Teacher workload and multidimensional well-being among pre-service early childhood education interns

Carga de trabajo docente y bienestar multidimensional en estudiantes en prácticas de educación infantil en formación inicial

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Abstract

Introduction: Teacher workload has been widely recognized as a critical occupational demand influencing interns' well-being, particularly in early childhood education contexts.
Objective: This study examines how teacher workload during the practicum period is associated with pre-service early childhood education interns' physical, psychological, and professional well-being.
Methodology: Using survey data from 493 pre-service interns enrolled in three higher vocational colleges in a central region of China, the study employs partial least squares structural equation modeling (PLS-SEM) to test direct, indirect, and sequential relationships among workload and multidimensional well-being outcomes.
Results: The results indicate that teacher workload is significantly and negatively associated with physical well-being, psychological well-being, and professional well-being. Moreover, both physical well-being and psychological well-being partially mediate the relationship between workload and professional well-being. A significant serial mediation pathway further reveals that workload undermines professional well-being through a sequential process in which reduced physical well-being leads to poorer psychological well-being.
Discussion: These findings highlight the interconnected nature of multidimensional well-being during the practicum stage and underscore the vulnerability of pre-service early childhood education interns under high workload conditions.
Conclusions: The study contributes to the literature by extending JD–R–based research to pre-service populations and offers practical implications for improving practicum design, institutional support, and teacher education policies aimed at promoting a sustainable early childhood education workforce.

Keywords

Physical well-being; pre-service early childhood education interns; professional well-being; psychological well-being; teacher workload.

Resumen

Introducción: La carga de trabajo docente ha sido ampliamente reconocida como una demanda ocupacional crítica que influye en el bienestar de los docentes, particularmente en el contexto de la educación infantil.
Objetivo: Este estudio examina cómo la carga de trabajo docente durante el período de prácticas se asocia con el bienestar físico, psicológico y profesional de los estudiantes en prácticas de educación infantil en formación inicial.
Metodología: Utilizando datos de encuesta de 493 estudiantes en prácticas matriculados en tres institutos de formación profesional superior ubicados en una región central de China, el estudio emplea el modelo de ecuaciones estructurales mediante mínimos cuadrados parciales (PLS-SEM) para analizar las relaciones directas, indirectas y secuenciales entre la carga de trabajo y los resultados de bienestar multidimensional.
Resultados: Los resultados indican que la carga de trabajo docente se asocia de manera significativa y negativa con el bienestar físico, psicológico y profesional. Además, tanto el bienestar físico como el bienestar psicológico median parcialmente la relación entre la carga de trabajo y el bienestar profesional. Asimismo, un efecto de mediación en serie significativo revela que la carga de trabajo deteriora el bienestar profesional a través de un proceso secuencial en el que la reducción del bienestar físico conduce a un deterioro del bienestar psicológico.
Discusión: Estos hallazgos ponen de relieve la naturaleza interconectada del bienestar multidimensional durante la etapa de prácticas y subrayan la vulnerabilidad de los estudiantes en prácticas de educación infantil en formación inicial bajo condiciones de elevada carga de trabajo.
Conclusiones: El estudio contribuye a la literatura al ampliar la investigación basada en el modelo JD–R a poblaciones en formación inicial y ofrece implicaciones prácticas para mejorar el diseño de las prácticas, el apoyo institucional y las políticas de formación docente orientadas a promover una fuerza laboral sostenible en educación infantil.

Palabras clave

Bienestar físico; estudiantes en prácticas de educación infantil en formación inicial; bienestar profesional; bienestar psicológico; carga de trabajo docente.

Introduction

China currently has nearly one million students enrolled in early childhood education (ECE) programs, with approximately 300,000 to 500,000 pre-service ECE interns entering kindergartens each year to complete mandatory teaching practicums prior to graduation (Ministry of Education of the People's Republic of China, 2024). These pre-service ECE interns constitute the primary pipeline of the future kindergarten teaching workforce. Against the backdrop of demographic changes and the sustained societal demand for accessible, safe, and high-quality early childhood education, the role of pre-service ECE teachers in supporting children's early learning and development has become increasingly salient (Ministry of Education of the People's Republic of China, 2020). In this context, the Chinese Academy of Educational Sciences (CAES, 2020) emphasizes that the pre-service stage represents a critical period for the development of professional competence, occupational identity, and long-term career stability among early childhood educators.

Despite a broad consensus that a high-quality and stable teaching workforce is fundamental to early childhood education quality, existing studies suggest that pre-service ECE interns frequently encounter precarious working conditions during their practicums. These conditions are commonly characterised by heavy workloads, intensive emotional labor, and insufficient institutional support (Zhang & Li, 2022). Such stressors may undermine multiple dimensions of well-being among pre-service ECE interns, including physical, psychological, and professional well-being (Li et al., 2025; Castro Silva et al., 2026). Compared with in-service teachers, pre-service kindergarten teachers often possess fewer professional resources, limited decision-making power, and less experience in coping with occupational demands, rendering them particularly vulnerable during the practicum phase.

Workload has been widely recognized as a central occupational risk in early childhood education. It typically encompasses long working hours, high-intensity caregiving responsibilities, extensive teaching and documentation tasks, and sustained physical engagement (Linnan et al., 2017; Harper et al., 2025). A growing body of research has linked excessive workload to compromised physical health, elevated psychological stress, emotional exhaustion, and diminished professional well-being among early childhood educators (Jeon et al., 2018; McLean et al., 2017). However, most of this evidence has been derived from studies focusing on in-service teachers. As a result, relatively little is known about how workload affects pre-service ECE interns, particularly during the practicum stage when occupational demands intensify while professional autonomy and support remain limited.

Furthermore, another limitation of the existing literature concerns the conceptualization of well-being. Although physical, psychological, and professional well-being are conceptually distinct yet interrelated, prior studies have often examined these dimensions in isolation, with a predominant emphasis on psychological outcomes such as stress and burnout (Linnan et al., 2017). There remains a lack of integrative research that simultaneously considers multiple dimensions of well-being within a unified framework, especially in the context of pre-service teacher education. Consequently, the mechanisms through which workload shapes different aspects of well-being during the pre-service stage remain insufficiently understood (Bakker & Demerouti, 2017). These gaps may be even more pronounced in resource-constrained regions of central China, where empirical evidence on pre-service kindergarten teachers remains limited.

Given that prior research on teacher workload and well-being has primarily focused on in-service teachers, systematic investigation of professional well-being among pre-service ECE interns remains limited (Kwon et al., 2022). This limitation is particularly pronounced with respect to multidimensional well-being outcomes and regional contexts characterized by resource constraints. Addressing these gaps, the present study examines how teacher workload relates to physical, psychological, and professional well-being among pre-service kindergarten teachers in a central region of China. By focusing on a large cohort of ECE interns and adopting an integrated well-being perspective, this study seeks to advance theoretical understanding of workload-related mechanisms during the pre-service stage and to provide empirical evidence that can inform practicum design, teacher education programs, and policy initiatives aimed at promoting a more sustainable early childhood education workforce.

Teacher workload

Teacher workload is commonly conceptualized as the aggregate of multiple demands associated with teachers' professional roles, including instructional responsibilities, caregiving duties, administrative tasks, and emotional labor (Kariou et al., 2021). Within early childhood education (ECE) contexts, workload extends beyond classroom teaching and activity organization to encompass childcare responsibilities, responses to unexpected incidents, communication with parents, documentation and record-keeping, learning environment preparation, and continuous emotional regulation. These multifaceted demands render early childhood teachers one of the most labor-intensive groups within the teaching profession (Bates et al., 2024). In recent years, rising expectations regarding educational quality, increasingly stringent administrative accountability, and heightened parental demands have collectively contributed to a sustained growth in workload within ECE settings, which has been widely recognized as a critical factor influencing teacher well-being and career sustainability.

International research provides substantial quantitative evidence regarding the severity of workload in early childhood education. For example, an Australian national survey conducted in 2025 reported that early childhood teachers worked an average of 6.87 hours of unpaid overtime per week, with 75% of respondents indicating that excessive administrative tasks significantly encroached upon time originally allocated for child interaction and professional preparation (Harper et al., 2025). Taken together, these findings suggest that workload in ECE is characterized not only by extensive time demands but also by intensive emotional and cognitive demands.

Domestic research likewise highlights the magnitude and complexity of early childhood teachers' workload. A nationwide survey further revealed that a substantial proportion of early childhood teachers reported heavy workloads and elevated levels of stress and burnout, with administrative responsibilities and staffing-related demands frequently cited as major sources of strain (National Association for the Education of Young Children, 2024). These findings not only underscore the multidimensional nature of workload in early childhood education, but also point to its potential threats to teachers' physical and psychological well-being.

Pre-service early childhood teachers often encounter substantial workload demands while having limited access to institutional support and professional resources. According to the job demands–resources framework, such imbalances between high demands and insufficient resources are likely to erode individuals' psychological resources, increasing their susceptibility to emotional exhaustion and burnout (Bakker, Demerouti, & Sanz-Vergel, 2023). Empirical evidence indicates that teachers' work-related stressors, such as heavy workload and role conflict, are significantly associated with emotional exhaustion (Asfahani, 2022; Phungsoonthorn & Charoensukmongkol, 2022). Consistent with this, studies focusing specifically on pre-service teachers further show that a substantial proportion of interns perceive their practicum workload as excessive and experience heightened stress and career-related uncertainty (Zito et al., 2024). Collectively, this evidence positions excessive workload not merely as a generic stressor, but as a critical, contextualized risk that directly threatens the well-being and professional socialization of this trainee population.

Overall, teacher workload in early childhood education is characterized by high complexity and a sustained upward trajectory, exerting profound effects on teachers' physical health, psychological functioning, and professional development. Particularly during the pre-service stage, workload not only shapes practicum experiences directly, but may also influence the formation of professional identity and intentions to remain in the profession. Against this backdrop, it is necessary to further examine how workload affects pre-service early childhood teachers through multiple well-being pathways, thereby providing a theoretical foundation and empirical context for subsequent analysis. The following section therefore focuses on teachers' physical well-being, elucidating its central role within the mechanisms through which workload exerts its influence.

Physical well-being

Physical well-being is widely regarded as a core occupational health outcome for teachers, referring to individuals' perceived physical health status and physical functioning in their work context, including symptoms, illnesses, pain, and limitations in daily activities (Centers for Disease Control and Prevention, 2018). Within early childhood education (ECE) contexts, teachers are routinely engaged in physically demanding tasks such as frequent bending, lifting children, prolonged standing, and constant move-

ment. As a result, physical well-being as an occupational health outcome tends to be more severely challenged among early childhood teachers than among educators in other educational sectors (Linnan et al., 2017). Accordingly, in the present study, physical well-being is operationalized primarily through teachers' musculoskeletal symptoms and physical health conditions, which represent key manifestations of physical well-being in physically demanding ECE contexts.

International research has provided substantial quantitative evidence demonstrating the impact of ECE working conditions on teachers' physical well-being. A large-scale national survey of several thousand ECE practitioners in the United States revealed that 66.3% of teachers were classified as obese, 46% reported musculoskeletal pain, and approximately 31% experienced frequent extreme fatigue, indicating compromised physical well-being (Linnan et al., 2017). More recent studies have further shown that early childhood teachers exhibit persistently elevated heart rates and physiological stress responses, suggesting that high workload erodes physical health through a cumulative strain mechanism over time (Wettstein et al., 2023; McGee et al., 2023). Post-pandemic research has additionally reported widespread sleep deprivation, physical exhaustion, declining health, and reduced well-being among ECE teachers, all of which are closely associated with heightened stress during extended working hours and increased task intensity (McGee et al., 2023).

In the Chinese context, the physical demands of early childhood teaching are manifested in more explicit forms of manual labor. According to the CAES (2020), early childhood teachers frequently engage in physically demanding tasks, such as bending, lifting children, and moving continuously throughout the day, reflecting a higher level of physical labor intensity than that found in many general teaching positions. Previous studies have shown that teachers are at high risk of work-related musculoskeletal disorders due to prolonged standing, repetitive movements, and sustained teaching postures. These occupational exposures are associated with increased prevalence of lower back pain, neck and shoulder disorders, and lower-limb discomfort, which may negatively affect teachers' physical well-being (Ng et al., 2019; Tahernejad et al., 2024). Early childhood teachers often shoulder heavier caregiving and instructional responsibilities, rendering physical health risks more pronounced due to compounded workload demands in resource-constrained central regions (Nong et al., 2024).

The physical health risks for pre-service teachers are exacerbated by their specific constraints. Research indicates that teachers frequently experience musculoskeletal disorders associated with physically demanding tasks, such as prolonged standing, repetitive movements, and manual handling, suggesting that pre-service teachers—who often lack sufficient training and physical conditioning—may be particularly vulnerable to such risks (Tahernejad et al., 2024). Concurrently, their practicum settings are often situated in resource-constrained contexts that may systematically lack ergonomic guidance and protective measures to mitigate workload strain (OECD, 2019). Given that early childhood education itself imposes significant physical burdens on in-service teachers (e.g., frequent bending and lifting throughout the day), it is reasonable to infer that this combination of low preparedness and high job demands may expose pre-service teachers to at least comparable, if not greater, risks of physical discomfort. Together, these factors suggest that pre-service teachers may have particularly limited personal and environmental resources at the physical level when confronting work demands.

In summary, physical well-being constitutes a critical occupational health outcome in early childhood education and is substantially affected by high workload conditions. Particularly during the pre-service stage, limited experience and support resources may amplify workload-related physical risks through cumulative strain processes. Understanding the mechanisms through which workload undermines physical well-being is therefore essential for constructing a comprehensive, multidimensional model of teacher well-being. The following section will examine teachers' psychological well-being, thereby providing a more complete account of well-being dynamics under high workload conditions.

Psychological well-being

The questionnaire is consistent with the conceptualization of psychological well-being proposed by Kwon et al. (2021), particularly with regard to its stress-related and emotional exhaustion components, while positive affect and work engagement are not the primary focus. In early childhood education (ECE), teachers are required to engage in sustained emotional labor, intensive interpersonal interactions, and complex multitasking, rendering psychological well-being as an occupational outcome particularly vulnerable. Existing research suggests that psychological well-being not only shapes teachers'

health and professional performance but also affects the quality of children's learning environments and teachers' intentions to remain in the profession (Jeon et al., 2018).

Over the past five years, international research has consistently documented high levels of psychological distress among early childhood educators. A large-scale Yale-CARES survey of childcare and preschool educators across the United States found that 66.5% of respondents reported moderate to high levels of stress, while 45.7% screened positive for depressive symptoms, indicating substantially compromised psychological well-being (Elharake et al., 2022). Bates et al. (2024) further demonstrated through physiological indicators such as heart rate and cortisol levels that early childhood teachers exhibit persistently elevated stress responses during regular working days, suggesting that sustained workload demands exert measurable biological effects via psychological stress pathways. Similarly, recent national surveys in Australia have revealed that administrative burdens, time pressures, and prolonged interpersonal emotional labor contribute to high rates of workload unmanageability (around 70%), severe stress, burnout, and diminished coping capacity among teachers, with implications extending to early childhood educators facing similar non-core task demands and emotional exhaustion (Granziera et al., 2025).

Evidence from China reflects similar patterns to those observed internationally. Preschool teachers are widely reported to experience considerable emotional demands and professional expectations in their work, particularly when managing interactions with children and communicating with parents (Zhang et al., 2020; Wang et al., 2025). Reports from CAES (2020) further suggest that early childhood educators encounter multiple sources of occupational stress, including challenges related to parent communication, child behavior management, administrative responsibilities, and performance evaluation systems. Moreover, research focusing on under-resourced and rural areas indicates that teachers in these contexts tend to experience higher levels of stress and emotional exhaustion than their counterparts working in more economically developed regions (Zhao et al., 2023; Yuan et al., 2025).

Multiple sources of instability shape the psychological well-being of pre-service teachers during the practicum stage. Research indicates that ambiguous role boundaries, underdeveloped coping strategies, and insufficient emotional and organizational support are common features of practicum experiences and are associated with heightened emotional strain, stress, and vulnerability to anxiety and emotional exhaustion among pre-service teachers (Zito et al., 2024; Zhang & Li, 2022). Recent surveys indicate that a substantial proportion of pre-service teachers report experiencing significant emotional stress and difficulties during their practicum (Maccormack & Brenner, 2025). This reflects how the emotional labor and cognitive pressure triggered by high-intensity job demands, when met with their limited capacity for emotion regulation, are more likely to precipitate psychological risks such as anxiety and emotional exhaustion.

In summary, psychological well-being constitutes a crucial psychological outcome of teachers' occupational experiences in early childhood education and is substantially shaped by high job demands, emotional labor, and limited support resources. During the pre-service stage, inadequate experience and support systems further amplify the negative effects of workload on psychological well-being. Understanding the mechanisms through which workload influences psychological well-being is therefore essential for explaining teachers' well-being trajectories and for informing subsequent analyses of professional well-being and retention intentions. The following section will examine professional well-being, thereby completing the conceptual framework of well-being among pre-service early childhood teachers.

Professional well-being

Professional well-being, also referred to as work-related well-being, describes individuals' feelings and evaluations regarding their work and job roles, drawing on the broader concept of well-being proposed by the Centers for Disease Control and Prevention (2018). Indicators of professional well-being may include self-efficacy, job commitment, job satisfaction, work engagement, and burnout (Cassidy et al., 2017; Collie et al., 2020; Hakanen et al., 2006; Hall-Kenyon et al., 2014; Triwiyanto et al., 2025). Compared with physical and psychological well-being, research indicates that early childhood teachers' professional well-being and perceived working conditions are significantly related to professional commitment and turnover intentions, with lower well-being and poorer working conditions associated with increased intentions to leave the field.

International research consistently indicates that the professional well-being of early childhood education (ECE) practitioners is highly susceptible to multiple structural factors, including intensive job demands, administrative workload, resource constraints, and insufficient organizational support, and has shown a persistent downward trend. Empirical studies grounded in the Job Demands–Resources (JD–R) framework demonstrate that excessive workload, as a central job demand, significantly undermines ECE teachers' job satisfaction and professional commitment while increasing burnout and turnover intentions (Kwon et al., 2021). These findings align with prior research suggesting that high workload and emotional demands are key risk factors for diminished teacher well-being in educational contexts (Wahab et al., 2024; Castro Silva et al., 2026). More recent evidence further suggests that administrative tasks and time pressure not only crowd out opportunities for teaching and professional development, but also indirectly erode professional well-being through the sustained depletion of emotional and psychological resources (Creagh et al., 2023; Pan et al., 2023). Emerging findings indicate that under conditions characterized by high job demands and limited supportive resources, workload exerts a particularly pronounced negative impact on professional well-being and has become a key risk factor constraining the occupational sustainability of the early childhood education workforce (Grant et al., 2019).

Domestic studies reveal a similar pattern, highlighting generally low levels of professional well-being and increasing risks of burnout among kindergarten teachers in China. Research shows that heavy demands related to teaching and caregiving responsibilities, classroom environment construction, parent communication, and administrative documentation impose substantial pressure on teachers, leading to declining job satisfaction, cumulative fatigue, and weakened professional identity (Creagh et al., 2023; Yang et al., 2025). Reports by CAES (2020) further indicate that teacher burnout in early childhood education has intensified in recent years, particularly in private kindergartens, rural areas, and resource-constrained settings. Evidence from a central region of China likewise demonstrates that teachers report elevated levels of emotional exhaustion, with high workload and work-related stress identified as major predictors of burnout (Li et al., 2020; Zhao et al., 2023). These findings suggest that professional well-being is especially vulnerable to structural working conditions in contexts characterized by limited resources and high job demands.

Professional well-being during the practicum is highly malleable and vulnerable to disruption. At this stage, a positive sense of professional development is being actively formed rather than being a stable trait (Deng et al., 2018). Research indicates that excessive administrative burdens can crowd out the time and mental space necessary for pedagogical reflection and professional growth, which are crucial for the development of professional well-being (Zhang & Li, 2022). When practicum experiences are reduced to routine physical or clerical tasks rather than meaningful teaching opportunities, opportunities for professional learning may be significantly diminished (Yin, 2019; Kadir & Aziz, 2021). This erosion is likely amplified in resource-constrained settings where systemic support is already limited, further jeopardizing the fragile development of professional well-being during this critical stage.

From a workload perspective, impairments in professional well-being among pre-service teachers are not incidental, but are closely linked to the structural configuration of job demands during practicum. On the one hand, heavy workloads and extensive administrative tasks may limit interns' opportunities for instructional reflection and professional growth, thereby reducing positive perceptions of professional development (Zhang & Li, 2022). On the other hand, the combined pressures of emotional labor and physical demands may intensify feelings of frustration and low accomplishment, further undermining job satisfaction and long-term occupational commitment (Collie, 2021; Kwon et al., 2022). These negative effects are likely to be amplified in resource-limited regions in China, where high job demands coexist with insufficient institutional support, rendering pre-service teachers' professional experiences particularly fragile (Zhao et al., 2023).

Taken together, professional well-being constitutes a critical indicator of pre-service early childhood teachers' professional development and future retention intentions, and is susceptible to sustained erosion under conditions of excessive workload. Accordingly, there is a clear need to integrate existing evidence and systematically examine the relationships between teacher workload and physical, psychological, and professional well-being, thereby providing a foundation for the development of the theoretical model and research hypotheses in the subsequent sections.

Teacher Workload and Multidimensional Well-Being

A substantial body of research has demonstrated that teacher workload is a critical predictor of physical, psychological, and professional well-being, with its effects being particularly pronounced in early childhood education contexts. Given that teaching work is characterized by high physical demands, intensive emotional labor, and simultaneous management of multiple tasks, workload often emerges as a primary source of diminished well-being (Li et al., 2025; Wahab et al., 2024). Increasingly, studies have also suggested that different dimensions of well-being do not operate in isolation but interact through complex mechanisms, jointly shaping individuals' practicum experiences and subsequent career trajectories. For early childhood education (ECE) pre-service interns undertaking full-time practicum prior to graduation, such multidimensional mechanisms may be especially salient.

With regard to physical well-being, extensive research indicates that high workload directly increases the physiological burden placed on early childhood educators, resulting in persistent fatigue, musculoskeletal pain, and deteriorated sleep quality. More recent studies further show that physical strain is not only reflected in subjective perceptions of tiredness but is also manifested in sustained elevations in physiological stress indicators such as heart rate and cortisol levels, suggesting a prolonged erosion of bodily systems under heavy workload conditions (Wettstein et al., 2023; Jõgi et al., 2023). During the practicum period, ECE pre-service interns are often required to rapidly adapt to frequent physical tasks—such as repeated bending, lifting children, and prolonged standing and walking—while lacking sufficient physical conditioning and self-regulation experience. Consequently, they are more susceptible to excessive fatigue and physical discomfort, which may serve as an important risk foundation for subsequent psychological stress and occupational burnout.

In terms of psychological well-being, research consistently demonstrates that elevated job demands, frequent emotional labor, and time pressure significantly increase perceived stress and emotional exhaustion among teachers (Jeon et al., 2018). Large-scale survey evidence indicates that under high workload conditions, a substantial proportion of early childhood educators report moderate to high stress levels, with many also exhibiting heightened risks of depressive symptoms. Within the Chinese context, early childhood educators generally report higher psychological strain than teachers in other educational sectors. For ECE pre-service interns, the practicum period is often accompanied by heightened vulnerability due to unstable role identity, limited coping strategies, and insufficient institutional support, making them particularly prone to anxiety, psychological insecurity, and emotional fluctuations. Collectively, these findings suggest that workload undermines psychological well-being by intensifying emotional labor requirements and cognitive pressure.

Regarding professional well-being, prior studies similarly support a robust negative association between workload and professional outcomes. Excessive workload has been shown to reduce job satisfaction, professional accomplishment, and work engagement, while simultaneously increasing burnout and weakening individuals' positive expectations regarding their future careers. Survey evidence from early childhood education settings indicates that a considerable proportion of teachers perceive workload as a direct contributor to declining professional satisfaction. Domestic studies likewise reveal that heavy workload is significantly associated with emotional exhaustion and professional doubt. For ECE pre-service interns, the practicum period is marked by concentrated task demands and role transition pressures, which may intensify professional self-doubt and undermine emerging professional well-being and future retention intentions.

Importantly, recent scholarship has increasingly emphasized the possibility of sequential or chain-like relationships among different dimensions of well-being. For instance, sustained physical strain may heighten fatigue and bodily discomfort, which in turn amplifies psychological stress and ultimately diminishes professional satisfaction and occupational commitment. This multidimensional linkage suggests that workload may influence well-being not only through direct pathways but also through cumulative processes connecting physical, psychological, and professional domains. In resource-constrained contexts, insufficient practicum support systems and challenging placement environments may further intensify the complexity of these mechanisms.

In summary, while existing literature has revealed the impact of workload on multidimensional well-being among early childhood teachers, two critical research gaps limit a deeper understanding. First, for pre-service teacher populations, the dual mediating pathways through which workload influences professional well-being via both physical and psychological well-being have yet to be empirically verified. Second, the sequential mediating mechanism—where workload impairs professional commitment first

by undermining physical well-being, which in turn damages psychological well-being—remains insufficiently examined. Systematic investigation of this integrated model is notably absent in resource-constrained settings.

Theoretical Framework: Job Demands–Resources Model (JD–R)

The Job Demands–Resources (JD–R) model is one of the most influential theoretical frameworks for explaining work-related stress and well-being (Demerouti et al., 2001; Bakker & Demerouti, 2007). The model posits that all occupations can be understood in terms of two fundamental dimensions: job demands and job resources. Job demands refer to aspects of work that require sustained physical or psychological effort and are therefore associated with physiological or psychological costs, such as high workload, time pressure, and emotional labor. Job resources, in contrast, are those aspects of work that help individuals achieve work goals, reduce the costs associated with job demands, and promote personal growth and development, including social support, feedback, and training opportunities (Bakker & Demerouti, 2017).

The JD–R model proposes two core processes. The first is the health-impairment process, which suggests that prolonged exposure to high job demands depletes individuals' energy and resources, leading to fatigue, stress, impaired health, and eventually burnout. The second is the motivational process, whereby job resources enhance work engagement, a sense of meaning, and well-being (Schaufeli & Taris, 2014). When job demands remain high while job resources are insufficient, individuals are more likely to follow the health-impairment pathway, resulting in reduced well-being and increased career instability.

Within early childhood education (ECE) settings, teacher workload represents a prototypical form of high job demands. It typically involves frequent physical exertion, intensive teaching and caregiving responsibilities, complex interactions with families, and substantial administrative and documentation tasks (Linnan et al., 2017). For ECE pre-service interns, these demands may be particularly salient. Due to limited professional experience, restricted autonomy, and relatively scarce support resources, workload during the internship period is more likely to be perceived as excessive job demands, making interns especially vulnerable to physical fatigue, cumulative psychological stress, and declines in professional well-being, as evidenced in prior research on pre-service interns in other professional fields (Abdullah & Azam, 2021).

The JD–R model also provides a theoretical basis for understanding the interconnections among multiple dimensions of well-being. Physical well-being can be viewed as a direct manifestation of energy depletion caused by job demands, whereby high workload initially impairs physical functioning through fatigue and bodily discomfort. When physical resources are continuously depleted without sufficient recovery, psychological strain and emotional exhaustion are more likely to emerge, which may subsequently shape individuals' overall evaluations of their professional role—that is, their professional well-being. From this perspective, teacher workload may not only exert direct effects on professional well-being but also operate indirectly through physical and psychological well-being in a sequential manner.

Although the JD–R model has been widely applied to studies of stress, burnout, and well-being among in-service teachers (Kwon et al., 2021), its systematic application to ECE pre-service interns remains limited, particularly in resource-constrained contexts in central China. Accordingly, guided by the JD–R framework, the present study conceptualizes teacher workload as a key job demand and examines physical well-being, psychological well-being, and professional well-being as core outcome variables. The study further investigates both the direct effects of workload on these dimensions of well-being and the mediating and serial mediating roles of physical and psychological well-being, thereby providing a theoretical foundation for the subsequent research questions and hypotheses.

Guided by the Job Demands–Resources (JD–R) framework and the conceptual model illustrated in Figure 1, the present study aims to examine how teacher workload during practicum, as a salient job demand, is associated with pre-service early childhood teachers' physical, psychological, and professional well-being. Specifically, this study first investigates whether higher levels of teacher workload are related to poorer well-being across these three domains.

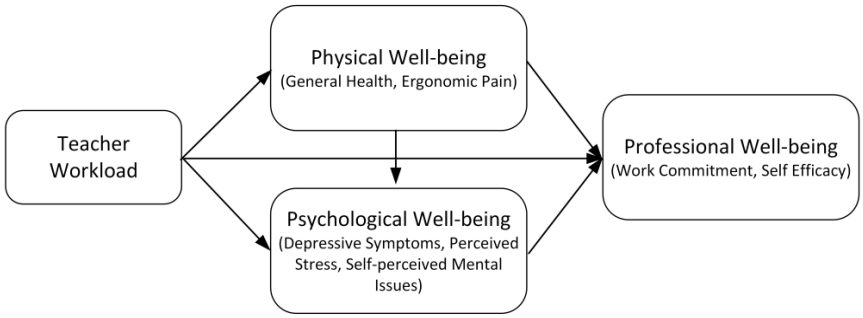
Drawing on the health-impairment process of the JD–R model, it is hypothesized that greater teacher workload will be negatively associated with physical well-being, reflected in poorer general health and

increased ergonomic discomfort. In addition, higher workload is expected to be linked to lower psychological well-being, manifested in elevated depressive symptoms, perceived stress, and self-reported mental health concerns. Consistent with this perspective, teacher workload is further expected to be negatively associated with professional well-being, including reduced work commitment and self-efficacy.

Beyond these direct associations, this study further examines the potential mediating roles of physical and psychological well-being in the relationship between teacher workload and professional well-being. Based on prior evidence suggesting that depletion of physical and psychological resources undermines teachers' professional functioning, it is hypothesized that both physical well-being and psychological well-being will partially mediate the association between teacher workload and professional well-being.

Moreover, given that physical strain may exacerbate psychological distress, a sequential mediation mechanism is also proposed. Specifically, higher teacher workload is expected to impair physical well-being, which in turn may negatively affect psychological well-being, ultimately leading to diminished professional well-being. Through testing these direct, indirect, and sequential pathways, the present study aims to clarify how teacher workload influences the multidimensional well-being of pre-service ECE interns and to identify the key explanatory mechanisms underlying this process.

Figure 1. Conceptual Framework



Method

Sample and Procedure

The study employed a convenience sampling approach, focusing on three higher vocational colleges in a central region of China, which represents a typical resource-constrained context (the province is anonymized for confidentiality). This region was selected because it exemplifies structural disparities in preschool education resources (Tang & Lan, 2025) and relies heavily on vocational colleges to prepare preschool teachers (Wang et al., 2024). As one of the less economically developed provinces, this context depends on higher vocational institutions as the primary channel for preschool teacher preparation, which makes it a distinctive and under-studied context for examining how workload influences well-being. In these practicum settings, pre-service interns typically assume assistant or caregiving roles—such as supporting lead teachers, managing routines, and performing childcare-related tasks—rather than independently conducting daily teaching (Zhang et al., 2025). Participants were pre-service early childhood education (ECE) interns undertaking mandatory kindergarten practicums.

The three selected colleges were chosen because they are among the largest providers of preschool education programs in the province and regularly assign students to mandatory practicums in kindergartens. This ensured both accessibility for data collection and coverage of typical vocational college practicum arrangements. Prior research has shown that vocational colleges are the primary channel for preschool teacher preparation in China, particularly in less-developed central regions (Wang et al., 2024; Tang & Lan, 2025).

A total of 493 valid questionnaires were obtained. The sample size was determined based on two considerations. First, participants were recruited from several vocational colleges offering preschool education programs in a central region of China, reflecting both the maximum accessible sample and the

unique characteristics of the region's preschool education practicum context. Second, an a priori power analysis conducted with G*Power 3.1 (assuming a medium effect size $f^2 = 0.15$, $\alpha = .05$, and power = 0.80) indicated that the minimum required sample size was 77. Additionally, the PLS-SEM "10-times rule" required at least 30 cases (given three maximum incoming paths). The final sample of 493, therefore, greatly exceeded both thresholds, ensuring adequate statistical power and robustness of the findings. The demographic characteristics of the respondents (e.g., gender, age, placement type) were consistent with national statistics for vocational preschool education students, further supporting the external validity of the sample.

Instruments

The Teacher Workload Scale was adapted from the OECD TALIS 2018 Teacher Questionnaire (Jensen, 2010). To ensure cultural and contextual relevance, the items were modified to reflect the unique demands of early childhood education in China. For example, "Determining course content" was revised to "deciding learning themes, activities, and materials for children." The final scale includes 5 items rated on a 5-point Likert scale (1 = Not at all to 5 = Very much), with higher scores indicating greater workload. The Cronbach's alpha in this study was 0.900.

According to the pre-service education practicum context, the well-being of pre-service interns is divided into three categories: physical well-being, includes general health and ergonomic pain, as measured by the Self-Report Health Questionnaire (Kwon et al., 2021) and the Work-Related Musculoskeletal Disorders Questionnaire (Cheng et al., 2013); psychological well-being: including depressive symptoms, perceived stress and self-perceived mental issue, measured using the CES-D-10 depression scale (Andresen et al., 1994), the perceived stress scale (Cohen et al., 1983), and the self-perceived mental health (Kwon et al., 2021); professional well-being: including work commitment and self-efficacy, measured using the Early Childhood Teacher Job Satisfaction Survey (Jorde-Bloom, 1988) and the teacher efficacy scale (Tschannen-Moran & Hoy, 2001). All scales were revised by two experts in the field of early childhood education to ensure cultural appropriateness, and internal consistency was achieved at an ideal level ($\alpha > 0.85$).

Data Analysis

We conducted PLS-SEM in SmartPLS 4 using a two-stage approach. The three well-being domains were modeled as reflective–reflective second-order constructs—physical well-being, psychological well-being, and professional well-being. In Stage 1, we estimated the first-order reflective constructs and assessed reliability (Cronbach's α, Dijkstra–Henseler's ρ_A, and composite reliability), convergent validity (average variance extracted, AVE), and discriminant validity (heterotrait–monotrait ratio of correlations, HTMT, and the Fornell–Larcker criterion). In Stage 2, latent variable scores from Stage 1 served as indicators of the second-order constructs, which were then used in the structural model to examine the effects of teacher workload on the three well-being dimensions. Model evaluation reported the standardized root mean square residual (SRMR) (saturated/estimated) and emphasized explanatory and predictive performance (coefficient of determination, R^2; local effect size, f^2; Stone–Geisser's Q^2; PLSpredict). Path coefficients and indirect effects (mediation) were tested via bootstrapping (5,000 resamples, bias-corrected CIs).

Ethics Statement

In accordance with institutional ethical guidelines at the authors' affiliated university, ethical review was not required for anonymous, minimal-risk educational survey studies. All participants provided written informed consent after being informed about the research objectives and procedures; participation was voluntary and could be withdrawn at any time without penalty. No personal identifiers were collected; all data were de-identified and used solely for research purposes. The study complied with the Declaration of Helsinki.

Data Availability Statement

De-identified data are available from the corresponding author upon reasonable request. Due to privacy concerns, the data are not publicly available, but researchers may request access to the dataset from the corresponding author.

Results

A total of 493 interns from three teacher training colleges in central China were recruited for the study. All participants were in the final six months of their education practicum. Of the 493 interns, 95.5% were female and 79.3% came from public kindergartens. Most interns worked as teaching assistants or in other support roles, with less than 3% taking on full responsibility for a class. Overall, the interns received limited compensation, and only 52% held a teaching certificate, reflecting a structural misalignment within the current pre-service education practicum group regarding gender, job positions, and professional qualifications. These demographic patterns indicate that limited responsibility, restricted resources, and institutional constraints characterize the practicum context. Such conditions provide an important backdrop for understanding the role of teacher workload in shaping well-being outcomes.

All participants had completed the pre-service education program and were conducting full-time practicums in kindergartens. To ensure the representativeness of the sample, the study excluded students who had not yet entered the practicum stage or had withdrawn from the practicum. The results are shown in Table 1.

Table 1. Demographic characteristics of participants (N = 493)

Variable	Response Category	Number	Percentage (%)	Total Percentage (%)
Kindergarten type	Public kindergarten	391	79.3	100
	Private kindergarten	97	19.7	
	Institution for early education	5	1	
Gender	Male	22	4.5	100
	Female	471	95.5	
Practicum class level	Nursery class	151	30.6	100
	Middle class	151	30.6	
	Senior class	153	31	
	Mixed-age class	32	6.5	
Intern position	Lead teacher	14	2.8	100
	Assistant teacher	297	60.2	
	Childcare worker	19	3.9	
	Support staff	163	33.1	
Intern meals and accommodation	Full board and lodging provided	129	26.2	100
	Meals provided only	186	37.7	
	Accommodation provided only	74	15	
	No subsidies provided	104	21.1	
Teacher certification	Certified	260	52.8	100
	Non-certified	233	47.2	
Intern salary	None	224	45.4	100
	RMB 500-1000	156	31.6	
	RMB 1000-2000	75	15.2	
	RMB 2000-3000	26	5.3	
	More than RMB 3000	12	2.4	

Measurement Model Assessment

Based on the results presented in Table 2, all constructs demonstrated satisfactory internal consistency reliability. Specifically, Cronbach's α values ranged from 0.906 to 0.957, exceeding the recommended threshold of 0.70 (Cronbach, 1951; Nunnally & Bernstein, 1994). In addition, Dijkstra–Henseler's rho (ρ_A) values ranged from 0.908 to 0.958, and composite reliability (CR) values ranged from 0.930 to 0.961, further confirming the reliability of the measurement scales (Dijkstra & Henseler, 2015; Hair et al., 2019). Regarding convergent validity, all average variance extracted (AVE) values exceeded the recommended criterion of 0.50, ranging from 0.575 to 0.766, indicating that each construct adequately captured the variance of its indicators (Fornell & Larcker, 1981). Overall, these results provide strong evidence of high internal consistency reliability and adequate convergent validity for all constructs, supporting the suitability of the measurement model for subsequent empirical analyses (Hair et al., 2011).

Table 2. Assessment results of measurement model

Name of construct	Construct reliability and validity			
	Cronbach's alpha	Dijkstra–Henseler's ρ_A	Composite reliability(ρ_C)	Average variance extracted (AVE)
Teacher workload	0.906	0.908	0.930	0.727
Physical well-being	0.957	0.958	0.961	0.747
Psychological well-being	0.926	0.927	0.934	0.575
Professional well-being	0.944	0.945	0.950	0.766

Note: Acceptable thresholds: α≥0.70; ρ_A≈ 0.70-0.95； CR ≥0.70； AVE ≥ 0.50

Furthermore, discriminant validity was assessed using the Heterotrait–Monotrait ratio (HTMT), as shown in Table 3. Most HTMT values ranged from 0.238 to 0.567, remaining well below the conservative threshold of 0.85 and indicating satisfactory discriminant validity for the majority of constructs.

One higher value was observed between self-efficacy and work commitment (HTMT = 0.902). Although this value slightly exceeds the commonly recommended cutoff of 0.85, it remains within the acceptable range for conceptually related constructs in social science research, where HTMT values below 0.90—or even 0.95—are considered acceptable when theoretical overlap is expected. Given that self-efficacy and work commitment are closely linked components of professional well-being, this higher value is theoretically justifiable and does not indicate problematic construct redundancy.

Overall, the HTMT results support adequate discriminant validity for all constructs in the model, confirming that each latent variable captures a distinct underlying concept.

Table 3. Discriminant validity using HTMT

	TW	GH	EP	DS	SMI	PS	WC	SE
TW								
GH	0.401							
EP	0.416	0.523						
DS	0.445	0.334	0.338					
SMI	0.332	0.238	0.254	0.450				
PS	0.381	0.291	0.306	0.361	0.398			
WC	0.420	0.418	0.482	0.346	0.567	0.421		
SE	0.427	0.431	0.481	0.321	0.422	0.399	0.902	

Note: N = 493. Values are HTMT ratios; HTMT <0 .85 supports discriminant validity. TW= teacher workload; GH =general health; EP =ergonomic pain; DS = depressive symptoms; SMI =self-perceived mental health; PS =perceived stress; WC=work commitment; SE =self-efficacy

Discriminant validity was further evaluated using the Fornell–Larcker criterion (Table 4). The square roots of the AVE values, shown on the diagonal, ranged from 0.753 to 0.894 and were all greater than the corresponding inter-construct correlations. This demonstrates that each construct shared more variance with its own indicators than with other latent variables, providing strong evidence of discriminant validity.

Teacher workload (√AVE = 0.852) showed lower correlations with General Health (–0.369), ergonomic pain (–0.391), Depressive Symptoms (–0.407), Self-perceived Mental Issues (–0.293), and perceived stress (–0.349), confirming that it is empirically distinct from both physical and psychological well-being indicators. Similarly, psychological well-being (√AVE = 0.755) and professional well-being (√AVE = 0.784) exhibited moderate correlations with related constructs but maintained higher AVE square roots, indicating acceptable discriminant validity within the multidimensional well-being framework.

Although some constructs displayed moderate associations—for example, work commitment and self-efficacy (0.531)—these values were still below their respective AVE square roots (0.784 and 0.894). Taken together, the Fornell–Larcker results confirm that all constructs in the model are conceptually distinct and adequately differentiated from one another.

Table 4. Discriminant validity using the Fornell and Larcker criterion

	TW	GH	EP	DS	SMI	PS	WC	SE
TW	0.852							
GH	–0.369	0.789						
EP	–0.390	0.494	0.755					
DS	–0.407	0.309	0.318	0.753				

SMI	−0.293	0.212	0.254	0.401	0.887			
PS	−0.349	0.267	0.287	0.334	0.354	0.755		
WC	−0.388	0.389	0.458	0.320	0.442	0.390	0.784	
SE	−0.394	0.401	0.457	0.298	0.379	0.369	0.531	0.770

Note: Diagonal values (bold) =√AVE; off-diagonals =latent correlations. Discriminant validity is supported when each diagonal exceeds the correlations in its row/column. TW=teacher workload; GH=general health; EP=ergonomic pain; DS=depressive symptoms; SMI=self-perceived mental issues; PS=perceived stress; WC=work commitment; SE=self-efficacy.

Structural Model Assessment

The overall model fit was assessed using the standardized root mean square residual (SRMR). The SRMR value of the saturated model was 0.083, which falls within the acceptable range suggested for PLS-SEM, indicating an acceptable model fit (Hu & Bentler, 1999; Henseler et al., 2014). Following prior recommendations, the saturated model SRMR was prioritized over the estimated model SRMR when evaluating global model fit, particularly in models with hierarchical constructs (Hair et al., 2011).

Table 5. Assessment results of structural model

	Saturated model	Estimated model
SRMR	0.083	0.089

Note: In PLS-SEM we prioritise Saturated SRMR; Estimated SRMR is reported for completeness.

In evaluating the significance of the structural paths, this study followed the commonly accepted criteria in PLS-SEM. Specifically, bootstrapping was employed to obtain p-values, with $p < .05$ indicating statistical significance and $p < .01$ and $p < .001$ representing higher levels of significance. In addition, the 95% confidence intervals (CIs) of the path coefficients were examined, and a path was considered significant when its CI did not include zero. The t-values were also referenced, with $|t| > 1.96$, 2.58, and 3.29 corresponding to significance at the .05, .01, and .001 levels, respectively. These criteria ensured that the standardized path coefficients (β) reflected true statistical associations rather than sampling fluctuations.

Results of the structural model indicated that teacher workload exerted significant negative effects on all three well-being constructs. Teacher workload was negatively associated with physical well-being (β = −0.434, SE = 0.040, t = 10.851, p < .001, 95% CI [−0.507, −0.353]) and psychological well-being (β = −0.342, SE = 0.040, t = 8.435, p < .001, 95% CI [−0.418, −0.263]). It also showed a smaller yet significant negative direct effect on professional well-being (β = −0.146, SE = 0.039, t = 3.734, p < .001, 95% CI [−0.226, −0.071]). The relationships among the well-being constructs were likewise significant: physical well-being positively predicted psychological well-being (β = 0.256, SE = 0.049, t = 5.211, p < .001, 95% CI [0.156, 0.348]) and professional well-being (β = 0.382, SE = 0.042, t = 9.012, p < .001, 95% CI [0.294, 0.462]), while psychological well-being positively predicted professional well-being (β = 0.298, SE = 0.040, t = 7.474, p < .001, 95% CI [0.218, 0.373]). All confidence intervals excluded zero, indicating robust statistical significance across all paths.

Bootstrapping further revealed that teacher workload exerted significant indirect effects on professional well-being through different well-being dimensions. The indirect effect transmitted through physical well-being alone was significant (teacher workload → physical well-being → professional well-being becomes: the indirect effect through physical well-being: β = −0.166, SE = 0.021, t = 8.033, p < .001, 95% CI [−0.211, −0.129]). The indirect effect transmitted through psychological well-being alone was also significant (the indirect effect through psychological well-being: β = −0.102, SE = 0.018, t = 5.520, p < .001, 95% CI [−0.141, −0.069]). Moreover, the serial mediation pathway—where teacher workload first influences physical well-being, which then influences psychological well-being, and subsequently professional well-being—was likewise significant (the serial indirect effect via physical well-being and psychological well-being: β = −0.033, SE = 0.009, t = 3.867, p < .001, 95% CI [−0.053, −0.019]). All confidence intervals excluded zero, indicating that these indirect effects were statistically robust.

Table 6. Path loadings for the conceptual model

Path	Original sample	Sample Mean	Standard deviation	T statistics	P values	95% CI
TW -> PhWB	-0.434	-0.435	0.040	10.851	0.000	[-0.507, -0.353]

TW -> PrWB	-0.146	-0.147	0.039	3.734	0.000	[-0.226, -0.071]
TW-> PWB	-0.342	-0.341	0.040	8.435	0.000	[-0.418, -0.263]
PhWB -> PWB	0.256	0.255	0.049	5.211	0.000	[0.156, 0.348]
PhWB -> PrWB	0.382	0.381	0.042	9.012	0.000	[0.294, 0.462]
PWB-> PrWB	0.298	0.300	0.040	7.474	0.000	[0.218, 0.373]
TW -> PhWB -> PrWB	-0.166	-0.165	0.021	8.033	0.000	[-0.211, -0.129]
TW -> PWB -> PrWB	-0.102	-0.102	0.018	5.520	0.000	[-0.141, -0.069]
TW-> PhWB -> PWB-> PrWB	-0.033	-0.033	0.009	3.867	0.000	[-0.053, -0.019]

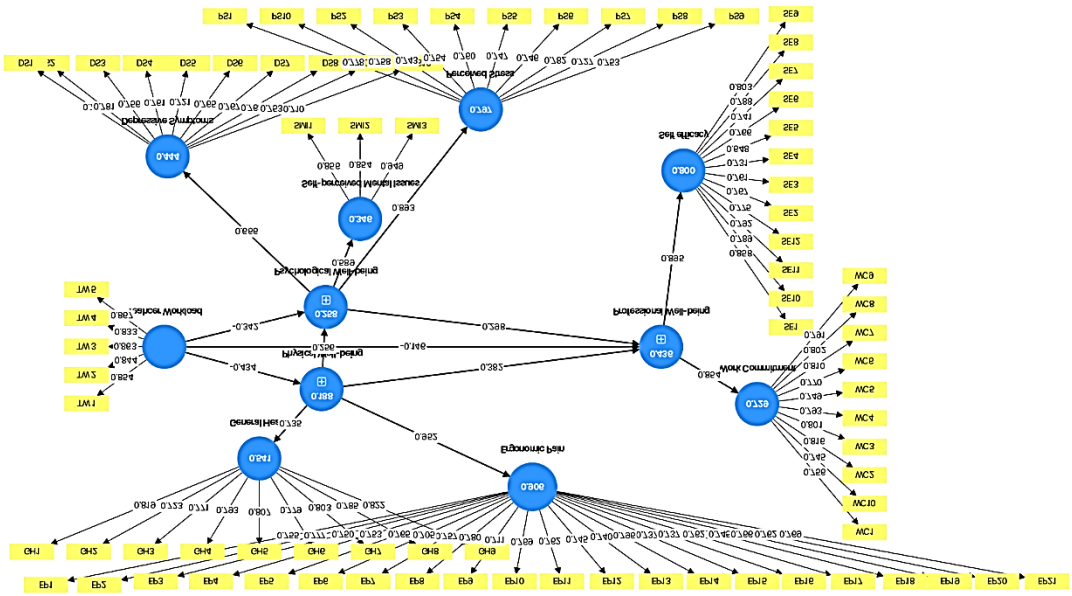
Note: TW=Teacher Workload; PhWB=physical well-being; PWB=psychological well-being; PrWB=professional well-being. p<.05.

To complement the numerical results reported in Table 6, Figure 2 visually illustrates the structural model with standardized path coefficients. The diagram provides an intuitive representation of the magnitude and direction of each relationship within the model, allowing a clearer understanding of how teacher workload and the three dimensions of well-being interact. Paths with larger absolute coefficients correspond to stronger effects, which is consistent with the numerical estimates shown in the table. For instance, the substantial negative paths from teacher workload to both physical and psychological well-being (β = −0.434 and β = −0.342, respectively) are visually represented by prominent arrows in Figure 2, highlighting the strong detrimental influence of workload on interns' well-being. Similarly, the positive predictive paths from physical well-being to psychological and professional well-being (β = 0.256 and β = 0.382) and from psychological well-being to professional well-being (β = 0.298) are also clearly reflected in the diagram, reinforcing the sequential nature of well-being transmission within the model.

Figure 2 also helps illustrate the mediation mechanism by visually displaying the flow from teacher workload to professional well-being through physical and psychological well-being. This corresponds directly to the significant indirect effects reported in Table 6, including the single mediation paths (via physical well-being and via psychological well-being) as well as the serial mediation involving both well-being dimensions. The consistency between the statistical evidence and the visual model strengthens confidence in the reliability of the results.

Together, Table 6 and Figure 2 provide a comprehensive understanding of the structural relationships: the table offers precise statistical estimates and confidence intervals, while the figure offers a structural overview of how the constructs are interconnected within the PLS-SEM framework.

Figure 2. Structural path model (PLS-SEM) with standardized path coefficients



In the assessment of the structural model, R^2, Q^2, and f^2 were used to evaluate explanatory power, predictive relevance, and effect size, respectively, following established methodological guidelines. R^2 indicates the proportion of variance explained in endogenous constructs, with values of approximately 0.25, 0.50, and 0.75 commonly interpreted as weak, moderate, and substantial explanatory power (Hair et al., 2011). Predictive relevance was assessed using Stone–Geisser's Q^2 statistic, where values greater than zero indicate that the model has predictive relevance (Stone, 1974; Hair et al., 2021). Effect sizes (f^2) were interpreted according to Cohen's (1988) criteria, with values of 0.02, 0.15, and 0.35 representing small, medium, and large effects, respectively.

Table 7 summarizes the explanatory and predictive performance of the model across the endogenous constructs. Physical well-being showed relatively weak explanatory power (R^2 = 0.188), as the value falls below the 0.25 threshold; however, its Q^2 value (Q^2 = 0.182) was greater than zero, indicating acceptable predictive relevance. The effect size of teacher workload on physical well-being was of medium magnitude (f^2 = 0.232). Psychological well-being exhibited slightly higher explanatory power (R^2 = 0.258), which can be interpreted as a transition from weak to moderate explanatory strength, and demonstrated adequate predictive relevance (Q^2 = 0.201). In terms of effect sizes, teacher workload exerted a small-to-medium effect on psychological well-being (f^2 = 0.128), whereas physical well-being contributed a relatively small effect (f^2 = 0.072).

Table 7. Assessment results of R^2, Q^2 and f^2

Endogenous construct	R^2	Q^2	f^2 (from predictors)
Physical well-being	0.188	0.182	Teacher Workload = 0.232
Psychological well-being	0.258	0.201	Teacher Workload = 0.128; Physical well-being = 0.072
Professional well-being	0.436	0.195	Teacher Workload = 0.027; Physical well-being = 0.196; Psychological well-being = 0.117

Professional well-being displayed moderate explanatory power (R^2 = 0.436) and acceptable predictive relevance (Q^2 = 0.195). Effect size analysis revealed that teacher workload had a negligible direct effect on professional well-being (f^2 = 0.027), whereas physical well-being exerted a medium effect (f^2 = 0.196), and psychological well-being showed a small-to-medium effect (f^2 = 0.117). These results indicate that physical and psychological well-being contribute more substantially to professional well-being than teacher workload itself.

Regarding the structural paths, teacher workload exerted significant negative effects on physical well-being (β = −0.434, SE = 0.040, t = 10.851, p < .001, 95% CI [−0.507, −0.353]), psychological well-being (β = −0.342, SE = 0.040, t = 8.435, p < .001, 95% CI [−0.418, −0.263]), and professional well-being (β = −0.146, SE = 0.039, t = 3.734, p < .001, 95% CI [−0.226, −0.071]). In addition, physical well-being significantly predicted psychological well-being (β = 0.256, SE = 0.049, t = 5.211, p < .001, 95% CI [0.156, 0.348]) and professional well-being (β = 0.382, SE = 0.042, t = 9.012, p < .001, 95% CI [0.294, 0.462]), while psychological well-being also significantly predicted professional well-being (β = 0.298, SE = 0.040, t = 7.474, p < .001, 95% CI [0.218, 0.373]). All confidence intervals excluded zero, indicating robust statistical significance.

Mediation analyses further demonstrated that the effect of teacher workload on professional well-being operated primarily through indirect pathways rather than through a strong direct effect. The indirect effect via physical well-being was significant (β = −0.166, SE = 0.021, t = 8.033, p < .001, 95% CI [−0.211, −0.129]), as was the indirect effect via psychological well-being (β = −0.102, SE = 0.018, t = 5.520, p < .001, 95% CI [−0.141, −0.069]). Moreover, a sequential mediation pathway through physical well-being followed by psychological well-being also reached statistical significance (β = −0.033, SE = 0.009, t = 3.867, p < .001, 95% CI [−0.053, −0.019]). As none of the confidence intervals crossed zero, these findings confirm the robustness of the indirect effects.

Conclusions

Drawing on the Job Demands–Resources (JD–R) framework, this study examined how teacher workload during the practicum period is associated with the physical, psychological, and professional well-being

of pre-service early childhood education interns. The findings provide clear evidence that teacher workload constitutes a salient job demand in practicum contexts and is significantly related to diminished well-being across multiple dimensions.

The structural model results indicate that higher levels of teacher workload are directly associated with poorer physical well-being and psychological well-being, as well as lower professional well-being. These findings are consistent with the health-impairment process proposed by the JD–R model, which posits that excessive job demands deplete individuals' physical and psychological resources, thereby undermining well-being (Demerouti et al., 2001; Bakker & Demerouti, 2017). In the context of early childhood education, where practicum experiences often involve intensive physical labor, emotional demands, and limited autonomy, workload appears to play a particularly critical role in shaping interns' well-being.

In the context of early childhood education, practicum experiences are often characterized by intensive physical labor, heightened emotional demands, and limited professional autonomy (Jeon et al., 2024; Muruvi et al., 2023; Purper et al., 2023). During this transitional phase, pre-service interns are required to adapt rapidly to professional expectations while simultaneously managing performance evaluations and role uncertainty. Under such conditions, workload may exert a particularly pronounced influence on interns' well-being, as they typically lack stable coping resources, institutional support, and accumulated professional experience. These contextual characteristics highlight the heightened vulnerability of pre-service ECE interns during the practicum period and underscore the importance of addressing workload-related risks at an early stage of professional development.

More importantly, the mediation analyses reveal that the impact of teacher workload on professional well-being operates primarily through indirect pathways. Both physical well-being and psychological well-being significantly mediate this relationship, and a sequential mediation effect was further identified, whereby higher workload undermines physical well-being, which in turn impairs psychological well-being and ultimately reduces professional well-being. This pattern underscores the interconnected nature of different well-being dimensions and aligns with prior research suggesting that physical strain and psychological distress jointly contribute to teachers' professional functioning and occupational experiences (Bates et al., 2024).

By focusing on pre-service early childhood education interns, this study extends existing JD–R–based research that has predominantly examined in-service teachers, and highlights the vulnerability of interns during the practicum phase—a critical transitional period for professional identity formation and future career commitment (Jeon et al., 2018). The findings suggest that professional well-being during practicum is not shaped solely by immediate professional experiences, but is closely linked to cumulative physical and psychological demands encountered in daily work.

Taken together, this study contributes to the literature by clarifying the mechanisms through which teacher workload influences professional well-being among pre-service early childhood education interns. By integrating physical and psychological well-being into a unified explanatory framework, the findings offer a more nuanced understanding of how job demands operate across multiple levels of well-being within practicum settings.

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