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Faculty of Education and Psychology

Doctoral School of Psychology

THESIS BOOKLET

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Occupational Stress, Mental Health Outcomes, and Protective Factors Among Healthcare Workers

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Table 1. Overview of accepted publications based on the projects presented in this dissertation.

Project 1 Spányik, A., Simon, D., Rigó, A., Griffiths, M. D., & Demetrovics, Z. (2022). Subjective COVID-19-related work factors predict stress, burnout, and depression among healthcare workers during the COVID-19 pandemic but not objective factors. *PLoS One*, *17*(8), e0270156.
Project 2 Spányik, A., Simon, D., Rigó, A., Griffiths, M. D., & Demetrovics, Z. (2023). Emotional exhaustion and traumatic stress among healthcare workers during the COVID-19 pandemic: longitudinal changes and protective factors. *PLoS One*, *18*(12), e0291650.
Project 3 Spányik, A., Simon, D., Rigó, A., Gács, B., Faubl, N., Füzesi, Z., ... & Demetrovics, Z. (2025). Cynicism among medical students: An in-depth analysis of mental health dynamics and protective factors in medical education using structural equation modeling. *PLoS One, 20*(4), e0321274.

1. Introduction

The dissertation comprises three empirical studies that explore the mental health of healthcare professionals and medical students across various yet interconnected contexts. The first study was an extensive cross-sectional survey conducted during the initial phase of the COVID-19 pandemic to assess risk and protective factors for healthcare workers' mental health. The second study adopted a longitudinal design to examine the dynamics of emotional exhaustion, secondary traumatization, and protective psychological factors among healthcare workers during a later phase of the pandemic. The third study focused on medical students, investigating the role of empathy, stress, cynicism, and patient-centered role models in the early stages of medical career socialization. Together, these studies provide complementary perspectives on the psychological challenges and protective factors relevant to both practicing healthcare professionals and future doctors.

The overall aim of the research presented in this dissertation is to describe the sources of stress experienced by healthcare workers (HCWs) and the diverse effects of workplace stress on mental health. In addition, a key objective of the dissertation is to explore individual, organizational, and early socialization protective factors that can help maintain the mental health of healthcare workers. Mental health problems among healthcare workers have become a growing concern due to increasing recognition of the psychological burden associated with their profession.

Work-related stress is significantly higher among HCWs compared to the general population, leading to a range of mental health complications, including depression, anxiety, post-traumatic stress disorder (PTSD), and burnout (Healy & McKay, 2000; Ito et al., 2014; Laranjeira, 2012). These issues not only affect HCWs' well-being but also have serious implications for patient care, workplace efficiency, and healthcare systems (Healy & McKay, 2000; Ito et al., 2014; Laranjeira, 2012).

HCWs worldwide are exposed to significant stressors in their work, which adversely affect both the mental and physical health of workers (National Institute for Occupational Safety and Health [NIOSH], 2024). Factors such as intense workloads, long working hours, emotionally stressful incidents, and the moral dilemmas often experienced in the healthcare sector contribute to workplace stress.

Beyond somatic consequences, chronic stress among HCWs is strongly associated with psychological outcomes. Persistent workplace stress can contribute to the development of mood disorders such as depression and anxiety, especially in cases where workers experience little control over their work environment or lack adequate support (Salvagioni et al., 2017). Another metaanalysis found that persistent stress among healthcare workers was significantly associated with higher rates of depressive symptoms, anxiety disorders, and sleep disturbances (Pappa et al., 2020). In addition, a metaanalysis published during the COVID-19 epidemic in 2021 also demonstrated that stress among HCWs is significantly associated with depressive symptoms and higher rates of anxiety disorders and sleep disturbances (Zaçe et al., 2021).

The COVID-19 pandemic has placed a significant mental health burden on HCWs, especially those who have had direct contact with infected patients. According to a comprehensive umbrella review, the prevalence of anxiety among HCWs was 24.9%, while that of depression was 24.8% (Sahebi et al., 2021), indicating a substantially elevated psychological burden compared to prevalence rates generally observed in the wider population (World Health Organization [WHO], 2023). In the context of such a crisis, health workers face not only increased workloads and unpredictable, constantly changing work environments but also the effects of emotional stress, including the secondary trauma of endangering their health and caring for critically ill patients (Brooks et al., 2018; Chen et al., 2021; Liu et al., 2012).

Protective factors mitigating mental health risks among healthcare workers operate at multiple interacting levels, including organizational, individual psychological, and developmental (professional socialization) domains. Rather than functioning in isolation, these factors dynamically interact with occupational stressors and shape long-term vulnerability or resilience trajectories among HCWs (Omri et al., 2022; Ruiz-Fernández et al., 2020).

The role of institutions and organizational interventions in ensuring health workers' mental well-being is paramount. A supportive organizational culture, transparent and fair leadership, and a sense of autonomy in the workplace can contribute to reducing stress (West et al., 2018). Optimizing workload, including reducing working hours overtime, can also contribute to reducing stress and subsequent burnout and job satisfaction (Dyrbye et al., 2017).

Psychological resilience is an individual's ability to adapt quickly to traumatic or significantly challenging situations and to restore previous psychological equilibrium (Robertson et al., 2015). Research has also shown that more resilient HCWs are at lower risk of anxiety and depression and that resilience has a protective role in burnout (De Brier et al., 2020; Labrague, 2021). Several studies emphasize the protective role of compassion satisfaction (CS) in maintaining mental health, particularly in reducing anxiety and burnout symptoms among healthcare professionals (Omri et al., 2022; Ruiz-Fernández et al., 2020).

Adverse mental health problems among medical students have been the subject of a wide range of previous research (Santen et al., 2010), with the primary focus of research being on the emotional burden of medical training and the consequences of career socialization, which can have a significant impact on the subsequent mental and physical health of medical professionals

(McKerrow et al., 2020; Santen et al., 2010). The high burnout rate previously presented in this thesis among HCWs is often already present during medical training, prior to career entry (Dyrbye et al., 2005; Newton et al., 2008; Peng et al., 2018).

It has been suggested that elevated perceived stress levels among students play a significant role in developing high burnout levels (Dyrbye et al., 2005; Frajerman et al., 2019; Peng et al., 2018). Higher stress also contributes to increased cynicism and decreased idealism (Cuttilan et al., 2016; Jafari et al., 2012). Cynicism also plays a prominent role among students because it can negatively affect the subsequent doctor-patient relationship and is of particular importance for the mental health of future doctors (Hershey & Stoddard, 2021).

Empathy in medicine is a key skill that develops significantly during medical career socialization and has a protective effect on medical students in several aspects (Cairns et al., 2024; Chen et al., 2024). Research suggests that high levels of empathy are associated with psychological well-being and a lower risk of burnout (Cairns et al., 2024; Chen et al., 2024). Results from a recent meta-analysis show that empathic students have both lower levels of emotional exhaustion and depersonalization and higher feelings of professional efficacy (Cairns et al., 2024).

The PhD dissertation aims to provide a comprehensive framework for exploring the mental health challenges of HCWs and factors shaping their mental health. One of the main focuses of the research was to examine the impact of the COVID-19 pandemic—an unprecedented stress on the health sector—to deepen our understanding of the psychological consequences for health workers and strengthen our preparedness for similar crises. Furthermore, a key objective was to identify protective factors at the organizational and individual levels that could mitigate the effects of emotional distress among HCWs.

The findings contribute to our understanding of mental health risks in this population and provide valuable insights into workforce management, the dynamics of doctor-patient relationships, and predictors of patient satisfaction. Furthermore, by investigating medical career socialization in our research from a mental health and professional socialization perspective, we gain insights into how the early stages of medical career development affect mental health. These findings are relevant to the mental health of students and have important implications for future doctor-patient interactions and preventive implications for mental health.

2. Project 1

Subjective COVID-19-related work factors predict stress, burnout, and depression among healthcare workers during the COVID-19 pandemic but not objective factors

2.1. Aim of the present study

The first study in this thesis examined the mental health of healthcare workers during the COVID-19 pandemic. In the initial period of the pandemic, frontline workers were exposed to extreme psychological stress; therefore, we decided to conduct a large-scale, cross-sectional,

nationwide survey (Brooks et al., 2018; Liu et al., 2012). This study provided a comprehensive picture of the most important risk and protective factors and laid the foundation for the conduct of subsequent longitudinal research.

Although a significant number of studies examining the mental health impact of COVID-19 on HCWs have been conducted during this period, very few studies have been conducted based on comprehensive systematic reviews that have examined the interrelationship of background factors with burnout, depression and anxiety (Pappa et al., 2020; Sahebi et al., 2021). The study's main objective was to investigate the background factors influencing adverse mental health outcomes, including subjective and objective factors. A complex, comprehensive model was used to process the data to better understand the background factors and the relationships.

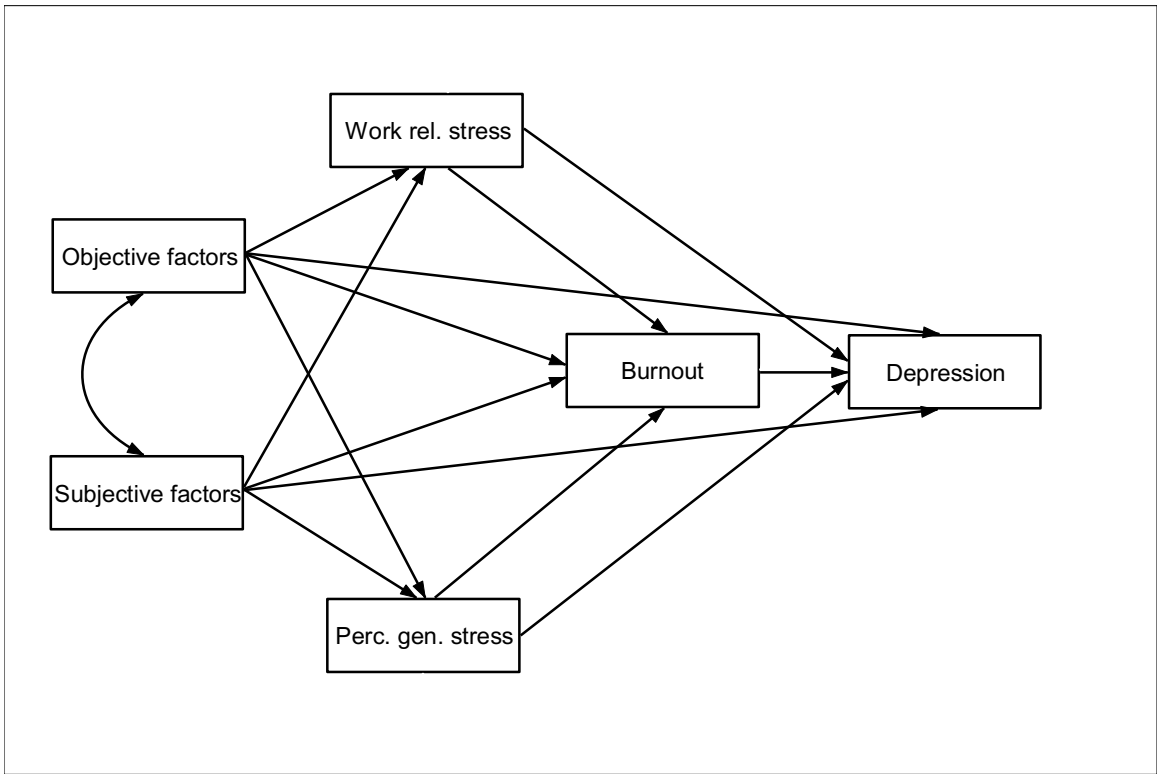
In addition to occupational stressors, the COVID-19 pandemic substantially affected the private lives and social functioning of healthcare workers. Lockdown restrictions, social isolation, fear of infecting family members, illness or loss among relatives, disruption of everyday routines, and reduced access to usual coping and recreational activities further contributed to psychological distress among HCWs (Fageera et al., 2021).

Based on the aforementioned considerations, the aim of the present study was to examine the mental health status (including depression and burnout syndrome) of HCWs and its possible predictors related to the COVID-19 outbreak. Compared to previous studies (Pappa et al., 2020; Sahebi et al., 2021), the present one examined the relationship between mental health indicators and the possible predictive factors in a complex model (Fig 1). The goal was to examine the extent to which stress (directly and indirectly) explained depressive symptoms. Moreover, the proposed model aimed to (i) differentiate between the objective (e.g., displacement, frontline work) and subjective (e.g., uncertainty, unpredictability) COVID-19-related possible stress factors, as well as (ii) determine the differences between physician HCWs and non-physician HCWs.

2.2. Hypothesis

1. Objective work factors associated with COVID-19 (e.g., reassignment, frontline work) have both direct and indirect effects on levels of burnout and depression among HCWs (Morgantini et al., 2020; Ruiz-Fernández et al., 2020).
2. Subjective factors associated with COVID-19 (e.g., insecurity, unpredictability, workload) also directly and indirectly increase levels of burnout and depression (Di Monte et al., 2020; Di Trani et al., 2021).
3. Work-related stress acts as a mediator between objective and subjective factors and burnout (Embriaco et al., 2007; Imo, 2017).
4. Perceived general stress acts in part as a mediating factor between COVID-19 work-related factors and depression (Tokuda et al., 2009).
5. Burnout appears as a mediating factor in the relationship between stress and depression, i.e., increased burnout significantly increases the odds of depression (Tokuda et al., 2009; Imo, 2017).
6. There is an interaction between subjective and objective factors: objective workplace conditions shape the individual's subjective experience (e.g., feelings of insecurity) (Di Monte et al., 2020; Di Trani et al., 2021).

Figure 1. Hypothetical model of COVID-19-related factors' possible effects on mental health



Objective factors influence subjective perceptions, while stress and burnout mediate the relationship between COVID-19-related work factors and depression.

2.3. Methods

2.3.1. Participants

After screening, the final sample consisted of 2087 participants (female: 85.82%; male: 13.46%; n/a: 0.72%), with ages ranging from 21 to 87 years (mean age = 45.58 years; standard deviation = 12.57 years). All respondents were active HCWs, with no retired persons included in the sample. A third of respondents (33.78%) worked as doctors, while 66.22% worked in non-medical health professions. 38.06% of the sample worked in departments directly involved in COVID-19 care (e.g., COVID departments, emergency departments, ambulance services), while 61.94% worked in non-COVID-related fields. Around one-sixth of respondents (16.72%) reported being transferred during the epidemic, while the majority (83.28%) remained in their original job.

2.3.2. Measures

The Perceived Stress Scale (PSS) was used to assess perceived stress levels. Work-related stress was measured using the Professional Quality of Life Scale secondary traumatic stress subscale (ProQOL STS). Burnout was assessed using the emotional exhaustion dimension of the Maslach Burnout Inventory (MBI-EE). Depression was measured with the Hungarian version of the Beck Depression Inventory (BDI).

2.3.3. Statistical analysis

Structural equation modeling (SEM) was used to test hypotheses. Model fit was assessed using RMSEA, CFI, TLI, and GFI indices. The model included standardized and unstandardized regression coefficients, total effects, and explained variances (R^2).

2.4. Results

2.4.1. Descriptive statistics

Non-physician HCWs perceived a significantly more substantial increase in workload and work schedule unpredictability than physicians. No significant differences were found between physicians and non-physician HCWs in stress, work-related stress, and burnout, but non-physician HCWs reported significantly higher depression scores.

The analyses showed high and statistically significant correlations between perceived stress, work-related stress, burnout and depression (.55-.72). The associations between COVID-19-related subjective background factors and indicators of mental well-being were of medium strength, while only weak correlations were found between objective COVID-19 factors and mental well-being indicators.

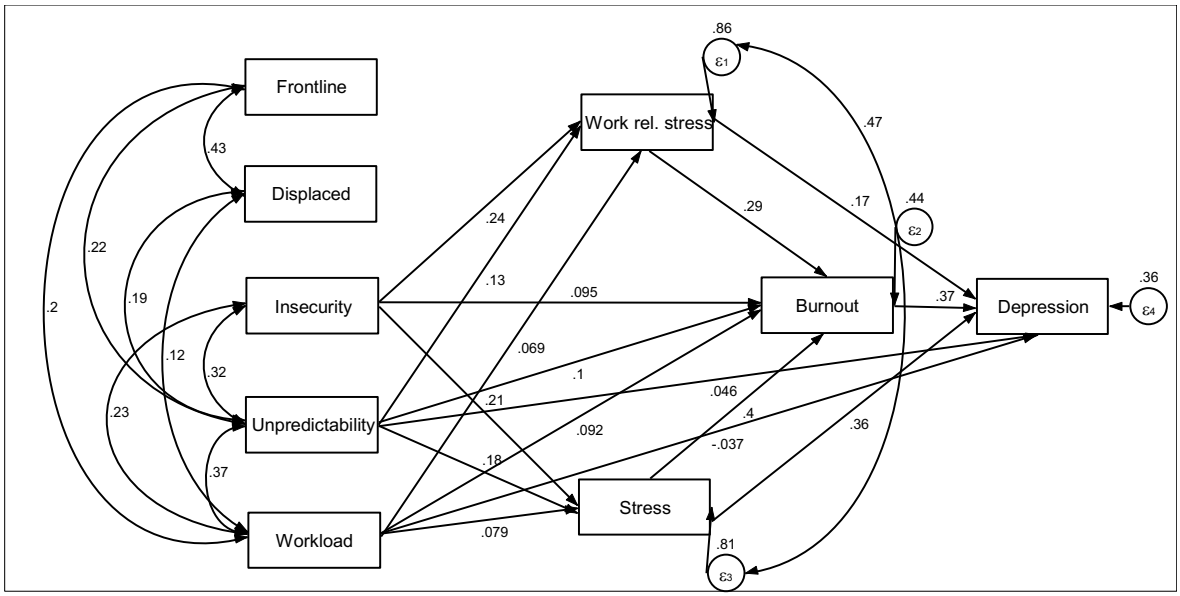
2.4.2. Structural equation model

The fit indicators indicated a good fit for the final model.

In the final structural equation model, no significant relationship was found between objective factors associated with COVID-19 and mental health indicators. However, these objective factors were weakly or moderately significantly correlated with COVID-19-related subjective factors. Increased sense of insecurity had a medium-strong positive direct effect on perceived stress and work-related stress, while increased unpredictability showed a weak positive direct effect on perceived stress, job stress, burnout, and depression. Increased workload showed weak positive direct effects on perceived stress, work stress, and burnout.

When direct and indirect effects were examined together, all subjective factors associated with COVID-19 showed positive effects on both burnout and depression. Two factors — increased sense of uncertainty and unpredictability — had a moderate effect on burnout and depression, while workload had a weaker effect.

Figure 2. Relationship between COVID-19 related factors and mental health (final SEM model)



Main findings of the final SEM model:

- Objective COVID-19-related factors had no direct effect on burnout or depression.
- Subjective perceptions of insecurity and unpredictability significantly increased perceived stress and work-related stress.
- Perceived stress had a strong overall effect on burnout and depression.
- Burnout acted as a mediating factor between stress and depression.
- The explained variance was:
    - 64% for depression
    - 56% for burnout
    - 19% for perceived stress
    - 14% for work-related stress.

2.5. Discussion

The SEM model partially confirmed the hypothesized model of the impact of objective and subjective factors associated with COVID-19 on stress, burnout, and depression. The results showed that both general perceived and work-related stress increased burnout, confirming previous research findings (Embriaco et al., 2007; Imo, 2017). Furthermore, both general perceived stress and work-related stress were directly and indirectly associated with depression, as previously reported by Tokuda et al. (2009).

Objective factors associated with COVID-19 (e.g., frontline work or transfer) did not show a direct effect on either stress, burnout, or depression. Instead, the results suggest that the adversities of the epidemic situation affect mental health primarily through subjective experience. A key conclusion of the model is that the impact of stressors is not direct but mediated by individual perception and interpretation.

These findings point toward important individual — and organizational — level intervention opportunities. The results imply possibilities for action for healthcare management and

underscore the importance of professional organizational communication related to patient care in healthcare institutions. Another important lesson is that providing professional information on COVID-19 care could have contributed to lower stress levels and safer patient care among healthcare workers by fostering a greater sense of control.

The research found no differences between physician and non-physician HCWs in the ways in which COVID-19-related factors can cause stress, burnout, and depression, suggesting that background factors have similar structural effects across professional groups. However, non-physician HCWs perceived higher levels of insecurity and stress and reported higher depression scores.

These findings highlight the more vulnerable position of non-medical healthcare workers, warranting special consideration in planning workplace communication and adequate supervision. The provision of specific mental health supervision may also be considered, with particular attention to more vulnerable populations.

3. Project 2

Emotional exhaustion and traumatic stress among healthcare workers during the COVID-19 pandemic: longitudinal changes and protective factors

3.1. Aim of the present study

Following the initial cross-sectional study, the second empirical study of the dissertation used a longitudinal approach to analyze changes in the mental health of healthcare workers during a later stage of the COVID-19 pandemic. The primary goal of the research was to explore changes in the levels of emotional exhaustion and secondary traumatization over time during the pandemic, with a particular focus on differences between frontline and non-frontline healthcare workers. The protracted nature of the pandemic and the persistent stress in the workplace necessitated an examination of how these psychological demands accumulate and intensify over time.

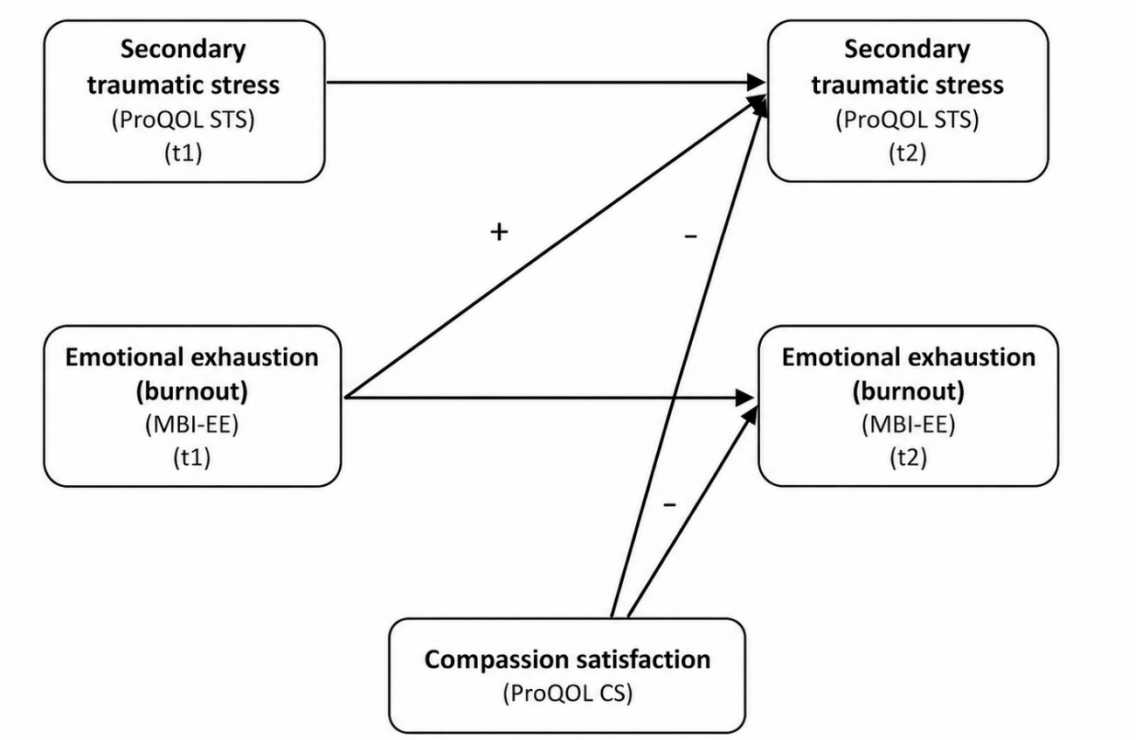
The study also paid particular attention to the role of positive psychological protective factors, primarily the concept of compassion satisfaction, which can mitigate the adverse effects of chronic and traumatic stress by providing satisfaction derived from helping others. The study also aimed to explore the extent to which emotional exhaustion contributes to the development of secondary traumatization and how these processes change during the different waves of the pandemic.

The study was exploratory, as longitudinal mental health data on the COVID-19 pandemic were limited at the time of the research, particularly for comparisons among healthcare professionals working in different work environments.

3.2. Hypothesis

1. Frontline healthcare workers will have higher levels of emotional exhaustion and secondary traumatization than non-frontline workers (Ruiz-Fernández et al., 2020; Wu et al., 2020).
2. Levels of emotional exhaustion and secondary traumatization will increase over time among health workers during the COVID-19 epidemic (İlhan & Küpeli, 2022; Ruiz-Fernández et al., 2020).
3. Compassion satisfaction will protect against emotional exhaustion and secondary traumatization (Stamm et al., 2010; İlhan & Küpeli, 2022).
4. Higher levels of emotional exhaustion predict an increase in secondary traumatization, according to the assumptions of the COR model (Hobfoll, 1989; İlhan & Küpeli, 2022).

Figure 3. Hypothetical model of the relationships between emotional exhaustion, secondary traumatic stress and compassion satisfaction



Note. ProQOL STS = Professional Quality of Life Scale–Secondary Traumatic Stress subscale; MBI-EE = Maslach Burnout Inventory–Emotional Exhaustion subscale; ProQOL CS = Professional Quality of Life Scale–Compassion Satisfaction subscale. t1 = baseline measurement; t2 = follow-up measurement.

+ = positive association – = negative association

- Emotional exhaustion and secondary traumatic stress interact dynamically over time.
- Frontline workers are expected to exhibit higher emotional burden.
- Compassion satisfaction acts as a protective factor against both emotional exhaustion and traumatic stress.
- Prolonged workplace stress contributes to cumulative psychological burden.

3.3. Methods

3.3.1. Procedure and participants

The first wave of data collection (T1) occurred between 14 January and 6 March 2021, during the second wave of the COVID-19 epidemic. The second data collection phase (T2) took place between 26 November 2021 and 19 January 2022, immediately before the fifth wave. Responses from the first and second waves were linked using pseudonyms to ensure anonymity and longitudinal traceability.

The study involved active healthcare workers in Hungary. During the first data collection phase, 3321 questionnaires were completed. To be valid, respondents had to complete at least 90% of the questionnaire. This criterion was met by 2260 respondents. Of these, 340 agreed to participate in the second wave of the survey. 79.9% of the sample were women, and 20.1% were men. Age ranged from 20 to 87 years (mean age = 45.91 years; standard deviation = 13.48).

3.3.2. Measures

Secondary traumatization was measured using the Professional Quality of Life Scale secondary traumatization subscale (ProQOL STS). Compassion satisfaction was assessed with the ProQOL Compassion Satisfaction subscale (ProQOL CS). Emotional exhaustion was measured using the emotional exhaustion subscale of the Maslach Burnout Inventory Human Services Survey (MBI EE).

3.3.3. Statistical analysis

Structural equation modeling (SEM) was performed using a cross-lagged panel model (CLPM). The analyses examined stability effects, reciprocity effects, and the predictive role of emotional exhaustion and secondary traumatization while controlling for age. Separate multigroup analyses were conducted for frontline and non-frontline healthcare workers.

3.4. Results

3.4.1. Descriptive statistics

For ProQoL STS and emotional exhaustion (EE), higher scores were found for frontline health professionals than for non-frontline health professionals, thus supporting the first hypothesis (H1). There was a significant increase between the two measurement time points (T1 and T2) for both groups, confirming the validity of the second hypothesis (H2). Similar differences were also observed for emotional exhaustion, with frontline workers reporting higher levels of burnout.

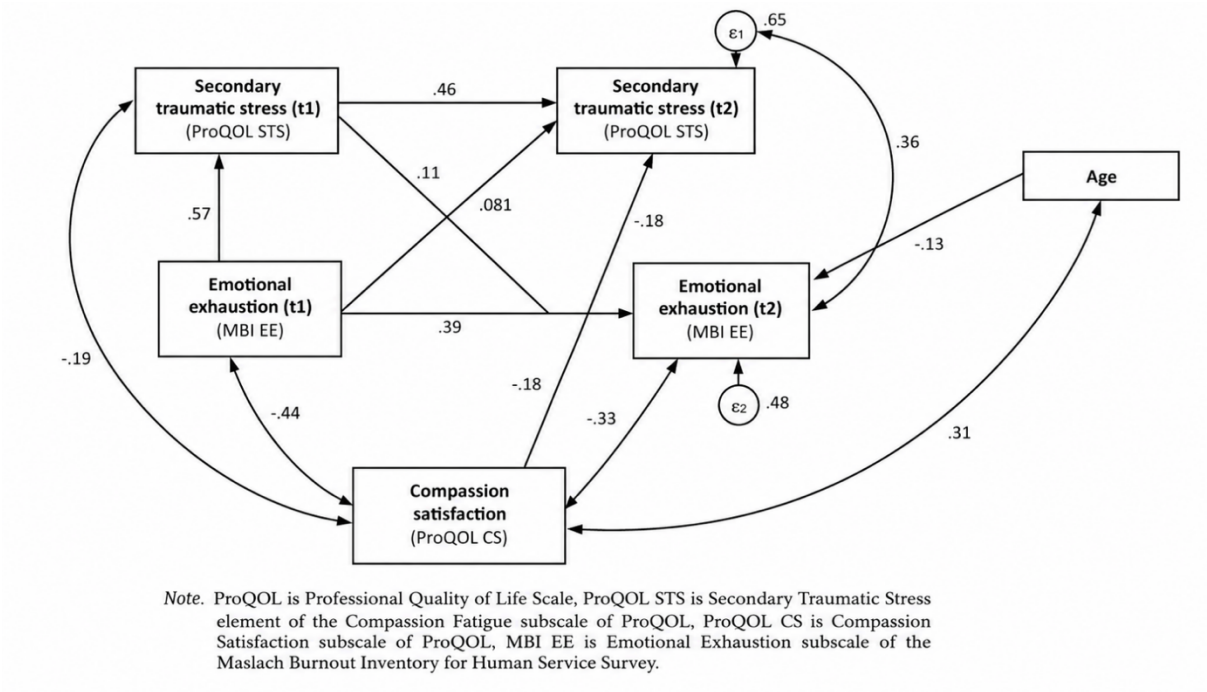
The relationships between secondary traumatization, emotional exhaustion and compassion satisfaction were moderate to high strength and significant (.33 to .64). The correlations between secondary traumatization and emotional exhaustion were positive, whereas compassion satisfaction showed a negative correlation with both psychological burden indicators. Frontline work showed weak but significant positive correlations with secondary traumatization and emotional exhaustion.

3.4.2. Cross-lagged panel models

The model with emotional exhaustion as an antecedent variable showed a significant improvement over the stability model and excellent fit on all fit indices. However, the reciprocal model did not yield further significant improvements. These results partially support hypothesis H4.

The multigroup model applied to frontline and non-frontline groups also showed a good fit. In frontline healthcare workers, emotional exhaustion showed a significant lagged effect on secondary traumatization, while no significant relationship was found in the opposite direction. In contrast, among non-frontline workers, secondary traumatization had a significant lagged effect on emotional exhaustion.

Figure 4. Reciprocity cross-lagged model between burnout and secondary traumatic stress with the effect of compassion satisfaction among healthcare workers



Note. ProQOL is Professional Quality of Life Scale, ProQOL STS is Secondary Traumatic Stress element of the Compassion Fatigue subscale of ProQOL, ProQOL CS is Compassion Satisfaction subscale of ProQOL, MBI EE is Emotional Exhaustion subscale of the Maslach Burnout Inventory for Human Service Survey.

Main findings of the reciprocal model:

- Emotional exhaustion predicted later secondary traumatization among frontline workers.
- Secondary traumatization predicted later emotional exhaustion among non-frontline workers.
- Compassion satisfaction showed a significant protective effect against both emotional exhaustion and secondary traumatic stress.
- The protective effect of compassion satisfaction was strongest among frontline healthcare workers.

Compassion satisfaction had a negative and significant effect on both emotional exhaustion and secondary traumatization in both groups, but the effect was strongest among frontline workers. These findings supported hypothesis H3.

3.5. Discussion

This study investigated longitudinal changes in the mental health of healthcare workers in Hungary during the COVID-19 pandemic, focusing on the dynamics of emotional exhaustion (EE), secondary traumatization (STS), and compassion satisfaction (CS). Cross-lagged panel models were employed to examine the interrelationships among these factors and to identify differences between frontline and non-frontline workers.

The results indicate that both STS and EE levels were higher among frontline workers at both time points compared to non-frontline workers, consistent with previous research emphasizing the negative impact of working with infected individuals on mental health (Carmassi et al., 2020; Chirico et al., 2021; De Kock et al., 2021). Emotional exhaustion and secondary traumatization increased over time during the COVID-19 pandemic, aligning with longitudinal findings indicating a progressive deterioration in healthcare workers' mental health (Sasaki et al., 2021).

Compassion satisfaction served as a protective factor against both emotional exhaustion and secondary traumatization among frontline and non-frontline workers. This finding is consistent with prior evidence indicating that positive experiences with patients contribute to a more favorable balance between compassion satisfaction and compassion fatigue (Tremblay et al., 2011).

Distinct causal patterns were identified between frontline and non-frontline workers: among frontline HCWs, higher levels of emotional exhaustion predicted increased secondary traumatization, whereas the reverse relationship was observed among non-frontline workers. These findings indicate a bidirectional association between emotional exhaustion and secondary traumatization, consistent with the assumptions of the COR model and confirming the possibility of circular causality, as proposed by Shoji et al. (2015).

This longitudinal study offers a comprehensive overview of the deteriorating mental health status of HCWs during the COVID-19 pandemic and highlights substantial differences between professional groups in various clinical contexts. While frontline HCWs exhibited higher levels of both STS and EE at both time points, a significant increase in EE over time was observed only among non-frontline workers. One possible explanation for this pattern is the buffering effect of CS among frontline workers, which may mitigate the escalation of emotional exhaustion.

These findings underscore the importance of addressing profession-specific vulnerability patterns when designing interventions. The results contribute to a more nuanced understanding of the diverse needs of HCWs in different fields and emphasize the necessity of tailored support strategies.

From a practical standpoint, these findings support the development of targeted positive psychological healthcare interventions and highlight the persistently poor mental health among HCWs, which has been further exacerbated by the COVID-19 pandemic.

4. Project 3

Cynicism among medical students: an in-depth analysis of mental health dynamics and protective factors in medical education using structural equation modeling

4.1. Aim of the present study

The third empirical study of the dissertation examined the interrelationships among mental health challenges that arise in the early stages of medical training, with a particular focus on the development of empathy, perceived stress, and cynicism during professional socialization. As detailed in the introductory chapter, medical students are already exposed to significant psychological stress during their training, which can manifest itself in high stress levels, increased risk of burnout, decreased empathy, and increased cynical attitudes (Cuttilan et al., 2016; Dyrbye et al., 2005; Newton et al., 2008; Peng et al., 2018). These processes not only threaten students' current mental well-being but also have a long-term impact on the quality of future doctor-patient relationships and the effectiveness of healthcare (Pappa et al., 2020).

Based on the literature stress, cynicism, and empathy form a close, interactive system during medical socialization. Increased academic and emotional stress, as well as inadequate coping strategies, can contribute to the development of cynicism, which can be interpreted in part as a defense mechanism, but can also be accompanied by a decrease in empathy and an increase in the depersonalization component of burnout (Cuttilan et al., 2016; Jafari et al., 2012). At the same time, empathy—especially its cognitive dimension—has been shown in previous studies to act as a protective factor, reducing emotional exhaustion and depersonalization and promoting psychological well-being (Cairns et al., 2024; Chen et al., 2024).

The theoretical framework of the third study was based on the concepts of professional socialization and the hidden curriculum. Medical students acquire professional norms not only through formal education but also through role models observed during clinical practice, instructor attitudes, and institutional patterns. The hidden curriculum can convey both empathetic, patient-centered and cynical, emotionally distant patterns of behavior, which can have a significant impact on students' value systems, emotional involvement, and stress management (Batt-Rawden et al., 2013; Gaufberg et al., 2010; Hafferty et al., 2009).

Accordingly, one of the central objectives of the study was to explore the developmental patterns and interactions of empathy, stress, and cynicism in the early stages of medical training, i.e., before the actual start of the career. Another essential objective of the research was to examine the protective effect of patient-centered, empathetic medical role models—as positive elements of the hidden curriculum—on these psychological factors.

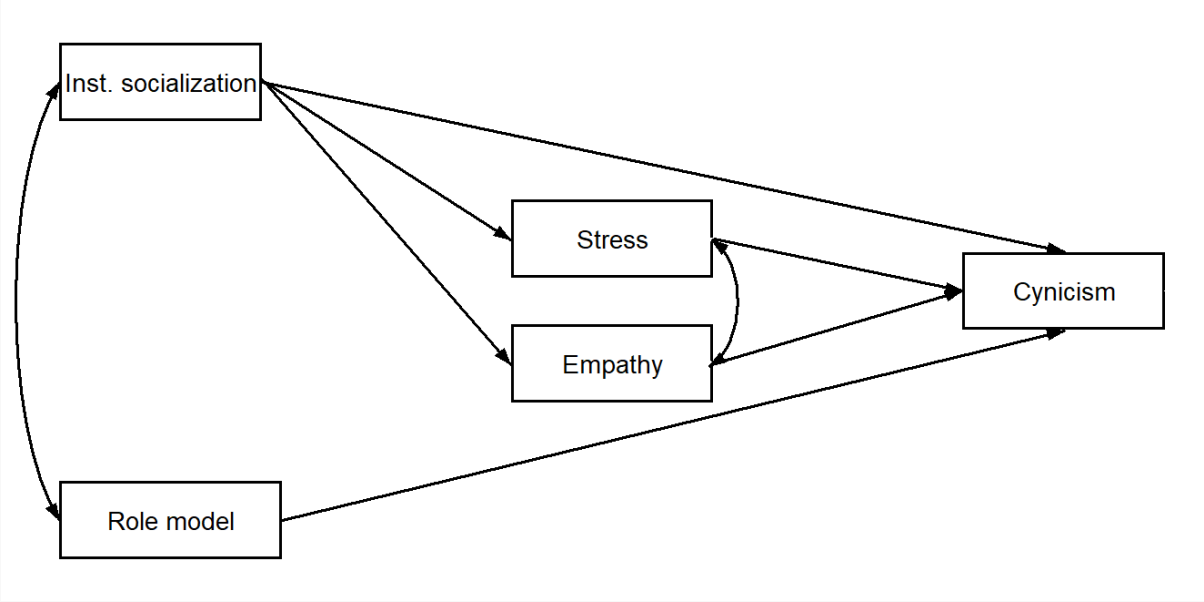
The third study thus contributes to the broader theoretical and practical question of what early intervention and prevention options are available to prevent burnout and protect the mental health of future physicians. The novel perspective of the research lies in the fact that it examines mental health risks not only after entering clinical work, but also in the early stages of professional identity formation, emphasizing the long-term significance of the educational environment and role models.

4.2. Hypotheses

• H1: Increased stress levels among medical students are expected as the years of study progress (Dyrbye et al., 2005; Frajerman et al., 2019; Peng et al., 2018).
• H2: Empathy levels show a gradual decrease over the course of education (Ferreira -Valente et al., 2017).
• H3: Medical students' cynicism levels will increase during the years of training (Hershey & Stoddard, 2021).
• H4: Empathy and the presence of a role model reduce cynicism among medical students (Bandura, 1977; Dyrbye et al., 2005; Passi & Johnson, 2016; Peng et al., 2018).
• H5: Higher stress levels are associated with higher levels of cynicism among medical students (Dyrbye et al., 2005; Peng et al., 2018).

The model was also extended to examine the impact of institutional socialization as part of the hidden curriculum, compared to the role model's measurable influence. We also examined the independence of the hypotheses (H1-H4) from time (H6), i.e., the stability of the results across different waves of data collection.

Figure 4. Hypothetical model of relationship between (length of) institutional socialization, role model, stress, empathy and burnout



Main assumptions of the model:

- Institutional socialization influences stress, empathy, and cynicism.
- Patient-centered role models reduce cynicism and stress.
- Increased stress contributes to higher cynicism.
- Empathy acts as a protective factor against cynicism.
- Hidden curriculum and professional socialization shape students' psychological functioning

4.3. Methods

4.3.1. Procedure and participants

The research was conducted in accordance with the ethical guidelines of the American Psychological Association (APA) and was approved by the Research Ethics Committee of the Faculty of Education and Psychology of Eötvös Loránd University (2018/168).

The first data collection took place in the autumn of 2018, while the second was conducted during the COVID-19 epidemic between 2020 and 2021.

The study was carried out among third and fifth-year students of the Faculty of General Medicine of the University of Pécs in a repeated cross-sectional study. Data were collected at two measurement points, allowing for both cross-sectional and longitudinal analyses.

In the first wave (2018/2019), 251 students participated, while in the second wave (2020/2021), 119 students responded. The fifth-year cohort in the second wave corresponded to the third-year cohort from the first wave, allowing longitudinal follow-up.

4.3.2. Measures

Stress levels were measured using the Perceived Stress Scale (PSS) and the Interpersonal Reactivity Index Personal Distress subscale (IRI-PD). Empathy was measured using the Empathic Concern subscale (IRI-EC). Cynicism was measured using the Cynicism subscale of the student version of the Maslach Burnout Inventory (MBI-CY).

The impact of role models was assessed using a self-developed questionnaire evaluating patient-centered doctor-patient relationships. Institutional socialization was represented by the number of years spent in medical training.

4.3.3. Statistical analysis

Hypotheses were tested using structural equation modeling (SEM). Model fit was assessed using RMSEA, CFI, TLI, and GFI indices. The final model included standardized and non-standardized path coefficients, total effects, and explained variance (R^2).

4.4. Results

4.4.1. Descriptive statistics

Perceptions of patient-centered physician role models were significantly lower among fifth-year students than third-year students during the 2018/2019 data collection period.

No significant difference was found between the perceived stress levels of third- and fifth-year students in any given year or between subsequent cohorts. However, third-year students in the

2020/2021 cohort reported significantly higher stress levels than students in the 2018/2019 cohort.

There was more significant heterogeneity in burnout dimensions. Cynicism scores were significantly higher among fifth-year students than third-year students, and cynicism also increased longitudinally in the follow-up cohort. This result supported hypothesis H3.

Patient-centered role modeling showed a weak to moderate positive correlation with professional efficacy and a weak but significant negative correlation with emotional exhaustion and cynicism.

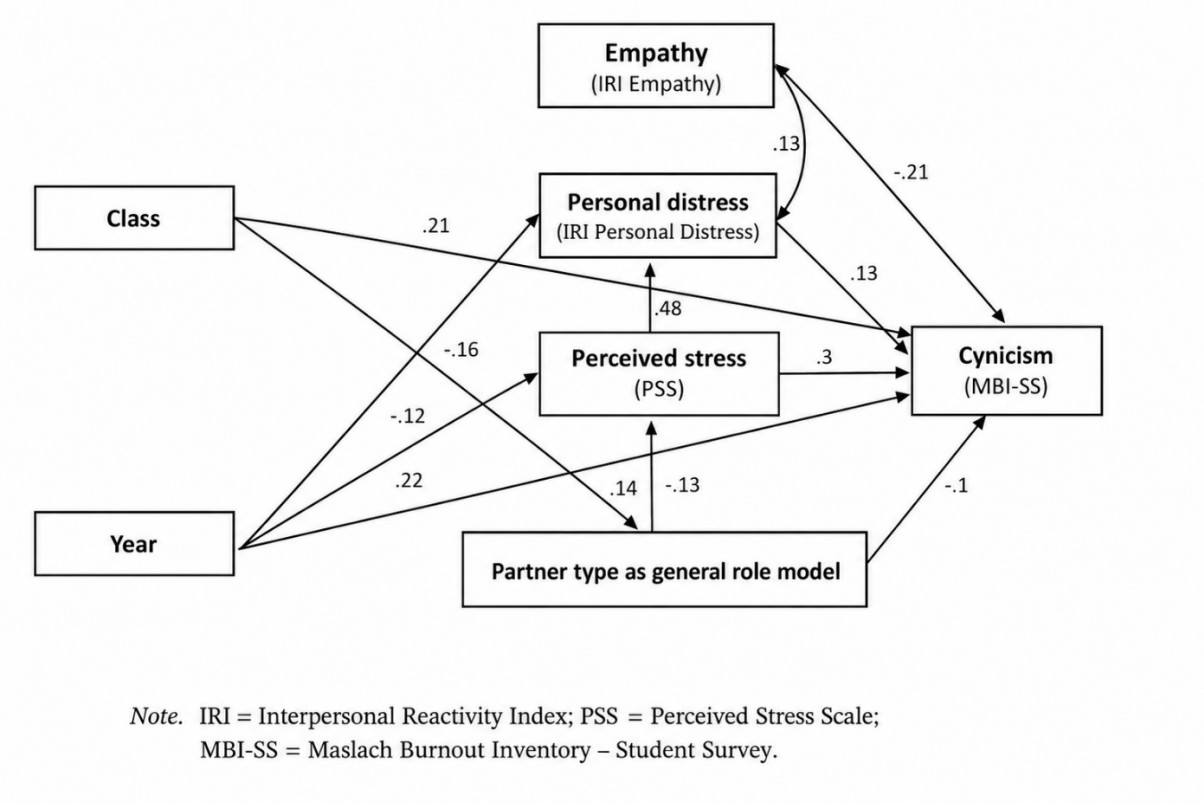
Perceived stress showed moderate to strong correlations with different subscales of empathy and burnout. The strongest positive relationship among burnout dimensions was found between emotional exhaustion and cynicism.

4.4.2. Structural equation model

The original model did not fit the data well, but after removing non-significant paths and accounting for modification indices, the final model demonstrated good fit: χ^2=15.12 (df=8), p=.057; CFI=.97; TLI=.92; GFI=.94; RMSEA=.049.

Based on the final structural equation model, the length of medical training had a weak positive direct effect on cynicism and a weak negative effect on the perception of patient-centered physician role models. Perceived stress had a moderate to strong positive effect on cynicism and personal distress. Empathic concern had a weak to medium reducing effect on cynicism. Patient-centered role model perception had a weak negative effect on both perceived stress and cynicism.

Figure 5. Final structural equation model showing associations between perceptions of a role model, length of training, time of data collection, perceived distress, empathic concern, and cynicism



Note. IRI = Interpersonal Reactivity Index; PSS = Perceived Stress Scale; MBI-SS = Maslach Burnout Inventory – Student Survey.

Main findings of the final SEM model:

- Longer medical training increased cynicism.
- Patient-centered role models reduced perceived stress and cynicism.
- Perceived stress showed the strongest positive effect on cynicism.
- Empathic concern reduced cynicism.
- Personal distress independently increased cynicism.

When total effects were analyzed, perceived stress showed a moderate to strong positive effect on cynicism, while empathic concern and patient-centered role modeling had reducing effects on cynicism. These findings supported hypotheses H4 and H5.

4.5. Discussion

The aim of the study was to investigate dynamic changes in empathy, stress, and cynicism among medical students, considering the effects of institutional socialization and patient-centered role models. The results confirmed hypothesis H3, namely that cynicism increases significantly during medical training.

Although the perception of patient-centered role models slightly decreased as training progressed, role models demonstrated a protective role in reducing cynicism. In addition, empathy showed a significant negative relationship with cynicism levels, confirming hypothesis H4.

Hypotheses H1 and H2 were not confirmed: the data did not detect an increase in stress or a decrease in empathy. This finding is consistent with previous longitudinal literature showing no consistent overall pattern in empathy changes over time (Ferreira-Valente et al., 2017).

In the structural equation model, personal distress and perceived stress had significant positive effects on cynicism, while empathic concern reduced cynicism. These findings are consistent with previous studies indicating that stress experienced during training contributes to the development of negative attitudes (Cuttilan et al., 2016; Jafari et al., 2012).

Overall, the results underline the impact of medical training on empathy and burnout-related processes, particularly cynicism. As training progresses, cynicism increases significantly, which may negatively affect future doctor-patient relationships and patient outcomes. The findings emphasize the protective role of empathy and patient-centered role models, especially in educational environments that focus heavily on technical and biomedical knowledge at the expense of humanistic approaches.

Taken together, these results highlight the importance of strengthening the humanistic aspects of medical education and developing support systems that help students manage emotional stress, prevent burnout, and improve doctor-patient relationships. The findings may provide useful guidance for curriculum development, student support programs, and future research.

5. General conclusion and future perspectives

The literature review and the three empirical studies presented in this doctoral dissertation focused on the mental health of healthcare workers, a population particularly vulnerable to psychological strain due to exposure to chronic and acute stressors (Healy & McKay, 2000; Ito et al., 2014; Laranjeira, 2012).

Two of the studies investigated the mental health consequences of the COVID-19 pandemic among healthcare workers using cross-sectional and longitudinal approaches, while the third study focused on medical students and the role of early protective factors during professional socialization. Together, the studies provide a broader understanding of how stress, burnout, depression, cynicism, and traumatic stress develop, as well as how protective psychological and organizational factors may mitigate these effects.

The first two studies clearly demonstrated that pandemics place a substantial psychological burden on healthcare workers, especially those working on the front lines. Structural equation modeling showed that psychological outcomes were not directly determined by objective

external factors such as frontline work or institutional transfer, but rather by their subjective interpretation. Perceived stress, insecurity, unpredictability, and work-related stress played central roles in the development of burnout and depression, confirming previous findings emphasizing the importance of subjective stress experiences (Embriaco et al., 2007; Imo, 2017; Tokuda et al., 2009).

The longitudinal findings further revealed that emotional exhaustion and secondary traumatic stress increased over time during the pandemic, particularly among frontline healthcare workers. Compassion satisfaction (CS), however, emerged as a significant protective factor that moderated emotional exhaustion and traumatic stress. Positive professional experiences and satisfaction derived from helping others appeared to strengthen resilience and reduce vulnerability to long-term psychological deterioration (Tremblay et al., 2011; Cieslak et al., 2014; Cummings et al., 2021).

The studies also highlighted the importance of organizational and psychological protective factors. Greater predictability, transparent communication, supportive institutional environments, and adequate professional information contributed to lower perceived stress and greater resilience. These findings suggest that interventions targeting subjective stress experiences and organizational climate may substantially improve mental health outcomes among healthcare workers during crises (Lee et al., 2018; Ruiz-Fernández et al., 2020).

The third study extended the scope of the dissertation by examining medical students during the early stages of professional socialization. The results showed that cynicism increased significantly during medical training, confirming previous literature on burnout-related processes among students (Brazeau et al., 2010; Kachel et al., 2020). At the same time, empathy and patient-centered role models proved to be important protective factors that reduced cynicism and moderated the negative effects of stress.

Importantly, the findings demonstrated that protective factors operate throughout the entire medical career trajectory—from undergraduate medical education to frontline healthcare work. Empathy, compassion satisfaction, supportive professional relationships, and positive role models all appeared to enhance resilience and reduce psychological vulnerability.

Taken together, the findings of this dissertation suggest that resilience should not be interpreted as a fixed individual trait, but rather as the dynamic interaction between external environmental conditions and internal psychological resources. Psychological well-being among healthcare professionals can therefore be strengthened not only through individual coping strategies but also through organizational interventions, supportive educational environments, and institutional cultures that promote predictability, empathy, and professional meaning.

From a practical perspective, the results underline the importance of preventive mental health strategies in healthcare and medical education. Transparent organizational communication, peer support systems, targeted psychological interventions, mentoring programs, and the conscious strengthening of patient-centered professional identity may all contribute to reducing burnout and improving long-term workforce sustainability.

Future research should continue to investigate the long-term mental health consequences of healthcare-related crises using longitudinal and multilevel approaches. Particular attention should be paid to the interaction between organizational environments, professional identity formation, and psychological protective factors across different stages of medical careers.

Further studies may also help identify targeted intervention strategies that strengthen resilience, reduce burnout, and support adaptive functioning among both healthcare workers and medical students.

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