the still limited number of studies conducted outside German-speaking populations. Although research in culturally different contexts does exist, its scope remains small, and cross-cultural studies directly comparing AVEM findings across different cultural backgrounds are extremely scarce. Accordingly, the reproducibility of the AVEM typology in non-German-speaking populations remains unclear. In this respect, it is worth noting that this limitation may, to a large extent, be attributable to the limited accessibility of key sources, as discussed earlier. Another important limitation concerns the small number of longitudinal studies examining the long-term development of AVEM patterns. As a result, the predictive value of AVEM diagnostics for occupational health, although theoretically well grounded and plausible, remains largely theoretical rather than empirically established. As discussed in the previous section, longitudinal research would be particularly valuable for clarifying how pattern B relates to the development of burnout, as well as to other occupational health problems, over time.

The Present Thesis

The specific aim of the empirical part of this thesis is to address some of the previously identified gaps and limitations in AVEM research, with a particular focus on the educational context. The core of the thesis comprises six studies published in international journals, each of which contributes to addressing these gaps. The first study (Warchałowski et al., 2025) aims to collect and synthesize research conducted with Polish samples, a substantial part of which is available only in Polish. This study is crucial for identifying research relevant to the educational context and for examining whether such evidence allows meaningful comparisons with findings from German-speaking samples, thereby extending AVEM research in education beyond a

solely German-speaking context to a broader European level. The second study (Mašková, 2023) focuses on synthesizing research conducted with student samples, providing comparisons of AVEM pattern distributions across different fields of study and summarizing correlates of the distinct patterns. Its overarching aim is to make findings that are largely available only in German accessible to an international audience. Studies three to six aim to extend AVEM research beyond German-speaking populations. The third study (Mašková, 2024) examines AVEM pattern distributions among Czech students across study programs, with particular attention to the role of academic excellence. The fourth study (Mašková et al., 2022) is a pilot study comparing AVEM pattern distributions across Czech and German teacher education students, while also exploring the role of motivation in pattern assignment from the SDT perspective. The fifth study (Mašková, Beer, et al., in press) represents a follow-up cross-country investigation examining AVEM pattern distributions among European teacher education students from Austria, Germany, Czechia, Slovakia, and Poland, with the aim of replicating the AVEM typology in a cross-cultural context. Finally, the sixth study (Mašková & Beer, 2025) examines AVEM pattern distributions among Czech and Austrian higher education teachers according to field of specialization. Taken together, the six studies systematically address key gaps in AVEM research and offer an integrated view of AVEM patterns within a broader European educational context. The studies are presented in a systematic order to ensure the thematic and conceptual coherence of the thesis, rather than following the chronology of publication. All co-authors of the included studies have expressed their consent to the inclusion of these studies as part of the present habilitation thesis.

Study 1

Study 1 is a published article:

Warchałowski, W., Mašková, I., & Buršíková, D. (2025). Occupational vulnerability profiles in the Polish workforce: A narrative review of AVEM-based research. *International Journal of Occupational Medicine and Environmental Health*, *38*(5), 434–456. https://doi.org/10.13075/ijomeh.1896.02642

(Indexed in Web of Science; Impact Factor [2024] = 1.4; Q3 in Public, Environmental & Occupational Health; Open Access)

This study is a review of AVEM research conducted with Polish populations. Based on structured database searches and complementary manual searches, it identifies and synthesizes findings on AVEM pattern distributions and correlates across occupational groups in Poland, drawing on all available empirical sources reporting AVEM distributions and/or AVEM correlates ($N = 29$). In doing so, the study addresses the lack of consolidated knowledge on the distribution of AVEM patterns in Polish populations and their comparison with international findings. This gap has largely resulted from limited accessibility due to language barriers, the dispersion of relevant studies across different fields, and publication in outlets with low international visibility. With respect to the overarching aim of this thesis, this study allows for the identification of findings specific to the Polish educational context and for their comparison at both the intra-national and international levels.

The study was first-authored by a student supervised by the author of this thesis. The author of this thesis is the corresponding author of the study and was primarily responsible for the conceptualization of the study, the development of the methodology, the interpretation of the findings, manuscript preparation, and supervision of the author team. Overall, she was involved in all essential stages of the study except for the literature search. Her contribution amounts to approximately 45% of the total work.

REVIEW PAPER

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OCCUPATIONAL VULNERABILITY PROFILES IN THE POLISH WORKFORCE: A NARRATIVE REVIEW OF AVEM-BASED RESEARCH

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Highlights
- Polish populations display increased vulnerability to occupational health issues.
- Professionals in people-centered occupations and women are among the most vulnerable.
- Having an additional job and living in smaller towns or villages are risk factors.
- Having a hobby and better perceived material standing are protective factors.

Abstract
The inventory *Work-related Coping Behavior and Experience Patterns* (*Arbeitsbezogenes Verhaltens- und Erlebensmuster* – AVEM) serves as a valuable preventive tool for the early identification of individuals at risk of burnout and occupational health issues by evaluating their work-related patterns, which may be either health-promoting or indicative of increased health risk. The aim of this narrative review was to map and synthesize research on AVEM conducted in Poland across occupational groups. A structured search of selected databases and search engines was performed, resulting in the identification of 29 sources whose findings were synthesized and compared with international evidence. The results showed that the overall proportion of Polish participants assigned to risk patterns was significantly higher than in the international context, particularly among teaching and healthcare professionals, indicating greater vulnerability to burnout and occupational health issues in these occupations. Beyond people-centered professions, women, older workers, individuals with an additional job, those living in smaller towns and villages, and those experiencing mobbing also emerged as highly vulnerable groups. These individuals also tended to be extrinsically motivated and exhibited higher levels of neuroticism, elevated stress, and poorer mental and physical health. In contrast, having a hobby and a better perceived material standing were mainly associated with healthy patterns. Individuals assigned to healthy patterns tended to be intrinsically motivated and reported higher job satisfaction, greater levels of fluid and emotional intelligence, and more adaptive personality traits. There is a clear need for targeted workplace interventions across professions in Poland to address the heightened risk of occupational health issues.
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Key words:
prevention, burnout, occupational health, vulnerability, Polish workforce, work-related patterns

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INTRODUCTION

A national report published in 2024 revealed alarming findings regarding the occupational health of the Polish workforce. Nearly 80% of working Poles reported experiencing ≥1 symptom of burnout, representing a 13-percentage-point increase from approx. 65.3% reported 3 years earlier. The most commonly reported symptom was persistent fatigue or lack of energy, affecting 43.4% of respondents [1]. These findings point to a growing threat to occupational health in Poland, likely driven by global economic uncertainty and rapid technological advancements that blur the boundaries between personal and professional life, heighten employer expectations regarding constant availability, and limit opportunities for recovery. Since these challenges are more likely to intensify than diminish in the near future, the focus of practitioners and researchers should shift toward preventive measures – particularly the early identification of individuals who may be especially vulnerable to developing occupational health issues, followed by targeted interventions to enhance their resilience to work-related stress. In this context, the concept of work-related coping behavior and experience patterns, together with its corresponding inventory, serves as a valuable preventive tool for assessing typical work-related behavior and experience patterns that may signal vulnerability to burnout and other occupational health issues, especially when problematic patterns persist without timely intervention [2]. The *Arbeitsbezogenes Verhaltens- und Erlebensmuster* (AVEM) inventory [3], which has also been referred to as the *Work-related Coping Behavior and Experience Patterns* (WCEP) [4,5], the *Measure of Coping Capacity* (MECCA) [6,7], or the *Occupational Stress and Coping Inventory* [8] in some English-language publications, assesses 11 dimensions across 3 areas. These include:

- professional commitment (subjective significance of work, professional ambition, tendency to exert, striving for perfection, emotional distancing);
- coping capacity (resignation tendencies, offensive coping with problems, balance and mental stability);
- subjective well-being (satisfaction with work, satisfaction with life, experience of social support).

Specific work-related patterns – validated across multiple studies and offering valuable insights for targeted occupational health interventions – are identified by analyzing scores across these dimensions and assigning individuals to 1 of 4 profiles derived through cluster analysis. Two profiles (G and S) are health-promoting, while 2 (A and B) indicate health risks:

- healthy ambitious (G): high ambition, balanced emotional distancing, strong coping skills, and well-being. These individuals achieve quality work without compromising leisure;
- unambitious (S): low professional commitment but adequate coping and well-being, indicating no health risks but low motivation;
- excessively ambitious (A): high work significance and exertion, low emotional distancing, weak coping, and poor well-being. This profile resembles workaholism and increases risks for occupational health issues, particularly cardiovascular issues;
- resigned (B): low commitment, ineffective coping (e.g., resignation), and poor well-being. This profile resembles late-stage burnout symptoms and increases risks for occupational health issues, burnout, and psychosomatic issues in particular [2,3].

These pattern descriptions refer to fully developed prototypes with >95% similarity to the respective reference profile. However, such clear cases are relatively rare. According to Schaarschmidt and Fischer [2], 5 levels of pattern expression can be distinguished:

- full (similarity >95%),
- accentuated (>80% and ≤95%),
- tendential (>50% and ≤80%, no second pattern >30%),
- combined (2 patterns >80%, the weaker pattern >30%),
- non-classifiable (no clear assignment).

The AVEM questionnaire was adapted to Polish cultural conditions and validated on a sample of 616 workers in various helping professions. The Polish version of the AVEM questionnaire, labeled *Kwestionariusz do badania indywidualnych wzorców zachowań i przeżyć związanych z pracą*, showed good psychometric qualities [9]. Since the Polish adaptation of the AVEM instrument became available, a growing number of empirical studies have applied it across diverse professional groups in Poland. However, these studies remain dispersed across various fields and are less accessible, as many have been published in lower-visibility sources, such as national journals not indexed in major international databases or institutional book chapters. As a result, there is a lack of consolidated knowledge on how AVEM patterns are distributed in the Polish workforce, or how they relate to occupational, psychological, and health-related variables. This fragmentation limits both the theoretical integration and the practical application of the findings. The aim of this review is to identify existing Polish research in a structured way, synthesize it, and ultimately integrate it into the broader body of international AVEM research. The review adopts a narrative approach based on structured database and manual searches, with the goal of mapping and synthesizing findings on AVEM patterns across occupational groups in Poland, drawing on all available empirical sources that report AVEM distribution and/or AVEM correlates, without limiting the scope to a specific time frame. Accordingly, the research question underpinning the review was formulated as follows: What insights does existing AVEM research provide regarding AVEM distribution across occupational groups in Poland, and what are the key correlates that act as risk or protective factors influencing (un)healthy work-related patterns? By bringing together findings that have remained scattered, the review aims to reveal broader trends, highlight country-specific risk and protective factors, and enhance the potential of AVEM-based research to inform occupational health policy and targeted interventions in the Polish context.

METHODS

Eligibility criteria

The review includes all literature that utilized the AVEM inventory in the Polish workforce and reported the distribution of the 4 AVEM patterns described in [3] and/or their correlates. Studies in English or Polish were considered, while those that did not assign participants to the AVEM pattern typology were excluded. The authors included studies using all above-described levels of AVEM pattern expression, as long as a primary classification into the 4 AVEM patterns (G, S, A, B) was provided.

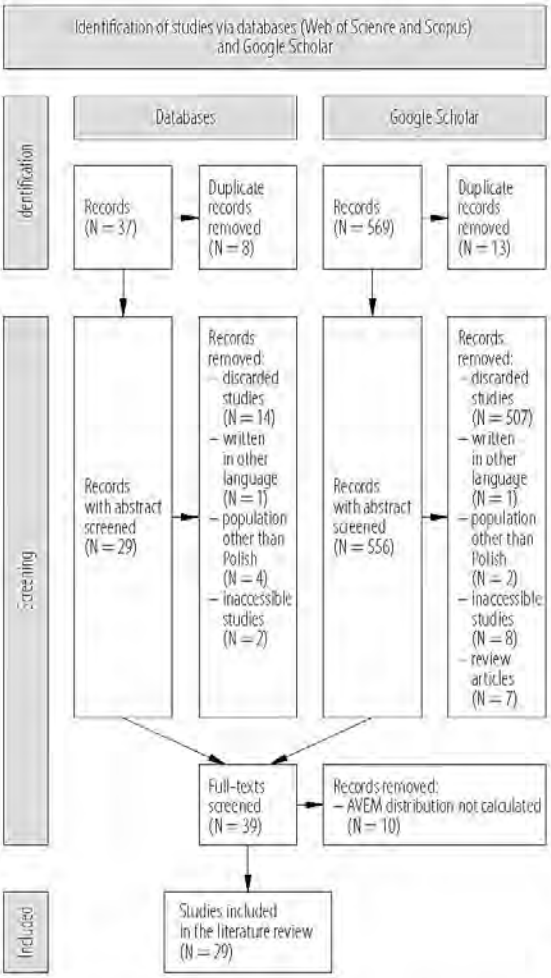
Search strategy

To identify relevant literature, key terms related to the AVEM instrument were combined with terms referencing the Polish workforce and searched in databases (Web of Science and Scopus) and the Google Scholar search engine. The Boolean search string used in the database queries was as follows: ("Arbeitsbezogenes Verhaltens- und Erlebensmuster" OR "work-related coping behavio?r and experience patterns" OR "AVEM" OR "WCEP" OR "wzorce zachowań i przeżyć związanych z pracą") AND ("Polish" OR "Poland" OR "Polska" OR "kwestionariusz").

No date restrictions were applied during the search; all available studies meeting the inclusion criteria were considered regardless of publication year. The searches were conducted between June 27 and September 13, 2024, with the upper limit of the inclusion period reflecting the time at which the review was conducted.

Study selection process

The database search identified 37 articles, and Google Scholar returned 569 records. Abstracts were manually screened for relevance, ensuring studies were accessible, utilized the AVEM questionnaire, were not review articles, focused on the Polish workforce, and were written in Polish or English. Duplicates were also removed during this process, excluding 29 records from the database search and



Adapted from PRISMA Statement [10].

Figure 1. A flowchart of the search strategy of the studies on the early identification of individuals at risk of burnout and occupational health issues published 2007–2024 and included in the review, search conducted June–September 2024

538 from the Google Scholar search. Subsequently, full texts were analyzed to confirm the inclusion of AVEM pattern typology calculations and/or investigations of pattern correlates. This step excluded an additional 10 studies, resulting in a final total of 29 works. Refer to Figure 1 for a flowchart illustrating the literature selection process. Detailed data from the included records are provided in Table 1.

Narrative thematic synthesis

To organize the findings across studies, the authors used a narrative thematic approach in which categories were developed inductively. During the data extraction process, recurring topics and correlates of AVEM patterns were identified and grouped into 15 thematic domains to enable a structured synthesis of results. These thematic domains included:

- profession,
- gender,
- age,
- partnership and personal life,
- education,
- socioeconomic characteristics,
- length of professional experience,
- type of workplace and work environment,
- job satisfaction,
- work motivation,
- intelligence,
- personality traits,
- adaptive characteristics,
- stress and coping strategies,
- mental and physical health.

RESULTS

The 29 studies included in the review were published in 2007–2024, reflecting the range of results from the unrestricted search. Across the included studies, a generally consistent approach to AVEM pattern classification was observed. Most studies applied a method based on the identification of the most dominant AVEM pattern, which corresponds to the tendential classification level (similarity >50%) and reflects the default procedure provided by the AVEM authors and implemented in the standardized scoring algorithm [2]. This method was either explicitly stated or could be inferred from the reported data. Only 2 studies diverged from this approach: Betke et al. [19] classified participants only when the probability of assign-

Table 1. A summarised overview of the studies on the early identification of individuals at risk of burnout and occupational health issues published 2007–2024 and included in the review, search conducted June–September 2024

Reference	Data collection period	Sample characteristics	Pattern distribution	Findings on AVEM correlates
Aouil et al. [11,12]	n.a.	employees in social services, education, administration, healthcare, and other sectors (N = 1000, 76.3% females, age M±SD 40.67±9.84 years)	– full sample: G = 30%, S = 22%, A = 24%, B = 24% – social services: G = 24%, S = 6%, A = 48%, B = 22% – educational sector: G = 27%, S = 28%, A = 26%, B = 19% – administration: G = 37%, S = 19%, A = 26%, B = 18% – healthcare: G = 29%, S = 24%, A = 19%, B = 28% – other sectors: G = 30%, S = 15%, A = 32%, B = 23%	– gender: women (↑ A/B) – seeking psychological help (↑ G/S/A, ↓ B) – prior psychological consultations (↑ G/A) – having an additional job (↑ A/B) – having a hobby (↑ G, ↓ B) – length of professional experience (↑ G/S) – marital status, income, age (G = S = B = A)
Bartosiewicz et al. [13]	May 25–June 24, 2021	primary and secondary school teachers (N = 412, 65.38% females, age M±SD 41.7±8.36 years)	G = 11.62%, S = 7.75%, A = 32.20%, B = 48.43%	– self-efficacy (↑ G/A, ↓ S/B) – job satisfaction (G > A > B > S) – age: <37 years (↑ G/A, ↓ S/B), 38–47 years (↑ B, ↓ G) – length of work experience: <5 years (↑ G, ↓ B), 5–15 years (↑ B, ↓ G/S/A) – position: certified teacher (↑ B, ↓ G), contract teacher (↑ A, ↓ S/B), trainee teacher (↑ B, ↓ G), appointed teacher (↑ G, ↓ A/B)
Bartosiewicz and Łuszczki [14]	beginning of 2022	nurses (N = 795, 100% females, age M±SD 40.89±10.47 years)	G = 11.19%, S = 11.19%, A = 30.19%, B = 47.43%	– work experience: 6–10 years compared to 1–5 years (↑ G) – education: master's degree compared to secondary education (↑ G) – place of work: private sector and primary health care compared to hospital (↓ S), outpatient specialist care compared to hospital (↑ A, ↓ S) – having an additional training course (↑ A) – career anchors: leadership (↓ S), challenge (↑ G) – job satisfaction (↑ G, ↓ B) – career anchors: security and stability, lifestyle, service and commitment to others (G = S = A = B)
Basińska et al. [15]	n.a.	soldiers (N = 141, 0% females, age M±SD 33±10 years)	G = 32.9%, S = 28.3%, A = 23.7%, B = 15.0%	emotional intelligence (↑ G, ↓ B)

Basińska and Andruszkiewicz [16]	n.a.	nurses working in hospital (N = 150, 100% females, age M±SD 40.11±7.16 years)	G = 9.8%, S = 31.8%, A = 16.4%, B = 42.0%	– positive thinking (G/A > B) – direct action (G/S/A > B) – seeking help (G > B)
Basińska and Dreas [17]	n.a.	military officers (N = 112, 0% females, age M±SD 33.7±10.4 years)	n.a.	– neuroticism (↑ A/B, ↓ G) – extraversion (↑ G, ↓ S/A/B) – openness (↑ G, ↓ B) – agreeableness (↑ S, ↓ A/B) – conscientiousness (↑ G, ↓ S/B)
Basińska et al. [18]	2006–2007	nurses (N = 331, 100% females, age M±SD 34.15±6.61 years)	G = 25%, S = 16%, A = 31%, B = 28%	– manageability (↑ G/S, ↓ B) – comprehensibility (↑ G/S, ↓ B) – meaningfulness (↑ G/S, ↓ A/B) – sense of coherence (↑ G/S, ↓ A/B)
Betke et al. [19]	November 2015–June 2016	nurses (N = 150, 100% females, age M±SD 41.34±8.82 years)	G = 10%, S = 22%, A = 2.67%, B = 15.33% non-classifiable 50%	– somatic symptoms (↑ A) – anxiety and insomnia (↓ G) – symptoms of depression (↑ B) – general mental health (↓ G) – social functioning disorders (G = S = A = B)
Drozd [20]	June 2020–April 2021	social workers (N = 150, 87.6% females, age M±SD 42.52±9.72 years)	G = 18%, S = 30%, A = 2.67%, B = 49.33%	emotional exhaustion, depersonalization, and personal accomplishment (G = S = A = B)
Góralewska-Słońska [21]	2nd half of 2017	employed full-time and part-time students of psychology, management, logistics, economics and management and production engineering (N = 180, 68.3% females, age M±SD 27.30±7.79 years)	G = 24%, S = 27%, A = 23%, B = 26%	– mobbing (↑ B, ↓ G) – masculinity (↑ G, ↓ B) – femininity (↑ B, ↓ S)
Haor et al. [22]	November–December 2012	nurses (N = 100, 100% females)	G = 26%, S = 16%, A = 22%, B = 36%	n.a.
Horoszkiewicz [23]	2008–2009	drivers (N = 1022, 2.94% females)	G = 61%, S = 12%, A = 23%, B = 4%	n.a.
Horoszkiewicz and Korchut [24]	n.a.	drivers (N = 188, 0% females, age M±SD 37.7±11.3 years)	G = 58.39%, S = 13.18%, A = 24.14%, B = 4.85%	– fluid intelligence (↑ S, ↓ A) – age (↑ A, ↓ S)
Jachimowicz-Wołoszynek et al. [25]	March–June 2009	nurses (N = 106, 100% females, age M±SD 40±7 years)	G = 16%, S = 22%, A = 21%, B = 41%	hospital wards (G = S = A = B)
Karabanowicz [26]	n.a.	teachers of public and special schools (N = 80, 93.75% females, age M±SD 42.38±8.83 years)	G = 0%, S = 6.2%, A = 3.8%, B = 90%	– task-oriented coping style (↓ A) – emotion-oriented coping style (↑ S, ↓ B) – avoidant style, distraction, seeking social contact, type of school (G = S = A = B)

Table 1. A summarised overview of the studies on the early identification of individuals at risk of burnout and occupational health issues published 2007–2024 and included in the review, search conducted June – September 2024 – cont.

Reference	Data collection period	Sample characteristics	Pattern distribution	Findings on AVEM correlates
Krajnik et al. [27], Muszalska et al. [7]	January 2005–June 2006	palliative care specialists (N = 79) and other medical practitioners (N = 223, 33% surgeons, 38% general practitioners, 29% anaesthetists)	– palliative care specialists: G = 30%, S = 14%, A = 38%, B = 18% – surgeons: G = 27%, S = 11%, A = 47%, B = 15% – general practitioners: G = 20%, S = 16%, A = 40%, B = 24% – anaesthetists: G = 25%, S = 15%, A = 25%, B = 35%	– mental health (↑ G/S [palliative specialists only]) – neuroticism (↑ B, ↓ G/S) – extraversion (↑ G, ↓ B) – openness (↑ G, ↓ B) – conscientiousness (↑ G, ↓ B) – agreeableness (G = S = A = B)
Mariańczyk and Otrębski [29]	n.a.	individuals with disabilities enrolled in a job preparation course (N = 46, 41.3% females)	G = 13%, S = 5%, A = 3%, B = 5%, non-classifiable = 75%	– social adaptation (↑ G, ↓ A/B)
Mroczek et al. [30,31]	2015–2016	medical workers (N = 432, N_{AVEM} = 424, 33.49% physicians, 37.73% nurses, 28.77% paramedics, 69% females, age M±SD 33.6±11.7 years)	– full sample: G = 31.8%, S = 19.1%, A = 24.1%, B = 25% – paramedics: G = 45.9%, S = 22.1%, A = 18.0%, B = 13.9% – nurses: G = 28.1%, S = 21.3%, A = 21.9%, B = 28.8% – physicians: G = 23.9%, S = 14.1%, A = 37.7%, B = 30.3%	– gender: women compared to men (↓ S) – level of general social competence (↑ G) – level of competence in intimate situations (↓ B) – age; years in the profession; years in the previous job (G = S = A = B)
Mróz [32]	n.a.	nurses (N = 183, 100% females, age M±SD 43.5±5.97 years)	G = 19%, S = 11%, A = 43%, B = 27%	– overall resilience (↑ G, ↓ B) – determination (↑ G, ↓ B) – openness and humor (↑ G, ↓ B) – coping competence (↑ G/S, ↓ B) – failure tolerance (↑ G/S, ↓ B) – optimism (↑ G/S, ↓ B) – total perceived stress (↑ B, ↓ G) – emotional tension (↑ B, ↓ G/S) – intrapsychic stress (↑ B, ↓ G) – external stress (↑ B, ↓ G)

Napora et al. [9]	n.a.	nurses (N = 372, 50% single mothers, 100% females, age M±SD 44.49±7.96 years)	– single mothers: G = 15%, S = 26%, A = 21%, B = 39% – mothers from 2-parent families: G = 22%, S = 24%, A = 20%, B = 34%	– help-seeking strategy (↑ G) – avoidance/resignation strategy (↓ S [single mothers only]) – work satisfaction (↑ G, ↓ B [entire sample], ↓ S [single mothers only])
Olkiewicz and Andruszkiewicz [33]	n.a.	neurological nurses (N = 50, 98%, age M±SD 35.82±6.99 years)	G = 12%, S = 30%, A = 17%, B = 41%	– educational level (↓ S) – material standing (↑ G) – job satisfaction (↑ G, ↓ B) – religious belief (↑ G) – place of residence: smaller towns/villages (↑ B)
Olszewski [34]	n.a.	special school teachers (N = 100, 92% females, age M±SD 43.65±10.46 years)	G = 35%, S = 24%, A = 22%, B = 16%	motives for work in the beginning: – G: top 3: M5, M17, M16; bottom 3: M2, M7, M9 – S: top 3: M5, M17, M16; bottom 3: M7, M4, M9 – A: top 3: M5, M16, M15; bottom 3: M2, M9, M7 – B: top 3: M5, M17, M7; bottom 3: M11, M4, M9 motives to continue work: – G: top 3: M5, M16, M17; bottom 3: M13, M7, M2 – S: top 3: M17, M5, M15; bottom 3: M4, M2, M7 – A: top 3: M14, M16, M5; bottom 3: M13, M2, M7 – B: top 3: M5, M6, M15; bottom 3: M9, M2, M4 – M9 (↑ G) – M2 (↑ B) – external factors (↑ A/B)
Ronginska and Doliński [35,36]	2014–2016	mid-level managers in public companies (N = 2164)	G/S/A = n.a., B = 9.15%	n.a.
Skonieczna-Żydecka et al. [37]	December 2014–January 2015	paramedics (N = 31.0% females)	G = 48.4%, S = 25.8%, A = 12.9%, B = 12.9%	sensory integration disorder (↑ A, ↓ G)
Zawadzka [38]	2015–2019	prison staff in their second year of preparatory service (N = 102, 27.5% females)	G = 62%, S = 34%, A = 3%, B = 1%	n.a.

n.a. – not available.

N_{AVEM} – number of participants out of the entire sample for whom the pattern assignment is available.

The sample characteristics refer to the entire sample and may slightly deviate from the characteristics of the subsample for which the pattern assignment is available. Only correlates with a clearly defined association with the pattern assignment were included in the overview. Totals of pattern distribution may deviate from 100% due to rounding imprecisions.

Codes for motives for work: M2 – no motive/accidental choice, M4 – the desire to achieve or maintain a certain social position, M5 – willingness to work with people who need help, M6 – convenient working hours, M7 – the need for a career change, M9 – unwillingness to change profession, M11 – rewarding salary, M13 – family tradition, M14 – creative nature of work, M15 – pursuing an interesting career, M16 – interest in disability, M17 – a passion for work involving direct contact with others.

ment exceeded 80%, corresponding to the accentuated and full levels, while Mariańczyk and Otrębski [28] used an even stricter threshold of >95%, equivalent to full expression only. As a result, both studies reported a number of non-classifiable individuals whose profiles did not meet the defined cut-off. The reviewed research on AVEM has primarily focused on Polish professionals in people-oriented occupations, such as medical staff, social workers, and teachers [11–14,22,29–31]. Additional studies have examined soldiers [15,17], police officers [19], students [21], drivers [23,24], individuals with disabilities [28], managers [34,35], and prison staff in preparatory service [37]. The following sections summarize the findings of AVEM research within the Polish workforce.

Profession

The distribution of work-related patterns varies significantly across occupations. People-oriented professions – such as teaching, social work, and healthcare – exhibit a notably higher prevalence of risk patterns A and B. For example, up to 93.8% of teachers displayed these risk patterns [26], alongside 52–70% of social workers [12,20]. Within the healthcare sector, the proportion of nurses exhibiting risk patterns ranged from 50.7% [29,30] to 77.62% [14]. Among physicians, the prevalence ranged from 56% [28] to 68% [29,30]. In contrast, paramedics demonstrated the lowest tendency toward risk patterns among medical professionals, with up to 74.8% classified under healthy work patterns [36]. Occupations such as professional driving, service work, and administrative roles also exhibit a more favorable distribution of work-related patterns. For instance, 62% of prison staff [37] and 61% of drivers [23] were assigned to the healthy pattern G. Moreover, only 9% of managers were classified under the least desirable risk pattern B [34,35].

Gender

Research indicates significant gender differences in the distribution of work-related patterns. Among medical staff, men are more frequently assigned to pattern S [29,30], whereas women in various professions tend to be assigned more often to patterns A or B [11]. Similarly, research on students from various academic disciplines revealed a positive association between femininity and pattern B, as well as a negative association between femininity and pattern S. Conversely, masculinity was positively linked to pattern G and negatively linked to pattern B. These findings suggest that femininity may be a risk factor for unhealthy patterns, whereas masculinity may serve as a protective factor [21].

Age

The relationship between work-related patterns and age remains inconclusive, though some evidence suggests a growing tendency toward risk pattern assignment with increasing age. Studies have found no significant association between age and AVEM pattern among professionals in education, social work, public administration, or healthcare [11,29,30]. Among teachers, younger individuals were more frequently assigned to patterns G and A, both indicative of strong professional motivation, while older teachers showed a greater propensity for pattern B [13]. Similarly, in the case of drivers, the likelihood of assignment to pattern S declined with age, whereas the probability of exhibiting pattern A increased [24].

Partnership and personal life

The association between partnership and work-related patterns is less straightforward. Aouil et al. [11] found no significant differences in pattern distribution based on marital status among individuals employed in various sectors. In contrast, research [9] suggests that relationship status may influence work-related patterns among nurses who are mothers, as single mothers were slightly more likely to be classified under risk patterns compared to their counterparts in 2-parent households. Additionally, engaging in a hobby was associated with a greater likelihood of being assigned to pattern G and served as a protective factor against pattern B [11].

Education

Research on nurses has also provided insights into the relationship between work-related patterns and education. In Poland, nurses can attain 1 of 3 educational levels: secondary medical education, a bachelor's degree, or a master's degree in nursing [38]. Bartosiewicz and Łuszczki [14] found that nurses with a master's degree were more likely to be assigned to pattern G. In contrast, lower educational levels were associated with a higher likelihood of being assigned to pattern S [32]. Additionally, completing further training courses, such as a nursing specialization course, was linked to a greater tendency toward pattern A [14].

Socioeconomic characteristics

There appears to be a relationship between work-related patterns and socioeconomic factors, such as personal income, having an additional job, and place of residence. Although no association was found between work-related patterns and the nominal value of income among professionals from various occupations [11], a positive perception of one's own material standing among nurses was associated with an increased likelihood of pattern G [32]. In contrast, having an additional job was linked to an increased tendency toward risk patterns among individuals in various occupations [11]. Regarding place of residence, nurses living in smaller towns or villages were more frequently assigned to pattern B compared to those living in larger cities [32].

Length of professional experience

Length of professional experience, or the number of years in a profession, plays a role in explaining pattern distribution, though the relationship is not linear and varies by profession. Although among medical professionals, neither years in the profession nor years in the previous job differentiated between patterns [29,30], research on individuals in various professions indicates that more experienced workers are generally less vulnerable, with a higher proportion classified into healthy patterns [11]. Similarly, a moderate length of professional experience (6–10 years) was associated with a higher likelihood of being assigned to pattern G in nurses compared to their early-career counterparts [14]. In contrast, early-career teachers exhibited the healthiest pattern distribution, which tended to become less favorable as their careers progressed. In addition, different professional statuses reflecting the level of seniority were associated with varying distributions of work-related patterns. Appointed teachers most frequently displayed pattern G, contract teachers tended toward pattern A, while both trainee and certified teachers showed an increased tendency toward pattern B [13].

Type of workplace and work environment

The specific type of workplace appears to influence work-related patterns. Although no statistically significant differences were found in pattern distribution among teachers working at different types of schools [26] or among nurses in different hospital wards [25], working in a hospital increased the likelihood of being assigned to pattern S, while employment in outpatient specialist care was associated with pattern A [14]. An adverse working environment – especially mobbing, defined as persistent negative communicative actions directed at an individual – negatively affects pattern distribution. Specifically, Góralewska-Słońska [21] found that experiencing mobbing decreases the likelihood of being assigned to pattern G and increases the likelihood of being assigned to pattern B.

Job satisfaction

Research has clearly confirmed that job satisfaction, among nurses and teachers, is associated with pattern G and serves as a protective factor against pattern B [9,13,14,32]. Among nurses who were single mothers, job satisfaction also protected against pattern S [9].

Work motivation

Research on the link between work-related patterns and work motivation was conducted with Polish special school

teachers. Olszewski [33] found that while certain motivations are common among teachers assigned to different patterns – such as cognitive, personal, and ideological motives at the beginning of their careers, including a desire to help people, interest in disability, and a passion for working with others – motives evolve over time and differ across patterns. Teachers assigned to pattern G are more likely to be motivated by a long-term commitment to their careers. In contrast, teachers assigned to pattern S are primarily motivated by a competitive salary, which remains a significant factor throughout their careers. For these individuals, passion for working with people and salary are key motivators for staying in the profession. Teachers assigned to pattern A, at the start of their careers, are driven by external factors like workplace proximity or salary. Later, their motivation shifts toward attaining social rank, pursuing creative work, and opportunities for knowledge acquisition and skill development. On the other hand, teachers assigned to pattern B are primarily motivated by external factors such as workplace convenience or flexible hours. Notably, 38% of teachers assigned to pattern B reported that their initial decision to pursue a teaching career was accidental [33]. A different perspective is offered by Bartosiewicz and Łuszczki [14], who investigated career anchors – i.e., personal values and motivations guiding individuals' career decisions – among nurses. They found that while career anchors related to security and stability, lifestyle, and service and commitment to others did not differentiate among work-related patterns, pattern S was associated with a lower level of the leadership career anchor, and pattern G was linked to a higher level of the challenge career anchor.

Intelligence

Available research has also explored the relationship between work-related patterns and intelligence, specifically fluid intelligence and emotional intelligence. Higher levels of fluid intelligence, which reflect an individual's cognitive abilities, were associated with pattern S, while lower levels were linked to pattern A in professional drivers [24]. The potential link between emotional intelligence – defined as the ability to understand one's own and others' emotions – and work-related patterns was examined in professional soldiers. This study found that higher levels of emotional intelligence were associated with pattern G, whereas lower levels were linked to pattern B [15].

Personality traits

The relationship between work-related patterns and personality was examined using the Big 5 personality traits model, which defines personality in terms of extraversion, conscientiousness, openness, agreeableness, and neuroticism. In both military officers and medical staff, pattern G was associated with higher levels of extraversion, openness, and conscientiousness, as well as lower levels of neuroticism. Lower levels of neuroticism were also observed in pattern S. Both patterns S and A were linked to lower levels of extraversion, with pattern A additionally showing higher levels of neuroticism and lower levels of agreeableness. Lastly, pattern B was associated with higher levels of neuroticism and agreeableness, and lower levels of extraversion, openness, and conscientiousness [7,17].

Adaptive characteristics

Research has also explored the association between work-related patterns and several adaptive characteristics, including sense of coherence, religious belief, resilience, self-efficacy, and social adjustment. Specifically, teachers assigned to patterns G and A tended to exhibit higher self-efficacy, whereas those assigned to patterns S and B displayed lower or average levels of self-efficacy [13]. Sense of coherence and its dimensions were positively associated with healthy patterns G and S, and negatively associated with risk patterns A and B in nurses [18]. Religious belief was also positively correlated with the healthy pattern G [32]. With respect to resilience, pattern G was positively related to determination, openness, coping competence, failure tolerance, and optimism, whereas

pattern B was negatively linked to these characteristics. Pattern S was positively associated with coping competence, failure tolerance, and optimism [31]. Regarding social adjustment, research on individuals with disabilities enrolled in a job preparation course found that individuals assigned to pattern G were better adjusted than those in patterns A and B [28]. Finally, it was revealed that social skills play a role in pattern distribution: whereas pattern G was linked to an increased level of general social competence, pattern B was linked to a decreased level of competence in intimate situations among medical workers [29,30].

Stress and coping strategies

The level of stress experienced by individuals and the coping strategies they use in dealing with such stress significantly differentiate among work-related patterns. In nurses, general stress levels – as well as levels of emotional tension, intrapsychic stress, and external stress – were higher in those assigned to pattern B and lower in those assigned to pattern G. Additionally, decreased emotional tension was observed in nurses assigned to pattern S [31]. With respect to coping strategies, positive thinking, direct action, and help-seeking were positively linked with pattern G and negatively linked with pattern B. In addition, positive thinking and direct action were also higher in pattern A, and direct action in pattern S [9,16]. Furthermore, in nurses who were single mothers, pattern S was linked to a decreased tendency toward the avoidance/resignation strategy [9]. In teachers, pattern S was associated with an increased tendency to adopt emotion-oriented coping, whereas in pattern B, this tendency was decreased. Pattern A, on the other hand, was linked to a decreased tendency to adopt task-oriented coping. Other coping styles – such as avoidant style, distraction, and seeking social contact – did not differentiate among the patterns [26].

Mental and physical health

Research shows that there is a clear link between aspects of mental and physical health and work-related patterns. Specifically, in nurses, higher scores on the *General Health Questionnaire* (GHQ-28), indicating poorer mental health, were associated with a decreased tendency toward pattern G. Additionally, pattern B was linked to symptoms of depression, while pattern A was associated with somatic symptoms. In contrast, individuals assigned to pattern G were less likely to experience anxiety and insomnia [19]. Among palliative care specialists, better mental health was associated with the healthy patterns G and S [27]. Nevertheless, symptoms of burnout were not associated with pattern distribution in social workers [20]. An interesting finding reported by Aouil et al. [11] is that individuals from various professions assigned to patterns G and A were more likely to have had prior psychological consultations, whereas those assigned to pattern B were less inclined to seek psychological support, such as consulting a mental health professional. With respect to physical health, Skonieczna-Żydecka et al. [36] found that paramedics assigned to pattern G exhibited fewer symptoms of sensory processing disorder compared to paramedics assigned to pattern A.

CONCLUSIONS

The aim of this review was to identify empirical studies that have employed the AVEM inventory specifically within the Polish workforce and to synthesize findings related to the distribution of the 4 work-related patterns – pattern G (healthy ambitious), pattern S (unambitious), pattern A (excessively ambitious), and pattern B (resigned) – as well as their correlates. A total of 29 studies published in 2007–2024 were identified and analyzed.

To situate the integrated findings from Polish AVEM-related research within the broader body of empirical evidence – primarily derived from German-speaking populations – the authors adopt a comparative perspective aimed at identifying key similarities and differences across contexts. To better understand the key findings, the authors interpret them through relevant theoretical frameworks drawn from occupational and health psychology.

Consistent with international results [3], Polish professionals in people-centered occupations – especially in teaching and healthcare – appear especially vulnerable to burnout and other occupational health issues, as indicated by the high prevalence of risk patterns A and B. However, a notable difference emerges when Polish data are compared with German findings: the proportion of individuals assigned to the risk patterns is significantly higher in the Polish context. For example, even among the most vulnerable group, teachers, approx. 60% of German teachers fell into the risk patterns [3], whereas in several Polish samples, the proportion reached 80% [13] or even exceeded 90% [26]. This discrepancy also aligns with earlier AVEM research [39], which noted a strong tendency toward the risk patterns in teachers in former Eastern Bloc regions, including Poland. A similar trend is observed among nurses: while 42% of German nurses were assigned to the risk patterns [3], the corresponding proportion in Polish samples ranged from 50.7% [29,30] to as high as 77.62% [14]. Strikingly, these alarmingly high rates of vulnerability are not observed across all occupational groups in Poland. In sharp contrast to the situation of teachers and nurses, >70% of Polish drivers [23,24] and >90% of prison staff [37] displayed healthy patterns. This profession-specific contrast suggests that not all sectors are equally affected and points to deeper structural and occupational drivers of these differences. An interpretative framework is offered by the social determinants of health (SDH) theory, which suggests that health inequalities are socially produced and that individual health outcomes are shaped by broader socioeconomic and cultural conditions [40]. The disproportionately high vulnerability observed among Polish teachers and healthcare professionals, compared to both their German counterparts and other Polish occupational groups, may reflect long-standing structural disadvantages affecting public-sector professions in post-socialist contexts – such as chronic underinvestment, low pay, precarious job conditions, and policy inconsistency. These broader disadvantages are also reflected in everyday working conditions, which can be further understood through the job demand–control–support (JDCS) model. This model suggests that vulnerability increases when high job demands are combined with low autonomy and insufficient social support [41]. From this perspective, Polish teachers face growing parental and societal expectations, an increasing bureaucratic workload driven by regulatory changes, and limited autonomy due to strict oversight by local education authorities [42,43]. A similar situation affects Polish nurses, who manage demanding workloads resulting from staff shortages and have little professional independence, as their role typically involves following physicians' orders rather than making autonomous decisions [44,45]. These occupational profiles reflect the high-strain work environments described by the JDCS model and illustrate how broader structural conditions and everyday working conditions combine to increase the risk of adverse occupational health outcomes.

Further insights come from studies examining individual and psychosocial correlates of the AVEM patterns. The well-documented trend of increased vulnerability among women has been confirmed in Polish samples, where both being female and possessing feminine traits were associated with the risk patterns A and B. In contrast, being male and displaying masculine traits were linked to the healthier patterns G and S [11,21,29,30]. This finding is consistent with evidence from university student populations in German-speaking countries [46] as well as among German professionals across various occupational fields [3], and aligns with broader research on gender disparities in mental health [47].

The relationship between age, length of professional experience, and work-related patterns appears to be complex and not entirely consistent. While research suggests a growing tendency toward risk pattern assignment with increasing age, the association between pattern distribution and length of professional experience is not linear and

varies by profession. Findings in nurses and teachers – that shorter and moderate durations of work experience have been linked to the healthy pattern G [13,14] – partially support a core assumption of the AVEM model, developed within the teacher occupational health framework: that pattern distribution is generally more favorable at the beginning of a professional career and tends to deteriorate over time [39]. However, the ambiguous relationship between age, work experience, and AVEM patterns is characteristic not only of the Polish studies included in this review but also of research from Germany [48]. These findings suggest that the influence of age and experience – along with their potential interaction – may be profession-specific rather than generalizable across occupational groups.

Polish research has not fully confirmed the findings from the German population, where marital status has been shown to have a protective effect against risk patterns [6], partly due to a lack of available studies. Nevertheless, Polish studies offer a novel finding: a link between having a hobby and an increased tendency toward pattern G as well as a decreased tendency toward pattern B [11]. This is largely consistent with existing evidence on the health-promoting effects of leisure activities [49] and can also be explained by the job demands–resources (JD-R) model, which emphasizes that personal resources – such as engaging in restorative hobbies – help buffer the effects of high job demands and lower burnout risk [50].

A potentially country-specific finding concerns the educational level of nurses. While education level had no significant effect on pattern assignment in a mixed German and Austrian sample [48], Polish data show that higher education was associated with the healthy pattern G, lower education with the unambitious pattern S, and participation in additional specialization courses with the excessively ambitious risk pattern A [14,32]. One possible explanation for this unique finding comes from self-determination theory (SDT) [51], which underscores the role of autonomous motivation in health and well-being. The empirical link between pattern G and autonomous motivation has been confirmed in prior research [52]. In this light, higher education may reflect greater autonomous motivation linked to pattern G, whereas lower education may be linked to reduced autonomous motivation, consistent with the low-engagement characteristics of pattern S. Conversely, participation in specialization courses may involve predominantly controlled motivation, driven by institutional requirements or external pressures. When such expectations are not matched by adequate rewards or recognition, they can foster overcommitment and stress, aligning with the excessively ambitious risk pattern A. Given Poland's specific regulations regarding nursing education, these dynamics may not be directly comparable internationally, yet they provide valuable insights for policymakers aiming to strengthen nurse training and professional development.

With regard to personal income, Polish research indicates that while nominal income level had no significant effect on pattern distribution [11], a higher subjective assessment of one's material standing was associated with a greater likelihood of exhibiting the healthy pattern G [32]. This finding aligns with research from a German-speaking sample [48], which linked pattern G to the perceived importance of having a high income. Together, these results suggest that subjective perceptions of income adequacy may be more relevant than nominal income, as the latter fails to reflect individual variations in living costs. This interpretation is further supported by studies on mental health and burnout, which show that satisfaction with one's income can buffer against negative psychological outcomes [53].

The finding that living in villages and smaller towns is associated with the resigned pattern B, while residence in larger cities is linked to the healthy pattern G [32], is unique within the existing AVEM literature. This result may be partly related to subjective income adequacy, as rural living often involves higher transportation costs, which could re-

duce perceived financial comfort. Additionally, longer commuting times may reduce leisure time, contributing to increased strain. Another possible explanation comes from mental health research, which highlights structural barriers – such as limited access to mental health services and greater stigma around seeking psychological help – as factors that may negatively impact the mental health of rural residents [54]. This interpretation also aligns with the SDH framework [41], which emphasizes that health outcomes are shaped by broader socioeconomic and structural conditions, including geographic and infrastructural inequalities. Another important finding that has not yet been supported by international AVEM research is that having an additional job increases the likelihood of being assigned to the risk patterns A and B [11]. This finding is generally in line with evidence on the link between multiple jobholding and burnout [55]. Since in Poland the weekly hours spent in a second job are almost 2.5 times higher than in Germany [56], having an additional job may be an important factor in partially explaining the observed cross-country differences in pattern distribution among German and Polish professionals. Given that having a hobby is also a protective factor against pattern B [11], lack of time caused by multiple jobholding may contribute to the increased vulnerability in the Polish workforce also through reduced engagement in restorative leisure activities.

The findings regarding the specific type of workplace that differentiates work-related patterns among nurses align with AVEM research conducted in German samples [57,58]. This suggests that professionals within the same occupational group may exhibit varying levels of vulnerability, depending on differences in job content, responsibilities, and working conditions. This interpretation is further supported by the observed impact of the work environment. In this context, the Polish research emphasized mobbing – a form of workplace bullying. Similar to findings in the Polish sample [21], bullying in the German sample was associated with a higher likelihood of pattern B and a lower likelihood of pattern G [4]. These findings are consistent with both national and international evidence on the detrimental effects of workplace bullying on mental health [59,60].

Another important factor distinguishing the most optimal, healthy pattern G from the resigned pattern B was job satisfaction, which consistently emerged as a protective factor against pattern B in both Polish [9,14,32] and German research [61,62]. With regard to work motivation, available evidence comes mainly from a Polish study on special school teachers, which found that teachers assigned to pattern G were primarily driven by intrinsic motivation (e.g., long-term commitment to the profession), while teachers assigned to patterns S and A showed mixed intrinsic and extrinsic motives. In contrast, teachers assigned to pattern B were mostly driven by extrinsic motives, with over one-third reporting that their decision to enter the teaching profession was accidental [33]. This Polish research complements AVEM-based findings from German studies on teacher education students. Specifically, students assigned to pattern B reported the lowest level of intrinsic motivation for pursuing a teaching career and were more likely to choose teacher education due to its low difficulty or as a fallback solution due to a lack of alternatives or personal confidence [5,63]. These findings align with SDT [51], which links intrinsic motivation to greater engagement and well-being. Taken together, this body of evidence highlights a practitioner-relevant concern: individuals assigned to pattern B tend to demonstrate problematic professional motivation that may warrant early attention in career guidance and training programs.

Polish AVEM-related literature also provides unique findings regarding fluid and emotional intelligence. Higher levels of fluid intelligence were associated with pattern S, whereas lower levels were linked to pattern A – an important pioneering finding in the AVEM literature [24]. This finding corresponds with existing evidence on the association between IQ and mental health [64]. With respect to emotional intelligence, which was found to be increased in

pattern G and decreased in pattern B [15], a similar result was reported by Hofmann et al. [65], who observed higher levels of emotion regulation in pattern G and lower levels in pattern B among German teachers. This body of evidence aligns with research highlighting the strong protective influence of emotional intelligence against burnout [66].

With respect to Big 5 personality traits, the results are in accordance with available AVEM-related evidence in that individuals assigned to risk patterns exhibited higher levels of neuroticism compared to those assigned to healthy patterns. In contrast, higher levels of extraversion, openness, and conscientiousness were specifically linked to pattern G [7,5,17], and agreeableness to pattern S [5,17]. Results related to other personal characteristics seem to mirror findings available in the German literature, with minor specifics. The link between healthy patterns and increased sense of coherence [18] mirrors the findings among Egyptian university lecturers [67], and the increased religious belief in pattern G [33] aligns with the religious/spiritual orientation observed in German pastors [68]. The healthy patterns were also linked to resilience, both in Polish nurses [31] and German teacher education students [3]. The observed link between pattern G and better social adjustment [28], and between pattern B and poor social skills [29,30], may be supported by findings on psychosocial competence in German teacher education students assigned to pattern G [69]. A unique result, only partially aligning with evidence from international literature, was the association between work-related patterns and self-efficacy. Whereas in Polish teachers increased self-efficacy was linked to patterns G and A [13], in German teacher education students it was related to patterns G and S [70], suggesting a possible cultural moderation in how self-beliefs influence AVEM patterns.

Another surprising finding among Polish nurses was the increased use of adaptive coping strategies in both G and A patterns, and their decreased use in S and B patterns. This contrasts with findings from Germany, where functional coping was linked to the healthy patterns G and S, and dysfunctional coping to patterns A and B, with pattern A in particular associated with elevated use of strategies such as alcohol consumption and smoking [71,72]. An equally unexpected result was observed in Polish teachers: a higher tendency toward emotion-oriented coping in pattern S and a lower tendency in pattern B [26]. This finding is atypical, as a Swiss study involving teacher education students reported the opposite – emotion-oriented coping was more prevalent in pattern B and less so in the healthy patterns [73]. These differences suggest that AVEM patterns are shaped by both personal characteristics and the broader cultural and occupational context in which individuals work.

Finally, findings from the Polish workforce regarding stress levels and mental and physical health align closely with international AVEM-related research. One study found clear differences in stress levels between nurses assigned to patterns G and B [31]. This aligns with international studies involving students and professionals from various fields, which consistently show that risk patterns are associated with higher stress levels, while healthy patterns offer protection against both general and job-specific stressors [46,74]. Similarly, research on mental and physical health indicates that risk patterns are linked to a range of issues, such as depression and somatic symptoms [19], as well as sensory processing disorder symptoms [36]. In contrast, healthy patterns are associated with lower incidences of such symptoms, including anxiety and insomnia [19]. These findings not only support the theoretical foundations of the AVEM typology but are also consistent with international evidence demonstrating that healthy patterns correlate with better mental and physical health, whereas risk patterns are associated with health problems [46,62]. An additional noteworthy finding [11] is that individuals with the resigned pattern B – marked by low engagement and a sense of limited control – are, ironically, less likely to seek psychological help, a tendency consistent with the learned helplessness framework [75]. This highlights an important challenge for

occupational health prevention, as those who might benefit most from support may be the least likely to access it.

This study identified and analyzed empirical findings on work-related coping behavior and experience patterns within the Polish workforce. By integrating these findings, it contributes meaningfully to the international body of research on this concept. In particular, it expands the existing evidence – previously based largely on German-speaking samples – by placing it in a broader international context, thereby enhancing its generalizability. The study's comprehensive focus on the Polish workforce also offers valuable insights for shaping national occupational health policy. Drawing from the integrated results and their comparison with international evidence, the following conclusions are presented.

The overall proportion of Polish participants assigned to risk patterns was significantly higher than in the international context, particularly among teaching and healthcare professionals, indicating greater vulnerability to burnout and occupational health issues in these occupations. Beyond people-centered professions, women, older workers, individuals with an additional job, those living in smaller towns and villages, and those experiencing mobbing also emerged as highly vulnerable groups. These individuals also tended to be extrinsically motivated and exhibited higher levels of neuroticism, elevated stress, and poorer mental and physical health. In contrast, having a hobby and a better perceived material standing were mainly associated with the healthy patterns. Individuals classified under the healthy patterns tended to be intrinsically motivated and reported higher job satisfaction, greater levels of fluid and emotional intelligence, and more adaptive personality traits.

Several studies have contributed pioneering findings within the AVEM literature, such as the associations between work-related patterns and having a hobby or an additional job, place of residence, fluid and emotional intelligence, and the tendency to seek psychological help – although these findings require international validation to be fully contextualized. While the research findings generally align with international AVEM-related studies, several unique results emerged that warrant further investigation. Notably, these include the unexpected association of pattern A with increased self-efficacy and adaptive coping strategies, as well as a reversed tendency in pattern distribution linked to emotion-oriented coping.

Limitations

The main limitation of this study lies in the relatively small number of available publications, each of which focuses on a distinct population and examines a relatively unique set of AVEM-related variables. This heterogeneity leads to a fragmented body of evidence, making cross-study comparisons difficult. Consequently, the findings are less easily aligned with international literature, as it remains unclear whether the observed effects are specific to the individual samples studied, reflective of broader national or occupation-specific trends, or indicative of country-specific characteristics. This lack of clarity limits the generalizability of the results and underscores the need for more empirical evidence on this topic within the Polish context. A further limitation is that the studies primarily used a cross-sectional design, which cannot detect causal effects. Therefore, the factors associated with the work-related patterns should be interpreted as correlates rather than direct predictors or causes. Further, the review includes literature of varying quality and also incorporates some sources that have not yet undergone peer review, such as preprints, which should be interpreted with appropriate caution. Another limitation is that no weighting or formal quality appraisal of the included studies was performed. This was due to substantial heterogeneity in study populations, methodologies, and reported outcomes, as well as the lack of standardized effect measures. As this is a narrative review, the findings were synthesized thematically rather than statistically. It should also be noted that while the AVEM clas-

sification approach was consistent across most studies – typically assigning participants to the most dominant pattern – 2 studies deviated by applying stricter thresholds for classification. This difference in assignment criteria should be considered when interpreting cross-study comparisons of AVEM type distribution. Finally, it should be noted that the list of included studies may not be comprehensive. While major academic databases such as Scopus and Web of Science were searched systematically, many relevant sources had to be located via Google Scholar, which does not allow precise search strings and therefore required extensive manual screening – an approach that may lack the same level of systematicity as database searches. Additionally, several sources – primarily theses – were excluded due to the unavailability of full texts.

Practical implications

The findings of this review point to a pressing need for profession-specific interventions in Poland, aimed at reducing the elevated risk of burnout and related occupational health problems – particularly in the most vulnerable sectors. Below, the authors outline several actionable recommendations grounded in the synthesized findings of AVEM studies conducted in Poland.

Given the alarming prevalence of vulnerable individuals in teaching and healthcare professions, preventive measures should begin as early as higher education. The authors recommend that the AVEM inventory be administered in teacher education, medical, and nursing programs as a self-reflective and preventive tool to help students identify vulnerabilities at an early stage. Preventive intervention modules could be integrated into curricula to provide guidance on coping strategies and resilience building. For timely correction of risk patterns, effective programs already exist – such as Strengthened for the Teaching Profession [76] – which could be adapted to the Polish context. Employers should prioritize creating a healthy and safe working environment in which employees' basic psychological needs – such as autonomy, competence, and relatedness – are met. This includes fostering mutual trust, enabling independent decision-making, encouraging constructive communication, and maintaining a positive workplace climate that actively prevents bullying and other forms of mistreatment. Employers and policymakers should strive to improve working conditions for all workers, including those in the public sector. Excessive workloads – whether stemming from administrative burdens or chronic staff shortages – should be addressed through structural solutions. Setting realistic performance expectations, coupled with ensuring fair and adequate wages, would help maintain a healthy work–life balance and allow individuals to cover their living expenses without resorting to additional employment. Such measures could reduce the risk of overburden and overcommitment, thereby lowering the likelihood of developing risk work-related patterns. Psychological counseling and intervention programs should be made accessible to all occupational groups to reduce work-related stress and strengthen individual coping capacity. Evidence shows that mainly cognitive-behavioral and mindfulness-based interventions – including web-based formats – can effectively improve mental health and well-being [77]. Such measures should be made particularly accessible to at-risk groups as identified in AVEM research, including professionals in people-centered occupations, women, older workers, and individuals living in rural areas.

AUTHOR CONTRIBUTIONS

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Research methodology: Wiktor Warchałowski, Ivana Mašková, Dana Buršíková

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Interpretation of results: Wiktor Warchałowski, Ivana Mašková, Dana Buršíková

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This study is a review of AVEM research conducted with student populations. Based on structured database searches complemented by manual searches, it identifies and synthesizes findings on AVEM pattern distributions and their correlates across student samples, drawing on 69 empirical sources. In doing so, the study provides an integrated overview of AVEM-related evidence across student populations. Moreover, it makes findings that were published predominantly in the German language and in low-visibility local sources accessible to an international readership.

The author of this thesis is the sole author and was fully responsible for the overall conduct of the study.

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Work-related coping behaviour and experience patterns in university students: a review of 20 years of research

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Work-related coping behaviour and experience patterns (WCEP) is the conceptualisation of personal experience with occupational stress and of the typical behavioural responses for coping with such stress. The objective of this review, which is based on 69 references that used the WCEP inventory in university students, is to offer a comprehensive overview of the findings on WCEP and their correlates in the student population. The results of the published studies consistently show that female students, teacher education students (compared to medical students) and students who receive insufficient social and financial support are at greater risk for being assigned to work-related patterns that indicate vulnerability to burnout and occupational health issues. Moreover, students assigned to these patterns, especially to the resigned (burnout) pattern, are prone to manifest other negative characteristics, such as less adaptive personality traits and coping strategies, vulnerability to stress, lower quality motivation, lack of commitment to the chosen career and suitability for the profession, and impaired physical and mental health. In contrast, the most desirable correlates, such as adaptive personality traits, higher quality motivation, commitment to the chosen career, suitability for the profession, stress resistance, adaptive coping and better physical and mental health, were related to the healthy ambitious pattern. Nevertheless, further research is needed to analyse work-related coping behaviour and experience patterns beyond the German speaking population to increase the generalisability of the findings.

KEYWORDS

burnout vulnerability, coping behaviour, occupational stress, university students, work-related patterns

1. Introduction

Among various occupational and age groups, university students have consistently been shown to be at risk of higher distress, anxiety, depression and poor mental health outcomes in general (e.g. Stallman, 2010; Evans et al., 2018; Rehman et al., 2021). Such issues may arise in part from the upheavals of the emerging adult life stage (lasting from 18 to about 29 years) that largely overlaps with the phase of university studies (Arnett and Schwab, 2012). In this respect, the characteristics of emerging adulthood, i.e., identity explorations, instability, self-focus, feeling in-between and possibilities/optimism, have specific implications for mental health. Specifically, identity struggles, frequent changes accompanied by lack of social support or feeling of not reaching adulthood yet can trigger anxiety and depression in emerging adults (Arnett

et al., 2014). On the other hand, as suggested by Nelson et al. (2008), the above-mentioned characteristics differentiating emerging adulthood from other life stages make emerging adulthood a particularly important time for establishing and intervening on long-term (health) behaviour patterns, including positive coping behaviours to deal with occupational demands that could, in turn, foster emerging adults' mental health and well-being. Therefore, the unique phase of emerging adulthood/higher education is of primary interest for the present study, which focuses on patterns of dealing with occupational demands and their various correlates. More specifically, a conceptualisation of personal experience with occupational stress and the typical behavioural responses used in coping with such stress referred to as *work-related coping behaviour and experience patterns* (*Arbeitsbezogenes Verhaltens- und Erlebensmuster* in its original German version) (Kieschke and Schaarschmidt, 2008) is brought into spotlight.

2. Work-related coping behaviour and experience patterns

Work-related coping behaviour and experience patterns (WCEP) can be gaged by the same named inventory involving 11 dimensions grouped into three main areas: professional commitment, coping capacity and subjective well-being (Kieschke and Schaarschmidt, 2008; Schaarschmidt and Fischer, 2008). Four profiles or patterns representing an individual's capability to deal with professional demands were identified by a cluster analysis of the 11 dimensions. Assigning an individual to one of the distinct patterns (G, S, A, and B) based on the highest match between the individual scores and the four patterns provides information about individual work-related health risks and motivational deficits (Schaarschmidt and Kieschke, 2007; Kieschke and Schaarschmidt, 2008; Schaarschmidt and Fischer, 2008). The characteristics of these patterns are presented in Table 1.

These profiles represent a relatively consistent style of dealing with professional demands. Nevertheless, if a spontaneous pattern transition occurs in the long-term, it is likely to be a transition toward less desirable patterns (Kieschke and Schaarschmidt, 2008). Thus, the main aim of pattern assessment is the early identification of vulnerable individuals that can lead to timely psychological interventions to correct the undesirable patterns or prevent such vulnerable individuals from entering highly demanding professions (Künsting et al., 2012). The importance of the early recognition of vulnerable individuals is reflected in a substantial proportion of WCEP research that focuses specifically on individuals in their earliest career stage–university students.

To facilitate the recognition of vulnerable individuals, student focused WCEP studies frequently aim to identify WCEP correlates that can function as protective or risk factors of (un)desirable work-related patterns. The objective of this review is to summarize the existing findings on WCEP and their correlates in the student population available from the year 2002 when the first study on WCEP in students was published to the year 2022 when the present review was conducted. The review is based on 69 references that used the WCEP inventory in university students and provide information on the WCEP distribution and/or related correlates. For a comprehensive outline of the literature, see the Supplementary material.

3. Review methodology

3.1. Eligibility criteria

The eligibility criteria for this review covered all the published empirical literature (journal articles, books, reports, theses and conference outputs) that used the WCEP inventory in university students and presented information on the distribution of the four patterns according to Schaarschmidt and Fischer (2008) and/or their correlates. Only records in English and German were included. The records that focused on other populations than undergraduate university students (or merged data of students with that of other populations) were excluded, as well as those involving teacher trainees in practical training, known as the second phase of teacher education ('Lehramtsreferendariat'). Excluded were also records where the participants were not assigned to one of the four patterns (the patterns were not calculated), the calculation did not correspond to the original typology by Kieschke and Schaarschmidt (2008), or the presentation of the WCEP distribution was unclear.

3.2. Search strategy

Searched were all keywords relevant to WCEP combined with the focus on students (search string: (Arbeitsbezogenes Verhaltens- und Erlebensmuster OR AVEM OR Work-related coping behaviour and experience patterns) AND (student)). The search strategy targeted the Web of Science and Scopus databases and the search engines Google and Google Scholar, supplemented with a search in the ResearchGate database and contact with prominent authors in the field of WCEP. Finally, reference lists of the identified articles were screened manually. The searches were performed between June 1st and September 15th 2022.

3.3. Literature selection

The initial search yielded 566 sources, including 30 from Web of Science, 22 from Scopus and 514 from additional searches. After removing 49 duplicates, the titles and abstracts of 517 records were screened resulting in the exclusion of 338 records that did not meet the eligibility criteria. After reading the remaining 179 full texts, the author decided to include 69 records (see Figure 1). Data extracted from the sources include a reference, the country of data origin and the higher education institution of data collection if available, the period of data collection, sample characteristics, the percentual distribution of WCEP in the sample and top-line findings on WCEP correlates (see Supplementary material).

3.4. Quality assessment

The quality of the included studies was assessed using the Mixed Methods Appraisal Tool (MMAT), which is a critical appraisal tool designed to appraise the methodological quality of qualitative, quantitative and mixed method studies (Hong et al., 2018). Studies that relied on the same dataset were assessed as one unit since their methodological approach was shared to a large extent. For the purpose

TABLE 1 Description of the four work-related patterns, their characteristics and specifics.

Pattern label	Pattern description	Pattern characteristics			Pattern-related specifics and health risks
		Professional commitment	Coping capacity	Subjective well-being	
G	The healthy ambitious pattern	High	High	High	health promoting attitude to work, optimal professional motivation, no health risks
S	The unambitious pattern	Very low	High	High average	greatly reduced professional motivation (restriction of efforts at work to only what is absolutely necessary), no health risks
A	The excessively ambitious risk pattern	Excessively high	Low	Low average	resemblance to type-A behaviour (workaholism), over-motivation, vulnerability to health risks, especially to cardiovascular diseases
B	The resigned risk pattern	Low	Low	Low	resemblance to the symptomatology of the late stages of the burnout syndrome, reduced professional motivation, vulnerability to burnout, vulnerability to health risks, especially to psychosomatic diseases

G refers to 'good health', S refers to 'sparing personal investment at work', A refers to 'ambitious', B refers to 'burnout'. Information based on Kieschke and Schaarschmidt (2008), Schaarschmidt and Fischer (2008), and Schwarzschmidt and Kieschke (2007).

of the critical appraisal, all relevant information provided across studies within a unit was considered. Out of the 54 assessed units, one was classified as a quantitative randomized controlled trial (Schaefer, 2012; Çelebi et al., 2014), one as a quantitative non-randomized study (Wild et al., 2014), one as a mixed method study (Cramer, 2012) and the remaining 51 units were quantitative descriptive studies. Units were assessed according to five criteria relevant to the respective category (see Hong et al., 2018). A score was assigned for each of the criteria based on whether the criterion was met: 2 = 'yes'; 1 = 'partially'; 0 = 'no/cannot tell'. Thus, the final quality assessment score for each unit could range from 0 to 10. Following current research practices, the methodological quality of each unit was classified as poor (final score ≤ 5), moderate (final score 6–7) or good (final score ≥ 8) (Squires et al., 2011; Li et al., 2015; Kamal et al., 2021). As a result, 26 units were classified as good quality, 11 as moderate quality and 10 as poor quality (see Supplementary material). Seven units were not assessed, as the records provided little information on the study methodology due to the nature of the record (e.g., conference posters).

4. WCEP and their correlates in university students—what we know so far

The most researched group within the student-focused WCEP research framework are teacher education students (e.g., Bauer, 2019; Mašková et al., 2022) followed by medical students (e.g., Kötter et al., 2021; Afshar et al., 2022). There is also evidence of WCEP distribution in psychology (Nowik and Franke, 2009; Reichl et al., 2014; Meiseneder, 2015), nursing (Kada, 2014), dentistry (Cramer, 2012), law (Römer et al., 2012, 2013), business/economics (Nowik and Franke, 2009; Jäger, 2017), STEM (Voltmer et al., 2019), natural science (Obst and Kötter, 2020), music (Nusseck and Spahn, 2013), sport (Fischer et al., 2018) and theology students (Voltmer et al., 2011b). The vast majority of WCEP research studies focusing on university students was conducted in Germany (e.g. Reichl et al., 2014; Afshar et al., 2022) while a small number of studies was also conducted in other German-speaking countries: Austria (e.g. Beer and Benieschek, 2012; Lüftenegger et al., 2019) and Switzerland (Albisser and Kirchhoff, 2007; Deiglmayr et al., 2018). Additionally, one study involved teacher education students from the Czech Republic (Mašková et al., 2022).

The following sections provide a review of the findings on WCEP correlates identified in student focused WCEP research.

4.1. Gender

The WCEP distribution tends to be affected by gender. Generally, women in all study fields were more likely than men to be assigned to the risk patterns, especially pattern A (Voltmer et al., 2010a; Rothland, 2011; Meier, 2015; Fischer et al., 2018; Afshar et al., 2022). In contrast, men were more likely to be assigned to pattern S (Rothland, 2011; Martin, 2012; Römer et al., 2013; Mašková et al., 2022) except for fifth-year medical students and Swiss teacher education students where women were more likely to be assigned to pattern S (Voltmer et al., 2008; Deiglmayr et al., 2018).

4.2. Study field

Since most studies focused on teacher education and medical students, comparing the WCEP distribution in students from various study fields was less straightforward. Specifically in teacher education students, most studies revealed that the distribution of WCEP was unaffected by teaching specializations (Künsting et al., 2012; Martin, 2012; Römer et al., 2013; Würfl, 2013; Meier, 2015; Mašková et al., 2022), although Boxhofer (2013) and Cramer (2012) found a tendency for teacher education students focused on special schools to be assigned to the pattern S. Compared to teacher education, the prevalence of risk patterns seemed to be higher in dentistry, sport, music, natural sciences, psychology and law students (Cramer, 2012; Nusseck and Spahn, 2013; Römer et al., 2013; Reichl et al., 2014; Fischer et al., 2018; Obst and Kötter, 2020). In contrast, the majority of studies showed that

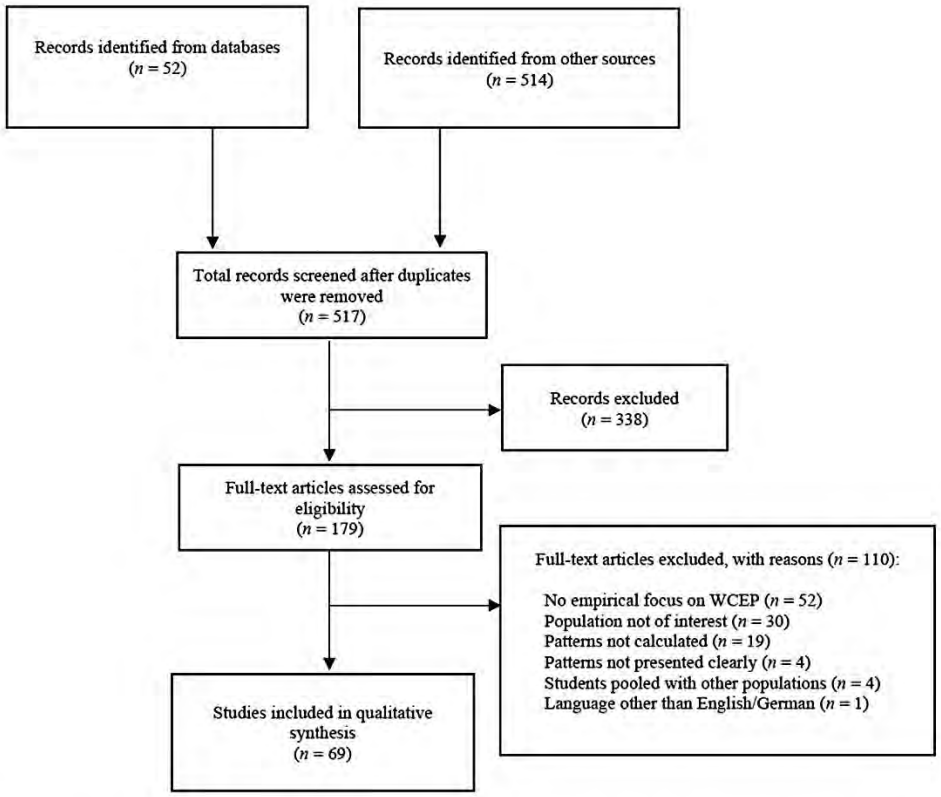

FIGURE 1
A flowchart of the search strategy. Flowchart adapted from PRISMA 2020 flow diagram for new systematic reviews which included searches of databases, registers and other sources available at https://prisma-statement.org/PRISMAStatement/FlowDiagram.

the prevalence of risk patterns tends to be lower in medical students (e.g., Aster-Schenck et al., 2010; Voltmer et al., 2010a), although there is also evidence on increased likelihood of pattern A in medical students at the beginning of medical education (Afshar et al., 2022). Specifically, teacher education students displayed an increased prevalence of the S pattern compared to dentistry (Cramer, 2012), sport (Fischer et al., 2018), law (Römer et al., 2013) or music students (Nusseck and Spahn, 2013), but a decreased prevalence of the S pattern compared to medical students (especially in the later phases of medical education) (e.g. Voltmer et al., 2010a, 2012).

4.3. Study phase

Findings related to the WCEP distribution in the initial and more advanced phases of higher education are rather inconsistent across the various fields of study. In teacher education students, cross-sectional studies showed either no difference in WCEP distribution in the various study phases (Buss, 2002; Römer et al., 2013; Bauer, 2019) or a higher prevalence of the risk patterns in the more advanced study phases (Schröder and Kieschke, 2006; Rothland, 2011). The latter was also observed in law and STEM students (Römer et al., 2013; Voltmer et al., 2019). Presenting a different trend in teacher education students, Grözinger and Förster (2016) found a slight increase of pattern S in fourth-year students compared to first-year students within a longitudinal framework. A similar but more pronounced trend was repeatedly observed in medical students who displayed a steady increase in the unambitious pattern S at the expense of the healthy pattern G from the initial to the final phases of their studies (Aster-Schenck et al., 2010; Voltmer et al., 2021a; Afshar et al., 2022). In sum, the WCEP distribution tended to either persist or transition toward less desirable patterns during the course of study.

4.4. Background characteristics

Student background characteristics seem to have only a limited impact on the WCEP distribution in general. Whereas Jäger (2017) found that younger students were more likely to be assigned to pattern G than older students, other studies did not confirm the link between age and WCEP (Buss, 2002; Aster-Schenck et al., 2010; Cramer, 2012; Meier, 2015). Likewise, neither marital/relationship status nor children were correlated with work-related patterns (Aster-Schenck et al., 2010; Jäger, 2017; Afshar et al., 2022). On the other hand, the likelihood of

being assigned to a healthy pattern was higher for students who had a personally important job while studying (Mašková et al., 2022) but who were not employed full-time (Jäger, 2017). Further, the WCEP distribution was more favorable in students who received financial support, whose parents had higher socioeconomic standing (Cramer, 2012; Rumpler, 2013; Afshar et al., 2022) and who had higher social support (Voltmer et al., 2008; Hamdan, 2012; Jäger, 2017).

4.5. Learning and academic achievement

In terms of student learning and achievement, the most notable differences tend to exist between the under-motivated S types followed by B types on the one hand and the over-motivated A types followed by the healthy motivated G types on the other hand. In this respect, S-type teacher education students recorded the lowest number of hours per week devoted to studying and the lowest level of increase in basic pedagogical knowledge, while A types recorded the highest in both cases. The findings related to both B and G types were relatively inconclusive (Rumpler, 2013; Römer et al., 2017). Further, S- and B-type students had a less pronounced learning goal orientation and showed a less intensive use of learning strategies compared to G and A types (Künsting et al., 2012), who also had the highest level of self-perceived academic achievement (Aster-Schenck et al., 2010; Voltmer et al., 2012). Nevertheless, although both medical and teacher education G- and A-type students tended to achieve better academic results (Künsting et al., 2012; Voltmer et al., 2012), the differences among the four types were statistically insignificant in terms of the final high school grade (Aster-Schenck et al., 2010), university grades (Künsting et al., 2012; Voltmer et al., 2012) or the number of exams passed (Künsting et al., 2012).

4.6. Personality factors

In terms of personality, students assigned to the risk patterns repeatedly displayed less favorable outcomes compared to those assigned to the unambitious pattern or to the healthy pattern. Specifically, A–and B-type individuals displayed higher levels of neuroticism than G and S types; reversely, extraversion was more prominent in G-type individuals than in those assigned to the less desirable patterns. Conscientiousness, on the other hand, was scored high in both G–and A-type students, and low in B and S types (Cramer, 2012; Künsting et al., 2012; Reichl et al., 2014; Römer et al., 2017; Lüftenegger et al., 2019). Further, G- and S-type students were more resilient and displayed higher levels of mindfulness and self-efficacy than A and B types, who, on the other hand, tended to be more pessimistic, irritable and less tolerant of uncertainty than their G–and S-type counterparts (Dietrich et al., 2015; Meiseneder, 2015; Awenius, 2019; Bauer, 2019). Finally, G-type theology students displayed higher levels of spirituality which protected them from the burnout pattern (Voltmer et al., 2011b).

4.7. Study and career choice motivation

A review of the research on the interrelatedness of WCEP and motivation in teacher education students is provided by Mašková et al. (2022). In sum, problematic or low-quality motives are usually related to the B pattern, while high quality forms of motivation are found in G types. In several studies, the motivational profile of S and A types resembles that of the B and G types, respectively (e.g., Künsting et al., 2012; Rothland, 2012; Reichl et al., 2014; Mašková et al., 2022).

4.8. Commitment to students' career choice

Students' motivation is closely interconnected with commitment to their career choice. Evidence has consistently shown that B-type teacher education students were the least satisfied with their studies and their choice of a teaching career (Albisser and Kirchhoff, 2007; Rothland, 2011; Künsting et al., 2012), whereas the most satisfied were typically the G (Rothland, 2011; Rumpler, 2013) and A types (Künsting et al., 2012). Similarly, G- and A-type medical and natural science students displayed the highest identification with their studies while B types showed the lowest (Obst et al., 2017; Obst and Kötter, 2020). Likewise, students with a high subjective certainty about their choice of a teaching career and with the intention of pursuing such a career after completing their studies displayed the most desirable WCEP profiles; the opposite applied to students who were uncertain or did not intend to become teachers (Schaarschmidt, 2005; Rothland, 2011). However, conflicting evidence exists on the time point of the decision to pursue a teaching career. Whereas in German students an earlier decision increased the probability of being assigned to the G pattern (Rothland, 2011), in Austrian students the life-anchored decision was linked to the higher likelihood of being assigned to the risk pattern A; in contrast, the most favorable WCEP profiles typically showed those who decided to pursue a teaching career later after entering teacher education (Lüftenegger et al., 2019). Further, Cramer (2012) found that the highest likelihood of being assigned to the pattern B showed students who set themselves against the teaching style they experienced as pupils and seek to change and modernize the educational system. Finally, although previous completed studies did not affect the WCEP distribution (Afshar et al., 2022), teacher education students, who had not completed their previous studies or were enrolled in multiple degree courses concurrently (Mašková et al., 2022), and male students, who had chosen teacher education as a second choice, were more likely to be assigned to pattern B (Rothland, 2011).

4.9. Suitability for the future profession

Adding to the above-mentioned evidence which shows that B-type students lack commitment to their career choice, several studies also suggest that B types, in contrast to G types, may be unsuitable for their future profession. Specifically, B-type teacher education students tend to lack beliefs, expectations, interests and competencies necessary for the teaching profession (Albisser and Kirchhoff, 2007; Kaub et al., 2014; Meier, 2015; Deiglmayr et al., 2018). Moreover, in medical students, patterns B and A were linked to lowered levels of empathy (Kötter et al., 2021). B types were also the most likely to be frequently absent from work/school (due to sickness) (Albisser and Kirchhoff, 2007; Awenius, 2019). In contrast, the most favorable career prospects were found in G-type students, who not

only rated their career prospects the highest (Rothland, 2011) but also displayed the highest levels of work-related vigor, dedication and absorption along with pedagogical, psychosocial and intercultural competence (Nolle, 2013; Meier, 2015; Meiseneder, 2015; Genkova and Schreiber, 2021). Further, G-type teacher education students displayed the highest match between their own individual interests and the requirements of teacher education (Kaub et al., 2014), and they expected the highest levels of success in their future career development (Rothland, 2011; Cramer, 2012; Rumpler, 2013). In contrast to their counterparts assigned to the less desirable patterns, G types manifested the lowest tendency toward work avoidance (Cramer, 2012). Finally, along with S types, G-type teacher education students were aware of their resilience to work-related demands and suitability for a teaching career (Schröder and Kieschke, 2006).

4.10. Subjective stress and coping strategies

In accordance with the theoretical underpinnings of the WCEP typology, G and S types reported the lowest levels of subjective stress and psychological burden (Schröder and Kieschke, 2006; Voltmer et al., 2012; Rumpler, 2013; Jäger, 2017; Voltmer et al., 2021b; Afshar et al., 2022). On the other side, students assigned to the risk patterns tended to perceive the highest levels of stress–types A were likely to be the most affected by general psychological stress (Aster-Schenck et al., 2010; Rumpler, 2013; Afshar et al., 2022) and stress induced by social commitments, scheduling of the daily routine, work-life balance and partnership problems (Schröder and Kieschke, 2006). During the COVID-19 pandemic, A types were also the most afraid of contagion and felt the largest negative impact of the pandemic on several areas of their life (Voltmer et al., 2021b). B types, on the other side, tended to perceive the highest levels of stress in relation to financial and living conditions or interpersonal conflicts (Schröder and Kieschke, 2006) and regarded their lives as being unpredictable, uncontrollable and overloaded (Voltmer et al., 2021b).

To deal with stress, S–and especially G-type students applied the most productive and health-promoting strategies, such as thinking positively, eating a balanced diet, exercising regularly, getting enough sleep and seeking social support from friends and family. On the other hand, students assigned to the risk patterns tended to use dysfunctional coping strategies, such as denial, self-blame, smoking or drinking alcohol. Ironically, they were also the least interested in information about health-promoting strategies (Buss, 2002; Albisser and Kirchhoff, 2007; Wolf et al., 2007; Jäger, 2017; Voltmer et al., 2021a,b; Afshar et al., 2022).

4.11. Physical and mental health

The evidence on the physical and mental health in students assigned to distinct patterns is not surprising in view of the previous paragraph. Applying the theoretical framework of WCEP, it was consistently shown that A- and especially B-type students admitted to having overall bad physical health compared to G and especially S types, who tended to have better physical health and lower levels of physical complaints (e.g., Hamdan, 2012; Voltmer et al., 2012). Likewise, in terms of mental health, G and S types enjoyed the best status. The worst results, on the other hand, were displayed by A- and especially B-type students (Voltmer et al., 2012; Awenius, 2019; Voltmer et al., 2021b). Specifically, G types felt the least socially disconnected and alienated from the rest of the word (Awenius, 2019), and along with S types displayed lower levels of anxiety, depression, exhaustion and cynicism than their counterparts assigned to the risk patterns (Albisser and Kirchhoff, 2007; Obst and Kötter, 2020; Voltmer et al., 2021a,b).

5. Discussion

This review, based on 69 records published between 2002 and 2022, aimed to offer a comprehensive overview of the findings on WCEP and their correlates in university students. Specifically, the main categories of correlates identified in student focused WCEP research, which were covered in the present review, were gender, study field, study phase, background characteristics, learning and academic achievement, personality factors, study and career choice motivation, commitment to students' career choice, suitability for the future profession, subjective stress and coping strategies and physical and mental health.

First, this review revealed that the female students were more likely to be assigned to risk patterns, especially the excessively ambitious risk pattern A than the male students, who in contrast, were more likely to be assigned to the unambitious pattern S. These findings are in accordance with evidence on the WCEP distribution in professionals, such as teachers and physicians (e.g., Schaarschmidt, 2005; Voltmer et al., 2010b), as well as general findings on increased psychological vulnerability in female university students (Auerbach et al., 2018; Sheldon et al., 2021). Our findings also support the notion of a relative stability of the patterns or rather a spontaneous tendency to transition toward less desirable patterns in the long-term suggested by Kieschke and Schaarschmidt (2008), as that the WCEP distribution tended to either persist or transition toward less desirable patterns during the course of study. This outcome is supported by findings from 3-year longitudinal studies of European undergraduate students that suggest a slight but notable worsening of psychological well-being and mental health across the degree course (Bewick et al., 2010; Macaskill, 2013). Background protective factors against being assigned to the less desirable patterns were mainly social and financial support, along with the socioeconomic status of students parents. These findings corroborate previous evidence on the lack of social support, financial difficulties, growing up in a poor family and lower parental educational attainment to increase the likelihood of mental health problems in university undergraduates (Eisenberg et al., 2007; Assari, 2018; Sheldon et al., 2021).

On the other hand, the findings on differences between students of distinct study fields are inconclusive. Although teacher education students seem to display a lower tendency toward the risk patterns than students of other study fields, unequivocal conclusions cannot be drawn due to the underrepresentation of students of study fields other than medicine and teacher education. In this respect, the only clear finding of the present review was that teacher education students were assigned to the risk patterns more frequently than medical students, which is in line with the findings on less desirable WCEP distribution in teachers compared to physicians (Voltmer et al.,

2011a). However, embedding these findings into the existing literature on student well-being and mental health is less straightforward due to the lack of clear evidence on differences among academic disciplines. Although it was repeatedly shown that students in art and humanities tend to mark the highest and students in business, engineering and nursing the lowest end of the continuum of various mental health issues, there are mixed research findings with regard to other study fields (Lipson et al., 2016; Erekson et al., 2022; Allen et al., 2022a). Similarly, the link between WCEP and academic achievement is ambiguous. Although healthy ambitious G types tended to achieve better academically, the differences between students assigned to distinct patterns were insignificant. In this respect, mixed results were also provided by research studies on the link between academic achievement and aspects of coping, well-being and burnout. While some studies have shown a positive link (Antaramian, 2015; Thomas et al., 2017), other have provided inconclusive results (Topham and Moller, 2011; Da Silva et al., 2022), or even evidence that high achieving students are more vulnerable to burnout (Kotzé and Kleynhans, 2013; Atalayin et al., 2015).

Regarding personality traits, study and career choice motivation, commitment to the chosen career, suitability for the profession, coping strategies and physical and mental health, the results of the present review are clear and coherent. Evidence consistently shows that the healthy ambitious pattern G was associated with the most desirable correlates, such as adaptive personality traits (e.g., extraversion, conscientiousness and self-efficacy), higher quality motivation, commitment to the chosen career, suitability for the profession, stress resistance, adaptive coping and better physical and mental health. In contrast, the findings on patterns S and A tended to be less straightforward. Generally, S types lacked professional motivation but tended to be healthier and more resistant to stress while A types, although highly motivated, were more vulnerable to stress and suffered from poor health. The least desirable correlates were related to pattern B, with B-type students clearly showing less adaptive personality traits, a tendency to be unmotivated, uncommitted to their chosen career, unsuitable for the profession, vulnerable to stress, unable to cope in a productive way and suffering from poor mental and physical health. This evidence clearly corresponds to the general literature on student burnout. For instance, students who scored high on burnout dimensions displayed high levels of neuroticism, lower quality motivation, reduced career choice satisfaction, tended to high-risk alcohol drinking and substance use and suffered from mental health problems. In contrast, their psychologically less vulnerable counterparts displayed higher levels of extraversion, openness, optimism, self-efficacy, spirituality, proactive personality traits, resilience, adaptive coping strategies, higher quality motivation or career choice satisfaction (Kovach Clark et al., 2009; Pisarik, 2009; Morgan and De Bruin, 2010; Wachholtz and Rogoff, 2013; Vizoso et al., 2019; Gong et al., 2021; Kong et al., 2021; Allen et al., 2022b).

Finally, it is important to highlight that several findings of this review could be considered particularly alarming. First, both A- and B-type students tended to suffer from various physical and mental issues, which implies that the health impairments related to these risk patterns can develop even before the individuals enter the profession. Second, B-type students clearly lacked the necessary prerequisites for their future profession, such as pedagogical and psychosocial competence in teaching or empathy in medicine. This may be taken as an early indication of the impaired quality of future work-related outcomes found in B-type in-service teachers and health care professionals (Klusmann et al., 2006; Mroczek et al., 2018), as well as in professionals with symptoms of burnout (Halbesleben and Rathert, 2008; Madigan and Kim, 2021).

5.1. Limitations

The main limitation of the present review is that the included studies provide unbalanced data since German and teacher education students are overrepresented. Further, the included literature varies in quality. Since the present review aimed to offer a comprehensive overview of the literature that provides evidence on WCEP and their correlates, quality-based exclusion was intentionally not performed to encompass all the relevant references.

5.2. Directions for future research

It is important for future research to extend WCEP research beyond Germany and German-speaking countries to increase the generalisability of the findings. Further, it would be useful to gain more data on students of other specializations since previous research on WCEP has focused mostly on students of psychologically demanding occupations (teaching and health care). We also suggest to direct future research toward a more concentrated focus on specific background factors (such as, for instance, study history or type of secondary school) linked to the assignment to (un)favorable patterns. Although so far only marginal interest has been devoted to these factors, this evidence can greatly facilitate the early recognition of vulnerable individuals in university settings. In addition, Manzano-García and Ayala (2017) identified several factors that have been neglected in the burnout literature despite their potential significant role in explaining burnout. Among these factors, for example, personality factors, such as self-esteem or problem-solving skills, may be relevant for future student-focused WCEP research.

5.3. Conclusions and implications

This review has provided robust evidence about WCEP and their correlates in university students that is largely in line with the literature on student mental health and burnout. In this respect, we can conclude that female students, teacher education students (compared to medical students) and students who receive insufficient social and financial support are at greater risk of being assigned to risk work-related patterns that indicate vulnerability to burnout and occupational health issues. Moreover, students assigned to these patterns, especially to the resigned (burnout) pattern, are prone to manifest other negative characteristics, such as less adaptive personality traits and coping strategies, vulnerability to stress, lower quality motivation, lack of commitment to the chosen career and suitability for the profession and impaired physical and mental health.

The findings of the present review highlight that particular attention must be devoted to psychologically vulnerable individuals in university settings. Specifically, measures for fostering

health-promoting coping and behavioural patterns should be adopted early to correct the risk patterns especially in individuals who aim at pursuing psychologically demanding careers. The present review has strong practical implications for higher education institutions, as it significantly contributes to the understanding of the risk and protective factors of vulnerability to burnout and occupational health issues in university students. The evidence provided could therefore be indicative for the selection and development of prospective professionals already in the higher education phase.

Author contributions

The author confirms being the sole contributor of this work and has approved it for publication.

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Conflict of interest

The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Supplementary material

The Supplementary material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyg.2023.1062749/full#supplementary-material

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Study 3

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This study is an empirical investigation conducted with 400 university students and aimed to examine correlates of work-related patterns in terms of background and study-related characteristics. A particular focus was placed on the role of academic excellence and its various indicators, namely educational excellence, manifested in high academic achievement, and personal excellence, manifested in prosocial, moral, and self-reflective behavior. A subsample consisted of students nominated by higher education teachers as excellent. Among these various indicators, only personal excellence emerged as a significant correlate of the work-related patterns. With respect to the overarching aim of this thesis, this study meaningfully extends AVEM research to the Czech cultural context, thereby enabling comparisons with the existing evidence, which is largely based on German-speaking samples. Moreover, by examining the associations between AVEM patterns and academic excellence and its dimensions, the study contributes to the theoretical foundations of AVEM research while also offering important practical implications for higher education.

The author of this thesis is the sole author and was fully responsible for the overall conduct of the study.

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Risk and protective factors of vulnerability to burnout and occupational health issues in university students: Is being excellent an advantage?

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Abstract
Little is known about whether being academically excellent matters when it comes to vulnerability to burnout and occupational health risks indicated by unhealthy patterns of dealing with work-related demand. The present study examined risk and protective factors of (un)healthy work-related coping behaviour and experience patterns assessed by the *Arbeitsbezogenes Verhaltens- und Erlebensmuster* inventory in 400 university students. A particular focus was given to the role of academic excellence conceptualised as a compound of educational excellence manifested in high academic achievement (operationalised through the grade point average and four other indicators) and personal excellence manifested in prosocial, moral, and self-reflective behaviour (operationalised through three specifically developed items). A multinomial logistic regression was performed to investigate the predictive values of background and excellence-related variables for assignment to distinct patterns. The central finding was a protective role of personal excellence against the resigned risk pattern B, indicating vulnerability to burnout. A similar protective effect had a personally important job, but not a job considered less important/temporal, suggesting that the protective role of the job status is mediated by the psychological value of the job itself rather than by the material benefits of having a job. In contrast, academic achievement or being considered excellent by teachers played no role in protecting individuals against burnout and occupational health risks. From the perspective of predicting a health-promoting approach in dealing with occupational stress, it appears that grades and academic success have little relevance and morality and virtuousness in a student are the most influential factors.

Keywords Burnout vulnerability · Coping · Academic excellence · Academic achievement · Virtues

Introduction

While academically excellent individuals undoubtedly possess numerous positive and desirable qualities, which are generally believed to make them perfectly predisposed to succeed in university settings and beyond, the question arises: Does academic excellence also imply a predisposition to effectively deal with occupational demand? The present paper contributes to the growing body of literature that aims to identify early on university students with unhealthy patterns of dealing with work-related demand, who are especially vulnerable to burnout and occupational health risks in the long term. So far, multiple research studies have sought to enhance the understanding of vulnerable individuals and to facilitate their early identification by examining the specific risks and protective factors of students' vulnerability. In this respect, several correlates of vulnerability to burnout and occupational health issues were established in university students, such as gender (e.g. Deiglmayr et al., 2018), study field (e.g. Fischer et al., 2018), study phase (e.g. Voltmer et al., 2019), background characteristics (e.g. Afshar et al., 2022), learning and academic achievement (e.g. Künsting et al., 2012), personality factors (e.g. Römer et al., 2017), study and career choice motivation (e.g. Reichl et al., 2014), commitment

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to students' career choice (e.g. Obst et al., 2017), suitability for the future profession (e.g. Kaub et al., 2014), subjective stress and coping strategies (e.g. Voltmer, Köslich-Strumann, Voltmer et al., 2021), and physical and mental health (e.g. Obst & Kötter, 2020). For a comprehensive review of the findings on WCEP and their correlates in the student population, refer to Mašková (2023). This study aims to broaden knowledge on the correlates of vulnerability to burnout and occupational health issues in university students by examining the role of academic excellence, which has not been systematically investigated so far. Although academic excellence is an inherently positive construct linked to various desirable outcomes, little is known about whether it has a protective effect against burnout and occupational health issues in university students. By adopting a comprehensive view of excellence that integrates educational excellence (manifested in academic achievement) with personal excellence (manifested in moral and virtuous character), the present study not only contributes to the literature on risk and protective factors of vulnerability to burnout and occupational health issues, but it is also one of very few studies that examines the phenomenon of academic excellence in its full complexity.

Work-related coping behaviour and experience patterns

In the present paper, vulnerability to burnout and occupational health risks is conceptualised in terms of individual experience and of the behavioural styles used in dealing with professional demands, and they are referred to as *work-related coping behaviour and experience patterns* (WCEP), or *Arbeitsbezogenes Verhaltens- und Erlebensmuster* (AVEM) in its original German version (Kieschke & Schaarschmidt, 2008; Schaarschmidt & Fischer, 2008). The homonymous inventory, which was developed within the health research framework of teachers, involves 11 dimensions that cover three main areas: professional commitment, coping capacity, and subjective well-being (Schaarschmidt, 2005a). For the structure of the inventory, refer to Table 1. To determine an individual's pattern of behavioural responses to occupational stress, information on the configuration of scores across all the dimensions is needed. For example, if high professional commitment is coupled with a low coping capacity, an individual tends to be at a higher risk of developing health issues than with high professional commitment alone. The results of an assessment are then interpreted in terms of four distinct profiles/patterns (G, S, A, and B) identified by an extensive cluster analysis (Kieschke & Schaarschmidt, 2008).

The healthy ambitious pattern G

The most desirable pattern G refers to good health and a health-promoting approach to work. G-type individuals show high but not excessive professional commitment (specifically, high professional ambition coupled with moderate to high subjective significance of work,

Table 1 The structure of the AVEM inventory including scale descriptions and sample items

Area/Scale	Scale Description	Sample Item
Professional commitment		
Subjective significance of work	Value of work in personal life	I need work like the air I breathe
Professional ambition	Striving for career advancement and success	Professional success is an important aim in my life
Tendency to exert	Preparedness to exert personal strengths to accomplish tasks	I tend to overwork
Striving for perfection	Demand for quality and reliability of one's own performance at work	My work should always be faultless
Emotional distancing	Ability to mentally rest from work	After work I can switch off easily
Coping capacity		
Resignation tendencies	Tendency to become reconciled to failures and to give up easily	Failures at work can easily discourage me
Offensive coping with problems	Active and optimistic attitude towards challenges and arising problems	Lack of success doesn't bring me down, but makes me try even harder
Balance and mental stability	Experience of mental stability and inner balance	I can be calm and collected in almost all situations
Subjective well-being		
Satisfaction with work	Satisfaction with professional accomplishments	My professional achievements are obvious
Satisfaction with life	Satisfaction with the entire life situation also beyond the job	By and large, I am happy and content
Experience of social support	Confidence in the support of close persons, sense of social security	I have the full support of my family

Each subscale comprises six items, which are answered on a five-point Likert-type scale: 1 = *I strongly disagree*, 2 = *I somewhat disagree*, 3 = *I am in the middle*, 4 = *I somewhat agree*, 5 = *I strongly agree*

tendency to exert, striving for perfection, and emotional distancing), high coping capacity (the lowest resignation tendencies, the highest offensive coping, and balance and mental stability), and high subjective well-being (the highest satisfaction with work and life, and experience of social support). Such individuals are motivated to achieve high-quality work-related outcomes and they are able to relax easily without allowing work problems to affect their leisure time. A G-type individual's profile is also characterised by a generally positive emotional tone and attitude (Kieschke & Schaarschmidt, 2008; Schaarschmidt, 2005a; Schaarschmidt & Fischer, 2008).

The unambitious pattern S

Pattern S refers to the approach of sparing personal investment at work, since S-type individuals tend to restrict their efforts at work to only the necessary. Their professional commitment is very low (the lowest subjective significance of work, professional ambition, tendency to exert, and striving for perfection; the highest emotional distancing), but it is coupled with relatively high coping capacity and subjective well-being. This means that S types lack professional motivation, but they display an effective coping capacity and a relatively positive attitude, which is derived from outside work sources rather than from occupational success. It is professional motivation, not occupational health, that causes concern in S-types. This profile may not be solely connected to an individual's personality, but it could result from very stressful or otherwise poor working conditions, such as a lack of challenging work tasks (Kieschke & Schaarschmidt, 2008; Schaarschmidt, 2005a; Schaarschmidt & Fischer, 2008).

The excessively ambitious risk pattern A

Unlike patterns G and S, pattern A (ambitious) indicates vulnerability to occupational health risks in that it resembles type A behaviour (workaholism; Friedman & Rosenman, 1974, as cited in Schaarschmidt, 2005a). Specifically, pattern A is characterised by excessive professional commitment (the highest subjective significance of work, tendency to exert, striving for perfection, and the lowest emotional distancing) and relatively low coping capacity and subjective well-being. In other words, A-type individuals couple excessive engagement with an impaired ability to free themselves from work problems after the day's work is over, a limited capacity to withstand work-related stress, and a rather negative emotional tone. In this respect, high professional commitment seems to provide minimal emotional reward (Kieschke & Schaarschmidt, 2008; Schaarschmidt, 2005a; Schaarschmidt & Fischer, 2008). This discrepancy may make an individual vulnerable to health risks in the long term, especially to cardiovascular diseases (Siegrist, 1991, cited as in Kieschke & Schaarschmidt, 2008).

The resigned risk pattern B

Pattern B (burnout) is the least desirable pattern because it poses significant health risks as B-type individuals tend to be vulnerable to burnout and psychosomatic illnesses among others (Schaarschmidt, 2006). Specifically, B-type individuals display low professional commitment. In this respect, they resemble pattern S. Nevertheless, in contrast to S types, B types as well as displaying low subjective significance of work and professional ambition show limited emotional distancing. Further, the B pattern is characterised by very low coping capacity (the highest resignation tendency and the lowest offensive coping with problems), and very low subjective well-being (the lowest satisfaction with work and life). Here is a similarity with pattern A, but the deficits in coping capacity and subjective well-being are more profound in pattern B. In sum, B types feel unmotivated (even resigned), experience excessive challenge, negative emotions, and exhaustion. This pattern mirrors the symptoms of the late stages of the burnout syndrome as proposed by Maslach (1982, as cited in Schaarschmidt, 2005a), although it cannot be fully equalled with the burnout syndrome, which is considered a developmental process. In this respect, although in some cases, pattern B can result from pattern A, it rather reflects a dispositional tendency towards defensive coping and resignation which an individual takes into the workplace (Kieschke & Schaarschmidt, 2008; Schaarschmidt, 2005a; Schaarschmidt & Fischer, 2008).

The significance of work-related coping behaviour and experience patterns in the workplace

Findings on WCEP in professionals of various occupations, such as teachers (Klusmann et al., 2006), healthcare professionals (Mroczek et al., 2018), police and military officers (Bartsch et al., 2011; Basinska & Dreas, 2011), finance employees (Voltmer et al., 2018), entrepreneurs (Voltmer, Spahn, et al., 2011), psychotherapists (Engel et al., 2015), pastors (Voltmer, Thomas et al., 2011), or musicians (Voltmer et al., 2008), strongly suggest that the healthy ambitious pattern G could be considered a prerequisite for professional success. Not only were G types in optimal mental and physical health, which is in accordance with the health-promoting nature of pattern G (Schulz et al., 2011), but they displayed many other desirable outcomes. Among the four patterns, G-type professionals displayed the highest job satisfaction, working ability, and work engagement along with optimal organisational and professional commitment (Hager & Seibt, 2018) and performance (Genkova &

Kaune, 2018; Ortner, 2012). Moreover, G-type healthcare professionals were the most socially competent and held the most positive attitudes towards patient care (Mroczek et al., 2018; Voltmer et al., 2017). Likewise, G-type teachers delivered instruction of the highest quality (Klusmann et al., 2006). In contrast, the outcomes of S and A types were ambiguous, since they tended to be in the middle of the continuum marked by pattern G on the one side and pattern B on the other (Klusmann et al., 2006; Voltmer et al., 2018). Nevertheless, the prototypical characteristics of the patterns were present just as expected because healthy but motivational-deficient S types displayed optimal health but low commitment, whereas the over-motivated risk pattern A showed high commitment but poor health (Hager & Seibt, 2018; Schulz et al., 2011). The professional functioning of B-types was highly likely to be impaired as they achieved the worst outcomes across the studied indicators (Hager & Seibt, 2018; Schulz et al., 2011; Voltmer et al., 2018).

In sum, professionals assigned to the less desirable patterns, especially to the B pattern, tended to display poor work-related outcomes that could, in turn, negatively affect their organisations as well as the receivers of their services (patients, clients, pupils, etc.). Longitudinal evidence also suggests that individuals assigned to the less desirable patterns are unlikely to undergo spontaneous improvements over time, and this applies to B types in particular (Schaarschmidt, 2005b). Therefore, effective strategies should be adopted to enhance the proportion of G-type professionals that are in good health, engaged, resilient, and capable of achieving optimal work-related outcomes in the long term. Measures such as psychological interventions or counselling for career transition have been suggested to correct the undesirable patterns or to prevent vulnerable individuals entering highly psychologically demanding professional fields (Bauer, 2019; Künsting et al., 2012). To increase the effectiveness of such measures, it is necessary to introduce them as early as possible and vulnerable individuals should be identified as early as at the initial phase of their careers: during higher education (Künsting et al., 2012; Reichl et al., 2014).

Risk and protective factors of (un)healthy work-related patterns in university students

To facilitate the timely recognition of vulnerable individuals, WCEP research studies frequently aim at identifying WCEP correlates that can function as protective or risk factors for being assigned to (un)desirable work-related patterns. Such evidence could help to establish a tangible set of criteria to identify high-risk individuals more easily and to select candidates with the highest prospects of success in their careers (Bauer, 2019).

Similar to the findings on in-service professionals, G-type students displayed the most desirable characteristics and WCEP correlates. These include adaptive personality traits (extraversion, conscientiousness, or self-efficacy), higher quality motivation, commitment to their chosen career, suitability for the profession, stress resistance, adaptive coping, and better physical and mental health. The opposite is true for B-type students who displayed less adaptive personality traits, such as neuroticism, pessimism, or irritability, were less motivated, less committed to their career, less suitable for their future profession, less able to cope in a productive way and more vulnerable to stress and health issues (Bauer, 2019; Deiglmayr et al., 2018; Künsting et al., 2012; Mašková et al., 2022; Reichl et al., 2014; Römer et al., 2017; Rothland, 2011; Voltmer, Köslich-Strumann, Voltmer et al., 2021; Voltmer, Köslich-Strumann, Walther et al., 2021).

However, despite its importance in facilitating the early recognition of vulnerable individuals in university settings, evidence linking student background characteristics to the assignment to (un)favourable patterns is scarce and/or inconsistent. Moreover, the majority of evidence comes from studies conducted in Germany, which may limit the generalisability of the findings.

Gender

Previous research based in Germany showed that women in all study fields were more likely than men to be assigned to the risk patterns, especially to pattern A, whereas men were more likely to be assigned to pattern S (e.g. Afshar et al., 2022; Fischer et al., 2018; Voltmer et al., 2010). However, studies outside Germany did not confirm that trend, as in a Swiss sample it was women who were more likely to be assigned to pattern S (Deiglmayr et al., 2018). In Czech samples, no gender-related differences were revealed (Mašková & Nohavová, 2021; Mašková et al., 2022).

Study programme

With regard to the study programme, previous research has shown that compared to teacher education, the prevalence of risk patterns was increased in students of dentistry, sport, music, natural sciences, psychology, and law (Cramer, 2012; Fischer et al., 2018; Nusseck & Spahn, 2013; Obst & Kötter, 2020; Reichl et al., 2014; Römer et al., 2013). In contrast, the prevalence of risk patterns was lower in medical students (Voltmer et al., 2010). These findings are, however, isolated due to the lack of studies focused on students of study programmes other than teacher education and medicine that compare students across different programmes.

Study level

Findings related to the WCEP distribution in the initial and more advanced phases of higher education are rather inconsistent. Either no differences between study levels were shown (e.g. Römer et al., 2013; Schröder & Kieschke, 2006) or a higher prevalence of the risk patterns in more advanced study phases (e.g. Römer et al., 2013; Rothland, 2011). In other words, the WCEP distribution tended to either persist or transition toward less desirable patterns during the course of study.

Study history

Mašková et al. (2022) identified study history as a significant risk factor in the WCEP assignment. Specifically, Czech teacher education students who had a history of previous uncompleted degree course, were enrolled in multiple degree courses, or had already obtained a university degree were more likely to be assigned to the burnout pattern B than their counterparts enrolled in their first and only degree course. A similar finding was reported by Rothland (2011), who found that German male students who transferred to teacher education from other degree courses displayed the burnout pattern prevalence twice as high as that of their direct-entry counterparts.

Job status

Previous research in Czech teacher education students has shown that students engaged in a personally important job while studying were more likely to be assigned to the healthy pattern G, whereas their counterparts who did not have a personally important job, were more likely to be assigned to the burnout pattern B (Mašková et al., 2022). Similarly, it was shown that German and Austrian students receiving financial support had a more favourable WCEP distribution (Afshar et al., 2022; Rumpler, 2013). Thus, it is not fully clear whether the protective effect of having a job stems from the psychological value of the job or from the material benefits of having a job.

Academic excellence

Excellence in higher education is an inherently appealing phenomenon in that excellent university students embody characteristics and qualities that are valued by the academic community (Brusoni et al., 2014; Gardner, 2015). The appeal of the construct is reflected in a growing body of educational research studies on excellent students and their characteristics and behaviours (e.g. López et al., 2013; Saidi et al., 2015). Indeed, excellence in a student is usually linked to various study- and career-related positive outcomes, such as deep learning (López et al., 2013) or work engagement (Kool et al., 2016). Conceptually, there are different views on academic excellence. The more simplistic definitions of academic excellence equal it with high academic achievement, whereas the more comprehensive ones encompass also non-achievement components (Ferrari, 2002). The present study uses a two-dimensional conceptualisation of excellence which connects the two concepts of educational and personal excellence as proposed by Ferrari (2002) and Li (2004). Educational excellence, which is manifested in academic achievement, refers to students who are deeply knowledgeable, capable of turning their knowledge and skills into action to achieve desirable high-quality outcomes, engaged in learning, and seeking the enhancement of knowledge and experience by doing more than what is required. Personal excellence, on the other hand, refers to the moral and virtuous character of a student manifested in prosocial, moral, and self-reflective behaviour. Although these two dimensions of excellence were shown to be independent of each other, they actually co-exist and ought to occur simultaneously for an individual to be considered excellent (Mašková et al., 2024).

Given that academic excellence is a positive phenomenon that is related to many aspects of present and future success, the present study aims to find out whether there is a link between academic excellence and the optimal health-promoting pattern G, which is related to multiple desirable outcomes and may be even considered a prerequisite for future professional success.

Examining the link between WCEP and the two facets of academic excellence

Educational excellence

High academic achievement was repeatedly linked to the desirable qualities of an individual, such as conscientiousness, effort regulation, and self-efficacy (Richardson et al., 2012), as well as to indicators of future professional success, such as earnings, job performance, and organisationally valued behaviours (French et al., 2014; Lyons & Bandura, 2017). Nevertheless, the link between academic achievement and aspects of coping, well-being, and burnout tends to be less straightforward. On the one hand, multiple studies have shown that high achieving students usually tend to use adaptive coping strategies (Thomas et al., 2017; Vizoso et al., 2018), display high levels of well-being, and low levels of psychopathological symptoms (Antaramian, 2015). Other studies, on the other hand, have provided contradictory findings on the lack of association between academic achievement,

resilience, well-being, and burnout indicators (da Silva et al., 2022; Nkosi, 2005; Salanova et al., 2010; Topham & Moller, 2011) or even a positive association with burnout indicators, such as emotional exhaustion and depersonalisation (Atalayin, 2015; Balogun et al., 1996; Kotzé & Kleynhans, 2013). Likewise, WCEP research on student learning and achievement has provided inconclusive results so far. Interestingly, the most notable differences in learning and academic achievement were found between S-type and A-type students only. S-type teacher education students recorded the lowest number of hours per week devoted to studying and the lowest level of increase in basic pedagogical knowledge, while A types recorded the highest in both cases (Römer et al., 2017; Rumpler, 2013). Nevertheless, the differences among the four types were insignificant in terms of their final high school grade (Aster-Schenck et al., 2010), university grades (Künsting et al., 2012; Voltmer et al., 2012), or the number of exams passed (Künsting et al., 2012).

Personal excellence

Personal excellence, conceptualised as moral and virtuous character manifested in prosocial, moral, and self-reflective behaviour, relates to positive correlates in all respects. Specifically, virtues and character strengths (morally positively valued traits that account for "good character") contribute significantly to positive behavioural outcomes in the workplace, such as higher performance, productivity, more organisational citizenship behaviour, and less counterproductive work behaviour (Lavy & Littman-Ovadia, 2016; Littman-Ovadia et al., 2016). Likewise, these traits have a positive connection to the aspects of coping, well-being, and burnout. For instance, virtues and character strengths tend to be protective against burnout in professionals of psychologically demanding occupations (Allan et al., 2019; Lian et al., 2021). In university students, virtues and character strengths, and specifically prosocial behaviour, morality, and reflection, have been shown to be related to adaptive coping strategies and increased well-being (e.g. da Silva et al., 2022; Gustems-Carnicer & Calderón, 2016; Martela & Ryan, 2016; Newman & Nezlek, 2019; Park & Millora, 2012; Waytz & Hofmann, 2020). Evidence by Gander et al. (2012) on virtues and character strengths in distinct WCEP types is in accordance with the above-mentioned findings. Unsurprisingly, G types showed the highest levels of character strengths, whereas B types showed the lowest levels. Thus, patterns G and B are well reflected in the strengths profile. In contrast, the profiles of S types and especially A types tended to be less distinguishable.

The present study

The present study aims to broaden the available knowledge on WCEP and their correlates in university students in several ways. Most importantly, we aim to investigate the role of academic excellence as a protective factor from being assigned to less desirable work-related patterns (patterns S, A, and B). In addition, our objective is to investigate the impact of selected background and study-related variables on the assignment to different work-related patterns. Due to the limited evidence on WCEP in non-German students and students of study fields other than teacher education and medicine, we seek to further extend the research scope to students from other cultural backgrounds and other study fields. In this respect, the present study was conducted in the Czech Republic, which is a country in Central Europe with a different historical and economic background than German-speaking countries (Germany, Austria, and Switzerland). In addition to teacher education students, the study focused on students of psychology, informatics, geography, and linguistics.

Both academic excellence and the health-promoting pattern G are related to multiple positive outcomes. However, little is known about the interplay between academic excellence and work-related patterns in university students. Although there is evidence of a link between WCEP and several indicators of academic excellence (Gander et al., 2012; Künsting et al., 2012), the comprehensive perception of excellence as a multifaceted phenomenon has not been considered so far. To fully understand the role of different academic excellence criteria in protecting an individual against burnout and occupational health issues, we established specific indicators to cover both dimensions of excellence. First, educational excellence manifested in high academic achievement was measured through the cumulative grade point average (GPA) and other academic achievement indicators. Second, personal excellence manifested in prosocial, moral, and self-reflective behaviour was measured using a personal excellence scale. In addition, we identified a subgroup of students nominated as excellent by teachers. Nomination is commonly used as a method for identifying excellent individuals, since it aligns with the socially-construed definition of excellence within specific communities (Kallas, 2014; Terzi, 2020). Given the popularity of nomination, we are interested in its informational value. Specifically, we aim to determine whether this method alone could yield a subsample of individuals with characteristics distinguishable from their non-nominated counterparts.

To postulate hypotheses for this research, it is necessary to first review previous research findings on the link between WCEP, indicators of academic excellence, and student background and study-related characteristics. With

respect to educational excellence alone, previous research has yielded inconclusive results regarding the relationship between WCEP and academic achievement. Studies have shown insignificant differences among the four WCEPs in terms of final high school grades (Aster-Schenck et al., 2010), university grades (Künsting et al., 2012; Voltmer et al., 2012), or the number of exams passed (Künsting et al., 2012). Thus, we hypothesise that:

H_1: Educational excellence operationalised through GPA and other academic achievement indicators is unrelated to WCEP.

In contrast, there seems to be a clear link between WCEP and indicators of personal excellence, such as virtues and character strengths, which were the most pronounced in individuals assigned to the healthy pattern G (Gander et al., 2012). In this respect, we hypothesise that:

H_2: Personal excellence operationalised through a personal excellence scale protects from being assigned to less desirable patterns.

Although inherently subjective, we consider teacher nomination to be a reasonable indicator of a student's alignment with the qualities associated with a prototypical excellent student who integrates both educational and personal excellence. Thus, we anticipate that nominated students display distinct characteristics compared to non-nominated students, including the assignment to distinct work-related patterns:

H_3: Students nominated as excellent display a more favourable WCEP distribution than non-nominated students.

With respect to the link between WCEP and student background and study-related characteristics, we build on our previous findings on Czech teacher education students that revealed that students enrolled in their first and only degree course and engaged in a personally important job while studying were more likely to be assigned to the healthy pattern G, whereas their counterparts, for whom their degree course was not their first and only and who did not have a personally important job, were more likely to be assigned to burnout pattern B (Mašková et al., 2022). We expect these findings to be replicated in the present student sample:

H_4: Being enrolled in a first and only degree course and having a personally important job protects from being assigned to less desirable patterns.

Finally, despite gender being a significant predictor of WCEP in German samples (e.g. Afshar et al., 2022; Rothland, 2011), our previous findings on Czech students showed no gender-related differences (Mašková et al., 2022). Further, previous research on German students revealed inconclusive findings regarding the link between WCEP, study field, and phase of study (see Mašková, 2023). Thus, based on the previous findings, we anticipate that:

H_5: Gender, field of study, and phase of study (initial vs. more advanced) are unrelated to WCEP.

All hypotheses H_1 – H_5 are tested using multinomial logistic regression. Figure 1 presents a graphical representation of the research model that includes the variables of interest.

Method

Participants

A total of 400 full-time students pursuing a bachelor's or master's degree at the Faculty of Education, University of South Bohemia (FE USB) participated in the present study. The full study sample comprised two subsamples – 60 students nominated as excellent and 340 non-nominated students.

The students nominated as excellent were identified by teaching staff nominators at the FE USB. More specifically, out of 106 teachers addressed, 53 (50%) nominated at least one student who they considered excellent. Teachers nominated such students who, in their subjective view, complied with the socially-construed definition of a prototypical excellent student agreed upon by the academic community at the institution. This definition was based on 10 criteria[1], which all the nominees complied with. 60 nominees out of 80 (75%) participated in the study after receiving an e-mail request. All participating nominees were full-time students at the FE USB pursuing a bachelor's or master's degree in Teacher Education, Psychology, Informatics, Geography, or Linguistics.

The sampling frame for the students non-nominated as excellent was narrowed to students who shared similar

[1] Nominators were asked to assess a nominee on a 10-item rating scale of the essential attributes of the excellent university student developed at the FE USB (Mašková et al., 2024). The 10 items refer to thoroughness and punctuality, deep and complex knowledge, integration of theory and practice, engagement in classes, openness to interdisciplinarity, openness to extra learning and experience, field of study as a hobby (educational excellence dimension); fairness and honesty, cooperativeness and helpfulness, and self-reflection (personal excellence dimension). The extent to which a nominee met the 10 criteria was assessed by the nominator using a five-point rating scale. All nominees scored "something between", "agree", or "strongly agree", indicating that, from the nominator's perspective, each nominee complied with the definition of a prototypical excellent student.

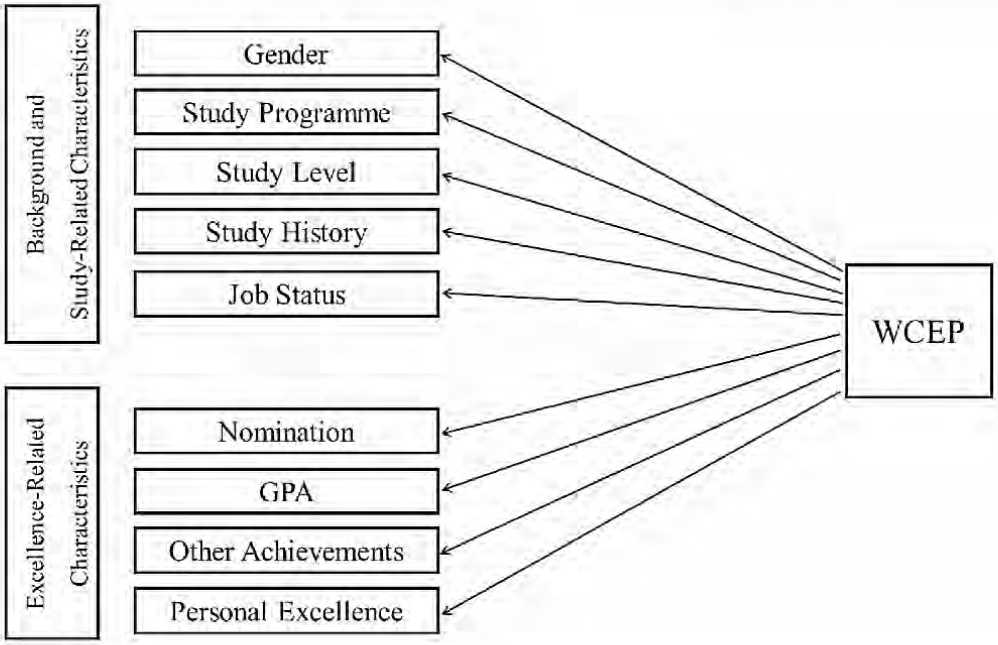

Fig. 1 A graphical representation of the research model

characteristics with the students nominated as excellent to ensure comparability of the two samples. Thus, the criteria for selecting the students non-nominated as excellent were: (1) non-nominated as excellent, (2) currently studying at the FE USB, (3) a full-time student, (4) enrolled in a bachelor's or master's degree programme in Teacher Education, Psychology, Informatics, Geography, or Linguistics. Students who did not meet these criteria were excluded from the study. Non-nominated students were recruited at various lectures taught at the FE USB to obtain a heterogeneous study sample representing various study programmes and study levels within the sampling frame. In this respect, the subsample of non-nominated students roughly reflects the proportions of the sampling frame. An overview of the background and study-related characteristics for the full sample and for the two subsamples separately is presented in Table 2.

Procedure

Participants were sent an online survey with the below-described measures. Students nominated as excellent were asked to complete the survey provided to them individually by e-mail. To prevent systematic dropout, non-nominated students were instructed to complete the same version of the online survey during lectures using their personal laptops, smartphones, or school computers. Since attendance at lectures is neither required nor measured, the response rate among the students present at the lectures was not calculated and cannot be reliably estimated. To prevent confusing the sample of non-nominated students with the sample of students nominated as excellent, two measures were implemented. First, the list of students enrolled in a particular course was screened, and the survey was administered only in such courses, where none of the nominated students participated. Second, the nominees were asked not to complete the survey again if they attend a lecture where the survey is administered.

The research was undertaken in accordance with the tenets of the Declaration of Helsinki and was approved by the FE USB Ethics Committee. All participants approved informed consent statements before participating in the study.

Measures

Background and study-related characteristics

The participants were asked to state their gender, age, study programme, level of study, study history (focusing on whether their current study programme was their first and only university degree course), and current job status.

Table 2 Background and study-related characteristics of the sample

Background and study-related characteristics	Full sample		Nominated as excellent		Non-nominated as excellent	
	n	%	*n*	%	*n*	%
Gender						
Male	98	24.50	19	31.67	79	23.24
Female	302	75.50	41	68.33	261	76.76
Study programme						
Teaching-oriented	337	84.25	52	86.67	285	83.82
Specialisation in Education	127	31.75	11	18.33	116	34.12
Teacher Training for Pre-Primary Education	28	7.00	2	3.33	26	7.65
Teacher Training for Primary Education	34	8.50	8	13.33	26	7.65
Teacher Training for Secondary Education	148	37.00	31	51.67	117	34.41
Non-teaching-oriented	63	15.75	8	13.33	55	16.18
Psychology	29	7.25	2	3.33	27	7.94
Informatics	17	4.25	2	3.33	15	4.41
Geography	14	3.50	2	3.33	12	3.53
Linguistics	3	0.75	2	3.33	1	0.29
Study level						
Initial (up to the 3rd year)	220	55.00	22	36.67	198	58.24
Advanced (4th year and above)	180	45.00	38	63.33	142	41.76
Study history						
Current degree course as the first and only	299	74.75	37	61.67	262	77.06
Current degree course as not the first and only	101	25.25	23	38.33	78	22.94
Job status						
Currently only studying	119	29.75	14	23.33	105	30.88
Currently in a job considered personally less important and/or temporary	151	37.75	22	36.67	129	37.94
Currently in a job considered personally important	130	32.50	24	40.00	106	31.18

$N = 400$ ($n = 60$ nominated as excellent and $n = 340$ non-nominated as excellent). The category of *Current degree course as not the first and only* was created by combining the following sub-categories: enrolled in multiple degree courses, already obtained a university degree, history of previous uncompleted teacher education study, history of previous study other than teacher education. The age of the full sample ranged from 18 to 48 years ($M = 22.73$, $SD = 2.93$). The age of the nominated as excellent student sample ranged from 19 to 28 years ($M = 23.15$, $SD = 1.90$). The mean age of the non-nominated as excellent student sample was 22.66 years ($SD = 3.07$). Differences between students nominated as excellent and students non-nominated as excellent were significant for the year of study, $\chi2(1) = 9.59$, $p < .01$, study history, $\chi2(1) = 8.14$, $p < .01$, and insignificant for gender, $\chi2(1) = 1.96$, $p > .05$, study programme, $\chi2(1) = 0.31$, $p > .05$, and job status, $\chi2(2) = 2.22$, $p > .05$

Work-related coping behaviour and experience patterns

The Czech version of the 66-item AVEM inventory by Schaarschmidt and Fischer (2008) with student-adjusted instructions was employed to measure WCEP (Mašková et al., 2022). Table 1 provides details about the 11 scales, sample items, and the answering format of the AVEM inventory.

Indicators of educational excellence

Educational excellence manifests itself in high academic achievement (Ferrari, 2002) and can be reliably assessed by using academic achievement indicators (Mašková et al., 2024). Nevertheless, academic achievement is a multidimensional construct, which may be indicated by several criteria representing various intellectual endeavours (Steinmayr et al., 2014). In this study, we combined several indicators of academic achievement that are of contextual relevance to the research setting. Specifically, participants were asked to report their cumulative GPA[2] and data related to four other academic achievement indicators: (a) significant achievement in a subject-related contest or student competition (i.e. awards for various kinds of achievement, e.g. The Outstanding Thesis Award), (b) membership of academic organisations/societies (e.g. University Senate), (c) a leadership role in extracurricular activities (e.g. Biology Olympiad organising committee member), and (d) significant achievement in research (e.g. authorship of a peer reviewed publication; Benbow, 1992; Kuncel et al., 2001; Mould & DeLoach, 2017).

[2] Since the personal data policy at the FE USB denies accessing students' complete grade record for research purposes, we relied on self-reported GPA. Nevertheless, this is not a matter of considerable concern, since research has shown that self-reported GPA and actual GPA are highly correlated (Kuncel et al., 2005). According to the Czech university grading system, the best grade is 1 (=A), the worst is 4 (=F). Hence, the higher the absolute value of GPA, the lower the achievement.

Indicators of personal excellence

Since personal excellence can hardly be assessed by objective means, we used three items developed by Mašková et al. (2024), which were shown to cover the personal excellence dimension from both the conceptual and psychometric perspective. The development of the items was informed by the results of an extensive qualitative research involving teachers and students at the FE USB, which focused on formulating observable behaviours and qualities of the excellent university student. The respective items were shown to be core characteristics of the excellent student, broadly agreed upon by students and teachers, and applicable to students across different disciplines or study levels. From the conceptual perspective, the content of the items overlapped with theoretical underpinnings of personal excellence (Ferrari, 2002; Li, 2004). From the psychometric perspective, the three items used for the other-report of student characteristics were shown to form a scale with an acceptable internal consistency (see Mašková et al., 2024). For the purposes of the present study, the items originally designed for teacher and peer assessment were converted into a self-reporting format. The wording of the items was: (1) *I behave fairly and honestly*, (2) *I cooperate with others and help them selflessly*, (3) *I critically reflect upon myself and my actions*. The instructions used for the self-report purposes were as follows: "Please indicate how often you behave in the manner described using the following scale: 1=*never*, 2=*rarely*, 3=*sometimes*, 4=*very often*, 5=*always*".

Statistical analyses

First, preliminary analyses were performed to test the assumption of normal data distribution, which showed that none of the continuous variables (the AVEM scales, the personal excellence scale, and GPA) were normally distributed. To test the construct validity of the instruments (the AVEM instrument and the personal excellence scale), we performed the confirmatory factor analysis (CFA) employing the Satorra-Bentler estimation procedure to control for non-normality in the data. Further, we determined the scores of the AVEM subscales and the personal excellence scale by averaging the scores on the respective items. We also assigned each participant to one of the four WCEPs that showed the highest match with the individual responses to the AVEM inventory items. This was performed using the algorithm provided by Schaarschmidt and Fischer (2008). Reliability estimates of the AVEM subscales and the personal excellence scale were calculated along with descriptive statistics and inter-variable correlations. Additionally, descriptive statistics of the continuous variables were calculated for each pattern separately. A dichotomous variable, labelled as *other achievements*, was created and coded as follows: 0=a student did not comply with any of the other academic achievement indicators, and 1=a student complied with at least one out of the four other academic achievement indicators.

To determine differences in scores of continuous variables between students nominated and non-nominated as excellent, the Mann Whitney U test was performed. To determine differences in the scores of the AVEM scales among students of different study fields, the Kruskal-Wallis test based on pseudo-ranks was performed, followed by the pairwise post-hoc Dunn test with and without Bonferroni adjustments. The pseudo-rank procedure overcomes the disadvantages of traditional rank-based inference for more than two groups in the case of unbalanced samples (Brunner et al., 2018). The chi-square test was used to test for differences between groups in the frequency distribution of categorical variables; where the expected cell size was less than five, Fisher's exact test was used. The predictive values of background, study-related, and excellence-related variables for assignment to distinct work-related patterns were investigated using multinomial logistic regression, which is a state-of-the-art method in WCEP research (see e.g. Adams et al., 2016; Hofmann & Kohlmann, 2019; Kalani et al., 2023; Reichl et al., 2014). Logistic regression assumes that independent variables are neither normally distributed nor linearly related, nor of equal variance within each group (Harell, 2015); therefore, it was an appropriate method to analyse our data. Specifically, we performed two sequential multinomial logistic regression analyses using the G pattern as a reference group. In this respect, we were interested in the predictive ability of excellence-related variables after adjusting for background differences; therefore, we first entered gender, study programme, study level, study history, and job status (Step 1). Subsequently, we entered nomination, GPA, other achievements, and personal excellence (Step 2). All statistical analyses were performed using IBM SPSS statistical software, version 25, except for CFA, Kruskal-Wallis tests, and Dunn tests, for which R software version 4.3.1 was used (packages "lavaan", "pseudorank", and "dunn.test").

Results

The construct validity and internal consistency of the scales were supported by the results of the CFA and the reliability tests. Regarding the AVEM instrument, CFA showed an acceptable model fit: MLMχ2(1976)=2851.941, $p<.001$, CFI=.911, RMSEA=.033, SRMR=.052[3]. With regard

[3] The baseline model' s RMSEA was 0.118, which is below the threshold of 0.158 that indicates the informative value of incremental fit indices (e.g. CFI) for evaluating the model fit (Kenny et al., 2015). In this respect, the absolute fit indices RMSEA and SRMR may be more informative for evaluating the model fit since incremental fit indices tend to be underestimated when the model size is large (Shi et al., 2019).

to the personal excellence scale, fit indices suggested an excellent fit: MLMχ2(2)=0.610, $p>.05$, CFI=1.000, RMSEA=0.000, SRMR=0.020[4]. Similarly, all reliability estimates (Cronbach's alpha and McDonald's omega coefficients) indicated at least an acceptable internal consistency (Hair et al., 2018). See Table 3 for the reliability estimates, descriptive statistics, and inter-variable correlations. Additionally, Fig. 2 displays a profile plot of the four patterns based on the mean scores of the AVEM scales. The descriptive statistics of the continuous variables for each pattern are presented in Supplementary Table 1.

Differences between student subsamples

Students nominated as excellent and students non-nominated as excellent

Students nominated as excellent displayed significantly better GPA ($M=1.70$, $SD=0.54$) than non-nominated students ($M=2.12$, $SD=0.55$), $U=5{,}582.50$, $p<.001$, $r=.28$. They were also more likely to comply with at least one other academic achievement indicator, $\chi2(1)=12.24$, $p<.001$ (35% of students nominated as excellent and 16% of students non-nominated as excellent complied). The difference in the level of personal excellence between students nominated as excellent ($M=4.51$, $SD=0.82$) and non-nominated students ($M=4.45$, $SD=0.65$) was statistically insignificant, $U=7{,}838.00$, $p>.05$, $r=.09$. There was no statistically significant difference between the two samples in the proportions of distinct WCEPs, $\chi2(3)=2.56$, $p>.05$. Figure 3 displays the relative frequency distribution of distinct WCEPs in the full sample, as well as in the subsamples of students nominated as excellent and non-nominated students. Considering the differences in the scores on the AVEM scales between the two subsamples, the only statistically significant difference was a higher level of satisfaction with work in students nominated as excellent, $U=7{,}677.00$, $p=.002$, $r=.15$ (see Table 4).

Students of different study fields

There was a statistically insignificant difference in the proportion of distinct WCEPs between students of different study fields, $\chi2(9)=8.12$, $p>.05$, Fisher's exact test $p>.05$, although psychology students tended to be assigned to the A pattern more frequently than to the S pattern (see Fig. 3). Regarding the differences in the scores on the AVEM scales, the Kruskal-Wallis test based on pseud-ranks showed significant differences in professional ambition, $H(3)=45.62$, $p<.001$, satisfaction with work, $H(3)=35.80$, $p<.001$,

[4] To estimate fit indices of the three-item personal excellence scale, factor loadings for all items were constrained to be equal.

Table 3 Descriptive statistics, reliability estimates, and the correlation matrix

	M	SD	α	ω	GPA	PE	SSW	PA	TE	SP	ED	RT	OCP	BMS	SW	SL
GPA	2.06	0.57	–	–	–											
PE	4.46	0.68	0.78	0.78	0.00	–										
SSW	2.68	0.75	0.80	0.81	0.03	0.07	–									
PA	3.37	0.74	0.80	0.80	0.01	0.05	0.56**	–								
TE	3.35	0.76	0.81	0.81	−0.04	0.08	0.49**	0.53**	–							
SP	3.66	0.75	0.83	0.84	−0.06	0.17**	0.30**	0.35**	0.53**	–						
ED	2.99	0.76	0.81	0.81	0.08	−0.11*	−0.28**	−0.24**	−0.47**	−0.29**	–					
RT	2.95	0.75	0.83	0.83	0.05	0.00	−0.08	−0.11*	−0.08	0.03	−0.15**	–				
OCP	3.38	0.68	0.85	0.86	−0.06	0.13**	0.26**	0.43**	0.37**	0.28**	−0.05	−0.57**	–			
BMS	3.14	0.75	0.81	0.83	−0.01	0.03	0.06	0.12*	0.06	0.13*	0.24**	−0.55**	0.52**	–		
SW	3.50	0.67	0.81	0.81	−0.13**	0.09	0.27**	0.40**	0.41**	0.21**	−0.22**	−0.27**	0.48**	0.27**	–	
SL	3.65	0.75	0.85	0.85	−0.13**	0.09	0.14**	0.15**	0.09	0.06	0.05	−0.36**	0.45**	0.37**	0.47**	–
ESS	4.04	0.73	0.76	0.77	−0.15**	0.07	0.08	0.01	−0.04	0.02	0.02	−0.05	0.10*	0.07	0.22**	0.47**

$N=400$

GPA = Grade point average (cumulative), *PE* = Personal excellence, *SSW* = Subjective significance of work, *PA* = Professional ambition, *TE* = Tendency to exert, *SP* = Striving for perfection, *ED* = Emotional distancing, *RT* = Resignation tendencies, *OCP* = Offensive coping with problems, *BMS* = Balance and mental stability, *SW* = Satisfaction with work, *SL* = Satisfaction with life, *ESS* = Experience of social support

* $p<.05$. ** $p<.01$

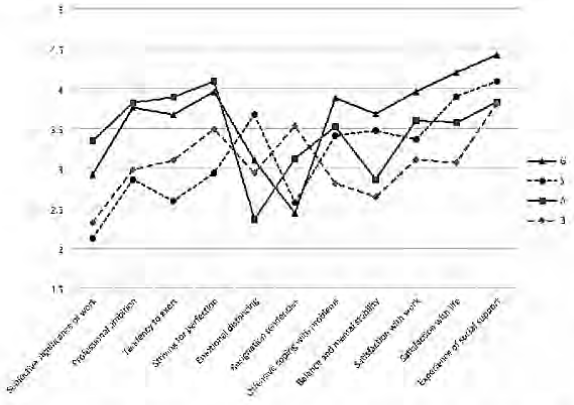

Fig. 2 A profile plot of the four patterns based on the mean scores of the AVEM scales. *Note.* $N = 400$ ($n = 116$ for pattern G, $n = 70$ for pattern S, $n = 87$ for pattern A, $n = 127$ for pattern B)

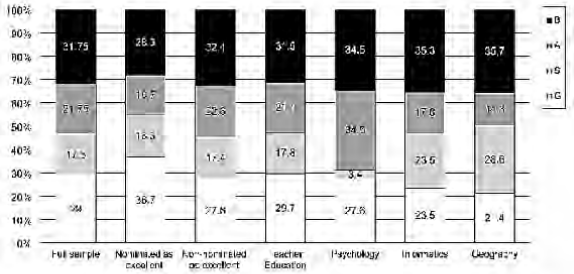

Fig. 3 The WCEP distribution in the full sample and in the subsamples of students nominated and non-nominated as excellent and students of different study fields. *Note.*$N = 400$. $n = 60$ for nominated as excellent. $n = 340$ for non-nominated as excellent. $n = 337$ for Teacher Education. $n = 29$ for Psychology. $n = 17$ for Informatics. $n = 14$ for Geography. Students of Linguistics ($n = 3$) were excluded from the subgroup analysis. G = the healthy ambitious pattern; S = the unambitious pattern; A = the excessively ambitious risk pattern; B = the resigned risk pattern. The difference between excellent and non-excellent students was insignificant, $\chi2(3) = 2.56$, $p > .05$, as well as the differences among students of different study fields, $\chi2(9) = 8.12$, $p > .05$, Fisher's exact test $p > .05$. Totals of the pattern distribution may deviate from 100% due to rounding imprecisions

satisfaction with life, $H(3) = 37.50$, $p < .001$, and experience of social support, $H(3) = 26.97$, $p < .001$, among students of different study fields. Nevertheless, the pairwise post-hoc Dunn test with Bonferroni adjustments indicated a significant difference only for professional ambition, which was increased in psychology students compared to teacher education students (adjusted $p = .002$), and experience of social support, which was increased in teacher education students compared to informatics students (adjusted $p = .04$). For a detailed overview of the results, refer to Table 5.

Predictive values of background, study-, and excellence-related characteristics for WCEP assignment

To test hypotheses $H_1 - H_5$, we investigated the predictive values of background, study-, and excellence-related variables for assignment to distinct WCEPs using two sequential multinomial logistic regression analyses. The likelihood ratio test showed statistical significance in both the first step that involved background and study-related predictors, $\chi^2(18) = 58.34$, $p < .001$, and the second step that involved excellence-related predictors, $\chi^2(30) = 85.42$, $p < .001$. The comparison of the likelihood ratios between step 2 and 1 showed significant enhancement in predicting the WCEP assignment, with $\Delta\chi^2(12) = 27.08$, $p < .01$.

To control for type I error that is associated with multiple comparisons, the Benjamini-Hochberg correction with a false discovery rate of 0.1 (McDonald, 2014) was applied to the results of multinomial logistic regression. The predictive values of the background and study-related variables significant after the Benjamini-Hochberg correction in step 1 were still tenable in step 2. More specifically, individuals who were enrolled in their first and only degree course displayed a lower probability of being assigned to the patterns S, $b = -1.25$, $p < .01$, A, $b = -1.53$, $p < .001$, and B, $b = -1.18$, $p < .01$. In addition, individuals who had a personally important job were less likely to be assigned to the patterns S, $b = -1.25$, $p < .01$, and B, $b = -1.85$, $p < .001$, compared to those who were only studying. With respect to the excellence-related variables, only personal excellence showed significant predictive value in that scoring higher on the personal excellence scale prevented from being assigned to the pattern B, $b = -0.75$, $p < .001$. See Table 6 for the regression coefficients and their respective standard errors, odds ratios, the 95% confidence intervals around them, results of likelihood ratio tests, and the values of R^2.

With respect to hypotheses $H_1 - H_3$, educational excellence was not significantly related to WCEP as expected (H_1 was confirmed) and personal excellence protected from being assigned to pattern B (H_2 was confirmed). However, despite our expectations, being nominated as excellent by teachers was not significantly related to WCEP (H_3 was disproved). In contrast, H_4 and H_5 were both confirmed. First, enrolled in a first and only degree course protected from being assigned to patterns S, A, and B and having a personally important job protected from being assigned to patterns S and B. Second, in line with our expectations, neither gender, study programme, nor phase of study were related to WCEP.

Table 4 Mann-Whitney U test results for differences in the scores on the AVEM scales between students nominated and non-nominated as excellent

Area/Scale	Nominated as excellent		Non-nominated as excellent		*U*	*p*	*r*
	M	*SD*	*M*	*SD*			
Professional commitment							
Subjective significance of work	2.65	0.78	2.69	0.75	9,973.00	0.783	0.01
Professional ambition	3.31	0.89	3.38	0.71	9,573.00	0.446	0.04
Tendency to exert	3.29	0.84	3.36	0.75	9,481.00	0.383	0.04
Striving for perfection	3.70	0.86	3.65	0.73	9,614.50	0.477	0.04
Emotional distancing	2.99	0.81	2.98	0.75	9,933.00	0.746	0.02
Coping capacity							
Resignation tendencies	2.94	0.74	2.96	0.75	10,156.00	0.957	0.00
Offensive coping with problems	3.43	0.75	3.37	0.67	9,586.50	0.456	0.04
Balance and mental stability	3.18	0.82	3.13	0.74	9,857.50	0.677	0.02
Subjective well-being							
Satisfaction with work	3.74	0.79	3.46	0.65	7,677.00	0.002	0.15
Satisfaction with life	3.80	0.77	3.63	0.75	8,877.50	0.108	0.08
Experience of social support	4.05	0.87	4.04	0.70	9,536.50	0.420	0.04

$N = 400$ ($n = 60$ nominated as excellent and $n = 340$ non-nominated as excellent). U = Mann Whitney U test statistics; r = the effect size estimate calculated as $r = z/\sqrt{N}$. A large effect is 0.5, a medium effect is 0.3, and a small effect is 0.1 (Coolican, 2009; Fritz et al., 2012)

Table 5 Kruskal-Wallis test results for differences in the scores on the AVEM scales among study fields

Area/Scale	Teacher Ed.		Psychology		Informatics		Geography		*H*(3)	*p*
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*		
Professional commitment										
Subjective significance of work	2.68	0.73	2.86	0.86	2.31	0.81	2.76	0.78	5.64	.130
Professional ambition	3.32[a]	0.72	3.78[a]	0.65	3.34	1.00	3.76	0.53	45.62	<.001
Tendency to exert	3.36	0.74	3.44	0.69	2.97	1.15	3.27	0.85	5.41	.144
Striving for perfection	3.65	0.76	3.70	0.74	3.57	0.83	3.74	0.62	0.80	.848
Emotional distancing	2.98	0.75	2.89	0.52	3.26	0.93	3.07	0.99	5.53	.137
Coping capacity										
Resignation tendencies	2.95	0.75	3.02	0.69	2.67	0.86	3.24	0.83	4.46	.215
Offensive coping with problems	3.38	0.65	3.35	0.77	3.27	1.04	3.45	0.66	0.76	.860
Balance and mental stability	3.14	0.73	2.97	0.78	3.29	0.80	3.10	0.97	2.69	.442
Subjective well-being										
Satisfaction with work	3.55	0.65	3.37	0.67	3.00	0.99	3.27	0.59	35.80	<.001
Satisfaction with life	3.71	0.73	3.33	0.86	3.19	0.94	3.48	0.58	37.50	<.001
Experience of social support	4.07[a]	0.72	3.98	0.66	3.61[a]	0.78	3.86	0.76	26.97	<.001

$n = 337$ for Teacher Education. $n = 29$ for Psychology. $n = 17$ for Informatics. $n = 14$ for Geography. Students of Linguistics ($n = 3$) were excluded from the subgroup analysis

H = Kruskal-Wallis test statistics. Kruskal-Wallis tests were based on pseudo-ranks because of unequal sample sizes (Brunner et al., 2018). Pairwise post-hoc Dunn tests with and without Bonferroni adjustments were performed to test for differences among study fields. With regard to professional ambition, teacher education students differed from psychology ($p < .001$, adjusted $p = .002$) and geography ($p = .01$, adjusted $p = .06$) students. With regard to satisfaction with work, teacher education students differed from informatics students ($p = .01$, adjusted $p = .06$). With regard to satisfaction with life, teacher education students differed from psychology ($p = .009$, adjusted $p = .06$) and informatics ($p = .02$, adjusted $p = .10$) students. With regard to experience of social support, teacher education students differed from informatics students ($p = .007$, adjusted $p = .04$)

[a] statistically significant differences between study fields indicated by a pairwise post-hoc Dunn test with Bonferroni adjustments

Discussion

The aim of the present study was to determine which university students' characteristics could be considered protective, and the risk factors that could lead to being assigned to the less desirable work-related patterns characterised by reduced professional effort (pattern S), health-risky professional overextension (pattern A), and burnout vulnerability (pattern B). At the centre of this study was the construct of academic excellence – a desirable quality in students that relates to present and future success. In this respect, our study investigated whether there was a link between academic excellence and the optimal health-promoting pattern G, which includes high professional motivation, coping capacity, and subjective well-being. Specifically, the two

Table 6 Results of the multinomial logistic regression

WCEP	Predictor	Step 1				Step 2			
		B	*SE*	*OR*	95% CI for *OR*	*B*	*SE*	*OR*	95% CI for *OR*
S	Intercept	0.18	0.72			2.96	1.53		
	Gender[a]	0.31	0.36	1.37	[0.66, 2.77]	0.28	0.40	1.32	[0.61, 2.86]
	Study programme[b]	0.04	0.49	1.04	[0.40, 2.72]	-0.02	0.52	0.98	[0.35, 2.74]
	Study level[c]	-0.02	0.35	0.98	[0.50, 1.94]	-0.33	0.39	0.72	[0.33, 1.55]
	Study history[d]	-0.84*	0.39	0.43	[0.20, 0.92]	**-1.25****	**0.43**	**0.29**	**[0.12, 0.66]**
	Important job[e]	-0.91*	0.43	0.40	[0.17, 0.94]	**-1.25****	**0.47**	**0.29**	**[0.12, 0.72]**
	Less important job[f]	0.44	0.40	1.55	[0.70, 3.40]	0.26	0.42	1.30	[0.57, 2.96]
	Nomination[g]					-0.45	0.50	0.64	[0.24, 1.69]
	GPA					0.27	0.33	1.31	[0.69, 2.47]
	Other achievements[h]					-0.87	0.47	0.42	[0.17, 1.04]
	Personal excellence					-0.54*	0.26	0.58	[0.35, 0.97]
A	Intercept	1.17	0.65			1.49	1.60		
	Gender[a]	-0.57	0.36	0.57	[0.28, 1.15]	-0.57	0.39	0.57	[0.27, 1.21]
	Study programme[b]	-0.22	0.44	0.80	[0.34, 1.90]	-0.31	0.46	0.74	[0.30, 1.80]
	Study level[c]	0.22	0.33	1.24	[0.65, 2.36]	0.10	0.37	1.10	[0.53, 2.27]
	Study history[d]	**-1.27*****	**0.35**	**0.28**	**[0.14, 0.56]**	**-1.53*****	**0.39**	**0.22**	**[0.10, 0.46]**
	Important job[e]	-0.50	0.37	0.61	[0.29, 1.27]	-0.53	0.40	0.59	[0.27, 1.29]
	Less important job[f]	-0.24	0.39	0.79	[0.37, 1.68]	-0.19	0.40	0.83	[0.37, 1.82]
	Nomination[g]					-0.65	0.45	0.52	[0.22, 1.25]
	GPA					0.02	0.30	1.02	[0.56, 1.83]
	Other achievements[h]					-0.45	0.40	0.64	[0.29, 1.39]
	Personal excellence					0.03	0.29	1.03	[0.60, 1.82]
B	Intercept	1.04	0.61			4.47***	1.31		
	Gender[a]	-0.35	0.34	0.71	[0.37, 1.36]	-0.23	0.36	0.80	[0.40, 1.61]
	Study programme[b]	0.13	0.41	1.13	[0.51, 2.53]	0.16	0.44	1.18	[0.50, 2.77]
	Study level[c]	0.47	0.30	1.60	[0.89, 2.88]	0.25	0.34	1.29	[0.66, 2.51]
	Study history[d]	**-0.82***	**0.35**	**0.44**	**[0.22, 0.89]**	**-1.18****	**0.38**	**0.31**	**[0.14, 0.65]**
	Important job[e]	**-1.51*****	**0.36**	**0.22**	**[0.11, 0.45]**	**-1.85*****	**0.39**	**0.16**	**[0.07, 0.34]**
	Less important job[f]	-0.28	0.33	0.76	[0.40, 1.46]	-0.46	0.35	0.63	[0.32, 1.25]
	Nomination[g]				-0.15	0.40	0.86	[0.39, 1.89]	
	GPA				0.25	0.28	1.28	[0.74, 2.23]	
	Other achievements[h]				-0.48	0.38	0.62	[0.30, 1.29]	
	Personal excellence				**-0.75*****	**0.23**	**0.47**	**[0.30, 0.74]**	

$N = 400$. Type G is used as a reference category. Predictors significant after Benjamini-Hochberg correction with a false discovery rate of 0.1 are marked in bold. GPA = grade point average (cumulative); CI= confidence interval. $\chi2(18) = 58.34, p < .001$ (Step 1), $\chi2(30) = 85.42, p < .001$ (Step 2), $\Delta\chi2(\Delta12) = 27.08, p < .01$. R^2 for Step 1 = .14 (Cox and Snell), .15 (Nagelkerke), .05 (McFadden), R^2 for Step 2 = .20 (Cox and Snell), .22 (Nagelkerke), .08 (McFadden)

[a] 0 = female, 1 = male. [b] 0 = non-teaching-oriented, 1 = teaching-oriented. [c] 0 = advanced, 1 = initial. [d] 0 = non-first and only degree course, 1 = first and only degree course. [e] 0 = no job, only study, 1 = personally important job. [f] 0 = no job, only study, 1 = personally less important and/or temporary job. [g] 0 = non-nominated as excellent, 1 = nominated as excellent. [h] 0 = compliance with no other academic achievement indicators, 1 = compliance with at least one other academic achievement indicator

* $p < .05$. ** $p < .01$. *** $p < .001$

components of excellence, educational and personal excellence, were closely investigated.

The central finding of this study was that personal excellence, i.e. a moral and virtuous character, prevented a student from being assigned to the pattern B. This finding is in line with Gander et al. (2012), who reported that G-type individuals tended to show the highest levels of character strengths (morally positively valued traits that account for "good character"), whereas B-types displayed the lowest level of virtuousness. Our results also show that educational excellence, manifested in high academic achievement, was unrelated to the WCEP assignment. This finding may be surprising given how workers assigned to the undesirable patterns (B pattern in particular) tend to perform unsatisfactorily in their profession (Genkova & Kaune, 2018; Klusmann et al., 2006; Ortner, 2012). Therefore, it appears that in students, including vulnerable individuals, the capacity to achieve desirable outcomes can remain preserved. In this respect, our findings resemble the inconclusive results on the link between WCEP and academic achievement presented

in other student-focused WCEP-related studies (Künsting et al., 2012; Voltmer et al., 2012).

Our findings also indicate that students nominated as excellent by teachers display a similar WCEP distribution as non-nominees. This implies that from the perspective of the WCEP framework, students considered excellent by teachers are predisposed psychologically to perform successfully in their future careers just as much as students not being considered excellent. This finding is less surprising given the differences between the two subsamples. Students nominated as excellent were significantly higher in educational excellence (academic achievement), which, however, accounted for no significant differences in the WCEP distribution. In contrast, personal excellence, which was the only significant excellence-related predictor of WCEP, was similar in both nominated and non-nominated students. Generally, the main features of students nominated as excellent were their higher objective academic achievement followed by higher subjective satisfaction with their professional accomplishments, which, however, brought them little, if any, health-promoting advantage over their non-nominated counterparts. From the procedural perspective of excellent student identification, we may conclude that teacher nomination is undoubtedly a useful method for identifying excellent students. However, the students nominated as excellent were mainly identified for their academic achievements. To reliably identify students who embody both dimensions of excellence – educational and personal – teacher nomination should not be used in isolation, but combined with other methods.

A further aim of this study was to provide additional evidence on background and study-related characteristics that may protect from vulnerability to occupational health risks and burnout. In this respect, we determined two background protective factors: having a personally important job and being enrolled in a first and only degree course. The first factor decreased the likelihood of being assigned to the resigned pattern B and motivational-deficient pattern S. The protective effect was, however, not found in students who had a job that they considered less important and/or temporal. Although there is abundant evidence on the positive impact of employment on psychological health and well-being even in students (Graetz, 1993; Moxham et al., 2018), little is known about the employment-related factors that produce this positive effect. Our findings seem to support the view that the protective role of the job status is mediated by the psychological value of the job itself rather than by the material benefits of having a job (Blanchflower & Oswald, 2004). The second protective factor, which prevents being assigned to the less desirable patterns S, A, and B, is linked to being enrolled in a first and only degree course. These findings reinforce our prior discovery of the protective effect of being enrolled in a first and only degree course against the resigned pattern B, observed in first-year teacher education students (Mašková et al., 2022). In the present, more diverse student sample, being enrolled in a first and only degree course also protected against other less desirable patterns. While study history is a largely overlooked student background factor, a similar finding was reported for (male) teacher education students enrolled in their second-choice degree course (Rothland, 2011). In addition, available evidence suggests that students with a history of attending another institution prior to the current one are particularly vulnerable to mental health challenges, showing increased levels of anxiety, depression, distress, self-injury, and suicidality (Beiter et al., 2015; Liu et al., 2019; Mehr & Daltry, 2016). However, the mechanism behind the effect of study history on student well-being and mental health remains unknown and speculative, with possible factors including adjustment difficulties, stressful experience of moving schools, or self-blame for leaving the original institution (Beiter et al., 2015; Liu et al., 2019; Mehr & Daltry, 2016; Withey et al., 2014). We posit that the protective effect of being enrolled in a first and only degree course may be mediated by a stronger identification with the study programme and higher subjective certainty in the choice of study, both serving as protective factors against undesirable work-related patterns (Obst & Kötter, 2020; Rothland, 2011). Nevertheless, without comprehensive research including various subgroups of students with different study history, the interpretation of these findings remains tentative.

In terms of gender differences, this study's results conform to our previous findings that gender was an insignificant predictor of work-related patterns in Czech first-year teacher education students (Mašková & Nohavová, 2021; Mašková et al., 2022). This lack of gender-related differences in the WCEP distribution also applies to the present, more diverse student sample. However, it is noteworthy that this result diverges from the pronounced gender differences in the WCEP distribution consistently observed in German students (e.g. Afshar et al., 2022; Rothland, 2011), which aligns with the general trend of increased psychological vulnerability in female university students (Auerbach et al., 2018; Sheldon et al., 2021). This discrepancy may possibly result from variations in mental health and well-being between genders across different cultures, influenced by gender-specific effects of social and cultural factors, such as levels of gender equality. Ironically, greater gender equality, which implies societal expectation for female employment, appears to decrease women's well-being while increasing men's (Meisenberg & Woodley, 2015). This indeed applies to Germany scoring above the European Union average in gender equality. In the Czech Republic, which ranks among

the lowest in gender equality among European countries, such trend was not observed (European Foundation for the Improvement of Living and Working Conditions, 2023; European Institute for Gender Equality, 2023). In sum, the discrepancy in the gender-related differences in the WCEP distribution between Czech and German students is likely to be attributed to cross-cultural factors. Nevertheless, this discrepancy further highlights the need for extension of the WCEP research beyond Germany to capture different trends in various populations.

Further, our study determined that the phase of study (initial vs. more advanced) tended to be an insignificant predictor of WCEP. The previous evidence on this topic yielded inconsistent results, with two types of outcomes observed: the WCEP distribution tended to either persist (e.g. Römer et al., 2013; Schröder & Kieschke, 2006) or transition toward less desirable patterns during the course of study (e.g. Römer et al., 2013; Rothland, 2011). Similarly, the available evidence on student mental health did not enable clear conclusions regarding the effect of the phase of the study. Some studies suggested a worsening of mental health during the course of study (e.g. Bewick et al., 2010), while others did not support this (e.g. Mohamad et al., 2021). Specifically in Czech students, inconsistent patterns of deterioration and improvement in mental health during various years of study were shown (Gavurova et al., 2022). Our results add to the branch of findings revealing no effect of the study phase on the WCEP distribution, suggesting that no negative developments must necessarily occur as the degree course advances. On the other hand, it confirms that the spontaneous improvement of the risk work-related patterns is unlikely, which further highlights the need for targeted interventions.

The present study also revealed no significant differences in the WCEP distribution among students of teacher education and those enrolled in various non-teaching study programmes. However, the results suggest that teacher education students tend to be the least vulnerable group, particularly in comparison to psychology students. In psychology students, there is a significantly higher level of professional ambition, which translates into the relatively high occurrence of pattern A (an excessively ambitious profile) coupled with a very low frequency of pattern S (an unambitious profile). Consequently, about two-thirds of psychology students could be classified at risk of developing occupational health issues. This finding is in accordance with Reichl et al. (2014), who found that psychology students tended to be assigned to the risk patterns more often than teacher education students. The significant increase in professional ambition in psychology students implies that their occupational motivation tends to be quantitatively higher than that of students of other study fields. There are at least two interpretations for this phenomenon. Either psychology as a career choice attracts mainly those who are highly ambitious and strive for professional success in their future career and/or such individuals are favoured during admission exams for psychology studies. In any case, we identified psychology students as one of the most vulnerable student groups that deserve the attention of higher education educators and policymakers to support their health and well-being.

Since the present study is one of very few studies on WCEP in university students that was conducted outside Germany, it is worth noting that several findings on risk/protective factors of assignment to (un)desirable patterns observed in German students were also replicated in the Czech sample, such as the inconclusive findings on the link between WCEP, academic achievement, and phase of study (Bauer, 2019; Künsting et al., 2012; Voltmer et al., 2012).

Limitations

This study has several limitations. To begin with, although the sample of students nominated as excellent might be considered representative of the target population at the FE USB, it was relatively small due to the exclusivity of this population. The sample of students pursuing non-teaching study programmes was also small because they represent only an insignificant portion of the entire student population at the FE USB. Therefore, this study had an increased risk of false negative results (Type II error) due to the reduced power of the study (Serdar et al., 2021). A further limitation pertains to the indicators used to cover the two facets of excellence. Although educational excellence was measured with objective indicators, they were self-reported. Since the self-reported data could not be verified by external sources, they are likely to have been biased to some extent. Similarly, personal excellence was measured with a self-rating scale and a self-report may yield different results than other reports on a student's attributes provided by teachers or peers. Finally, this study relied on a cross-sectional design. In occupational health psychology, this is a typical design in which the concepts examined tend to be presented as "antecedents" and "consequences", although the cross-sectional design cannot distinguish between a presumed cause and its possible effect (Taris et al., 2021). These general limitations of the cross-sectional design must be taken into account when interpreting the present results.

Theoretical and practical implications

The results of this study have several implications for both theory and practice. To begin with, our finding about the similar levels of academic achievement among students displaying both healthy and unhealthy work-related patterns is theoretically interesting. In this respect, the theoretical underpinnings

of the WCEP framework suggest that individuals displaying the burnout pattern B lack the capacity to perform satisfactorily at work (Schaarschmidt, 2005a), which was also confirmed empirically by WCEP research in professionals (Klusmann et al., 2006; Ortner, 2012). In contrast, both our results and the findings of research conducted in Germany indicate that even unfavourably predisposed students can achieve good academic results. Put differently, it appears that at the early stages of vulnerable individuals' career, the capacity to achieve satisfactory outcomes can remain preserved. Such evidence is encouraging because a timely identification of vulnerable individuals and correction of their undesirable work-related patterns can maintain their ability to perform successfully even after the transition to professional life.

Since more than half of the university students in our sample displayed vulnerability to burnout and occupational health risks, it is recommended that higher education institutions take effective action to foster resilience and mental health in students. Intervention programmes or individual counselling could enhance professional motivation, coping capacity, and the well-being of students even beyond their university career. Therefore, the results of this study have strong practical implications for higher education educators, counsellors, and policymakers.

Finally, this study has highlighted the relevance of two-dimensional conceptualisation of excellence where the personal attributes of morality and virtuousness are shown to be an integral part of academic excellence. Since the practice in the education system is to focus mainly on readily quantifiable outcomes such as academic achievement, it is important to stress that personal excellence plays a crucial role in students' professional development in that prosocial, moral, and self-reflective behaviour protects an individual against vulnerability to burnout and occupational health risks. Therefore, higher education institutions and universities should also focus on the less tangible students' qualities and intensively engage in promoting and supporting personal excellence in students.

Directions for future research

Only limited evidence is available on WCEP and their correlates in non-German student populations. Although this study has provided preliminary results on WCEP in Czech students, conducting WCEP research in culturally different countries is highly needed. Likewise, additional data collection in students of study fields other than teacher education or medicine could help to determine the possible differences between students of various study fields. Further, prospective studies are needed to confirm our findings over a long-term perspective. In this respect, it would be worth examining the trajectory of individual WCEP developments and establishing work-related outcomes in early career professionals that could be predicted from behaviours displayed during the university studies. A comparison of individual trajectories of excellent and non-excellent students would be of particular interest to determine the significance of academic excellence after graduation.

Conclusion

The present study revealed that personal excellence in university students, manifested in prosocial, moral, and self-reflective behaviour, is a protective factor against the least desirable work-related pattern B (vulnerability to burnout). In contrast, educational excellence manifested in high academic achievement played no role in protecting a student against vulnerability to burnout and occupational health issues. Likewise, students considered excellent by teachers were not better protected from these risks than their non-nominated counterparts. These findings suggest that although excellent academic achievement is undoubtedly related to many positive outcomes, in terms of an individual's preparedness to deal with work-related demands, grades and academic success have little relevance. From the perspective of predicting a health-promoting approach in dealing with occupational stress, it appears that morality and virtuousness in a student are the most influential factors.

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Data availability The data that support the findings of this study are available from the corresponding author upon reasonable request.

Declarations

Ethics approval This study was performed in line with the principles of the Declaration of Helsinki. Approval was granted by the Ethics Committee of the FE USB (No. EK 003/2018).

Consent to participate Informed consent was obtained from all individual participants included in the study.

Conflict of interest statement The author has no relevant financial or non-financial interests to disclose.

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Study 4

Study 4 is a published article:

Mašková, I., Mägdefrau, J., & Nohavová, A. (2022). Work-related coping behaviour and experience patterns, career choice motivation, and motivational regulation of first-year teacher education students – Evidence from Germany and the Czech Republic. *Teaching and Teacher Education, 109,* Article 103560. https://doi.org/10.1016/j.tate.2021.103560

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This study is an empirical investigation involving 216 German and 265 Czech first-year teacher education students. It represents the first pilot study within the AVEM framework to provide a direct cross-country comparison of pattern distributions. In addition, the study examined the role of motivation within the framework of SDT, including career choice motivation, in relation to pattern assignment. The findings revealed notable cross-country differences in pattern distributions, underscoring the need for further comparative research, and confirmed the central role of autonomous motivation in pattern assignment. Overall, this study addresses an important gap in AVEM research by initiating cross-cultural comparisons while simultaneously providing novel evidence on the quality of motivation associated with the work-related patterns. The study offers theoretical contributions and, in particular, practical implications for teacher education.

The study was first-authored by the author of this thesis, who was primarily responsible for the conceptualization of the study, the development of the methodology, statistical analyses, interpretation of the findings, manuscript preparation, and supervision of the author team. Overall, she was involved in all essential stages of the study except for participant recruitment and data collection. Her contribution accounts for approximately 90% of the total work.

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Research paper

Work-related coping behaviour and experience patterns, career choice motivation, and motivational regulation of first-year teacher education students – Evidence from Germany and the Czech Republic☆

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ABSTRACT

This study examined the association between work-related coping behaviour and experience patterns (WCEP), career choice motivation, and motivational regulation in first-year German teacher education students and their counterparts from the Czech Republic. The key finding of the present study was the association between the desirable health-promoting work-related pattern and the more autonomous higher-quality types of motivation. Regarding the cross-country differences, German students differed significantly from Czech students in terms of WCEP assignment. Whereas German teacher education students displayed more frequently the healthy work-related pattern, Czech teacher education students, on the other hand, tended to be more vulnerable to burnout.

Teaching is a psychically demanding occupation which bears increased mental health risks compared to other professions, including the risk of burnout (Nübling et al., 2011). Considering the high levels of stress faced by teachers, an individual's stress-related coping skills may play a prominent role in protecting them against the negative impact of elevated stress on both their physical and mental health (Schröder & Kieschke, 2006). This may in turn help to maintain a high level of professional effectiveness and the quality of education (Klusmann et al., 2006; Seth, 2016). Therefore, it is a matter of concern that a significant number of prospective teachers display ineffective coping patterns and vulnerability to burnout already at the beginning of their teacher education process (Reichl et al., 2014). However, when specific interventions are applied early, risk patterns can be corrected (Schaarschmidt, 2006). The present study aims to facilitate the prediction and prevention of stress-related health risks in prospective teachers through the timely identification of these vulnerable individuals. Additionally, since it seeks to extend the understanding of the inter-relatedness of teacher education students' coping patterns and their study and career choice motivations, the present study also pursues to provide evidence on motivational factors that could protect prospective teachers from being assigned to unhealthy work-related coping and behavioural patterns. In this respect, the present study provides evidence from two culturally distinct countries: Germany and the Czech Republic.

1. Work-related coping behaviour and experience patterns

This study relies on the conceptualization of the interplay between vocational engagement and individual coping capacity, referred to as *work-related coping behaviour and experience patterns* (WCEP), or *Arbeitsbezogenes Verhaltens- und Erlebensmuster* (AVEM)

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in its original German version (Kieschke & Schaarschmidt, 2008; Schaarschmidt & Fischer, 2008). The AVEM inventory has been designed to gather self-reported data about personal experience with work-related stress and the typical behavioural responses in coping with this stress. It involves 11 dimensions covering three areas of characteristics: *professional commitment* (including the subjective significance of work, professional ambition, tendency to exert, striving for perfection, and emotional distancing), *coping capacity* (resignation tendencies, offensive coping with problems, and balance and mental stability), and *subjective well-being* (satisfaction with work, satisfaction with life, and experience of social support) (Kieschke & Schaarschmidt, 2008). In a cluster analysis of the above-described dimensions, four distinct types of profiles or coping patterns were identified: the healthy ambitious type G, the unambitious type S, the excessively ambitious risk type A, and the resigned risk type B. For each person, their individual profile is determined by the highest match between the individual tendencies and the four distinct profiles (Schaarschmidt & Kieschke, 2007).

Type G (*good health*) is characterized by a health-promoting attitude towards work and is therefore seen as the desirable pattern. G-type individuals show high professional commitment and coping capacity, and the ability to distance themselves from work-related demands. Moreover, a G-type person displays positive emotions and high subjective well-being. Type S (*sparing personal investment at work*), in contrast, restricts their effort at work to the absolutely necessary displaying low professional commitment. However, they score the highest of all four types on the emotional distancing scale and display an effective coping capacity towards professional challenges. This health protective coping ability and the relatively high subjective well-being of S-type individuals' derive primarily from the family and free time areas rather than from success at work. Therefore, it is not occupational health, but professional motivation that tends to be a matter of concern in type S individuals.

On the other side, individuals displaying work-related patterns A and B tend to be at risk of psychological and physical health. Risk type A (*ambitious*) is characterized by excessively high commitment in the workplace but lacks sufficient coping capacity to withstand stress and work-related demands. In this respect, A-type individuals are the least able to distance themselves from work-related problems. Moreover, their high commitment to work does not seem to be emotionally rewarding, as low satisfaction dominates their work experience. This work-related pattern closely resembles the well-established concept of type A behaviour or workaholism that sets the individual at high risk of developing health problems, especially cardiovascular diseases (Friedman & Rosenman, 1974, as cited in Schaarschmidt, 2006). Finally, risk type B (*burnout*) reflects the symptoms in the late stages of the burnout syndrome (Maslach, 1982, as cited in Kieschke & Schaarschmidt, 2008). Although this pattern does not equal the burnout syndrome, it is displayed in individuals who tend to inner resignation and are vulnerable to burnout (Künsting et al., 2012). This type shares similarities with type S, especially in terms of low professional commitment. However, in contrast to type S, reduced commitment in type B is connected to a limited ability to distance oneself from work-related demands. In type B, satisfaction and coping capacity are low. Thus, this type is characterized by a negative emotional tone, exhaustion, experience of excessive challenge, and resignation. Consequently, in B-type individuals, the psychological and health disturbances tend to be much more prevalent than in other types. In particular, this pattern is associated with an increased risk of psychosomatic diseases (Kieschke & Schaarschmidt, 2008; Schaarschmidt & Fischer, 2008; Schaarschmidt, 2006).

2. WCEP-focused research in teachers and teacher education students

In teachers, compared to other occupational groups, the prevalence of the risk patterns was shown to be alarmingly high. More specifically, the most extensive WCEP-focused study conducted between 2000 and 2006 by the University of Potsdam (*Potsdamer Lehrerstudie*) in Germany revealed that about 60% of approximately 16 000 German teachers taking part in the study displayed one of the risk patterns, while only 17% showed the most desirable G pattern (Schaarschmidt & Kieschke, 2007). Interestingly, the tendency of displaying the risk patterns was particularly pronounced in teacher samples from the German federal states of the former Eastern Bloc (East Germany), with overwhelmingly high proportions of A-type individuals. The increased inclination towards the A pattern with a lower number of S types was even more markedly present among teachers from other European countries of the former Eastern Bloc – Russia, Poland, and the Czech Republic[1] possibly due to historical-political events (Schaarschmidt, 2005).

Similar surveys conducted with teacher education students in German-speaking countries, on the other hand, showed that the distribution of the distinct patterns was generally more favourable than in in-service teachers – typically, the proportion of G-type individuals ranged between about one-fourth to two-fifths of the research samples in German-speaking countries (e.g., Reichl et al., 2014; Römer et al., 2017, 2013; Rothland, 2011; Schaarschmidt, 2005). In fact, G-type individuals represented about half of the study sample of Swiss (Deiglmayr et al., 2018) and Austrian (Zehetner & Boxhofer, 2018) teacher education students.[2]

Despite the overall positive results of teacher education students in German-speaking countries, the studies also revealed that risk A-type and B-type individuals comprised about 40% of the teacher education students on a regular basis (e.g. Reichl et al., 2014; Römer et al., 2013, 2017). Considering the higher prevalence of health problems in risk A-type and B-type individuals, which was confirmed in teacher education students even before the transition to the demanding in-service teaching phase (Deiglmayr et al., 2018), the above-mentioned findings may be matter of concern in terms of individual health risks faced by future teachers (Kieschke & Schaarschmidt, 2008), as well as societal risks related to diminished quality of teaching in teachers displaying unfavourable work-related patterns (Klusmann et al., 2006). Further, longitudinal research shows that without specific interventions an individual's inclinations towards distinct work-related patterns either persist or transition towards less desirable patterns (Kieschke & Schaarschmidt, 2008; Voltmer et al., 2010). Thus, individuals displaying undesirable work-related patterns at the beginning of their studies are unlikely to make any significant spontaneous improvements after becoming in-service teachers.

[1] A limited number of participants from these countries took part in the first phase of the *Potsdamer Lehrerstudie* that was realized between 2000 and 2003. More specifically, it was 255 and 289 participants from Russia and Poland respectively. For the Czech sample, no participant-related data is available. Nevertheless, Schaarschmidt (2005) showed that the Czech teacher sample comprised of 15% of G types, 19% of S types, 42% of A types, and 24% of B types.

[2] An exception to these findings was a study sample of teacher education students at the University of Potsdam (former East Germany's district), in which the proportion of individuals displaying the risk patterns reached almost 60% and G types constituted only about 15% of the sample (Schröder & Kieschke, 2006). The unusual finding was explained by the East-West differences in WCEP distributions described by Schaarschmidt (2005). The more recent research, however, did not confirm the finding, since the WCEP distribution of University Potsdam's teacher education students resembled to that of students of other German universities (Schaefer, 2012; Çelebi et al., 2014).

Nevertheless, the chance that such individuals enter the teaching profession may be substantially reduced by early psychological interventions and training, as well as through counselling to help select a more appropriate field of study (Künsting et al., 2012). To apply such measures effectively, however, it is essential to perform the WCEP assessment at the beginning of teacher education.

Although the number of WCEP-related research studies has grown significantly over the past two decades, one of the main limitations of these studies is their almost exclusive focus on German-speaking (prospective) teacher samples. The currently available evidence is thus confined to a specific population and can hardly be transferred to countries with different cultural, social, and economic backgrounds.

3. The inter-relatedness between WCEP and motivation

Several above-mentioned research studies have revealed a link between the WCEP of teacher education students and their study and career choice motivations. In general, whereas individuals with less desirable work-related patterns tend to display unsatisfactory motivation to pursue their teacher education and a future teaching career, those being assigned to the desirable G pattern seem to be genuinely motivated. More specifically, Rothland (2012) found that G-type teacher education students opted for a teaching career due to the intrinsic value of teaching, the desire to work with children, and – along with A types – social engagement. Intrinsic motivation as the reason for choosing teacher education was confirmed in G-type individuals by Reichl et al. (2014) and in G types and A types by Künsting et al. (2012). On the other hand, teacher education students assigned to risk patterns A and B were highly unlikely to pursue a teaching career after graduation (Rothland, 2011; Schaarschmidt, 2005) and tended to opt for teacher education due to its perceived low difficulty compared to other studies (Reichl et al., 2014). Further, in B- and S-type individuals intrinsic and altruistic career choice motivation was significantly reduced (Rothland, 2012). They were also less firmly rooted in the teaching career because they had opted late for teacher education, and they were more uncertain about their teaching career choice than G types (Rothland, 2011). In sum, whereas evidence about the motivation of A and S types is rather equivocal, it appears that there is a strong contrast between individuals assigned to the most desirable G pattern and the least desirable B pattern. The insufficient motivation of B-type teacher education students may be related to the fact that teaching is a *fallback career* for them (Rothland, 2012; Watt & Richardson, 2007, as cited in Rothland, 2012) due to the lack of other alternatives, or because their first-choice career options could not be attained (Römer et al., 2013; Rothland, 2012). However, contradictory results were presented by Künsting et al. (2012), who revealed that B-type teacher education students do not significantly depart from individuals assigned to other work-related patterns in the level of extrinsic study motivation. In this respect, their study showed no differences in the level of extrinsic motivation among distinct types at all.

The above-mentioned findings indicate that motivational variables create an important group of WCEP correlates in the teacher education student population. However, due to the still limited number of relevant studies and existing inconsistencies in the available findings, there is a prevailing lack of understanding of how exactly individuals assigned to distinct work-related patterns differ according to their motivations. Moreover, since the above-mentioned research was conducted exclusively in German-speaking countries, there is a lack of evidence for culturally different countries, such as the Czech Republic. Thus, although the already set research line on the WCEP-motivation association contributes significantly to WCEP-related research by achieving considerable preliminary results, there is a need to gain more solid evidence in this area.

4. The self-determination theory of motivation

The AVEM instrument alone covers several aspects related to an individual's motivation, especially in terms of the subjective significance of work and professional ambition. However, these are rather general motivational variables (Kieschke & Schaarschmidt, 2008; Rothland, 2012) reflecting solely the quantitative approach to motivation. Therefore, a more comprehensive approach towards motivation needs to be applied to gain a more complex view on the motivation of individuals assigned to distinct work-related patterns. Such an integrated approach is represented by the self-determination theory (SDT), which distinguishes among different types of motivation having different qualities and suggests that higher levels of motivation do not necessarily yield more desirable outcomes if the motivation is of a poor quality (Deci & Ryan, 2002; Ryan & Deci, 2000). In this respect, the SDT framework proposes a taxonomy of motivational regulations differing in the degree to which the motivation for a behaviour emanates from the self (i.e., is autonomous). The prototype of autonomous behaviour is a state in which an activity is done out of interest and with inherent satisfaction. This is referred to as *intrinsic motivation*. In contrast, *extrinsic motivation*, when an activity is performed to attain a separable outcome, can vary greatly in its relative autonomy. SDT suggests that for an extrinsically motivated behaviour to become more autonomous, the value and regulation of the requested behaviour must be internalized. The degree of internalisation can be expressed by different forms of extrinsically motivated behaviour; on this continuum, *external regulation* represents the least autonomous type. It occurs when an individual is motivated to obtain rewards or avoid punishment, as for instance a student studying for a high salary in the future. *Introjected regulation* is a type of partially internalized motivation that describes behaviours aimed at producing feelings of self-worth or at avoiding guilt and shame, for example studying to show one's intellectual abilities to others. Both external and introjected regulations are associated with low autonomy and may be considered *controlled motivation*. Conversely, a higher degree of autonomy and adaptive behaviour are associated with *identified regulation*, where an individual sees value in a behaviour that enables them to attain personally important goals, such as studying for the important personal goal of graduation. The most autonomous type of extrinsic regulation, *integrated regulation*, is characterised by an individual perceiving the behaviour as part of their personality. Identified regulation, integrated regulation, and intrinsic motivation are classified as *autonomous motivation* since the origin of motivation comes from internal factors and is perceived as a higher-quality motivation compared to controlled motivation (Deci & Ryan, 2002; Ryan & Deci, 2000; Thomas et al., 2018). Comparisons between individuals varying in the degree of autonomy of their behaviour typically revealed that greater autonomy brings individuals manifold advantages, such as more behavioural effectiveness, greater persistence, enhanced subjective well-being, and better assimilation of the individual into their social group (Ryan & Deci, 2000). Such evidence is in concordance with the more recent research on SDT suggesting that quality of motivation also plays a significant role in the burnout process. The findings reveal that whereas autonomous motivation was negatively associated with burnout, controlled motivation was positively associated with burnout – this applies both to teachers (Eyal & Roth, 2011; Fernet et al., 2012) and students (Pisarik, 2009).

Considering the suggested narrow link between work-related patterns and motivational variables, the present study seeks to

contribute to WCEP-related research by following the line of research on career choice motivation set out by Rothland (2012), but also by adding a new perspective: that of the qualitative approach to motivation within the SDT framework.

5. Country-related differences in prospective teachers' motivation

Although an individual's motivations may vary according to their unique preferences, experiences, and biographies, social and economic factors may also be reflected in specific motivational patterns of individuals opting for teacher education. Although Czech teaching professionals tend to experience levels of stress and demand similar to their counterparts in German-speaking countries (European Commission/EACEA/Eurydice, 2021; Nübling et al., 2011), contrary to them, they long had inadequately low salaries coupled with low social status (Dolton et al., 2018; Shewbridge et al., 2016). The combination of the above-mentioned factors was identified as the main reason for teachers leaving the teaching profession, as well as for the low interest of talented young people in entering teacher education (Prokop & Dvořák, 2019). Thus, it is not surprising that the career choice motivation of Czech teacher education students and applicants was shown to be unsatisfactory. A survey led by Scio (2013) revealed that, compared to the applicants for different study programs, teacher education applicants were the most likely to choose their field of study because they perceived it as easier and less costly than others. Similarly, teacher education has typically been perceived as a backup study option, as first demonstrated by Havlík (1995) who found that up to one-third of first-year teacher education students would have opted for another study program if they had been accepted on it. This trend still persisted a decade ago, as Davidová (2012) confirmed that 35% of first-year teacher education students did not have teacher education as their first-choice study option.

However, in 2019, a dramatic increase in the salaries of Czech teachers occurred, along with a government promise to further increase the salaries of teachers in the coming years, which resonated strongly in the Czech public sphere. It is therefore expected that these most recent developments have promoted the attractiveness of the teaching profession in young people and enhanced their motivation to pursue the teaching career (Münich & Smolka, 2020). However, the motivational tendencies in the most recent generation of Czech teacher education students are unknown due to the lack of up-to-date evidence.

On the other side, research conducted in Germany did not reveal any significant tendencies to perceive teacher education as a backup study option. For instance, research conducted at Leipzig University revealed that for 88% of first-year students, teacher education was their first choice, and only 12% would opt for another study program instead (Grüneberg et al., 2018). Further, the study choice motive of the perceived low difficulty of studies was the least significant motivation according to Pohlmann & Möller (2010), whereas Grüneberg et al. (2018) found that this motive was of no relevance at all. Generally, despite the diversity in study designs and research methods, the results consistently indicate that in Germany, the intrinsic motivation for choosing the teaching career strongly dominates over extrinsic motivation (König & Rothland, 2012; Rothland & Terhart, 2010).

6. The present study

The present study is a unique attempt to fill the gaps left by previous research. First, it seeks to deepen and broaden the understanding of the inter-relatedness of WCEP and motivational variables by following the research line on career choice motivation initiated by Rothland (2012), but also by adding the new perspective of the SDT framework (Deci & Ryan, 2002; Ryan & Deci, 2000). Second, it is a pilot study to examine whether prospective teachers from culturally distinct countries differ in terms of vulnerability to work-related health risks. From this perspective, it extends teacher education students-focused WCEP research beyond the German-speaking population to one of Germany's neighbouring countries: the Czech Republic – a Central European country of the former Eastern Bloc with a different cultural and economic background. At this point, it is unclear whether significant differences in WCEP could be expected between German and Czech teacher education students. In this respect, Schaarschmidt's (2005) evidence about WCEP-related East-West differences is outdated over two decades and more recent research revealed that the WCEP distribution of teacher education students from former Eastern Germany's districts resembles that of students of other German universities (Schaefer, 2012; Çelebi et al., 2014). Due to the lack of up-to-date evidence, it is also unclear whether the unfavourable motivational background still persists in the most recent generation of Czech teacher education students to generate the potential WCEP-related differences. Thus, this study is an important first step in determining whether special attention should be devoted to fostering the prospective teachers' coping capacity for work-related demands in countries culturally distinct from Germany.

The present study aims to answer the following research questions:

1. Which motivational variables act as predictors of the healthy work-related pattern in first-year teacher education students at both the common and the country level?
2. How do first-year German and Czech teacher education students differ in terms of WCEP, career choice motivation, and motivational regulation?

In line with existing empirical evidence on the association between WCEP and motivational variables, we expect that:

H1. The healthy work-related pattern is positively associated with higher-quality desirable career choice motives, such as the intrinsic value of teaching or the desire to work with children (H1a), and autonomous types of motivational regulation (H1b).

H2. The healthy work-related pattern is negatively associated with lower-quality undesirable career choice motives, such as teaching as a fallback career (H2a), and controlled types of motivational regulation (H2b).

Due to the lack of up-to-date evidence on WCEP- and motivation-related differences between German and Czech teacher education students, we formulate the respective hypotheses as follows:

H0. There is no difference between German and Czech teacher education students in terms of WCEP (H0a), career choice motivation (H0b), and motivational regulation (H0c).

7. Method

7.1. Participants

The German study sample consisted of 216 participants that belonged to the cohort of 499 first-year teacher education students at the Faculty of Arts and Humanities of the University of Passau (participation rate = 44%). 80% of the participants were females. The mean age was 19.55 (SD = 2.356) ranging from 18 to 43 years.

Table 1
The distribution of the German and Czech sample according to gender, study program, study history, and job status.

Background variables	Germany		Czech Republic	
	n	%	*n*	%
Gender				
Male	44	20.4	104	39.2
Female	172	79.6	161	60.8
Divers	0	0	0	0
Study Program				
Teacher Education for Primary Education (GE)	111	51.4	–	–
Teacher Education for Secondary Education - *Gymnasium* track (GE)	61	28.2	–	–
Teacher Education for Secondary Education - *Realschule* track (GE)	25	11.6	–	–
Teacher Education for Secondary Education - *Mittelschule* track (GE)	16	7.4	–	–
Bachelor in Education (GE)	3	1.4	–	–
Specialization in Education (CZ)	–	–	265	100
Study History[a]				
Current degree course as the first and only	192	88.9	201	75.8
Enrolled on multiple degree courses	0	0	8	3
Already obtained a university degree	5	2.3	3	1.1
History of previous uncompleted teacher education study	4	1.9	18	6.8
History of previous uncompleted study other than teacher education	15	6.9	35	13.2
Job Status[b]				
Currently only studying with no job experience considered important	92	42.6	102	38.5
Currently in a job considered personally less important and/or temporary	52	24.1	94	35.5
Currently in a job considered personally important	40	18.5	39	14.7
Currently only studying with past experience of a personally important job	32	14.8	30	11.3

Note. $n_{GE} = 216$, $n_{CZ} = 265$. *Gymnasium* refers to grammar school covering both the lower and upper level (5th – 12th class). *Realschule* refers to a lower secondary level qualifying pupils for higher-level vocational work or vocational higher education (5th – 10th class). *Mittelschule* refers to a lower secondary level focused on vocational education, but also providing students with the pre-requisites to continue at higher-level schools (5th –10th class). The Bachelor in Education follows the conventional curriculum of Teacher Education for Secondary Education - *Realschule* track, yet it is adapted to the international bachelor's degree system and is followed by the Master of Education in Teaching and Learning Processes study program. Specialization in Education is a bachelor's degree program followed by the Master's teacher education study program focused on qualifying students for a teaching career at the lower secondary stage of elementary school (6th – 9th class).

[a] The question was formulated as: "Is teacher education your first and only university degree course?" For the purposes of the multinomial logistic regression, the categories were merged as follows: the *first and only degree course* category was left as a stand-alone category, the remaining categories were collapsed into *non- first and only degree course* category.

[b] The question was formulated as: "Beside your studies, do you currently have a job?" For the purposes of the multinomial logistic regression, the categories were merged as follows: the two categories referring to the experience of having a job considered as an important part of the participant's life (currently and in the past) were merged into the *personally important job* category, the remaining categories were merged into the *no personally important job* category.

The participants were enrolled in several teacher education programs, which provide teacher qualifications in different school tracks within the German school system (for detailed overview of these programs and the distribution of participants according to their studied program, see Table 1).

The Czech study sample consisted of 265 participants belonging to the cohort of 303 first-year teacher education students at the Faculty of Education of the University of South Bohemia (participation rate = 87%). 61% of the participants were females. The mean age was 20.22 years (SD = 2.229), ranging from 19 to 39 years. All Czech participants were enrolled on the Bachelor's degree program *Specialization in Education*.

7.2. Procedure

A questionnaire comprised of the below described measures was administered at the end of the winter term 2019/2020, the participants' first term at the university, in introductory courses in Psychology and Pedagogy obligatory for first-year teacher education students. All participants completed the questionnaire electronically to avoid the errors which may occur during the transcription of paper-pencil data. As the particular course that Czech participants were enrolled in is specifically designed to help students discover their individual potential and facilitate their personal development, Czech participants were asked to complete the questionnaire to obtain their individual results under a confidential identification code. Their results were further discussed in classes. The completion of the questionnaire was, therefore, highly recommended. The German participants completed the questionnaire independently of the course content; however, they were also offered the possibility to access their individual results under a confidential identification code.

7.3. Measures

The final questionnaire comprising the below-mentioned items was compiled in German and Czech identical versions. For details about the compilation procedure, see Supplementary Material 1.

7.3.1. Background characteristics

The participants were asked to state their gender, age, study specialization,[3] and study history focusing on whether their current study program was their first and only university degree course.

7.3.2. Work-related coping behaviour and experience patterns

The original version of the AVEM inventory by Schaarschmidt and Fischer (2008) was employed to measure WCEP. This instrument comprises 11 subscales with six items each. All 66 items were answered on a five-point Likert-type scale; for each item, respondents had to choose one of the following options: *I strongly agree|I somewhat agree|I'm in the middle|I somewhat disagree|I strongly disagree* (Schaarschmidt & Fischer, 2001). This instrument was not specifically designed for students and the items address work and life situations in general rather than study-related circumstances. Although there is a teacher education students-oriented AVEM modification referred to as *Schulpraxisbezogenes*

[3] This applied to German respondents only, as the Czech respondents were all enrolled in the Specialization in Education study program.

Verhaltens- und Erlebensmuster (SPAVEM) by Boxhofer (2014), the SPAVEM items address practical teaching experience. Thus, SPAVEM cannot be administered to teacher education students during the initial phase of their studies as they lack such experience. To overcome these limitations, we employed the original work-related AVEM items and instructed respondents that they may refer to their work-related experience in the case they have had a job which they consider personally important; this did not apply to a personally unimportant temporary job because it may not have an appropriate corresponding value for the WCEP assessment. If they had not had a personally important work-related experience, they had to consider their studies as their job. This kind of instructional adjustment addressing students that may lack job-related experience has been commonly applied in students-focused WCEP research (e.g. Künsting et al., 2012; Schaefer, 2012). To identify the kind of experience respondents were referring to when answering the work-related AVEM items, we added a question related to the participants' job status.

7.3.3. Motivation

We assessed the main motive for choosing the study program focused on teacher education with an open-ended question: "What is your main reason for choosing a career in teaching?" Further, we administered a measurement tool specifically designed to assess motivational regulations in the context of SDT by Deci and Ryan (1985, as cited in Thomas et al., 2018) in the student population, referred to as *Skalen zur Motivationalen Regulation beim Lernen im Studium* (SMR-LS; *Scales of Motivational Regulation for Learning in Higher Education*) (Thomas et al., 2018). SMR-LS comprises four subscales with three items each (intrinsic motivation, identified regulation, introjected regulation, external regulation).[4] All 12 items were answered on a seven-point Likert-type scale ranging from 1 = *fully disagree* to 7 = *fully agree*.

7.4. The analysis procedure for qualitative data on career choice motivation

Responses to the open-ended question "What is your main reason for choosing a career in teaching?" that varied from a single word to a few sentences were analysed using a general inductive approach (Thomas, 2006). In contrast to the deductive approach that matches data consistency with prior assumptions or theories, the purpose of the inductive approach is to allow research findings to emerge from themes inherent in data (Thomas, 2006). This approach also enabled us to reflect the evidence on career choice motivation stemming from extant literature – in the inductive coding process we considered motives previously identified as significant predictors of distinct work-related patterns (Rothland, 2012). More specifically, in order to establish a sound category system, all responses (both German and Czech) were repeatedly read by the first author until she was familiar with the content to fully appreciate the significance of the themes covered in the text. The text segments that carried a meaning specific to our research objectives were identified and gathered into rudimentary categories that were continually revised and refined to reduce overlapping and redundancy. This strategy resulted in a final category system consisting of 12 categories of career choice motives that was checked and agreed upon by all three authors. The established categories, along with exemplary quotes, are presented in Table 2. Subsequently, the responses were assigned to the respective categories by the first author and two independent researchers (a German native speaker and a Czech native speaker). Inter-rater percentage agreement was 89% for German data and 88% for Czech data. Rating discrepancy was resolved either by discussion or by requesting a third independent assessor to provide an additional opinion. Although typically a single category was assigned to an individual response, the nature of the responses allowed multiple categories to be assigned that resulted in 349 and 369 coded motives occurring in the German and Czech sample, respectively. Table 2 shows the relative frequency distribution of the career choice motives in both samples.

7.5. Statistical analyses

To obtain valid conclusions of the cross-country comparison, we first tested the measurement invariance of the constructs measured by the AVEM and SMR-LS instruments across the two countries. The measurement invariance tests were performed in a structural equation modelling framework using *Mplus* (Muthén & Muthén, 1998-2017). Other statistical analyses were performed using *SPSS 25*. We determined the scores for SMR-LS subscales by calculating the respective mean score based on the values of the three items in each subscale. Next, we assigned each participant to one of the four WCEPs that showed the highest match with the individual responses to the AVEM inventory items – this was performed by using the algorithm provided by Schaarschmidt and Fischer (2008). Reliability estimates of the AVEM and SMR-LS subscales were calculated along with the descriptive statistics and inter-variable correlations.

To answer our first research question and to investigate the predictive values of the background and motivational variables for assignment to distinct WCEPs, we performed sequential multinomial logistic regression analyses using the G pattern as a reference group. Continuous variables of the four motivational regulations were standardized due to the more intuitive interpretation of the results. Three distinct analyses were performed – for the pooled sample, and for German and Czech samples separately. We were interested in the predictive ability of motivational variables after adjusting for demographic differences; thus, we first entered the background variables (gender, study history, and job status) (Model 1). Subsequently, we entered the 12 categories of career choice motives in the second step (Model 2) before entering the four motivational regulations (Model 3). In the last step, which applied only to the pooled sample analysis, we added the dichotomous variable of country to investigate its predictive value (Model 4).

Finally, to answer our second research question, we performed independent t-tests and chi-square tests to determine the differences between the two samples relating to the continuous variables of the AVEM and SMR-LS subscales and categorical variables including the WCEP distributions and career choice motives. Additionally, the background variables of study history and job status were compared.

8. Results

8.1. Measurement invariance across countries

To test measurement invariance across the two countries, we first established country-specific baseline confirmatory factor analysis (CFA) models. Since both German and Czech data were non-normally distributed, we used the Satorra-Bentler robust approach with standard errors and tests of fit that are robust in relation to non-normality (Muthén & Muthén, 1998-2017). The CFA model demonstrated a good overall fit for both samples (see Table 3).

[4] There is lack of empirical distinction between the last two types of external regulation, and the integrated regulation is therefore not being assessed by the SMR-LS instrument (Thomas et al., 2018).

Table 2
The frequency distribution of categories of career choice motives in the German and Czech sample including example quotes.

Categories	Germany		Czech Republic		$\chi 2(df)$	p
	n	%	n	%		
MOT1: Work with children/people [a] "I love children and I want to work with them."	100	29	61	16	28.96(1)	<.001
MOT2: Educating others, transmission of knowledge "to teach others something new"	45	13	39	11	28.96(1)	.08
MOT3: Positive impact on others, helping and developing others "to help others and to support them in their learning journey"	45	13	26	7	11.49(1)	<.001
MOT4: Intrinsic value of career (study) "it is a varied and meaningful profession"; "interest in pedagogy and psychology"	36	10	37	10	.68(1)	.41
MOT5: Previous experience related to teaching "an internship in a primary school where I realized that this was the right profession for me"	28	8	26	7	1.19(1)	.28
MOT6: Dream job/long-term goal "I've been dreaming of becoming a teacher since I was a child."	23	7	16	4	3.40(1)	.07
MOT7: Extrinsic value of career (study) "a secure job"; "an academic degree"	22	6	28	8	.02(1)	.89
MOT8: Study specialization [a] "a fondness for history and geography"	14	4	43	12	10.82(1)	<.01
MOT9: Positively influenced by other people "My family encourages me to pursue this path."	13	4	15	4	.03(1)	.87
MOT10: Making social contribution "to change the word in a positive way"	12	3	11	3	.52(1)	.47
MOT11: Fallback option "I didn't know where else to go, I was unsuccessful at the school of my first choice."	6	2	15	4	2.37(1)	.12
MOT12: Career in teaching without further specification "I want to become a teacher."	5	1	52	14	34.13(1)	<.001

Note. In the German sample, 349 motives were coded. In the Czech sample, 369 motives were coded.
[a] Since the results of Fisher's exact test showed significant differences ($p < .05$) in distribution of the motive across the teacher education programs German participants were enrolled in, the differences across countries may be confounded by heterogeneity of the study programs in both samples.

Following the contemporary guidelines for measurement invariance testing (Hirschfeld & van Brachel, 2014; Kühne, 2017; van de Schoot et al., 2012), we first tested the configural invariance by investigating a baseline model with no constrained parameters across the two countries. The configural model showed an acceptable model fit (MLM$\chi 2_{(5619)} = 8769.694$, $p < .001$, CFI= .808, RMSEA= .048, SRMR= .072) which supported the basic organization of the constructs (i.e., the same pattern of free and fixed loadings) in the two countries (Putnick & Bornstein, 2016). We then performed a metric invariance testing by constraining factor loadings to be equal across countries. The fit of the metric model was consistent with that of the configural model (MLM$\chi 2_{(5682)} = 8939.949$, $p < .001$, CFI= .802, RMSEA= .049, SRMR= .076). To define invariance, we adopted the most widely used and empirically best supported criterion of a -.01 change in CFI for nested models (Cheung & Rensvold, 2002; Hirschfeld & van Brachel, 2014), paired with changes in RMSEA of .015 and SRMR of .030 for metric invariance or .015 for scalar invariance (Chen, 2007). The comparison of the above-mentioned goodness-of-fit measures between configural and metric invariance models suggested that all factor loadings were sufficiently invariant (ΔCFI = -.006, ΔRMSEA = .001, ΔSRMR = .004). As the full metric invariance was supported, implying that the latent constructs had equivalent meanings across the two countries, we are justified to make comparisons of relationships among latent constructs across countries (Kühne, 2017). Scalar invariance was tested by additional constraining items' intercepts to be equal in the two countries. The overall model fit was significantly worse compared to the metric invariance model (MLM$\chi 2_{(5760)} = 9906.749$, $p < .001$, CFI= .748, RMSEA= .055, SRMR= .083); the comparison of the goodness-of-fit measures indicated that not all items' intercepts were invariant across countries (ΔCFI = -.054, ΔRMSEA = .006, ΔSRMR = .007). Sequential release of 25 items' intercept constraints yielded an acceptably fitting model (MLM$\chi 2_{(5735)} = 9142.920$, $p <$. 001, CFI= .793, RMSEA= .050, SRMR= .079). Comparing this model against

Table 3
Results of confirmatory factor analyses for German and Czech data.

CFA Model	MLM$\chi 2$ (df)	CFI/CFI$_{Rob}$	RMSEA (90% CI)	RMSEA$_{Rob}$ (90% CI)	SRMR
German	4204.419*** (2813)	.810	.048 (.045 - .051)	.049 (.046 - .052)	.072
Czech	4557.326*** (2805)	.808	.049 (.046 - .051)	.050 (.047 - .052)	.072

Note. $n_{GE} = 216$, $n_{CZ} = 265$. MLM = maximum likelihood estimation with robust standard errors and a Satorra-Bentler scaled test statistic; CFI = the comparative fit index (based on the MLM statistic); CFI$_{Rob}$ = robust CFI corrected for non-normality; RMSEA = the root mean square error of approximation (based on the MLM statistic); CI = the confidence interval; RMSEA$_{Rob}$ = robust RMSEA corrected for non-normality; SRMR = the standardized root mean squared residual (based on the MLM statistic). Robust CFI and Robust RMSEA and its 90% CI were calculated from the MLM statistic according to formulas suggested by Brosseau-Liard et al. (2012) and Brosseau-Liard and Savalei (2014). The non-normality corrections adjust the sample estimate to the inflation due to non-normality, i.e. enable to estimate what the sample CFI/RMSEA would have been had data been normal. In our data, the CFI values are equal to the CFI$_{Rob}$ values, and the difference between RMSEA and RMSEA$_{Rob}$ is minimal. With regard to the established cut-offs proposed to assess the fit of the model (e.g. Hu & Bentler, 1999), it is apparent that CFI, RMSEA, and SRMR provided inconsistent evaluations of the model fit. This inconsistency, which can occur in real data, should not lead to an automatic rejection of the model, since it is not diagnostic of particular problems in model specification or data, but may arise because CFI and RMSEA evaluate the fit from different perspectives (Lai & Green, 2016; Mueller & Hancock, 2010). In this respect, Shi et al., (2019) showed that incremental fit indices, such as CFI and TLI, which compare the fit of a hypothesized model to the fit of the baseline (null) model, are especially sensitive to sample size and model size (number of observed variables). More specifically, when the sample size was small ($n = 200$) and the model size large, the incremental fit indices tended to be substantially underestimated (they tended to be downwardly biased and suggested a worse fit). Therefore, Kenny (2020) recommends first examining the RMSEA for the null model to make sure it is not too "good", i.e. is no smaller than .158. If the RMSEA for the null model is less than .158, the value of an incremental measure of fit (CFI) would be too small (below .90) and not informative. Note that the null RMSEA was .106 and .107 for German and Czech data, respectively. Thus, we may conclude that although the CFI is below the required cut-off proposed by Hu and Bentler (1999), the overall fit of the model could be considered adequate. *** $p < .001$.

the metric model suggested partial scalar invariance across countries (ΔCFI = -.009, ΔRMSEA = .001, ΔSRMR = .003). As Steenkamp and Baumgartner (1998) argued that valid comparisons between groups require only two indicators to be invariant, we are justified to make meaningful comparisons in terms of all latent factors across countries, except from the professional ambition subscale of the AVEM instrument (one invariant item per subscale) and the external regulation subscale of the SMR-LS instrument (no invariant items per subscale). Table 4 displays a summary of the measurement invariance tests and the non-invariant items.

8.2. Reliability estimates, descriptive statistics, and inter-variable correlations

Internal consistency reliability was estimated for both samples. Most of the calculated Cronbach's alpha coefficients indicated an acceptable internal consistency > .70 (Hair et al., 2018); the identified regulation scales (Czech sample) and external regulation were within the range of .60 to .70 that Hair et al. (2018) consider the lower limit of acceptability. The value of alpha for scale of identified regulation (German sample) did not reach the suggested cut-off value (α_{GE} = .58). Nevertheless, alpha is affected by the number of items; if the scale is short, the value of alpha is reduced (Cortina, 1993; Nunnally & Bernstein, 1994). Therefore, taking into account that the respective scale consisted of only three items and the value of alpha was close to the acceptable threshold suggested by Hair et al. (2018), we considered the internal consistency of the scale acceptable. Table 5 shows the reliability estimates, descriptive statistics, and Pearson correlations among the continuous variables for both samples.

8.3. Prediction of WCEP using multinomial logistic regression

To control for type I error that is associated with multiple comparisons, the Benjamini-Hochberg correction with a false discovery rate of 0.1 (McDonald, 2014) was applied to the results of each multinomial logistic regression model. After the Benjamini-Hochberg correction, the results of the multinomial logistic regression of the pooled sample showed that for Model 1 males were significantly more likely than females to be assigned to the S pattern than to the G pattern, $b = 0.64$, $p < .05$. Similarly, individuals who had had personally important work were less likely to be assigned to the B pattern compared to the G pattern, $b = -0.68$, $p < .05$. For Model 3, the predictive validity of having personally important work was still tenable, $b = -0.80$, $p < .05$. Further, individuals whose current degree course was the first and only, $b = -1.04$, $p < .01$, and individuals scoring high on the intrinsic motivation scale, $b = -0.71$, $p < .001$, displayed a lower probability of being assigned to pattern B. For the final Model 4, higher scores for intrinsic motivation prevented from being assigned to patterns A, $b = -0.53$, $p < .01$, and B, $b = -0.72$, $p < .001$, while higher scores for identified regulation prevented from being assigned to patterns S, $b = -0.58$, $p < .01$, and B, $b = -0.61$, $p < .01$. Further, students at the German university were less likely to be assigned to patterns S, $b = -1.23$, $p < .001$, A, $b = -1.37$, $p < .001$, and B, $b = -1.66$, $p < .001$, compared to students at the Czech university.

Considering the results for the divided samples significant after the Benjamini-Hochberg correction, in the German sample, the risk of showing the S pattern increased in males compared to females, $b = 1.02$, $p < .05$ (Model 1), whereas in the Czech sample, the predictive value of gender was insignificant, $b = 0.02$, $p > .05$. Inversely, whereas in the German sample, the predictive value of intrinsic motivation to being assigned to the B pattern was insignificant, $b = -0.44$, $p > .05$, in the Czech sample, it was statistically significant, $b = -0.81$, $p < .01$ (Model 3). Therefore, the predictive value of these variables was shown to be country specific.

For the regression coefficients and their respective standard errors, odds ratios, the 95% confidence intervals around them, results of likelihood ratio tests, and the values of R^2 for the pooled sample, and the German and Czech samples, see Supplementary Material 2.

Regarding our hypotheses, career choice motives and controlled types of motivation (external and introjected regulations) showed neither positive nor negative association with the healthy work-related pattern G, whereby hypotheses H1a, H2a, and H2b were disproved. In line with hypothesis H1b, autonomous types of motivation (intrinsic motivation and identified regulation) were positively associated with the G pattern.

8.4. Cross-country differences

8.4.1. Continuous variables

Contrary to our hypothesis (H0c), independent t-tests indicated that in the Czech sample, identified regulation was significantly higher, $t(479) = -2.95$, $p < .01$, $d = .27$, than in the German sample. Additionally, the same applied for tendency to exert, $t(479) = -5.57$, $p < .001$, $d = .51$. In the German sample, by contrast, the scores were significantly higher for offensive coping with problems, $t(477) = 4.13$, $p < .001$, $d = .38$, balance and mental stability, $t(479) = 4.13$, $p < .001$, $d = .38$, satisfaction with work, $t(479) = 4.63$, $p < .001$, $d = .42$, satisfaction with life, $t(479) = 5.20$, $p < .001$, $d = .47$, and experience of social support, $t(479) = 5.46$,

Table 4
Summary of measurement invariance tests.

Model	MLMχ2 (*df*)	CFI	RMSEA (90% CI)	SRMR	ΔMLMχ2 (Δdf)	Model comparison	ΔCFI	ΔRMSEA	ΔSRMR
M1: Configural Invariance	8769.694*** (5619)	.808	.048 (.046 - .050)	.072	–	–	–	–	–
M2: Metric Invariance	8939.949*** (5682)	.802	.049 (.047 - .051)	.076	170.255*** (63)	M2 vs M1	.006	.001	.004
M3: Scalar Invariance	9906.749*** (5760)	.748	.055 (.053 - .057)	.083	966.800*** (78)	M3 vs M2	.054	.006	.007
M3a: Partial Scalar Invariance	9142.920*** (5735)	.793	.050 (.048 - .052)	.079	202.971*** (53)	M3a vs M2	.009	.001	.003

Note. $n_{GE} = 216$, $n_{CZ} = 265$; ΔMLMχ2 was calculated according to the formula for a corrected chi-square difference test available at https://www.statmodel.com/chidiff.shtml. The CFI index was calculated only for purposes of measurement invariance testing to assess a change in CFI for the nested models. If the RMSEA of the null model is < .158, which applies to our models, the CFI cannot be used as a reliable indicator of the overall model fit (Kenny, 2020).
Non-invariant items according to instruments and subscales were: AVEM - items 56 (subjective significance of work), 2, 13, 24, 46, 57 (professional ambition), 3, 14, 58 (tendency to exert), 26 (striving for perfection), 27, 49 (emotional distancing), 6, 28, 50 (resignation tendencies), 7 (offensive coping with problems), 41 (balance and mental stability), 31, 53 (satisfaction with work), 43 (satisfaction with work); SMR-LS - items 1 (intrinsic motivation), 11 (introjected regulation), 4, 8, 12 (external regulation).
*** $p < .001$.

Table 5
Descriptive statistics, correlations, and Cronbach alphas.

	INT	ID	INTR	EXT	SSW	PA	TE	SP	ED	RT	OCP	BMS	SW	SL	ESS	M_{CZ}	SD_{CZ}	α_{CZ}
INT		.58**	.25**	.08	.15*	.14*	.04	.11	−.12	−.20**	.26**	.19**	.20**	.28**	.11	4.62	1.11	.83
ID	.57**		.41**	.31**	.15*	.31**	.23**	.24**	−.21**	.00	.25**	.08	.27**	.19**	.09	5.71	.99	.61
INTR	.21**	.31**		.42**	.21**	.27**	.18**	.26**	−.16**	.25**	.03	−.08	.01	−.06	−.10	4.81	1.51	.84
EXT	−.07	−.02	.46**		.08	.19**	.12*	.08	.01	.21**	−.03	−.08	−.04	−.06	−.05	4.95	1.28	.69
SSW	.38**	.28**	.30**	.14*		.46**	.46**	.44**	−.44**	.11	.19**	.03	.35**	.05	.04	2.54	.70	.77
PA	.17*	.33**	.43**	.39**	.39**		.48**	.48**	−.39**	.08	.31**	.05	.28**	.09	.01	3.32	.74	.79
TE	.15*	.30**	.23**	.09	.46**	.38**		.61**	−.51**	.18**	.22**	−.06	.32**	−.04	−.12*	3.25	.81	.83
SP	.24**	.36**	.24**	.14*	.34**	.40**	.51**		−.41**	.18**	.21**	.01	.29**	.00	−.04	3.63	.71	.79
ED	.02	−.18**	−.10	.02	−.29**	−.17*	−.52**	−.33**		−.20**	−.09	.14*	−.20**	.11	.01	3.23	.86	.84
RT	−.24**	−.11	.11	.13	−.10	−.01	.05	.05	−.20**		−.47**	−.50**	−.20**	−.35**	−.13*	3.00	.81	.82
OCP	.37**	.38**	.13*	−.03	.32**	.36**	.27**	.35**	−.09	−.54**		.51**	.31**	.36**	.05	3.25	.69	.84
BMS	.12	.08	−.17*	−.11	.00	−.05	−.15*	−.01	.23**	−.49**	.32**		.22**	.33**	.08	3.08	.77	.71
SW	.23**	.34**	.13	−.03	.19**	.27**	.26**	.36**	−.19**	−.08	.33**	.17*		.38**	.16**	3.30	.68	.80
SL	.31**	.20**	.00	−.07	.14*	.08	.00	.09	.08	−.27**	.33**	.39**	.42**		.44**	3.43	.82	.85
ESS	.22**	.20**	−.05	−.11	.06	−.04	.03	.09	.01	−.26**	.26**	.23**	.28**	.54**		3.89	.72	.70
M_{GE}	4.67	5.45	4.69	4.01	2.44	3.35	2.87	3.70	3.16	3.02	3.50	3.35	3.60	3.79	4.22			
SD_{GE}	1.03	.90	1.33	1.35	.66	.59	.67	.68	.66	.72	.60	.70	.76	.71	.61			
α_{GE}	.71	.58	.77	.68	.79	.72	.78	.84	.81	.86	.83	.82	.87	.86	.75			

Note. INT = intrinsic motivation, ID = identified regulation, INTR = introjected regulation, EXT = external regulation, SSW = subjective significance of work, PA = professional ambition, TE = tendency to exert, SP = striving for perfection, ED = emotional distancing, RT = resignation tendencies, OCP = offensive coping with problems, BMS = balance and mental stability, SW = satisfaction with work, SL = satisfaction with life, ESS = experience of social support. Values below the diagonal are for the German sample ($n = 216$) and those above the diagonal are for the Czech sample ($n = 265$). **$p < .01$, *$p < .05$.

$p < .001$, $d = .50$. For complete results of performed t-tests see Table 6.

8.4.2. Categorical variables

Contrary to the hypothesis (H0a), a significant difference was found between the two samples in the proportions of the G-type and B-type individuals. In the German sample, a higher proportion of participants were assigned to the G pattern, $\chi2(1) = 26.01$, $p < .001$, whereas the Czech sample had a significantly higher assignment to the B pattern, $\chi2(1) = 12{,}25$, $p < .001$. The relative frequency distribution of distinct WCEPs in both samples is displayed in Fig. 1. Due to the German sample's heterogeneity of the teacher education programs the participants were enrolled in, we also tested the association between the individual WCEP and the teacher education program to detect the potential confounding effect of distinct study programs. The results of Fisher's exact test revealed no dependence between these variables ($p > .05$).

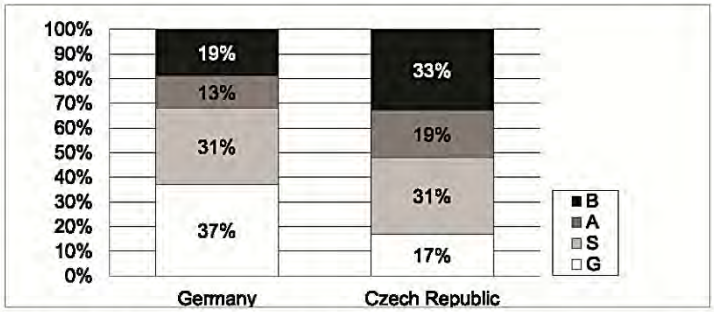
Regarding career choice motivation, we found significant differences in the prevalence of several career choice motives across the two countries. Whereas in the German sample, the motives of working with children/people, $\chi2(1) = 28.96$, $p < .001$, and having a positive impact on others, $\chi2(1) = 11.49$, $p < .001$, were significantly more prevalent, in the Czech sample, the motives of pursuing a career in teaching without further specification, $\chi2(1) = 34.13$, $p < .001$, and of study specialization, $\chi2(1) = 10.82$, $p < .01$, occurred significantly more frequently. Thus, the hypothesis (H0b) was also disproved.

Additional analyses focused on the background variables of study history and job status (descriptives for these variables are presented in Table 1) revealed that the two samples differed significantly in their study history. In this respect, the German participants declared more frequently that their current degree course was their first and only, $\chi2(1) = 13.69$, $p < .001$. On the other hand, the Czech participants stated more frequently to be enrolled in multiple degree courses concurrently, $\chi2(1) = 6.76$, $p < .01$, that they had an uncompleted teacher education degree course, $\chi2(1) = 6.76$, $p < .01$, and an uncompleted degree course other than teacher education, $\chi2(1) = 4.84$, $p < .05$. No significant differences

Table 6
Independent t-test results for German and Czech samples' mean scores of SMR-LS and AVEM subscales.

Instrument/Subscale	Germany		Czech Republic		*t*	*df*	*p*	Cohen's *d*
	M	SD	M	SD				
SMR-LS								
Intrinsic motivation	4.67	1.03	4.62	1.11	.52	479	.60	.05
Identified regulation	5.45	.90	5.71	.99	−2.95	479	<.01	.27
Introjected regulation	4.69	1.33	4.81	1.51	-.90	479	.37	.08
External regulation	4.01	1.35	4.95	1.28	–	–	–	–
AVEM								
Subjective significance of work	2.44	.66	2.54	.70	−1.68	479	.09	.15
Professional ambition	3.35	.59	3.32	.74	–	–	–	–
Tendency to exert	2.87	.67	3.25	.81	−5.57	479	<.001	.51
Striving for perfection	3.70	.68	3.63	.71	1.07	479	.29	.10
Emotional distancing	3.16	.66	3.23	.86	−1.13	477	.26	.10
Resignation tendencies	3.02	.72	3.00	.81	.26	479	.80	.02
Offensive coping with problems	3.50	.60	3.25	.69	4.13	477	<.001	.38
Balance and mental stability	3.35	.70	3.08	.77	4.13	479	<.001	.38
Satisfaction with work	3.60	.76	3.30	.68	4.63	479	<.001	.42
Satisfaction with life	3.79	.71	3.43	.82	5.20	478	<.001	.47
Experience of social support	4.22	.61	3.89	.72	5.46	479	<.001	.50

Note. $n_{GE} = 216$, $n_{CZ} = 265$. T-tests for external regulation and professional ambition were not performed as these failed to show scalar invariance.



Note. $n_{GE} = 216$, $n_{CZ} = 265$. In absolute numbers, 80 and 44 participants were assigned to the most desirable G pattern, 67 and 82 to the S pattern, 28 and 51 to the A pattern, and 41 and 88 to the least desirable B pattern for the German and Czech sample respectively. The differences in the proportions of the G types and B types between the two samples were statistically significant ($p < .001$).

Fig. 1. The relative frequency distribution of distinct WCEPs in the German and Czech sample.

were determined in job status between the two samples, $\chi 2(3) = 7.76$, $p > .05$.

9. Discussion

The central aim of the present study was to assess the coping capacity for work-related demands and the vulnerability to health risks in prospective teachers at the beginning of their teacher education. To facilitate the early prediction and prevention of health risks resulting from undesirable WCEPs (Kieschke & Schaarschmidt, 2008), we investigated the link between WCEP and motivation and identified motivational predictors of work-related patterns. As far as the authors are aware, the present study is unique in its attempt to extend the knowledge on WCEP and its correlates beyond the German-speaking population of teacher education students by comparing first-year German prospective teachers with their counterparts in the Czech Republic.

In this respect, the key finding of the present study is the association between the healthy pattern G and the more autonomous higher-quality types of motivation. More specifically, in both German and Czech prospective teachers, intrinsic motivation was shown to protect from the risk A pattern, and in the Czech sample also from the risk B pattern, while identified regulation protected from S and B patterns in both samples. These findings are in line with the overall positive effect of autonomous motivation on psychological outcomes (Ryan & Deci, 2000), including the protective effect against burnout (Eyal & Roth, 2011; Fernet et al., 2012; Pisarik, 2009). They are also consistent with the previously reported link between intrinsic motivation and the healthy G pattern (Künsting et al., 2012; Reichl et al., 2014).

Further, our results suggest also a modest predictive value of gender, study history, and job status for the WCEP assignment. In conformity with Schaarschmidt (2005) and Künsting et al. (2012), we revealed that males were more likely to be assigned to the S pattern than to the G pattern compared to females; interestingly, the effect of gender was significant solely in the German sample. Generally, the observed gender differences in the likelihood of being assigned to the most desirable health-promoting pattern between the two countries may be determined by cultural variance, for instance, in terms of country-level gender equality. Since gender equality is an important social determinant of gender-related mental health differences (King et al., 2020), its varying levels in Germany and the Czech Republic could possibly generate the observed cross-country gender differences in the WCEP distribution (European Institute of Gender Equality, 2020). The protective effect of studying for the first time and of being enrolled in a single study program against the burnout work-related pattern could be explained by the fact that these students are exposed to fewer stress factors than the students who have experienced (or experience) longer term and more intensive study-related stress. In these, multiple study demands are likely to reduce their coping capacities and increase their vulnerability to burnout. Additionally, students who have had a personally meaningful job display a lower probability of being assigned to the B pattern. This finding may point out the positive effect of a satisfying job on psychological health and well-being that was noted also in employed students compared to unemployed students (Graetz, 1993).

Another key finding of this study is the significant difference in the distribution of distinct work-related patterns between the German and Czech participants – more specifically, the two samples differed in the frequency of occurrence of the most desirable G pattern indicating good psychological health and the least desirable B pattern implying vulnerability to burnout. Whereas the majority of German prospective teachers (37%) displayed the healthy pattern, this pattern was found in only 17% of their Czech counterparts. In contrast, one-third of the Czech prospective teachers were already at risk of burnout at the initial stage of their teaching career. In sum, the health-threatening risk patterns A and B were prevalent in about one-third of first-year German teacher education students, but appeared in more than half of their Czech counterparts.

In contrast, this study revealed the insignificant effect of lower-quality controlled motivation on the WCEP distribution. Such finding supports Künsting et al.'s (2012) evidence on a missing link between work-related patterns and external motivation. Unexpectedly, and contrary to previous research (Reichl, 2014; Rothland, 2012), also career choice motives showed poor predictive value in explaining WCEP assignment. In this respect, our research relied solely on participants' statements on their central career choice motives rather than on responses to multiple items of specific instruments covering various career choice motives as by Reichl (2014) and Rothland (2012). Thus, it seems that the combination of an individual's main and collateral career choice motives could display a higher predictive value in explaining the individual work-related patterns than the central motive alone.

Finally, the investigation of motivation-related differences

between German and Czech participants yielded inconclusive results. Due to the lack of scalar invariance of the extrinsic motivation items, we cannot provide a direct comparison of the level of extrinsic study motivation in the two samples. Nevertheless, regarding intrinsic motivation and lower-quality introjected regulation, the two samples did not differ significantly. Surprisingly, the Czech sample displayed increased levels of identified regulation that correspond to the higher-quality type of motivation where study is consciously valued as personally important (Deci & Ryan, 2002). Next, the differences linked to the main career choice motives seem to be minor. The higher distribution of the altruistic motive - having a positive impact, helping and developing others - in the German sample is likely to be culturally conditioned. Since Germany is one of the wealthiest countries in Europe and wealthy nations display increased levels of altruism (Hoffman, 2011), the higher prevalence of the altruistic motivation in the German sample may be mediated by the country's economic position. Additionally, different culture-specific norms resulting from opposing histories, which have contributed to the ongoing East-West variation in the levels of solidarity and cooperation, may offer an explanation for Western Europeans showing more solidarity behaviour (Brosig-Koch et al., 2011; Ockenfels & Weimann, 1999). Czech participants, on the other hand, declared more frequently that they intended to become teachers without further specifying the reasons for their decision. This finding, combined with that of the increased numbers of Czech participants declaring to enter teacher education after uncompleting another study program, raises some controversy. It may imply that a portion of Czech students were likely to opt for teacher education as a second-choice option after failing the requirements of their first study; thus, they have a less clear picture of the profession resulting in their inability to specify any personally attractive attributes of the teaching profession. Hence, although the unsatisfactory career choice motives such as the fallback option or extrinsic value of career (study) occurred with comparable frequencies in Czech and German samples as participants' main motives, based on the above-mentioned findings, we cannot rule out the potential increased prevalence of these motives as the collateral motives in the Czech teacher education students. Further research is warranted to better understand the overall motivational tendencies in the current generation of Czech teacher education students.

In conclusion, the results of the multinomial logistic regression showed country as the strongest predictor of WCEP beyond other variables of our interest. Although the WCEP distribution in the Czech sample with an increased proportion of B types over G types does not mirror Schaarchmidt's (2005) findings on excessive proportions of A types over S types in the countries of the former Eastern Bloc, the East-West specifics may still offer a possible explanation of the revealed differences between the German and Czech participants. It was apparent from our results that Czech participants displayed overall low scores on the subjective well-being area covered by the AVEM instrument compared to their German counterparts. Since recent research suggests that residents of European countries of the former Eastern Bloc tend to experience a decreased sense of well-being compared to North and West Europeans (Huppert & So, 2013), we may expect cultural factors to play a significant role in the observed psychological health-related differences.

9.1. Limitations

Several limitations to this cross-country study need to be acknowledged. Most importantly, the research was carried out on non-randomized student samples of two particular universities. Thus, the found cross-country differences need not necessarily apply to the entire population of German and Czech teacher education students. Next, the sample sizes were rather small. The small sample sizes combined with a relatively large number of observed indicators in the CFA models influenced the model fit indices – the absolute value of the CFI was underestimated and did not reach the conventional cut-off point for adequate fit. In this respect, as the adherence to ethical norms in research did not allow us to enforce participants to be involved in our study in any way, we were not able to reach results fully representative for the whole cohort of first-year teacher education students. Thus, inevitably, the accuracy of the results may be lowered. Another limitation pertains to the heterogeneity of the two samples in terms of study programs students were enrolled in. While all the Czech participants were enrolled in a study program that is the most common teacher education study program offered by Czech universities, the German participants were enrolled in several study programs related to various school tracks within the German school system. Although the WCEP assignment among German students was unaffected by the German sample's heterogeneity in our study and in previous research (Künsting et al., 2012), it influenced the distribution of career choice motives to some extent. Finally, the present study focused solely on assessment of the central motive for choosing teaching career. Admittedly, the omission of the collateral motives has prevented us from evaluating the full range of the participants' career choice motives.

9.2. Conclusions

The present study, which is the first pilot study to expand WCEP-related teacher education students-oriented research beyond German-speaking countries, revealed a significant difference between first-year German teacher education students and their counterparts from the Czech Republic in terms of assignment to work-related patterns. More specifically, German teacher education students displayed more frequently the most desirable G pattern that indicates good psychological health, while Czech teacher education students displayed more frequently the least desirable B pattern indicating vulnerability to burnout. Although intrinsic motivation and identified regulation showed good predictive values for the probability of being assigned to the G pattern, motivational variables per se could not explain the country-related differences because the country acted as the strongest predictor of the WCEP assignment.

Further investigation is needed to fully understand these cross-country differences. First, larger study samples representative for the entire population of first-year German and Czech teacher education students are warranted to validate our preliminary findings. Further, to explore the potential influence of opposing historical, social, and economic background on teacher education students' work-related patterns, follow-up research should further extend its scope to other countries in Eastern and Western Europe. At the same time, these follow-up investigations should aim also at students of other study programs, in-service teachers, and professionals of other occupations to prove whether the cross-country differences in the WCEP distribution are pertinent to the entire country's population or are rather subgroup-specific.

9.3. Implications for practice

From a health-promoting perspective, the present study offers important insight into the coping capacity for work-related demands in prospective teachers and the motivational factors that could protect them from being assigned to the less desirable unhealthy work-related coping and behavioural patterns. In this respect, we observed an alarming trend of increased burnout

vulnerability among prospective teachers (at the Czech institution in particular) already at the beginning of their education that may have negative consequences not only for the individuals themselves but also for the quality of education. Thus, the evidence provided by this study is of practical value especially for institutions preparing prospective teachers. We suggest that a psychological assessment and counselling should be an integral part of teacher education study programs, or even of an admission process at institutions ensuring teacher education. Individuals prone to health risks resulting from teaching-related demands they are unable to cope with should be advised of a more appropriate career choice as early as possible. Next, measures for fostering health-promoting coping and behavioural patterns should be adopted early to correct the risk patterns in vulnerable individuals who decide to pursue the teaching career. For instance, an effective intervention program *Strengthened for the teaching profession* specifically designed to strengthen teacher education students' coping capacities could be widely implemented in institutions providing teacher education (Schaefer, 2012; Çelebi et al., 2014). In general, special care should be devoted to students who have already been exposed to multiple study demands as they tend to display increased vulnerability to burnout.

Since we found that genuinely motivated individuals are also more likely to display the health-promoting work-related coping behaviour, we would suggest that the admission committees at teacher education institutions should pay more attention to the motivation of teacher education applicants. This would increase the probability that only individuals with suitable characteristics enter the teaching profession.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.tate.2021.103560.

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Study 5

Study 5 is an article currently in press:

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This study is an empirical investigation involving 3,005 first-year teacher education students from Germany, Austria, Czechia, Slovakia, and Poland. It constitutes a follow-up study aimed at extending cross-country comparisons within AVEM research in this population. The study also addresses a critical gap in AVEM research, namely the replication of the AVEM typology in a large international sample, by employing LPA. The results revealed significant differences in pattern distributions between Germany and Austria on the one hand and the remaining three countries on the other, pointing to the potential role of broader structural factors characteristic of countries of the former Eastern Bloc. Importantly, the four-profile solution was successfully replicated in this international sample, supporting the meaningful application of the AVEM instrument to first-year teacher education students beyond German-speaking contexts. Similar to Study 4, this study provides theoretical contributions to AVEM research and, in particular, offers relevant practical implications for teacher education.

The study was first-authored by the author of this thesis, who was primarily responsible for the conceptualization of the study, the development of the methodology, statistical analyses, interpretation of the findings, manuscript preparation, and supervision of the author team. Overall, she was involved in all essential stages of the study except for participant recruitment and data collection. Her contribution accounts for approximately 85% of the total work.

Abstract

The *Arbeitsbezogenes Verhaltens- und Erlebensmuster* (AVEM) is a preventive diagnostic tool designed to assess typical work-related patterns of perceiving and coping with occupational stress. It aims to identify individuals at risk of burnout and other occupational health problems at an early stage. The present study examined cross-country differences in pattern distribution among teacher education students in Central Europe and tested the replicability of the work-related patterns in an international sample. The sample consisted of 3,005 first-year students enrolled in full-time teacher education programs at higher education institutions in Austria, Czechia, Germany, Poland, and Slovakia. The findings revealed that 36.97% of Austrian, 39.16% of German, 59.63% of Polish, 62.18% of Slovak, and 62.85% of Czech students were classified into risk patterns, indicating heightened vulnerability to occupational health problems. Latent profile analysis confirmed the original four-pattern solution, underscoring the diagnostic utility of the AVEM instrument. These findings suggest that AVEM can be implemented as early as the first year of teacher education to facilitate the early identification of vulnerable individuals. The concerning trends revealed in this study highlight the need for policy action, particularly the integration of psychological interventions into teacher education to support occupational health in prospective teachers.

Keywords: Burnout vulnerability, coping behavior, cross-country differences, latent profile analysis, teacher education students

Identifying Occupational Health Risk at the Start of Teacher Education: A Five-Country Study

Meeting the demands of both higher education in teacher training and the future professional challenges of the teaching profession requires fostering individuals who are engaged, resilient, and psychosocially healthy. Recognizing the critical importance of preventing occupational health issues—particularly among teachers—Uwe Schaarschmidt and colleagues developed a preventive diagnostic tool designed to identify individuals at risk of burnout and other occupational health problems at an early stage. In this context, they introduced the concept of *Arbeitsbezogenes Verhaltens- und Erlebensmuster* (AVEM; work-related coping behavior and experience patterns; Schaarschmidt, 2005; Schaarschmidt & Fischer, 2008), along with a corresponding inventory. This tool assesses typical work-related patterns, focusing on how individuals perceive occupational demands and the coping strategies they employ to manage them (for more details on the AVEM, see Kieschke & Schaarschmidt, 2008; Mašková et al., 2022). The key result of the assessment using the AVEM inventory is the assignment of an individual to a specific work-related pattern based on the highest correspondence between their response profile and one of the four patterns, two of which indicate vulnerability to occupational health issues (patterns A and B; Kieschke & Schaarschmidt, 2008).

The healthy ambitious pattern G (*Gesundheit* or *good health*) is characterized by high professional commitment coupled with high coping capacity and subjective well-being, reflecting a health-promoting attitude toward work and not being associated with long-term health risks. The unambitious pattern S (*Schonung* or *sparing personal investment at work*) reflects a conservation-oriented work-related pattern characterized by very low professional commitment, which is, however, coupled with high coping capacity and subjective well-being and therefore bears no significant health risks. In contrast, the excessively ambitious risk pattern A (*Anstrengung* or *ambitious*) is associated with a heightened likelihood of developing occupational health issues over time, particularly cardiovascular diseases. It is characterized by excessive professional commitment coupled with low coping capacity and subjective well-being. Finally, the resigned risk pattern B (*Burnout*) is a high-risk profile characterized by low professional commitment and very low coping capacity and subjective well-being. These manifestations mirror the symptoms of the late stages of the burnout syndrome; however, pattern B does not refer to a diagnosis of burnout but is rather considered an indicator of burnout vulnerability (Kieschke & Schaarschmidt, 2008; Schaarschmidt & Fischer, 2008).

Early identification of these behavioral tendencies enables the implementation of timely and effective preventive measures before serious health issues arise (Kieschke & Schaarschmidt, 2008; Schaarschmidt & Fischer, 2008). From this preventive perspective, early application of the tool is recommended, particularly during the initial phases of teacher education (Künsting et al., 2012). Given this diagnostic potential, numerous studies have investigated work-related patterns in student populations, including teacher education students, identifying a wide variety of factors associated with pattern assignment (for more details, see Mašková, 2023). However, relatively little is known about cross-cultural differences in pattern distributions. This gap exists largely because the vast majority of studies have been conducted in German-speaking populations. To date, the only comparative study involving university students examined first-year teacher education students from Czechia and Germany, revealing that Czech students displayed risk patterns significantly more frequently than their German counterparts (Mašková et al., 2022).

The work-related patterns were originally identified through cluster analyses conducted on a large sample (n = 1,589) in 1996, yielding a consistent four-pattern solution, which was replicated in a later 2003 sample (n = 4,793), confirming the stability and robustness of the patterns across different populations. Notably, the samples involved exclusively German and Austrian participants (Schaarschmidt & Fischer, 2008). The replicability of the four work-related patterns was also tested and confirmed in later samples using various analytical techniques. In German (Klusmann et al., 2006) and Iranian (Kalani et al., 2024) teachers, this was done through cluster analysis. Latent profile analysis (LPA; for more details, see the Statistical Analyses section) was used in studies on German teachers (Menge, 2025; Menge & Schaeper, 2019) and teacher education students (Fischer et al., 2018; Künsting et al., 2012). All studies, including one LPA study using only eight scales of the AVEM instrument (Klusmann et al., 2008), confirmed the original patterns. Except for Kalani et al. (2024), who tested the replicability of the four-pattern solution in an Iranian sample using the original cluster analysis method, the above-mentioned more recent studies were conducted with German samples. Thus, alongside analyzing possible cross-country differences in pattern distribution, it is important to test the replicability of the solution beyond the German cultural context to confirm the generalizability of the concept cross-culturally. In response to this need, the present study has a twofold aim: First, to examine potential cross-country differences in pattern distribution among teacher education students from Austria, Czechia, Germany, Poland, and Slovakia; and second, to assess the replicability of the patterns in an international sample.

The research questions and the corresponding hypotheses guiding this research are as follows:

RQ_1: What is the distribution of work-related patterns in first-year teacher education students across five Central European countries?

RQ_2: Are the work-related patterns proposed by Schaarschmidt and Fischer (2008) replicable across an international sample?

H_1: Teacher education students from Czechia, Poland, and Slovakia display risk patterns A and B more frequently than their counterparts from Austria and Germany.

H_2: The four work-related patterns are well replicable in an international sample.

Method

Research Design

This study employed a cross-sectional, questionnaire-based design to assess work-related patterns among first-year teacher education students in Austria, Czechia, Germany, Poland, and Slovakia using the AVEM instrument. Data were collected at a single time point from several first-year cohorts (2022–2024) via an online survey administered during university instruction. This design enabled the testing of both research hypotheses. First, cross-country differences in pattern distributions were examined by assigning students to AVEM patterns using the original algorithm and comparing distributions across countries using chi-square tests. Second, the replicability of the four-pattern AVEM typology in an international sample was evaluated using LPA. Model fit was assessed using established fit indices, and the best-fitting LPA solution was compared with the original patterns to determine structural correspondence.

Participants

Participants were 3,005 first-year students enrolled in full-time teacher education programs at higher education institutions in Austria (n = 587), Czechia (n = 735), Germany (n = 710), Poland (n = 431), and Slovakia (n = 542). In terms of gender, 77.77% identified as female, 21.16% as male, 0.60% as another gender, and 0.47% preferred not to disclose their gender. The predominance of female students reflects the typical gender distribution among teacher education students in the countries involved. Participants ranged in age from 17 to 57 years (M = 20.21, SD = 2.90). The sample included 2.80% international students, defined as individuals who held citizenship in a country other than the one in which they were studying or who had entered the country specifically for the purpose of study. The sample included several cohorts of first-year teacher education students that entered higher education institutions between 2022 and 2024. The sample was recruited using purposive, institution-based sampling

rather than probability sampling and therefore does not meet the criteria for national representativeness. Nevertheless, to minimize potential institutional or regional bias and to enhance the generalizability of findings within each country, participants were recruited from at least two higher education institutions per country. A detailed overview of the participating institutions and descriptive statistics of participants by country is provided in Table 1. Students enrolled in non–teacher education programs, other years of study, or part-time study formats were excluded. All participants were offered personalized feedback regarding their pattern assignment, provided under a confidential identification code and accompanied by explanatory material and tailored developmental recommendations.

Table 1

Sample Characteristics by Country

Country	Institution	*n*	*n* females (%)	Mean age (*SD*)	*n* international students (%)
Austria	University College of Teacher Education in Vienna	268			
	Private University College of Teacher Education of Christian Churches	193			
	University of Klagenfurt	114			
	Other	12			
	Total	587	512 (87.22)	21.29 (4.86)	22 (3.75)
Czechia	University of South Bohemia	400			
	University of West Bohemia	335			
	Total	735	494 (67.21)	19.98 (1.27)	15 (2.04)
Germany	University of Passau	473			
	Kiel University	237			
	Total	710	487 (68.59)	20.06 (3.08)	9 (1.27)

Country	Institution	*n*	*n* females (%)	Mean age (*SD*)	*n* international students (%)
Poland	Kazimierz Wielki University	138			
	Jan Dlugosz University in Czestochowa	121			
	Adam Mickiewicz University	70			
	Other	102			
	Total	431	398 (92.34)	19.90 (2.04)	2 (0.46)
Slovakia	University of Presov	322			
	Comenius University Bratislava	220			
	Total	542	446 (82.29)	19.78 (1.29)	36 (6.64)

Procedure

Participants were asked to participate in the research approximately one month after entering the higher education institution to gain sufficient academic experience prior to completing the AVEM items. They completed an online survey via their smartphones or personal computers during university lectures. This administration method was chosen to reduce the likelihood of systematic dropout. In Austria and Poland, additional efforts were made to reach teacher education students enrolled at institutions beyond the direct access of the researchers; these students were invited via email and/or posts on social media platforms. Since lecture attendance was voluntary and not systematically recorded at any participating institution, and the reach of indirect contact methods (email and social media) could not be accurately estimated, it was not possible to determine the exact number of students invited to participate. Therefore, a response rate could not be calculated. The general conduct of the research was approved by the Ethics Committee of the Faculty of Education, University of South Bohemia, as well as by local ethics committees and/or relevant institutional review boards in all participating countries. All participants provided informed consent prior to participation.

Measures

The original 66-item version of the AVEM inventory was employed, with instructions adapted for a student population (see Mašková et al., 2022). The inventory comprises 11 scales, with items rated on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly

agree). For German and Austrian participants, the original German version was used (Schaarschmidt & Fischer, 2008). Validated Czech and Polish versions, previously applied in research, were used for participants from Czechia and Poland (Mašková et al., 2022; Rongińska & Gaida, 2001). The Slovak version was derived from the previously validated Czech version, given the high degree of cultural and linguistic similarity between the two languages. The adaptation was conducted by two bilingual Czech–Slovak researchers fluent in German. They independently compared each item in the Czech and original German versions of the AVEM to verify conceptual equivalence, assess semantic clarity, and identify any potential linguistic ambiguities, which were then addressed through mutual discussion. Pilot testing with Slovak teacher education students revealed no comprehension issues, supporting the appropriateness of the adapted version for this population. Internal consistency of the AVEM scales was acceptable across all language versions (α = .68 to .87).

Statistical Analyses

First, the eleven scales covered by the AVEM instrument were calculated by reversing the negatively worded items and then averaging the items corresponding to each scale. Each individual was subsequently assigned to one of four work-related patterns based on the degree of match between their individual profile and each pattern, following the algorithm provided by the authors of the AVEM instrument (Schaarschmidt & Fischer, 2008). Missing values analysis revealed approximately 0.11% missing data in the dataset. Single imputation was conducted using predictive mean matching (PMM) with 10 iterations to generate one complete dataset. To assess the normality of the data distribution, histograms were inspected and statistical parameters including kurtosis, skewness, and standard deviations were examined. As no marked deviations from normality were detected, parametric estimators were applied in all analyses. A correlation matrix and reliability estimates were computed for all scales. To test the first hypothesis, the distribution of work-related patterns across countries was evaluated using the chi-square test. All analyses described above were conducted in SPSS, version 25, and R.

To test the second hypothesis, LPA was conducted in R using the *tidyLPA* package (Rosenberg et al., 2018). The data were standardized prior to analysis. Along with latent class analysis (LCA), LPA is a person-centered mixture modeling technique used to identify data-driven subgroups within cross-sectional data. While LCA is based on response patterns across categorical input variables, LPA uses continuous input variables. Specifically, LPA assumes the existence of two or more latent profiles, allowing the sample to be subdivided into more

homogeneous groups based on patterns of means and (co)variances among the indicator variables. The best-fitting LPA solution is characterized by the degree of similarity among individuals assigned to each class, as reflected in their mean scores on the indicator variables (Wardenaar, 2024; Williams & Kibowski, 2016). Recent psychological research increasingly favors model-based clustering techniques such as LPA over traditional cluster analysis. This shift is primarily due to the greater rigor of model-based approaches, which estimate parameters to guide model selection and enable probabilistic classification, thereby reducing the subjectivity inherent in traditional methods (Pastor et al., 2007). Simulation studies suggest that a minimum of 500 participants is required to achieve adequate statistical power for LPA (Tein et al., 2013). Given that the present sample exceeds this threshold, LPA was deemed an appropriate analytic approach.

Within the LPA framework, it is recommended to test a range of model specifications alongside varying numbers of profiles to identify the best-fitting solution, taking into account both the optimal number of profiles and the most appropriate variance–covariance structure (Masyn, 2013; Pastor et al., 2007). Accordingly, four different LPA model variants were tested, differing in whether the class-specific variances and covariances of the indicator variables were constrained to be equal across profiles or freely estimated. The first and most parsimonious variant, referred to as the EEI (equal volume, equal shape, and undefined orientation) model, assumes that indicators are independent within each profile, with covariances fixed to zero. Each indicator is allowed its own variance, but these variances are held equal across all profiles. The second model, the VVI (varying volume, varying shape, and undefined orientation) model, also assumes independence among indicators (zero covariances) within each profile. However, the variances of each indicator are allowed to vary both within and across profiles, offering greater flexibility in capturing between-profile differences. The third model, the EEE (equal volume, equal shape, and equal orientation) model, estimates both variances and covariances among the indicators, relaxing the independence assumption. However, the full variance–covariance matrix is constrained to be equal across all profiles, allowing for complex within-profile relationships while maintaining a consistent structure between groups. The fourth and most flexible model, the VVV (varying volume, varying shape, and varying orientation) model, allows both the variances and covariances to vary freely within and across profiles. This results in each profile having its own unique variance–covariance matrix, enabling the modeling of the most complex structure of between- and within-profile differences (Scrucca et al., 2016; Wardenaar, 2024).

To assess the fit of the LPA solutions, model fit indices provided by the *tidyLPA* package were evaluated, consistent with current best practices in LPA research. These included the Akaike Information Criterion (AIC; Akaike, 1987), Bayesian Information Criterion (BIC; Schwarz, 1978), entropy (Celeux & Soromenho, 1996), the minimum average posterior probability of class membership, the smallest class proportion, and the bootstrapped likelihood ratio test (BLRT; McLachlan & Peel, 2000). Both AIC and BIC are information criteria based on the model's log-likelihood, with AIC penalizing for the number of parameters and BIC additionally accounting for sample size. Lower values of AIC and BIC indicate better model fit (Akaike, 1987; Schwarz, 1978). Entropy reflects the overall classification accuracy of the model, with higher values (closer to 1) indicating more distinct and better-separated profiles (Celeux & Soromenho, 1996). Values above 0.60 are often considered a minimum threshold for acceptable separation (Weller et al., 2020). The minimum average posterior probability of class membership captures the certainty with which individuals are classified into their respective profiles. Values of 0.80 or higher are considered acceptable (Spurk et al., 2020; Weller et al., 2020). The smallest class proportion represents the share of participants assigned to the smallest latent profile based on their most likely class membership. Very small classes should be avoided, as they often indicate overfitting and may lack generalizability, reflecting idiosyncratic patterns in the data rather than meaningful subpopulations (Nylund et al., 2007; Sinha et al., 2021). The BLRT is a nested model comparison that tests whether a model with $k + 1$ profiles fits significantly better than a k-profile model. It uses bootstrapped samples to determine the significance of the log-likelihood difference, with a significant p value (typically $p < .05$) indicating preference for the more complex model (McLachlan & Peel, 2000). Best practice in LPA model selection involves evaluating multiple criteria—including AIC, BIC, entropy, BLRT, and class sizes—as no single indicator should be used in isolation (Masyn, 2013; Nylund et al., 2007; Sinha et al., 2021; Weller et al., 2020). Importantly, statistical indices should be balanced with considerations of parsimony and interpretability to ensure that the resulting profiles are both conceptually meaningful and practically useful (Wardenaar, 2024). Consistent with previous AVEM research using LPA to test the replicability of work-related behavior patterns (Künsting et al., 2012; Menge, 2025; Menge & Schaeper, 2019), we initially estimated two- to six-profile solutions across four model specifications (EEI, VVI, EEE, VVV), which were then further evaluated.

Results

A correlation matrix, presented in Table A1, displays the interrelations among the 11 AVEM scales. The strongest positive correlation was observed between tendency to exert and striving for perfection (r = .52, p < .001), while the strongest negative correlation was found between resignation tendencies and offensive coping with problems (r = -.55, p < .001). Internal consistency estimates, including Cronbach's alpha and McDonald's omega, indicated acceptable reliability for all scales in the pooled sample (see Table 2). Cross-country differences in pattern assignment were statistically significant, with a substantial difference in pattern distribution across countries, $\chi^2(12) = 200.17, p < .001$. The distribution of work-related patterns across countries is illustrated in Figure 1.

Table 2

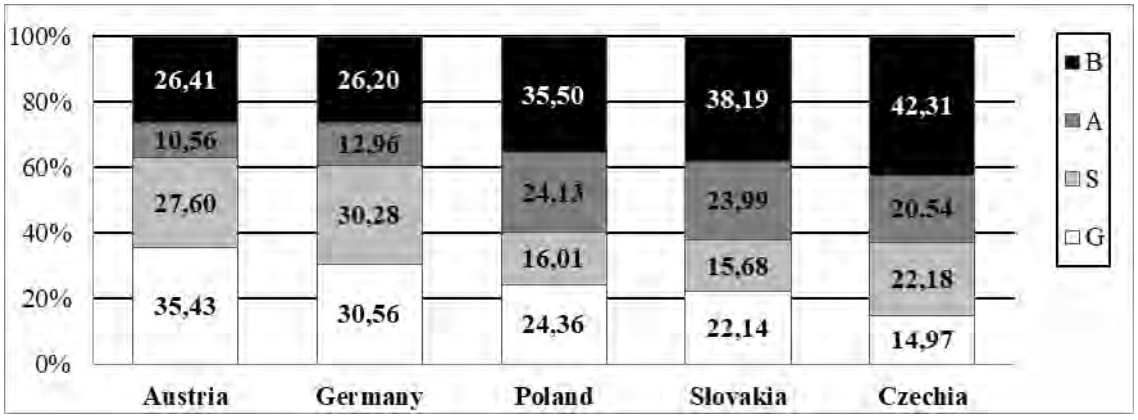
Descriptive Statistics and Internal Consistency Estimates

Parameter	SSW	PA	TE	SP	ED	RT	OCP	BMS	SW	SL	ESS
M	2.53	3.44	2.99	3.56	3.04	2.95	3.44	3.25	3.41	3.44	3.84
SD	.74	.76	.79	.75	.74	.82	.72	.77	.76	.85	.80
α	.79	.78	.78	.79	.77	.84	.84	.76	.83	.86	.78
ω	.80	.79	.78	.79	.77	.85	.84	.76	.83	.86	.79

Note. N = 3,005. α = Cronbach's alpha; ω = McDonald's omega; SSW = Subjective significance of work; PA = Professional ambition; TE = Tendency to exert; SP = Striving for perfection; ED = Emotional distancing; RT = Resignation tendencies; OCP = Offensive coping with problems; BMS = Balance and mental stability; SW = Satisfaction with work; SL = Satisfaction with life; ESS = Experience of social support.

Figure 1

Relative Frequency of Pattern Distribution Across Countries



Note. Austria (n = 587; pattern G = 208, pattern S = 162, pattern A = 62, pattern B = 155); Czechia (n = 735; pattern G = 110, pattern S = 163, pattern A = 151, pattern B = 311); Germany (n = 710; pattern G = 217, pattern

S = 215, pattern A = 92, pattern B = 186); Poland (n = 431; pattern G = 105, pattern S = 69, pattern A = 104, pattern B = 153); Slovakia (n = 542; pattern G = 120, pattern S = 85, pattern A = 130, pattern B = 207).

To examine pairwise differences between countries for each AVEM pattern, two-proportion z tests with pooled variance were conducted. To control for Type I error due to multiple testing, Bonferroni correction was applied within each AVEM pattern (10 pairwise comparisons per pattern). Detailed results of the pairwise comparisons are reported in Table A2. In general, Austria and Germany exhibited similar pattern distributions, with no significant differences between them. However, both countries significantly differed from Czechia, Slovakia, and Poland, showing a higher prevalence of patterns G and S and a lower prevalence of patterns A and B. Additionally, Czechia differed not only from Austria and Germany but also from Poland and Slovakia, showing the lowest prevalence of pattern G among all countries included in the study. Overall, the first hypothesis was confirmed.

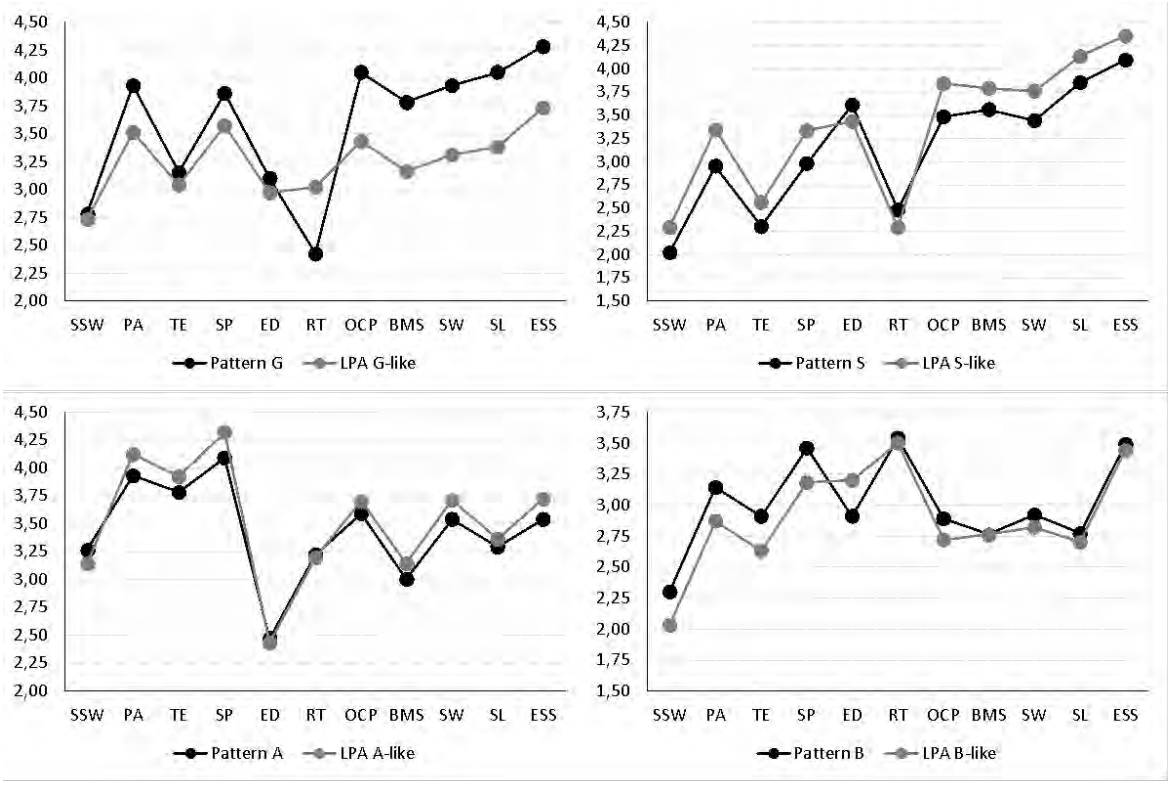
Results of the LPA for the six generated solutions under four different model specifications (EEI, VVI, EEE, VVV), presented in Table A3, were evaluated using multiple model evaluation criteria. An overall inspection of the fit indices across the two- to six-profile solutions and model specifications revealed a consistent decrease in AIC and BIC values, suggesting incremental improvements in relative model fit with an increasing number of profiles. Entropy also increased with more profiles, except for a drop in the three-profile solution under the EEE specification. The bootstrapped likelihood ratio test (BLRT) was significant for most models, except for the five-profile solution under the EEE (p = .20) and VVV (p = .07) specifications, indicating no significant improvement in model fit with the addition of a fifth profile. Moreover, the five- and six-profile solutions included classes representing fewer than 10% of the total sample—thresholds below which classes are typically considered unstable or potentially spurious in latent profile modeling (Nylund et al., 2007). This was especially true for the six-profile solution, which had small class sizes across all specifications. Taken together, the four-profile solution appeared to offer the best balance of model fit, classification accuracy, and class size. Consequently, the four-profile solution under the VVI specification was selected as the best-fitting model, identifying four typical AVEM scoring profiles with indicators independent and differing in their mean levels and variability across profiles. This solution demonstrated relatively low AIC and BIC values, acceptable levels of entropy and minimum average posterior probabilities, and adequate representation of the smallest profile. Overall, the four-profile solution was favored because it showed good model fit without indications of misspecification observed in alternative solutions, produced

acceptable class sizes, and offered clear interpretability based on visual inspection of the profiles.

To further validate the solution, mean scores on the 11 indicator variables were calculated for each profile in the four-profile VVI model and compared to the mean scores of the original AVEM work-related patterns (see Table A4). The highest correlation was observed between pattern A and its corresponding LPA profile ($r = .99$, $p < .001$), followed by pattern S ($r = .96$, $p < .001$), pattern B ($r = .91$, $p < .001$), and pattern G ($r = .86$, $p < .001$). These strong correlations, together with visual inspection of the profile plots based on AVEM scale means for the original and LPA-derived pattern solutions presented in Figure 2, indicate that the original work-related patterns replicate well in the present international sample, with the LPA-derived profiles showing theoretically expected configurations of high and low indicator scores consistent with the defining characteristics of patterns G, S, A, and B. Consequently, the second hypothesis was confirmed.

Figure 2

Profile Plots Based on AVEM Scale Means for Original and LPA-Derived Pattern Solutions



In terms of classification, 901 participants were assigned to the LPA profile corresponding to pattern G (29.98% vs. 25.29% originally assigned to pattern G), 852 to pattern S (28.35% vs. 23.09%), 594 to pattern A (19.77% vs. 17.94%), and 658 to pattern B (21.90%

vs. 33.68%). The overall association between the original AVEM patterns and LPA profiles was strong (Cramér's V = .51, $p < .001$), suggesting structural similarity between the two classification approaches. However, the frequency of pattern B appeared to be underestimated in the LPA solution, primarily in favor of patterns G and S.

Discussion

The present study focused on the AVEM concept, which identifies individuals at risk for occupational health issues by evaluating their work-related patterns. By applying the inventory to a sample of 3,005 first-year teacher education students from five Central European countries, we were able to (1) determine cross-country differences in pattern distribution and (2) test the replicability of the original patterns, developed nearly 30 years ago based solely on German-speaking samples.

Regarding our first aim, we found significant cross-country differences in pattern distribution. Teacher education students from Czechia, Poland, and Slovakia showed notably higher proportions of risk work-related patterns—indicative of heightened vulnerability to burnout and other occupational health issues—compared to their counterparts from Austria and Germany, where healthy patterns clearly prevailed. In total, 36.97% of Austrian and 39.16% of German students can be considered increasingly vulnerable to developing occupational health issues in the long term. In contrast, this applies to approximately 59.63% of Polish, 62.18% of Slovak, and 62.85% of Czech students. With the results of this international comparative study, we confirmed tentative recent findings suggesting a greater tendency toward risk patterns in former Eastern Bloc countries compared to German-speaking populations (Mašková et al., 2022; Bartosiewicz et al., 2022). Moreover, our results partially align with earlier AVEM research by Schaarschmidt (2005), which reported a strong inclination toward risk patterns—particularly pattern A—in former Eastern Bloc regions. That research showed that 56% of Polish and 42% of Czech teachers exhibited pattern A, and that 77% of Polish and 66% of Czech teachers overall were considered vulnerable. In the current study of first-year teacher education students, however, we did not confirm an increased tendency toward the excessively ambitious pattern A. Instead, the least desirable pattern B—associated with a resigned attitude toward work and life—was most prevalent in countries of the former Eastern Bloc. The current framework on the social determinants of health emphasizes that long-term political, economic, and institutional developments can leave deep and enduring imprints on individuals' health and coping (World Health Organization, 2025). In the context of former Eastern Bloc countries, the

transition from a planned to a market economy—accompanied by educational reforms, labor market uncertainty, and shifting social norms—may contribute to persistent psychosocial stress, particularly in occupational fields such as education, where role clarity and systemic support are essential. This reflects a typical picture of the contemporary teaching role in these countries, where teachers face a range of occupational stressors that extend beyond the inherently demanding nature of the profession itself—most notably the perceived low social prestige of the profession and the chronic underfunding of the educational system, which results in unsatisfactory salaries. These pressures have been further intensified by multiple systemic reforms, including curricular changes and the restructuring of the school system, which have increased administrative burdens and contributed to substantial job insecurity (OECD, 2020; Wiśniewski & Zahorska, 2020). In addition to these long-standing structural influences, evidence indicates that global crises such as the recent COVID-19 pandemic have further amplified existing social and health inequalities by increasing stress exposure, reducing access to support, and deepening socioeconomic insecurities. With regard to the pandemic, Green et al. (2021) demonstrated a direct relationship between the social determinants of health and health and well-being outcomes, particularly among vulnerable groups such as low-income individuals and women, who were disproportionately affected. In this respect, the COVID-19 pandemic clearly intensified pre-existing social inequalities and placed additional strain on the mental health and coping capacities of already vulnerable populations (Green et al., 2021; Marmot & Allen, 2020). Taken together, these structural pressures, further exacerbated by crisis-related burdens, help explain the observed disparities in vulnerability. Given that general comparative data also reveal notable differences in health-related variables, such as well-being, between Eastern and Western European countries (European Foundation for the Improvement of Living and Working Conditions, 2024), broader cultural and socioeconomic East–West inequalities—reflected also in our teacher education student data—appear plausible.

The second aim of this study was to assess whether the originally proposed AVEM typology could be replicated in an international sample and thereby generalized beyond the German cultural context. The results of the LPA confirmed the four-pattern solution with a very high level of similarity, showing only minor deviations from the original. In this respect, our study provides important insights into the diagnostic potential of the AVEM instrument: it can be effectively applied as early as the first year of teacher education to support the early identification of vulnerability to burnout and occupational health risks—even beyond the German-speaking context. Despite the strong replicability of the patterns via LPA, the pattern

assignment did not fully align with the original classification; healthy patterns were slightly overrepresented. This discrepancy may stem from methodological differences between cluster analysis and LPA in how pattern assignment is conducted. To ensure comparability of findings across studies, we strongly recommend using the original algorithm developed by the AVEM authors when assigning patterns.

Limitations

The main limitation of this research lies in the purposive selection of the sample, which was drawn from higher education institutions and lectures accessible to the researchers. Although efforts were made to reduce bias by avoiding recruitment from a single institution per country, the sample cannot be considered nationally representative. Additionally, response rates could not be reliably calculated for any of the participating countries. This limitation hinders our ability to assess the representativeness of the sample and raises the possibility that participants may differ systematically from non-participants. A further limitation concerns translation equivalence and potential cultural bias. Although validated German, Czech, and Polish versions of the AVEM were used and the Slovak version was carefully adapted through bilingual comparison procedures, subtle differences in linguistic nuance or cultural interpretation of items cannot be entirely ruled out, particularly since structural invariance testing across all language versions was not performed in the present study. While previous research involving the Czech and German versions demonstrated partial scalar invariance for most AVEM scales, indicating that the scales function equivalently across these contexts (Mašková et al., 2022), the absence of invariance testing for all participating countries means that undetected cross-cultural variations in how respondents interpret the AVEM items cannot be excluded. Finally, as the study focused exclusively on first-year teacher education students, the generalizability of the findings to other populations may be limited.

Conclusion

This study revealed a heightened vulnerability to burnout and occupational health issues among prospective teachers at an early stage of their careers, shortly after entering teacher education. These findings may have serious implications not only for the individuals themselves but also for the future academic achievement and well-being of their students, and should therefore be reflected in educational policy. Early implementation of preventive measures is crucial. Given its diagnostic potential to identify vulnerable individuals even before the onset of health problems, and its international validation for this population, we recommend the

routine use of the AVEM instrument at the beginning of teacher education. Targeted interventions should then follow in the form of psychological counselling and structured intervention programs, which should become an integral part of teacher education curricula—particularly in countries of the former Eastern Bloc.

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Appendix

Table A1

Correlation Matrix

Scale	SSW	PA	TE	SP	ED	RT	OCP	BMS	SW	SL
SSW										
PA	.48***									
TE	.44***	.44***								
SP	.34***	.43***	.52***							
ED	-.33***	-.24***	-.47***	-.39***						
RT	.00	-.02	.19***	.19***	-.24***					
OCP	.22***	.35***	.14***	.23***	.01	-.55***				
BMS	.01	.06***	-.11***	-.03	.21***	-.52***	.44***			
SW	.13***	.26***	.14***	.19***	-.07***	-.23***	.37***	.28***		
SL	.03	.10***	-.13***	.00	.16***	-.42***	.48***	.41***	.48***	
ESS	-.06***	-.01	-.18***	.00	.06**	-.24***	.25***	.20***	.31***	.49***

Note. N = 3,005. α = Cronbach's alpha; ω = McDonald's omega; SSW = Subjective significance of work; PA = Professional ambition; TE = Tendency to exert; SP = Striving for perfection; ED = Emotional distancing; RT = Resignation tendencies; OCP = Offensive coping with problems; BMS = Balance and mental stability; SW = Satisfaction with work; SL = Satisfaction with life; ESS = Experience of social support.

** $p < .01$. *** $p < .001$.

Table A2

Pairwise Comparisons of AVEM Pattern Distributions Between Countries

Pattern	Country 1	Country 2	% Country 1	% Country 2	*Z*	*p*
G	Austria	Czechia	35.43	14.97	8.65	< **.001**
	Austria	Germany	35.43	30.56	1.86	.063
	Austria	Poland	35.43	24.36	3.78	< **.001**
	Austria	Slovakia	35.43	22.14	4.92	< **.001**
	Czechia	Germany	14.97	30.56	-7.08	< **.001**
	Czechia	Poland	14.97	24.36	-3.99	< **.001**
	Czechia	Slovakia	14.97	22.14	-3.30	< **.001**
	Germany	Poland	30.56	24.36	2.26	.024
	Germany	Slovakia	30.56	22.14	3.33	< **.001**
	Poland	Slovakia	24.36	22.14	0.82	.414
S	Austria	Czechia	27.60	22.18	2.27	.023
	Austria	Germany	27.60	30.28	-1.06	.289
	Austria	Poland	27.60	16.01	4.36	< **.001**
	Austria	Slovakia	27.60	15.68	4.84	< **.001**
	Czechia	Germany	22.18	30.28	-3.50	< **.001**
	Czechia	Poland	22.18	16.01	2.55	.011
	Czechia	Slovakia	22.18	15.68	2.90	**.004**
	Germany	Poland	30.28	16.01	5.41	< **.001**
	Germany	Slovakia	30.28	15.68	6.00	< **.001**
	Poland	Slovakia	16.01	15.68	0.14	.890
A	Austria	Czechia	10.56	20.54	-4.91	< **.001**
	Austria	Germany	10.56	12.96	-1.33	.184
	Austria	Poland	10.56	24.13	-5.79	< **.001**
	Austria	Slovakia	10.56	23.99	-6.00	< **.001**
	Czechia	Germany	20.54	12.96	3.85	< **.001**
	Czechia	Poland	20.54	24.13	-1.43	.153
	Czechia	Slovakia	20.54	23.99	-1.47	.142
	Germany	Poland	12.96	24.13	-4.85	< **.001**
	Germany	Slovakia	12.96	23.99	-5.06	< **.001**
	Poland	Slovakia	24.13	23.99	0.05	.958

Pattern	Country 1	Country 2	% Country 1	% Country 2	*Z*	*p*
B	Austria	Czechia	26.41	42.31	-6.02	< **.001**
	Austria	Germany	26.41	26.20	0.08	.932
	Austria	Poland	26.41	35.50	-3.12	**.002**
	Austria	Slovakia	26.41	38.19	-4.24	< **.001**
	Czechia	Germany	42.31	26.20	6.45	< **.001**
	Czechia	Poland	42.31	35.50	2.29	.022
	Czechia	Slovakia	42.31	38.19	1.48	.138
	Germany	Poland	26.20	35.50	-3.33	< **.001**
	Germany	Slovakia	26.20	38.19	-4.53	< **.001**
	Poland	Slovakia	35.50	38.19	-0.86	.387

Note. Z = z score from pairwise proportion test. A Bonferroni-adjusted critical value of $\alpha = .005$ was applied within each AVEM pattern (10 pairwise comparisons); values remaining statistically significant after adjustment are shown in bold.

Table A3

LPA Fit Indices

Model	Classes	AIC	BIC	Entropy	Min. probability	Smallest *n* (%)	BLRT (*p*)
EEI	1	93839.02	93971.20	1	-	-	-
	2	90415.32	90619.59	0.75	0.91	41%	0.01
	3	88464.95	88741.32	0.75	0.88	29%	0.01
	4	87366.46	87714.93	0.75	0.84	15%	0.01
	5	86535.04	86955.60	0.77	0.81	8%	0.01
	6	85957.89	86450.55	0.78	0.78	7%	0.01
VVI	1	93839.02	93971.20	1	-	-	-
	2	90180.63	90450.99	0.75	0.91	44%	0.01
	3	87993.12	88401.67	0.76	0.88	33%	0.01
	4	**86716.79**	**87263.52**	**0.77**	**0.85**	**20%**	**0.01**
	5	85677.67	86362.59	0.78	0.85	14%	0.01
	6	85223.69	86046.79	0.78	0.81	10%	0.01
EEE	1	83586.73	84049.35	1	-	-	-
	2	83409.48	83944.19	0.66	0.75	22%	0.01
	3	83437.14	84043.95	0.35	0.42	23%	0.01
	4	83295.59	83974.49	0.47	0.49	12%	0.01
	5	83264.37	84015.37	0.58	0.54	5%	0.20
	6	83253.88	84076.98	0.49	0.11	2%	0.01
VVV	1	83586.73	84049.35	1	-	-	-
	2	82739.24	83670.48	0.49	0.77	40%	0.01
	3	82419.21	83819.09	0.57	0.78	30%	0.01
	4	82289.76	84158.26	0.59	0.69	19%	0.01
	5	82226.98	84564.10	0.60	0.65	11%	0.07
	6	82144.79	84950.54	0.65	0.64	8%	0.01

Note. EEI = Equal volume, equal shape, and undefined orientation model (Equal variances and covariances fixed to 0); VVI = Varying volume, varying shape, and undefined orientation model (Varying variances and covariances fixed to 0); EEE = Equal volume, equal shape, and equal orientation model (Equal variances and equal covariances); VVV = Varying volume, varying shape, varying orientation model (Varying variances and varying covariances); AIC = Akaike Information Criterion; BIC = Bayesian Information Criterion; Min. probability = lowest average posterior probability for class assignment; Smallest *n* (%) = size and percentage of the smallest class; BLRT (*p*) = *p*-value from Bootstrap Likelihood Ratio Test. Final solution in bold.

Table A4

Means, Standard Deviations, and Correlations of Original and LPA-Derived Pattern Solutions

Parameter	Pattern G	LPA G-like	Pattern S	LPA S-like	Pattern A	LPA A-like	Pattern B	LPA B-like
SSW	2.78 (0.63)	2.73 (0.52)	2.02 (0.57)	2.29 (0.66)	3.26 (0.56)	3.14 (0.72)	2.30 (0.63)	2.03 (0.64)
PA	3.93 (0.54)	3.51 (0.47)	2.95 (0.62)	3.34 (0.72)	3.93 (0.56)	4.12 (0.56)	3.14 (0.70)	2.87 (0.75)
TE	3.15 (0.64)	3.04 (0.50)	2.30 (0.57)	2.56 (0.65)	3.78 (0.62)	3.92 (0.57)	2.91 (0.68)	2.63 (0.71)
SP	3.86 (0.56)	3.57 (0.50)	2.98 (0.67)	3.33 (0.69)	4.09 (0.59)	4.32 (0.46)	3.46 (0.71)	3.18 (0.82)
ED	3.10 (0.62)	2.97 (0.51)	3.61 (0.59)	3.43 (0.62)	2.47 (0.61)	2.43 (0.68)	2.91 (0.69)	3.20 (0.80)
RT	2.42 (0.65)	3.02 (0.52)	2.48 (0.61)	2.29 (0.59)	3.22 (0.65)	3.19 (0.85)	3.54 (0.66)	3.50 (0.78)
OCP	4.05 (0.52)	3.43 (0.45)	3.48 (0.55)	3.84 (0.55)	3.59 (0.54)	3.70 (0.74)	2.89 (0.61)	2.72 (0.61)
BMS	3.78 (0.60)	3.16 (0.52)	3.56 (0.65)	3.79 (0.62)	3.00 (0.63)	3.14 (0.84)	2.76 (0.65)	2.76 (0.73)
SW	3.93 (0.62)	3.31 (0.50)	3.44 (0.67)	3.76 (0.67)	3.54 (0.61)	3.71 (0.75)	2.92 (0.69)	2.82 (0.77)
SL	4.05 (0.54)	3.38 (0.56)	3.85 (0.61)	4.13 (0.49)	3.29 (0.72)	3.36 (0.89)	2.77 (0.72)	2.70 (0.78)
ESS	4.28 (0.59)	3.73 (0.68)	4.09 (0.66)	4.35 (0.52)	3.54 (0.80)	3.72 (0.88)	3.49 (0.80)	3.44 (0.82)
r	.86***		.96***		.99***		.91***	

Note. N = 3,005. Sample sizes for original patterns: G (n = 760), S (n = 694), A (n = 539), B (n = 1,012). For LPA-derived profiles: G-like (n = 901), S-like (n = 852), A-like (n = 594), B-like (n = 658). Values represent means with standard deviations in brackets. r = Pearson correlation coefficient between original and LPA-derived pattern solutions.

*** $p < .001$

Study 6

Study 6 is based on a previously published German-language article; an English extended summary of the study is provided:

Mašková, I., & Beer, G. (2025). Psychosoziale Gesundheitsaspekte bei Hochschullehrenden in Österreich und Tschechien [Psychosocial health aspects among higher education teachers in Austria and the Czech Republic]. *Erziehung und Unterricht, 9-10,* 823–831.

This study is an empirical investigation of 771 Austrian and 853 Czech higher education teachers. It represents the first descriptive output of a larger project on higher education employees in Austria and the Czech Republic, focusing on a subsample whose work responsibilities include teaching. In this respect, it provides descriptive data on the distribution of work-related patterns among Austrian and Czech higher education teachers overall, as well as across fields of specialization, revealing uneven pattern distributions both within and between countries. With respect to the overarching aim of the study, this constitutes an important cross-cultural extension of existing evidence on pattern distributions in a population considered to be among the most vulnerable. Moreover, it adds important contextual information to our previous cross-country comparisons focusing on teacher education students (Studies 4 and 5) by highlighting the relative vulnerability of higher education teachers involved in the education of future teachers.

The study was first-authored by the author of this thesis, who was primarily responsible for the conceptualization of the study, the development of the methodology, statistical analyses, interpretation of the findings, manuscript preparation, and supervision of the author team. Overall, she was involved in all essential stages of the study. Her contribution accounts for approximately 90% of the total work.

Extended Summary: Psychosocial Health Aspects Among Higher Education Teachers in Austria and the Czech Republic

The work of higher education teachers is associated with a wide range of demanding requirements, such as balancing research and teaching, performing at a high level in both domains, or acquiring third-party funding. At the same time, higher education teachers not only play a central role in academic education but also shape young adults' personal development—particularly through their own attitudes toward life and work. In order to meet these scientific, educational, and societal responsibilities at a high level over the long term, psychosocially healthy and engaged individuals are needed. In light of these considerations, the AVEM instrument enables the early identification of risk constellations, thereby creating opportunities for preventive interventions to maintain and promote the health and performance of higher education teachers.

Studies using the AVEM instrument that have primarily included German professionals from various occupational groups suggest that teachers belong to particularly at-risk professions (Schaarschmidt, 2005). Within this group, higher education teachers appear to be especially vulnerable. A notable characteristic of this occupational group is their more frequent assignment to pattern A, often at the expense of pattern S. For example, among Ukrainian higher education teachers in the medical field, 39% were assigned to pattern A and 10% to pattern S (Lalymenko et al., 2020), and in another sample even 44% were assigned to pattern A and none to pattern S (Thielmann et al., 2021). Similarly, among Egyptian higher education teachers in nursing education, 68.5% were assigned to pattern A and only 1.5% to pattern S (Sharaf & Taha, 2019). In a German sample focusing specifically on higher education staff in leadership positions (including administrative personnel), the prevalence of these patterns was less pronounced. Nevertheless, even in this group, a trend toward a higher proportion of pattern A and a reduced proportion of pattern S compared to other occupational groups was evident, with 32.6% assigned to pattern A and 18.6% to pattern S (Buck, 2019).

With regard to correlates of the AVEM patterns, research among Ukrainian higher education teachers in the medical field has shown that field specialization constitutes a significant predictor of pattern assignment. Faculty with a humanities-oriented profile exhibited a more favorable pattern distribution, characterized by a lower tendency toward pattern B and a stronger expression of the unambitious pattern S. In contrast, pattern S was less pronounced among teachers with natural science or clinical profiles, while risk patterns were more prevalent

in these groups (Lalymenko et al., 2020). Furthermore, the health-promoting pattern G was most frequently observed in the age group between 48.6 and 56.6 years, whereas younger and older participants were more likely to exhibit risk patterns. In addition, assignment to risk patterns was associated with an increased likelihood of psychological impairments (Thielmann et al., 2021). Finally, among Egyptian teachers in nursing education, both years of professional experience and a strong sense of coherence were found to exert a protective effect against risk patterns (Sharaf & Taha, 2019).

However, because studies that explicitly focus on higher education teachers remain scarce and originate from diverse cultural contexts, it remains unclear to what extent observed pattern distributions reflect occupation-specific demands or are influenced by the cultural background of the samples. In this context, it is noteworthy that samples from Eastern European countries generally show less favorable pattern distributions than those from German-speaking countries, with pattern A being markedly more prevalent (Böckelmann et al., 2024; Muszalska et al., 2007)—a finding consistent with earlier results reported by Schaarschmidt (2005). Consequently, there is a clear need for further research in this area. Thus, the aim of this study was to investigate the distribution of work-related patterns among higher education teachers in Austria and the Czech Republic, as well as within-country differences in pattern distributions across fields of specialization.

Method

Participants

The sample comprised 771 respondents from Austria and 853 from the Czech Republic. Because the sample was drawn from a larger dataset of university employees in both countries, analyses were restricted to academic staff with direct teaching responsibilities; administrative personnel and research staff without teaching duties were excluded. In Austria, 53.8% of participants identified as female and 45.7% as male, with 0.5% reporting a diverse gender identity; in the Czech sample, 52.1% identified as female, 47.8% as male, and 0.1% as diverse. The mean age was 42.97 years (SD = 11.14) for Austrian participants and 45.01 years (SD = 10.36) for Czech participants.

Procedure

Data were collected as part of a larger international project targeting higher education employees in Austria and the Czech Republic. An online survey was conducted between

September 2023 and May 2024. Study invitations were distributed via email to higher education staff identified through publicly available higher education websites, reaching 45,272 individuals in Austria (the entire accessible population across 72 higher education institutions) and 21,619 individuals in the Czech Republic (a randomly selected subset of higher education employees from 22 higher education institutions, contacted until the number of Czech respondents approximately matched that of Austrian respondents). Response rates were 2.96% in Austria and 6.64% in the Czech Republic. The study was approved by the Ethics Committee of the University of South Bohemia (Czech Republic) and by the responsible institutional review board of the Private University College of Teacher Education of Christian Churches Vienna/Lower Austria (Austria). All participants provided informed consent prior to participation.

Measures

The shortened 44-item version of the AVEM instrument was used (Schaarschmidt & Fischer, 2008). The instrument demonstrated acceptable internal consistency across all subscales in both the Austrian and Czech samples. Field of specialization was assessed using the following multiple-choice item: "Field of the faculty/department of the university or higher education institution at which you are (primarily) employed."

Results

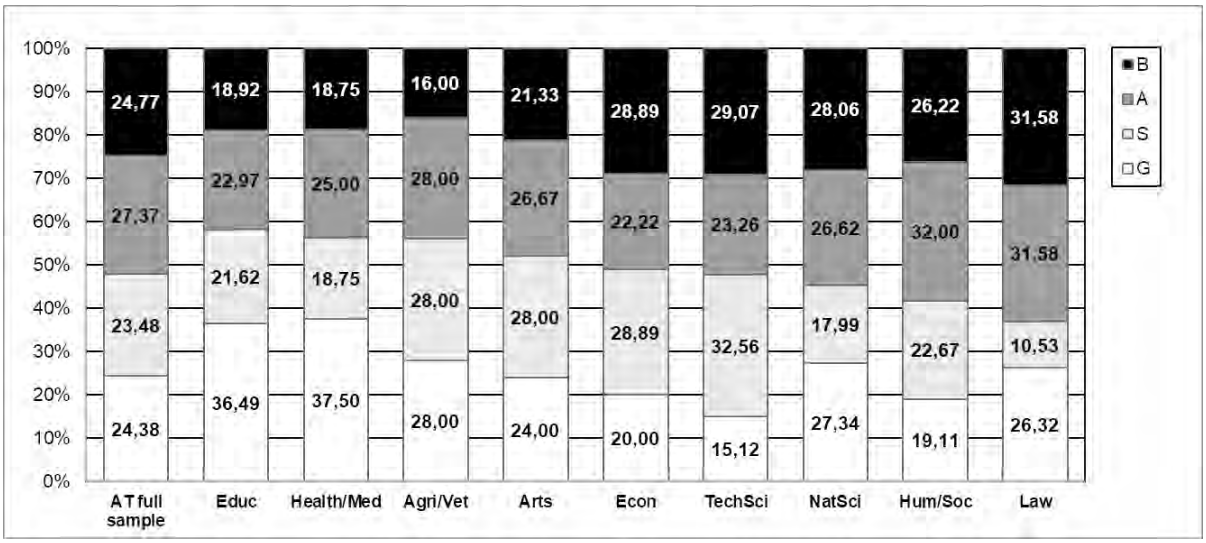
The results of the pattern assignment indicate that 24.38% of Austrian respondents were assigned to pattern G, 23.48% to pattern S, 27.37% to pattern A, and 24.77% to pattern B. In the Czech sample, 15.12% of respondents were assigned to pattern G, 15.94% to pattern S, 42.09% to pattern A, and 26.85% to pattern B. Differences between Austrian and Czech higher education teachers were statistically significant, $\chi^2(3) = 55.24$, $p < .001$. Post hoc analyses showed that Austrian respondents were significantly more frequently assigned to pattern G ($p < .01$) and pattern S ($p < .05$), whereas Czech respondents were more frequently assigned to pattern A ($p < .001$). Differences between higher education teachers across fields of specialization were examined with respect to pattern prevalence. For this field-related analysis, 752 cases from Austria and 820 from Czechia were analyzed. Fields of specialization were ranked in descending order according to the proportion of the two healthy patterns (pattern G and pattern S). In Austria, the fields of Pedagogy, teacher training (36.49% pattern G and 21.62% pattern S) and Healthcare, medical and pharmaceutical sciences (37.50% pattern G and 18.75% pattern S) show the highest prevalence of healthy work-related patterns. In contrast,

the lowest prevalence of healthy work-related patterns was observed in Humanities and social sciences (19.11% pattern G and 22.67% pattern S) and Law (26.32% pattern G and 10.53% pattern S). In Czechia, the highest prevalence of healthy work-related patterns is found in Healthcare, medical and pharmaceutical sciences (20.69% pattern G and 19.54% pattern S) and Law (7.69% pattern G and 30.77% pattern S). Conversely, the lowest prevalence of healthy work-related patterns is observed in Natural sciences (10.00% pattern G and 16.15% pattern S) and Agricultural, forestry and veterinary sciences (5.56% pattern G and 19.44% pattern S).

The largest difference in the proportion of healthy work-related patterns emerges in Law, which ranks last in Austria but second in Czechia. A similarly pronounced difference is observed for Pedagogy, teacher training, which ranks first in Austria but only seventh in Czechia. Agricultural, forestry and veterinary sciences also show a marked disparity, ranking third in Austria but last in Czechia. The pattern distribution in the Austrian and Czech samples by field of specialization is shown in Figures 1 and 2, respectively.

Figure 1

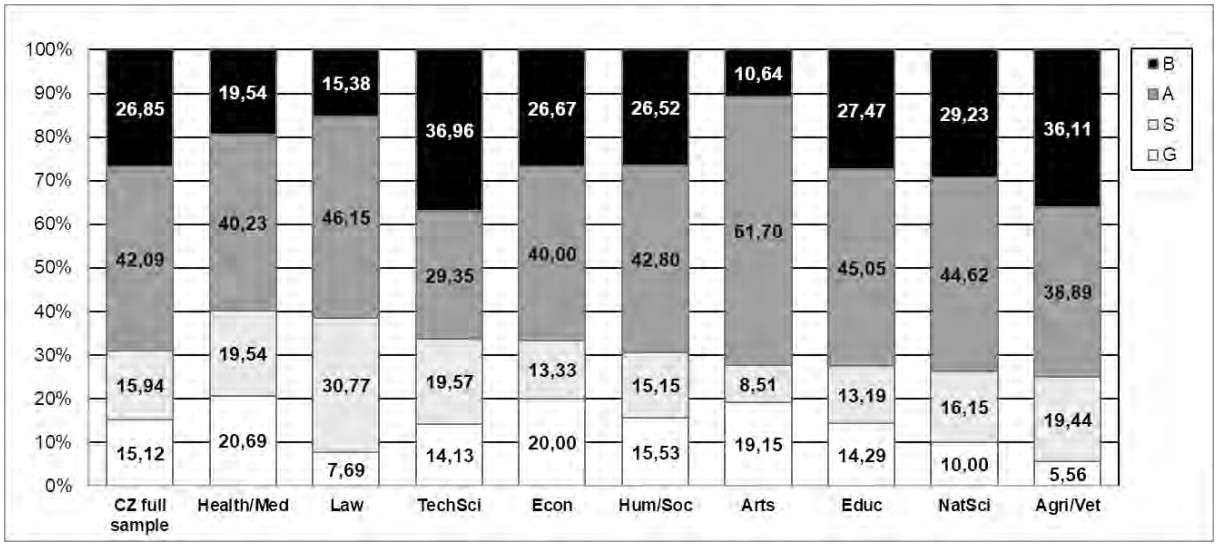
Pattern Distribution in the Austrian Sample by Field of Specialization



Note. Educ = Pedagogy, teacher training (n = 74); Health/Med = Healthcare, medical and pharmaceutical sciences (n = 64); Agri/Vet = Agricultural, forestry and veterinary sciences (n = 25); Arts = Culture and art (n = 75); Econ = Economic sciences (n = 45); TechSci = Technical sciences (n = 86); NatSci = Natural sciences (n = 139); Hum/Soc = Humanities and social sciences (n = 225); Law (n = 19). Fields are ordered in descending order based on the proportion of healthy patterns.

Figure 2

Pattern Distribution in the Czech Sample by Field of Specialization



Note. Health/Med = Healthcare, medical and pharmaceutical sciences (n = 87); Law (n = 13); TechSci = Technical sciences (n = 92); Econ = Economic sciences (n = 60); Hum/Soc = Humanities and social sciences (n = 264); Arts = Culture and art (n = 47); Educ = Pedagogy, teacher training (n = 91); NatSci = Natural sciences (n = 130); Agri/Vet = Agricultural, forestry and veterinary sciences (n = 36). Fields are ordered in descending order based on the proportion of healthy patterns.

Discussion

Higher education teachers constitute a particularly vulnerable occupational group (Buck, 2019; Lalymenko et al., 2020; Sharaf & Taha, 2019; Thielmann et al., 2021). The previously described trend that higher education teachers are predominantly assigned to pattern A is not strongly pronounced among Austrian higher education teachers, but it is nevertheless discernible. This pattern emerges more clearly among Czech higher education staff—a finding that is consistent with the generally higher tendency toward pattern A observed in countries of the former Eastern Bloc (Böckelmann et al., 2024; Muszalska et al., 2007; Schaarschmidt, 2005). From a health-related perspective, these results are alarming: More than half of Austrian higher education teachers and nearly two thirds of their Czech counterparts exhibit a risk pattern.

Differences between fields of specialization are also noteworthy; however, these appear to reflect national contexts rather than general trends. An exception are higher education teachers working in healthcare, medical, and pharmaceutical fields, who display one of the healthiest distributions of work-related patterns in both countries. In contrast, a striking

difference is observed in pedagogy and teacher training: while this field shows the most favorable pattern distribution in Austria, it ranks among the most vulnerable in Czechia. An opposite trend is evident in law. It can be assumed that these country-specific differences are primarily attributable to differences in working conditions at faculties and institutes; however, this assumption should be examined in more detail in future research. In any case, the alarming results of this study warrant serious attention from higher education institutions. By optimizing working conditions and providing targeted psychological interventions, institutions can actively contribute to the promotion and protection of their teaching staff's mental health.

A central limitation of this study is the low response rate, which may indicate that participation was more likely among higher education teachers experiencing perceived dissatisfaction and increased strain. The results therefore cannot be readily generalized to the entire population. It should also be noted that the question on field of specialization referred to the specialization of the institution rather than that of the teachers themselves. Finally, this study did not include an analysis of measurement invariance; therefore, direct cross-country comparisons should be interpreted with caution.

General Discussion

Overall, this thesis aimed to familiarize readers with the AVEM concept, which remains relatively unknown outside the German cultural context, with particular emphasis on the educational context in which the concept was originally developed. The theoretical part of this thesis presented the reader with the most important findings related to this concept, including their integration and synthesis. The empirical part of this thesis comprises six studies that collectively address major practical and empirical gaps in existing AVEM research. Practical gaps relate primarily to the limited accessibility of findings due to publication in national languages and in low-visibility outlets, while empirical gaps concern the lack of studies conducted outside German-speaking countries and limited cross-cultural comparisons, resulting in strong context dependence and unclear replicability of work-related patterns. In this final section, the empirical findings are integrated and discussed within the European educational context.

The first study (Warchałowski et al., 2025), which synthesized findings from Polish samples, indicated that teachers represent one of the most vulnerable professional groups in Poland, as evidenced by alarmingly high proportions of risk-related work patterns. Specifically, Bartosiewicz et al. (2022) reported that more than 80% of teachers manifested risk patterns

(30.19% assigned to pattern A and 47.43% to pattern B). Similarly, Karabanowicz (2014) found that 90% of teachers manifested pattern B, with none assigned to the healthy pattern G; the remaining participants were assigned to pattern A (3.8%) or pattern S (6.2%). These results not only suggest that teachers are the most vulnerable occupational group nationwide, but also indicate that their vulnerability far exceeds the already concerning levels observed among German teachers, where risk patterns typically account for approximately 60% of the sample (Schaarschmidt, 2005). This comparison reinforces the view that teaching constitutes a particularly high-risk profession and suggests that vulnerability may be further exacerbated by contextual factors. An exception within the Polish findings concerned special school teachers, who manifested risk patterns in 38% of cases (22% pattern A and 16% pattern B). In contrast, German special school teachers showed higher vulnerability, with risk patterns reported in 52% of the sample (Schaarschmidt, 2005). Taken together, these findings suggest the presence of national structural disadvantages that translate into adverse everyday working conditions, unevenly affecting professionals across workplaces. This interpretation is further supported by additional findings emerging from the study that complement existing AVEM-related evidence. In particular, Polish samples show a higher incidence of pattern A at the expense of pattern S—a tendency already evident in early East–West comparisons by Schaarschmidt (2005), as well as in contemporary AVEM research with Ukrainian samples (e.g. Thielmann et al., 2021; Böckelmann et al., 2024). However, this tendency is strongly shaped by professional context. While increased vulnerability is evident in some occupational settings—especially education and healthcare—it is not observed uniformly. On the contrary, several professional groups display predominantly healthy pattern distributions that even exceed those reported in German-speaking samples, such as Polish drivers, among whom more than 70% manifested healthy patterns (Horoszkiewicz, 2011; Horoszkiewicz & Korchut, 2019), and prison staff, with over 90% showing healthy patterns (Zawadzka, 2022). In sum, although this study was not primarily focused on the educational context, it provides important insights into pattern distributions among professionals within the cultural context of a European country of the former Eastern Bloc. These findings offer crucial contextual grounding for the interpretation of the remaining five studies and for the application of their results to educational settings.

The second study (Mašková, 2023), which synthesized findings from student samples, provided important insights into the distribution of patterns across different fields of study. However, because the reviewed literature focused unevenly on specific groups—primarily teacher education and medical students—and almost exclusively on participants from German-

speaking countries, comparisons between study programs remain limited, as does the transferability to other cultural contexts. Despite these constraints, teacher education students tended to show a higher prevalence of risk patterns already before entering the profession, at least in comparison with medical students. This observation is consistent with evidence from research on German teachers and physicians, indicating a generally higher risk level among the former group (e.g., Schaarschmidt, 2005; Voltmer et al., 2010b). These findings may point to an important insight, namely that vulnerability may already originate before exposure to demanding working conditions, thereby supporting a hypothesis of negative self-selection into the teaching profession that has already been suggested by some authors. Although this hypothesis has not been fully confirmed and is likely to be context-specific, some findings from particular cultural contexts suggest that individuals with lower cognitive abilities (Hanushek & Pace, 1995) or lower openness to experience (Klusmann et al., 2009) are more likely to enter teacher education than other fields of study. Since several studies (including Studies 4 and 5) show that this increased vulnerability is already present at the very beginning of teacher education, it seems plausible that—at least in some contexts—students entering teacher education already display less favorable motivational and personality characteristics, including lower resilience, compared with students in other fields of study. Study 2 also provided an important integrative synthesis of correlates associated with work-related patterns, convincingly showing that pattern G is linked to the most desirable correlates—such as adaptive personality traits, higher-quality motivation, commitment to the chosen career, perceived suitability for the profession, stress resistance, adaptive coping, and better physical and mental health—whereas pattern B is associated with the least desirable correlates, including less adaptive personality traits and coping strategies, higher levels of stress, lower-quality motivation, weaker commitment to the chosen career and perceived suitability for the profession, and poorer physical and mental health. Taken together, these findings demonstrate the diagnostic value of the AVEM instrument, which may both directly and indirectly identify highly problematic risk states. From an educational perspective, these risk states may reflect undesirable characteristics already present during teacher education which, if left unaddressed, may substantially hinder individuals' potential to become effective teachers.

The third study (Mašková, 2024) examined pattern distribution among 400 Czech university students and found no significant differences across fields of study. Although nonsignificant, the results descriptively indicated that psychology students—rather than teacher education students—showed higher proportions of risk patterns (almost 70%), with pattern A

being most prevalent. When compared with Germany-based evidence, these findings remain inconclusive. While Reichl et al. (2014) reported a comparatively higher proportion of risk patterns among psychology students than among teacher education students (55% vs. 46%), Engel et al. (2015) observed less pronounced levels, with risk patterns present in 44% of psychology students and 37% of psychotherapists—levels that were broadly comparable to those observed in teacher education students and lower than those reported for teachers. Since this occupational group has not been a primary focus of AVEM research and levels of vulnerability across occupational groups are likely to be context dependent, these scattered findings warrant further investigation. Despite the study's limitations—most notably the uneven sample distribution and the small number of students from some study programs—Study 3 did not provide sufficient evidence to support the previously discussed hypothesis of negative self-selection into teacher education in the Czech educational context. Nevertheless, a finding of both theoretical and practical importance in this study relates to the role of academic excellence in pattern distribution. In this respect, it was primarily personal excellence—reflecting a student's virtuous character—that was associated with a higher likelihood of pattern G. In contrast, indicators of educational excellence did not differentiate between patterns. Taken together, these findings represent important evidence for educational practice and may also be relevant for evaluations in new employee hiring. They indicate that grades—the primary indicator of educational excellence—play a limited role in identifying a desirable constellation of healthy engagement and resilience, which is essential for long-term effective performance in a profession, particularly in demanding occupations involving intensive interpersonal interaction.

The fourth (Mašková et al., 2022) and fifth (Mašková, Beer, et al., in press) studies provided crucial cross-country evidence regarding pattern distribution among first-year teacher education students. While the fourth study offered initial evidence of significant differences between German and Czech teacher education students, the fifth study confirmed these differences in a larger and more locally balanced sample. In doing so, it extended the evidence for German-speaking countries on the one hand and for former Eastern Bloc countries in Central Europe on the other. Although smaller differences were observed—with Austria showing more favorable pattern distributions than Germany on the one hand, and Czechia showing the least favorable distribution among the former Eastern Bloc countries on the other—the results collectively revealed a clear pattern of similarity within each of the two country groups. In this respect, students from former Eastern Bloc countries showed considerably higher proportions

of risk patterns than those from German-speaking countries, which—from an interpretative and educationally applied perspective—is particularly concerning and warrants closer attention. Moreover, the fourth study provided evidence that autonomous motivation is indicative of pattern G and appears to protect against risk patterns, thereby pointing to the potential relevance of motivation-focused interventions in teacher education. The fifth study, in turn, provided evidence for the replicability of the original four-pattern solution in an international sample, confirming the transferability of the AVEM framework to international contexts and suggesting its applicability within the teacher education student population.

The sixth study (Mašková & Beer, 2025) drew on a subsample from a larger project on Czech and Austrian higher education employees and, focusing specifically on higher education teachers, provided initial descriptive insights into this population. The study showed that approximately 52% of Austrian and 69% of Czech higher education teachers were assigned to risk patterns. From the perspective of this thesis, an important finding is that higher education teachers employed at institutions focused on teacher education exhibited substantial within-country differences. Specifically, in Austria, they showed the most favorable pattern distribution among all examined higher education teachers (42% assigned to risk patterns), whereas in Czechia, the pattern distribution of higher education teachers in teacher education was among the least favorable (73% assigned to risk patterns). The interpretation of these findings is not straightforward and requires the integration of multiple interpretative perspectives. On the one hand, assignment to risk patterns appears to be largely shaped by working conditions, as shown in the parent study (Mašková & Beer, 2024). Using a large sample of academic employees—including those without teaching responsibilities—we demonstrated that several working conditions that differ significantly across countries also represent significant predictors of risk patterns, thereby helping to interpret the substantial cross-country differences observed in pattern distribution. In particular, key distinguishing working conditions included availability of resources needed for academic work, perceived performance pressure, and sense of community at work, all of which were evaluated less favorably in the Czech sample. An additional important factor was total working hours across all jobs within and outside the higher education sector. While Austrian academics worked approximately 44 hours per week, Czech academics worked about 50 hours per week, with longer working hours predicting assignment to pattern A. On the other hand, it is unlikely that differences in working conditions alone account for the within-country differences observed among respondents from institutions with different specializations. As higher education teachers at institutions focused on teacher

education are themselves largely graduates of teacher education programs, the present findings are consistent with the "entry-level vulnerability" observed among first-year teacher education students in Study 5, along with an anticipated increase in risk patterns following prolonged exposure to professional demands. This increase is evident in both countries (Austria: 37% of students vs. 42% of higher education teachers assigned to risk patterns; Czechia: 63% vs. 73%, respectively). In other words, it is plausible that the substantial vulnerability observed among Czech higher education teachers in teacher education originates largely from vulnerability already present during the phase of teacher education, which may be further exacerbated by prolonged exposure to generally unsatisfactory working conditions at higher education institutions in the Czech Republic, and possibly to an even greater extent at institutions of teacher education.

From an educational perspective, the six studies collectively offer converging evidence for the originally proposed heightened vulnerability of teachers and teacher education students, while substantially extending existing knowledge through the introduction of a cross-country perspective. In this respect, our findings indicate that the heightened vulnerability among professionals in the field of education reported by Schaarschmidt and colleagues for German-speaking countries is even exceeded in former Eastern Bloc countries. This is reflected in the very high proportions of Polish teachers assigned to risk patterns (80–90%), as well as in 72% of Czech higher education teachers at institutions focused on teacher education. Although structural issues leading to adverse working conditions for teachers, as well as for higher education teachers, clearly contribute to the exacerbation of these alarming trends, our findings also highlight a key underlying factor: the "entry-level vulnerability" of teacher education students. This trend is already evident in Germany, where teacher education students exhibit risk patterns more frequently than students in fields such as medicine, even prior to entering the profession, lending support to the negative self-selection hypothesis. However, entry-level vulnerability appears to be particularly pronounced among teacher education students in former Eastern Bloc countries. This represents a key explanatory factor for the previously described alarmingly high levels of vulnerability among education professionals in these contexts, which are likely to gradually emerge from an initially unaddressed vulnerability that is compounded by the inherent demands of teaching and intensified by structural challenges characteristic of the educational sectors in these countries. In this respect, several contributing factors to "entry-level vulnerability" in teacher education students in countries of the former Eastern Bloc can be considered. First, a generally elevated level of vulnerability among higher education students

in these countries appears likely, which may stem from a relative lack of key protective factors alongside an increased prevalence of risk factors known to play a role in pattern assignment. With regard to protective factors, characteristics such as optimism—often found to be lower at the general population level in these countries—may offer less protection against assignment to risk patterns. In contrast, increased financial strain and other pressures arising from structural deficits may contribute to higher overall strain, translating into increased vulnerability (European Foundation for the Improvement of Living and Working Conditions, 2024). Further, negative self-selection into teacher education cannot be excluded, with students displaying less favorable characteristics compared to their peers being more likely to enter teacher education. Finally, a highly problematic, self-perpetuating cycle may be present, given that students are exposed from an early age to close interactions with teachers whose occupational health tends to be impaired. Since such teachers are also likely to undermine students' motivation and well-being (Kidger et al., 2016; Klusmann et al., 2006; Madigan & Kim, 2021), students' vulnerability tends to increase even before entry into teacher education. After entering teacher education, these students come into contact with higher education teachers who, once more, often display unfavorable work-related behavioral and experiential patterns, thereby modelling these patterns of functioning for their students. In this way, a vicious, self-perpetuating cycle may be reinforced.

Limitations

The overarching limitation of this thesis, affecting both the theoretical and empirical parts, is that it draws conclusions from a very narrow field of research. As stated in several places throughout the thesis, the evidence on AVEM stems predominantly from Germany and is mainly focused on selected occupational groups. This not only limits the generalizability of the findings but also makes cross-country and occupation-related comparisons less straightforward. The empirical studies presented in this thesis constitute an initial step toward addressing these gaps, as they provide pioneering findings on previously underresearched populations and dimensions. Consequently, the reported findings require corroboration through further research. These overarching limitations should therefore be taken into account when interpreting the findings presented in this thesis. Beyond the specific limitations pertaining to each individual study, it should be reiterated that the cross-country evidence reported in Studies 5 and 6 needs to be interpreted with caution. As these studies report initial findings from larger research projects, they are situated at an earlier stage of methodological development. In this

respect, some analytical procedures—most notably measurement invariance testing—are still pending.

Directions for Future Research

As discussed throughout this thesis, although the present work provides important extensions to existing AVEM research, continued research efforts are warranted to systematically advance cross-country comparative evidence. Beyond the lack of cross-cultural evidence, another important gap in AVEM research remains, which is the lack of evidence on pattern development over time, its interaction with burnout, and its predictive value for occupational health. In light of the current findings, the need to address this gap appears even more pressing. In this respect, prospective evidence is urgently needed that follows individuals—future teachers—not only across early career trajectories and occupational health development, but also into earlier developmental and educational phases, thereby shedding light on the origins of "entry-level vulnerability", particularly in former Eastern Bloc countries. To disentangle the respective roles of structural factors and negative self-selection into teacher education, research should therefore examine students prior to entry into higher education, already at the upper secondary level, with a focus on career decision-making processes and perceptions of the attractiveness of the teaching profession. This would support a better understanding of the conditions under which students with characteristics well suited to the demands of the teaching profession are more likely to enter teacher education. Further, it is important to note that a narrow focus on educational professions within AVEM research may obscure vulnerability in other occupational groups. As suggested by our findings, in some contexts the vulnerability of teacher education students may even be exceeded by that observed in other student groups, such as psychology students, which may remain underrecognized due to limited research attention. Addressing this blind spot represents an important task for future AVEM research, not only for advancing theoretical understanding but also for informing targeted prevention efforts aimed at at-risk populations. Finally, we propose that one of the most important directions for future research lies in applied work focused on the development and empirical testing of effective interventions aimed at reducing vulnerability across all levels of the educational system.

Recommendations for Educational Practice

The main recommendation for educational practice is to address the increased vulnerability among teacher education students, teachers, and higher education teachers at

teacher education institutions. First, the most pressing known causes or exacerbating factors should be addressed through educational policy, particularly those related to working conditions across the educational sector, which in former Eastern Bloc countries are to a large extent shaped by systematic underfunding. Nevertheless, as these systemic issues are unlikely to be resolved in the short term, efforts should primarily focus on developing and implementing effective psychological interventions—ideally across all levels (students, teachers, and higher education teachers)—to help interrupt potential self-reinforcing cycles of vulnerability between students and teachers. Existing intervention-focused research yields highly promising results, suggesting that risk patterns can be modified. In this respect, the most promising results have been achieved at early stages—during teacher education; therefore, alongside continued support for teachers and higher education teachers, we strongly advocate prioritizing intervention efforts among teacher education students. Among teacher education students, at least two intervention programs have been successfully implemented—the *Potsdam Training Model* (Schaarschmidt & Kieschke, 2007) and the *Strengthened for the Teaching Profession* program (Çelebi et al., 2014)—with the latter, in particular, yielding substantial shifts toward healthier work-related patterns. While adaptation to teacher education settings in other countries beyond Germany—including those of the former Eastern Bloc—is highly recommended, we also support the development and implementation of additional intervention programs with broader applicability and complementary benefits. More recently, particularly promising results have been reported for intervention programs grounded in modern psychotherapeutic approaches, as illustrated by our pilot study implementing a six-week module based on Acceptance and Commitment Therapy—a third-wave cognitive-behavioral approach aimed at cultivating psychological flexibility. In our study, this approach was complemented by an enhanced mindfulness component. This program demonstrated promising pilot results in terms of both pattern shifts and stress reduction and was well accepted by the participating group of university students (Mašková & Třískalová, 2025). Further recommendable approaches include interventions aimed at fostering characteristics that have been identified as protective factors against assignment to risk patterns, such as optimism. In this respect, positive psychology interventions—for example, the *Best Possible Self* exercise—represent simple and effective strategies for enhancing optimism (Malouff et al., 2017). Another branch of interventions that we strongly recommend comprises motivation-focused interventions and preventive programs that explicitly target students' motivation and engagement (for a review of motivational interventions in educational settings, see Lazowski & Hulleman, 2016). Such intervention efforts may not only facilitate shifts away from risk patterns, given that high-quality motivation

represents an important protective factor against risk pattern assignment, but may also benefit individuals assigned to pattern S—a group that has received little attention in intervention research despite its specific risks—potentially promoting transitions from pattern S to pattern G. Motivational support in teacher education should address both general academic engagement and career choice motivation, with the aim of strengthening awareness of the meaningful, rewarding, and enjoyable aspects of the teaching profession.

While individualized psychological support should be widely accessible to all mentioned groups, including students—for example, through counseling centers—our primary intervention-oriented recommendation is the systematic integration of preventive modules into compulsory teacher education curricula. Importantly, individuals assigned to pattern B are often the least likely to seek psychological support, which may result in a paradoxical situation in which those most in need of intervention remain outside the reach of voluntary support services (Aouil et al., 2011). Further, the high number of vulnerable students may exceed the capacity of existing support resources at higher education institutions. When embedded within existing supportive structures—such as psychology-oriented seminars—and delivered sensitively in a group format, these interventions can help prevent the overburdening of institutional support structures while also offering additional benefits, including facilitated peer exchange of experiences and strategies, as well as stigma reduction. In this way, basic preventive support can be provided broadly and equitably, increasing the likelihood that it reaches students who are most vulnerable but least likely to engage with voluntary support services.

Conclusion

This thesis aimed to synthesize and extend the evidence on the AVEM framework, with a particular focus on educational contexts in Central Europe. The empirical part of the thesis revealed a consistent and concerning picture: compared with other occupational groups within the same national contexts, professionals and students in the field of education—especially teachers, teacher education students, and higher education teachers at teacher education institutions—exhibit disproportionately high levels of risk-related work patterns, indicating increased vulnerability to burnout and other occupational health problems. Moreover, by adopting a cross-country comparative perspective, we have shown that the proportion of risk patterns in education-related populations in Central European countries of the former Eastern Bloc tends to substantially exceed that observed in their German-speaking counterparts. Importantly, the synthesized findings indicate that a central role in explaining the alarmingly

high levels of vulnerability among teachers is played by the “entry-level vulnerability” of teacher education students. This early vulnerability is further amplified by the inherently demanding nature of the teaching profession and, particularly in countries of the former Eastern Bloc, exacerbated by adverse working conditions resulting from long-term underfunding of the educational sector. The integrated findings also point to a potentially self-perpetuating cycle of vulnerability within educational systems, in which impaired occupational health among teachers and higher education teachers may negatively affect students’ motivation and well-being, thereby increasing vulnerability even prior to entry into the profession. Breaking this cycle requires coordinated efforts that go beyond individual support and include interventions embedded in existing structures. As the most promising results have been achieved at early stages—during teacher education—we strongly advocate prioritizing intervention efforts among teacher education students. From this perspective, the systematic integration of preventive modules into compulsory teacher education curricula emerges as a particularly effective and equitable strategy for the long-term sustainability and quality of educational systems in Central Europe.

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