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Münster ; New York : Waxmann 2026, 116 S.

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WAXMANN

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Waxmann 2026
Münster • New York

The project is co-financed by the Republic of Slovenia, Ministry of Higher Education, Science and Innovation, and the European Union – NextGenerationEU. The project is implemented in accordance with the Smart, Sustainable and Inclusive Growth development area, Strengthening of Competencies component, especially digital competencies and those required by new professions and the green transition (C3 K5), for the investment measure Investment F. Implementation of pilot projects, the results of which will serve as a basis for the preparation of grounds for the reform of higher education for a green and resilient transition to Society 5.0: the project Pilot projects for the Reform of Higher Education for a Green and Resilient Transition.

THE RECOVERY AND RESILIENCE PLAN

University of Maribor

REPUBLIC OF SLOVENIA
MINISTRY OF HIGHER EDUCATION, SCIENCE AND INNOVATION

Funded by the European Union
NextGenerationEU

Bibliographic information published by the Deutsche Nationalbibliothek
The Deutsche Nationalbibliothek lists this publication in the Deutsche Nationalbibliografie; detailed bibliographic data are available in the Internet at http://dnb.dnb.de

Print-ISBN 978-3-8188-0143-4
E-Book-ISBN 978-3-8188-5143-9

Waxmann Verlag GmbH, 2026
Steinfurter Straße 555, 48159 Münster

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Cover Design: Anne Breitenbach, Münster
Typesetting: MTS. Satz & Layout, Münster

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1. Introduction

A healthy lifestyle is recognised as a key foundation of wellbeing for individuals and society. The combined patterns of daily life – covering physical activity, eating habits, sleep, stress management, and social connections – have a profound impact not only on immediate health but also on long-term risks of chronic diseases, work ability, social engagement, and overall quality of life. As a result, encouraging healthy lifestyles across populations can be seen as a valuable public good. As supportive daily routines spread across the population, societies enjoy reduced healthcare costs, increased productivity, stronger communal bonds, and improved resilience. Conversely, widespread unhealthy behaviours – such as physical inactivity, poor nutrition, chronic sleep deprivation, and social isolation – lead to a growing burden of mental and physical illnesses.

Importantly, a healthy way of living cannot be summed up as a few isolated actions or narrow medical metrics. Rather, it should be viewed as a dynamic system of interconnected habits that support physical vitality, mental balance, and positive social relationships. This system includes multiple areas, including dietary choices, regular physical activity with limited sedentary time, consistent daily routines, restorative sleep, effective stress management techniques, and participation in meaningful activities that promote connection and purpose.

Within this framework, wellbeing and lifestyle are closely interconnected. A supportive lifestyle boosts emotional stability, energy, and cognitive function, which in turn strengthens the ability to maintain health-promoting habits. By contrast, poor lifestyle patterns can wear down mental resources, amplify stress, and impair one's ability to interact with others and perform necessary tasks. This aligns with the biopsychosocial model of health, which argues that health results from the complex interaction of biological, psychological, and social factors. Lifestyle acts both as an outcome of these interactions and as a key mechanism for promoting positive health outcomes.

The lifestyle habits of university students deserve special attention here. During their university years, young adults undergo a key phase, gaining greater freedom to shape their own routines. For many, it is the first time they take full responsibility for meal choices, exercise, sleep patterns, and managing academic and social pressures. During this phase, health behaviours are not only

demonstrated but also actively developed and strengthened. The habits established during late adolescence and early adulthood often persist into later life, with a lasting impact on long-term health.

For students, a healthy lifestyle is not just an abstract ideal but a practical requirement for academic success and personal growth. Regular physical activity, balanced nutrition, and sufficient rest support cognitive functions such as concentration, memory, and emotional regulation, thereby enhancing stress resilience. Effective coping strategies and strong social networks can reduce the risk of anxiety, depression, and burnout, which are becoming more common among students. On the other hand, irregular daily patterns, excessive sitting, poor nutrition, and persistent sleep deprivation can negatively impact academic outcomes and reduce involvement in university activities.

This is especially important in teacher-education programmes. Students preparing to become teachers are not only shaping their own lifelong health habits but also serving as future role models who will influence the next generation. Their personal wellbeing is therefore doubly important. On a personal level, maintaining a healthy lifestyle provides them with the physical and emotional resilience needed for a demanding profession. On a professional level, their health behaviours will directly and indirectly influence the health-related attitudes and behaviours they demonstrate to their students.

Acknowledging this, the present monograph adopts a holistic view of a healthy lifestyle tailored to the higher education setting. It examines eating habits, physical activity, daily routines, socio-emotional balance and creativity as interconnected domains that together shape a student's lifestyle. At the same time, it situates lifestyle alongside other important aspects of university life: subjective wellbeing, engagement in art and culture, and physical fitness. Art and cultural participation, for example, are regarded as significant components that promote emotional expression, enjoyment, and social bonding, thereby enhancing wellbeing and stress management.

Physical activity and body composition are studied not just for their effects on long-term health but also for their influence on students' daily experiences. Regular exercise boosts cognitive function and mood, while sedentary behaviour and poor body composition can impact self-view and perceived quality of life. By considering these aspects together, the monograph presents student lifestyles as complex and varied, rather than simply categorising them as "healthy" or "unhealthy."

Building on this conceptual foundation, the monograph presents empirical findings from a comprehensive study of lifestyle and wellbeing among university students, with a specific focus on teacher education candidates. Utilising validated instruments and objective measures, the study identifies distinct lifestyle-wellbeing profiles, moving beyond the assumption of homogeneous student patterns. The results indicate multiple adaptive pathways to higher wellbeing: some students rely mainly on health-promoting behaviours, while others depend more on psychological resources, social support, or creative arts engagement. At the same time, the study uncovers a vulnerable subgroup characterised by disengagement across several areas – physical inactivity, irregular routines, limited cultural participation, and low wellbeing – highlighting a need for targeted support.

The implications for higher education, particularly teacher education, are evident. If a healthy lifestyle is a central determinant of wellbeing and societal participation, then it constitutes a critical professional competency for future educators. Universities should therefore approach student lifestyle and wellbeing not as marginal concerns but as integral to educational quality. This necessitates institutional policies and practices that create environments where healthy choices are accessible and valued, where diverse pathways to wellbeing are recognised, and where at-risk students receive tailored interventions.

Moving from the broad societal importance of healthy lifestyles to their specific expression in the lives of university students, especially future teachers, this monograph encourages a reassessment of the role of higher education. Promoting how students live – how they move, eat, rest, create, and connect – is seen not just as an individual responsibility but as a collective educational and societal duty with significant implications for the wellbeing of future generations.

This monograph fills this gap by providing an empirical, theory-based exploration of lifestyle habits, wellbeing, and educational implications among university students enrolled in teacher education programmes at the Faculty of Education, University of Maribor. Using a cross-sectional quantitative approach, the study combines objective and self-reported data from 193 students to examine how health-related behaviours and resources cluster within this group. A set of validated tools was used: the Healthy Lifestyle and Personal Control Questionnaire (HLPCQ) to evaluate lifestyle habits across five domains (Darviri et al., 2014); the WHO-5 Wellbeing Index to measure subjective psychological wellbeing (WHO Regional Office for Europe, 1998; Topp et al., 2015); the

International Physical Activity Questionnaire-Short Form (IPAQ-SF) to assess physical activity levels (Craig et al., 2003); an Arts Engagement Scale to measure active and receptive artistic participation; and InBody 270 bioelectrical impedance analysis to obtain objective body composition indices (InBody Co., Ltd., 2018; Ling et al., 2011).

Using K-means clustering of these indicators, the study identifies distinct lifestyle-wellbeing profiles among future teachers. It examines how these profiles relate to specific lifestyle components, arts engagement, and body composition. The findings highlight both vulnerabilities, such as students with low engagement across domains and decreased wellbeing, and adaptive pathways, including a physically vital cluster and a holistically balanced, creatively engaged cluster. By interpreting these patterns through biopsychosocial and positive-education frameworks (Engel, 1977; Dodge et al., 2012; Seligman, 2011), the monograph develops concrete implications for curriculum design, student support, and the broader health-promoting role of teacher education institutions.

The monograph is organised to guide readers from fundamental concepts to empirical evidence and educational practices. The opening chapters clarify key ideas – such as healthy lifestyles, wellbeing, physical activity, and arts engagement – in the context of higher education, framing them within international policy and research perspectives. Subsequent chapters outline the research design, measurement tools, and analysis methods, followed by a presentation of the empirical findings, including the identification and interpretation of lifestyle clusters. The final chapters synthesise these findings into recommendations for university programmes, curriculum development, and institutional strategies to enhance students' health, resilience, and creative skills. Overall, the chapters encourage readers – researchers, educators, policymakers, and students – to see student lifestyle and wellbeing not just as personal issues but as shared educational responsibilities and opportunities for meaningful change.

2. Defining a Healthy Lifestyle in Higher Education

2.1 Definition and Scope

A healthy lifestyle in higher education can be seen as an active pattern of daily behaviours, resources, and social connections that support physical, mental, and social wellbeing during students' studies and into later adulthood. This idea aligns with the World Health Organization's (WHO) definition of health as "a state of complete physical, mental, and social wellbeing and not merely the absence of disease or infirmity" (WHO, 2021b, p. 3) and with broader policy frameworks that emphasise the social factors affecting health (Marmot & Allen, 2014; Bull et al. 2020). In the context of universities and other higher education institutions, a healthy lifestyle is not just about avoiding illness; it also involves fostering conditions that enable students to function, learn, and participate meaningfully in academic and social life.

From a life course perspective, the transition into higher education is a particularly sensitive period. Emerging adults often move away from home, experience new freedoms and demands, and reshape their social networks. Longitudinal studies indicate that these transitions are frequently accompanied by changes in physical activity, diet, and weight status, often in an unfavourable direction (Winpenny et al., 2020). For example, a meta-analysis of first-year university students found that most gained weight, with an average increase of about 1.4 kg over five months, suggesting that university entry may mark the start of longer-term trends in weight gain and metabolic risk (Vadeboncoeur et al., 2015). Simultaneously, umbrella reviews and meta-analyses show that a significant proportion of university students experience symptoms of common mental disorders, including depression and anxiety, with high prevalence rates and, in some cases, increasing (Paiva et al., 2025).

In this context, lifestyle is best conceptualised as a modifiable, multi-domain construct that encompasses:

- everyday food choices and eating patterns;
- the avoidance of harmful or dysregulated dietary practices;
- temporal organisation of daily life (sleep-wake patterns, study and leisure routines);

- engagement in structured physical activity; and
- social connectedness, mental health, and coping strategies.

Lifestyle medicine emphasises that such behaviours rarely occur alone; instead, they form interconnected clusters that can either increase risk or work together to protect health (Rippe, 2018). Among university students, for example, irregular sleep, low physical activity, and poor diet often happen along with high stress and emotional distress, and these combinations are strongly linked to lower quality of life and academic problems (Memon et al., 2021; Oftedal et al., 2024).

At the same time, lifestyle is influenced by social and institutional contexts. The social determinants of health framework emphasises how economic resources, housing, social support, and institutional culture affect individuals' ability to adopt and maintain healthy behaviours (Marmot & Allen, 2014). In higher education, factors such as tuition costs, workload, campus food options, class schedules, availability of sports and cultural programmes, and access to counselling services shape the kinds of lifestyle patterns feasible for students (Li et al., 2025). Therefore, universities are not just neutral environments where students make personal choices; they are active participants in creating either health-promoting or health-compromising settings (Li et al., 2025; WHO, 2020).

To promote healthy lifestyles in this complex environment, researchers and practitioners increasingly rely on multidimensional tools that measure daily behaviours and their psychological foundations. One such tool is the Healthy Lifestyle and Personal Control Questionnaire (HLPCQ), which views lifestyle as a collection of daily practices through which individuals exercise self-regulation and personal control over their health (Darviri et al., 2014). The HLPCQ has recently been adapted and validated in various cultural contexts, including Slovenia, enabling cross-national comparisons and the customisation of interventions to local needs (Svenšek et al., 2025). Building on this concept, the present chapter organises the healthy lifestyle of university students into five interconnected core areas: (1) healthy dietary choices, (2) avoiding dietary harm, (3) daily routines, (4) structured physical activity, and (5) social and mental wellbeing.

2.2 Core Domains

The five domains outlined below offer a comprehensive framework for understanding how students' lifestyles are shaped and sustained in higher education. They conceptually draw from the domains evaluated by the HLPCQ – such as healthy food choices, avoiding harmful diets, organised physical activity, and sleep and daily routines (Darviri et al., 2014) – and align with current research on health behaviours and mental health in college populations (Belogianni & Baldwin, 2019; Memon et al., 2021; Paiva et al., 2025). Rather than viewing each domain as an isolated "risk factor," the framework highlights their interconnectedness. For instance, irregular sleep can lead to stress-induced eating, which can decrease energy and motivation for physical activity, ultimately impacting mood and social engagement (Alexatou et al., 2025; Memon et al., 2021; Oftedal et al., 2024; Rippe, 2018).

Recognising these domains is not only helpful for analysis but also for understanding the broader context. It also guides the design of practical interventions. Systematic reviews of interventions in university settings show that programmes that address diet, physical activity, and weight-related outcomes together tend to be more effective than those focusing on a single behaviour (Belogianni & Baldwin, 2019; Deliens et al., 2016; Plotnikoff et al., 2015). Similarly, approaches that combine wellbeing, social support, and mental health services are increasingly recommended as vital parts of campus-wide health promotion strategies (Li et al., 2025; Osborn et al., 2022; Ruihua et al., 2025).

2.2.1 Healthy Dietary Choices

Healthy dietary choices refer to the regular consumption of nutrient-dense foods – such as fruits, vegetables, whole grains, pulses, and minimally processed sources of protein – together with adequate hydration and balanced energy intake across the day. In higher-education settings, this domain is particularly important because students' diets often shift towards more energy-dense, nutrient-poor foods, irregular meals, and meal skipping, influenced by time pressure, limited budgets, campus food offerings, and social norms (Deliens et al., 2016; Oftedal et al., 2024; Winpenny et al., 2020).

Systematic reviews of dietary interventions among university students show that targeted programmes – ranging from nutrition education and digital feedback to changes in food environments – can improve indicators such as fruit and vegetable intake and reduce consumption of sugar-sweetened beverages,

although effect sizes are typically modest and often not sustained without structural changes (Belogianni & Baldwin, 2019; Deliens et al., 2016). These findings underscore that supporting healthy dietary choices requires both individual competencies (e. g. food literacy, planning skills) and structural supports (e. g. affordable healthy options on campus, adequate kitchen facilities in student housing).

During the first year of university, even relatively small dietary shifts can contribute to measurable weight gain. A meta-analysis found that most first-year students gained weight, with an average change of approximately 1.4 kg over a five-month period, and that those who gained weight often gained substantially more (Vadeboncoeur et al., 2015). Such changes, while not dramatic at the individual level, can signal the beginning of longer-term trajectories of weight gain and metabolic risk. Framing healthy dietary choices as part of a broader lifestyle – rather than as restrictive "dieting" – is therefore essential for sustainable health promotion in higher education (Rippe, 2018).

Within the HLPCQ framework, healthy dietary choice items capture behaviours such as selecting whole-grain or low-fat options, choosing "home-cooked" rather than fast food, and regularly consuming fruits and vegetables (Darviri et al., 2014). These behaviours are both health-promoting in themselves and markers of an underlying orientation towards proactive self-care.

2.2.2 Dietary Harm Avoidance

While healthy dietary choices emphasise what university students should eat, the domain of dietary harm avoidance focuses on what they should try to limit or regulate. This includes reducing the frequency and quantity of ultra-processed foods high in free sugars, saturated fats, and salt, avoiding heavy late-night eating, and moderating alcohol consumption used as a calorie source or as a trigger for disinhibited eating. It also encompasses the regulation of emotional and stress-related eating, which is highly relevant for university populations.

Recent literature syntheses document high levels of emotional eating among university students and consistent associations with higher body mass index (BMI), depressive and anxiety symptoms, sleep problems, and lower perceived quality of life (Alexatou et al., 2025). A mini-review focused on stress and dietary behaviours among university students concludes that higher perceived stress is typically associated with increased intake of snack foods and sweet-

ened beverages, particularly among women (Deliens et al., 2016). These findings echo broader evidence from lifestyle medicine that chronic stress can shift food preferences towards high-fat, high-sugar items, contributing to energy imbalance and adiposity (Rippe, 2018).

Among university students, patterns of stress-related eating may be reinforced by irregular schedules, extended studying, social events centred on food, and the ready availability of inexpensive ultra-processed products. Over time, they can undermine efforts to maintain a balanced diet and healthy body weight and are often associated with guilt and shame, which may further compromise mental health (Alexatou et al., 2025; Paiva et al., 2025).

In the HLPCQ, dietary harm avoidance is reflected in items that assess the deliberate restriction of certain foods or eating contexts – for example, limiting sugary snacks, avoiding eating when not hungry, or refraining from eating late at night (Darviri et al., 2014). Interpreted within a health-promotion framework, these behaviours represent adaptive self-regulation rather than rigid dieting: they aim to reduce the frequency of situations in which students are likely to overeat or make impulsive choices, while preserving flexibility and enjoyment of food. Interventions that combine psychoeducation about stress and emotions with strategies for mindful eating appear particularly promising for supporting this domain (Alexatou et al., 2025; Deliens et al., 2016; Rippe, 2018).

2.2.3 Daily Routine

Daily routine refers to the temporal structuring of everyday activities, including regular sleep-wake cycles, consistent meal times, time allocated for study and work, and predictable windows for leisure, physical activity, and rest. The transition into university often disrupts previously established routines: students report later bedtimes, irregular wake times, variable meal patterns, and prolonged evening screen use, particularly during examination periods (Lund et al., 2010; Oftedal et al., 2024).

Large cross-sectional studies show that more than half of college students can be classified as poor sleepers, and poor sleep quality is strongly associated with worse physical and psychological health, including higher levels of depressive symptoms, anxiety, and impaired academic functioning (Lund et al., 2010). A systematic review and meta-analysis of sleep and physical activity in university students further indicates that higher levels of moderate-to-vigorous physical activity are associated with better self-reported sleep quality, although most

studies rely on self-report measures and cross-sectional designs (Memon et al., 2021).

From a lifestyle perspective, daily routine acts as a scaffolding for other health behaviours. Regular sleep-wake rhythms and mealtimes increase the likelihood of planning and consuming balanced meals, facilitate participation in scheduled physical activities, and may buffer against stress-related eating and late-night snacking. Conversely, chaotic routines – such as frequently changing bedtimes, all-night studying, and skipping meals – can erode self-regulatory capacity and amplify vulnerabilities in other domains. Qualitative studies of students' experiences when starting university describe how shifts in routine are often experienced as both liberating and destabilising, with implications for diet, sleep, and mental wellbeing (Oftedal et al., 2024).

Instruments such as the HLPCQ operationalise this domain through items assessing the consistency of bedtime and wake time, planning of the day, and regularity of meals (Darviri et al., 2014; Svenšek et al., 2025). For health promotion in higher education, supporting daily routine may involve structural measures (e. g. timetabling that avoids excessively early or late classes, providing quiet study spaces) as well as individual skills training (e. g. time management, sleep hygiene).

2.2.4 Organised Physical Activity

Organised physical activity refers to planned, structured, and repetitive movement behaviours that are undertaken with the goal of improving or maintaining physical fitness and health, such as sports clubs, fitness classes, group exercise, or regular individual training sessions. While incidental activity (e. g. walking or cycling to campus) also contributes to health, the organised component is particularly relevant in university settings because it can provide social support, accountability, and identity, which help sustain long-term engagement.

WHO guidelines recommend that adults engage in 150–300 minutes of moderate-intensity or 75–150 minutes of vigorous aerobic physical activity per week, or an equivalent combination, along with muscle-strengthening activities on at least two days (Bull et al., 2020; WHO, 2021b). However, many students do not meet these recommendations, and longitudinal evidence suggests that physical activity often declines when young people transition from secondary school into higher education and then into full-time employment (Plotnikoff et al., 2015; Winpenny et al., 2020).

A systematic review and meta-analysis of interventions targeting university and college students found that programmes focusing on physical activity, nutrition, and healthy weight often produced significant improvements in at least one outcome, with meta-analytic evidence for increased moderate physical activity in intervention groups compared with controls (Plotnikoff et al., 2015). Another overview of systematic reviews concluded that multi-component interventions, including environmental changes (e. g. access to facilities), behaviour-change techniques, and social support, tend to be more effective than isolated educational approaches (Belogianni & Baldwin, 2019).

Beyond physical health, organised physical activity is closely linked to mental health and cognitive functioning. Findings in university populations suggest that higher levels of physical activity are associated with reduced symptoms of depression and anxiety, as well as improved sleep quality, although the causal mechanisms underlying these associations are still being explored (Memon et al., 2021; Paiva et al., 2025). Within the HLPCQ, this domain captures regular participation in sports, exercise, or other structured physical activity, and is conceptualised as both a health behaviour and a domain of personal control, reflecting the extent to which individuals can plan, initiate, and maintain activity despite competing demands (Darviri et al., 2014; Svenšek et al., 2025).

2.2.5 Social and Mental Balance

The domain of social and mental balance integrates psychological wellbeing, emotional regulation, and the quality of students' social relationships. It recognises that lifestyle cannot be reduced to "behaviours" alone; it is also shaped by feelings of belonging, perceived support, purpose, and control.

Recent umbrella reviews and meta-analyses indicate that a substantial proportion of university students worldwide experience symptoms of common mental disorders, with notable rates of moderate to severe depression and anxiety (Paiva et al., 2025). At the same time, systematic reviews of service use show that only a minority of university students experiencing significant distress make use of formal mental-health services, highlighting barriers such as stigma, lack of awareness, financial constraints, and limited service capacity (Osborn et al., 2022). These findings have prompted calls for comprehensive, institution-wide mental health strategies that integrate prevention, early identification, peer support, and accessible treatment (Li et al., 2025).

Within this landscape, social support emerges as a central protective factor. A recent systematic review on social support and college students' wellbeing found consistent evidence that higher perceived social support is associated with better mental health outcomes and more health-promoting behaviours, including physical activity and a balanced diet (Ruihua et al., 2025). Social ties (family, peers, mentors) provide emotional reassurance, practical help, and normative guidance about health behaviours, thereby stabilising lifestyle patterns during the challenges of higher education.

The HLPCQ includes items that indirectly index this domain, such as spending time in relaxing activities, engaging in hobbies, and maintaining regular social contact, all of which contribute to perceived balance between demands and resources (Darviri et al., 2014; Svenšek et al., 2025). From a social determinants perspective, however, mental and social balance is also influenced by structural conditions such as financial insecurity, discrimination, academic pressure, and housing instability, which shape both mental health and opportunities for health-promoting behaviours (Marmot & Allen, 2014; Paiva et al., 2025).

Arts-based programmes, peer-support initiatives, and community-building interventions on campus illustrate how social and mental balance can be actively fostered as part of lifestyle promotion. Emerging evidence suggests that such initiatives can enhance psychological wellbeing, social connection, and creative expression, offering low-stigma entry points into mental health support (Li et al., 2025; Osborn et al., 2022). Integrating these approaches with efforts to support a healthy diet, regular routines, and organised physical activity may be particularly powerful in creating holistic health-promoting higher education environments.

3. Conceptual Domains of a Healthy Lifestyle

A comprehensive understanding of healthy lifestyles among students requires an analytical approach that extends beyond the traditional view of health as merely a set of individual behaviours or biomedical indicators. A healthy lifestyle results from complex interactions among psychological, physical, and creative aspects, which together shape an individual's capacity for effective self-regulation, balance, and achieving personal and academic success. Therefore, in this chapter, we highlight five interrelated areas – art, wellbeing, body composition, physical activity, and physical literacy – that broaden the perspective on a healthy lifestyle and create opportunities for a more comprehensive approach to promoting healthy living among students.

In the context of a healthy lifestyle, art serves as an important source for expressing emotions, reflecting on existential questions, and making sense of reality through creative expression, emotional regulation, and social connection. Research indicates that arts engagement supports mental resilience, reduces stress, and strengthens a sense of meaning and identity, which are key elements of a healthy daily life for students and other target groups. Psychological wellbeing is a key indicator of the internal psychological resources that enable individuals to experience vitality, satisfaction, and the capacity to cope with challenges. Good mental health is directly linked to the quality of interpersonal relationships, cognitive functioning, and motivation to maintain healthy habits, making it a central pillar of a healthy lifestyle. Physical activity is traditionally considered one of the main predictors of health, but in higher education, it assumes a broader significance: it serves as a strategy for managing stress, enhancing cognitive functions, maintaining energy stability, and fostering social interactions. Regular physical activity, therefore, forms the foundation that connects physical vitality with mental balance. Body composition offers an objective perspective on an individual's physiological condition, complementing subjective and behavioural health indicators. Understanding the relationships between muscle mass, fat mass, and general metabolic indicators is essential for assessing risks and planning appropriate support programmes in the university student environment. Physical literacy serves as a connecting concept that extends beyond measuring the quantity of physical activity. It encompasses the motivation, confidence, competence, and understanding that enable an individual to engage in physical activity over the long term. It is a sustainable

aspect of a healthy lifestyle, influencing not only behaviour but also attitudes towards physical activity.

Drawing on a holistic view of health, it highlights how physical, psychological, social and creative factors interact in everyday life. The aim is to provide a broad framework for understanding a healthy lifestyle as the outcome of habits, experiences, relationships and forms of cultural participation that support overall quality of life.

3.1 Art

Art is one of the most profound manifestations of human creativity and meaning-making. Far beyond its aesthetic or decorative role, art is a mode of human existence through which individuals perceive, express, and transform their relationship with the world. It mediates between the inner and the outer, the visible and the invisible, the emotional and the intellectual. As Dewey (1934) argued in Art as Experience, artistic activity integrates doing and undergoing – it transforms everyday experience into reflective, embodied understanding. Through imagination and perception, art serves as a means of knowing that unites cognition, emotion, and bodily presence.

Building on this experiential understanding, McCarthy and colleagues (2004) conceptualise art as a communicative experience – a dialogical process through which inner human experiences are externalised in symbolic, aesthetic, and sensory forms that evoke emotional and intellectual responses in others. Rather than transmitting information, art invites participation; it creates a space for dialogue between the creator and the audience, between the individual and the community. In this sense, art becomes both an act of expression and an act of relation – a way of encountering oneself and others through shared meaning and emotion.

From this perspective, art cannot be confined to the sphere of leisure or culture; it is integral to human flourishing and health. The process of creating, observing, or participating in art nurtures awareness, empathy, and coherence – dimensions that parallel contemporary models of holistic wellbeing (Fancourt & Finn, 2019). Art is therefore not an ornament to life but a mode of living that embodies balance, vitality, and meaningful connection to others and the world.

3.1.1 Definition of the Area

Art can be understood as a multifaceted human practice that encompasses communication, embodied perception, meaning-making, and existential reflection. Rather than a singular aesthetic event, art constitutes a relational experience in which the intrinsic, often intimate or vulnerable experiences of the creator are externalised and become accessible to others through symbolic, sensory, or performative forms (McCarthy et al., 2004). The RAND definition conceptualises art as a communicative experience in which the process of perception parallels the process of creation: while the artist expresses an internal experiential reality through a creative medium, the viewer or listener re-creates meaning through active interpretation. As McCarthy and colleagues (2004) state, the essence of aesthetic experience is not passive observation but an "intense form of feeling enriched by reflection," which stimulates curiosity, questioning, and the search for meaning (p. 42).

Beyond communication, art enables individuals to confront and symbolically represent existential experiences of profound significance. Through literature, theatre, dance, painting, or other media, the individual enters an event holistically – sensorially, emotionally, imaginatively, and bodily. This embodied mode of knowing aligns with Merleau-Ponty's (2006) concept of embodied knowledge, suggesting that understanding arises not only from cognition but also through perception, sensation, and bodily attunement. Such experiences enable individuals to explore their vulnerabilities, relationships, and moral orientations. Nussbaum (1997) emphasises that the aesthetic encounter teaches respect for the inner worlds of others and expands one's moral imagination by enabling empathetic entry into the lives of characters whose experiences may differ from one's own.

Engaging with art thus supports reflection on internal conflicts, recognition of patterns, and the release of stereotypical assumptions. This process strengthens prosocial tendencies and sensitivity to the suffering or marginalisation of others – dimensions essential for psychological wellbeing and ethical development (Kroflič, 2007, 2022; Nussbaum, 1997). Dissanayake (1995) similarly argues that art invites individuals to explore deeper questions of meaning, human existence, and one's relationship with the world, serving as a powerful tool for introspection and existential inquiry.

Another key dimension of art is its capacity to foster dialogue. Artistic expression serves as an authentic mode of forming relationships with others and with the world, allowing individuals to communicate personal truths through

diverse artistic languages (Kroflič, 2017, 2022). Participatory art practices – community projects, collective performances, public art interventions – build social capital, promote inclusion, and strengthen communal belonging (Matarasso, 1997; Putnam, 2000). Through symbolic representation, art can challenge stereotypical portrayals of otherness or support social recognition and "domestication" of difference (Kroflič, 2017). In turn, viewers respond with compassionate imagination – the ability to recognise the humanity and suffering of others – which supports post-traumatic growth and increases empathy (Nussbaum, 1997).

Art also contributes to mental health by providing young people with a space for processing sensitive or taboo topics. Marjanovič Umek (2016) emphasises that artistic expression provides children and adolescents with a safe symbolic space for exploring issues such as loneliness, addiction, depression, trauma, and violence – facilitating understanding, emotional release, and the development of coping strategies. These processes are crucial for identity formation and the preservation of mental health.

Finally, art stimulates curiosity, wonder, and sensitivity to meaning. As Vecchi (2010) notes, creating and interpreting art functions as a "filter for interpreting the world," requiring care, attention, sensitivity, imagination, and humour (p. 10). Artistic experience inspires individuals to move beyond superficial appearances, discover new perspectives, and question assumptions. This not only enriches cognitive and emotional life but also enables the experience of beauty, which Aristotle (2012) viewed as a natural form of human pleasure contributing to harmony and fulfilment. Empirical studies confirm that arts engagement enhances feelings of joy, curiosity, satisfaction, and vitality – core components of wellbeing (Cameron et al., 2013; Štirn Janota & Dýrfjörð, 2025).

3.1.2 The Relationship Between Art and Health in International Policy Frameworks

The importance of this link between art and a healthy lifestyle can also be found in international policy documents.

The WHO report *What is the evidence on the role of the arts in improving health and wellbeing?* (2019) highlights the importance of the arts not only as a means to regulate other goals or qualities of the individual, but as that which is good in itself, while pointing out that engaging in the arts (as spectators or creators) enhances creativity or originality, stimulates the activation of all the senses,

externalisation of emotional response, cognitive stimulation, which are seen as important factors in health and healthy lifestyles (see Fancourt & Finn, 2019), and highlights the importance of culture and creative expression in meeting the challenges of changing times, especially during pandemic times, for children and adolescents. They highlight the role of the arts in promoting social interaction and reducing social alienation among children and adolescents, in reflecting on and discovering the meaning of existence, and in coping with mental health challenges and identity crises.

OECD studies (Winner et al., 2013, OECD, 2019a) also accentuate the importance of the arts for the holistic development of the individual. In 2013, they published a study on Art for Art's Sake (Winner et al., 2013), which, based on a variety of research, examined the effects of cultural and arts education (CEA) on children's holistic development, including wellbeing and health. This is an area that is difficult to research, and few relevant studies are available. The results of the included studies point to several links and effects of CEA, such as the promotion of critical and creative thinking and innovative ideas, increased academic performance in non-arts subjects (mathematics, science, reading, writing), and the development of social skills such as communication and cooperation. However, they point out that in most cases the research is not designed in such a way that a clear conclusion can be drawn as to whether the improvements (e. g. in wellbeing, knowledge, innovation) are the direct effects of culture and art or something else. This is why they stress that the evaluation of CEA must remain at the core (intrinsic) value of the arts and the associated skills and important ways of thinking that they develop. At the same time, the report makes it clear that it is unnecessary for both the education sector and society to question the impact of arts and culture on innovation and the labour market, as it is "an important part of our right to education and wellbeing" (ibid., p. 32).

Similarly, a recent UNESCO document, the UNESCO Framework for Culture and Arts Education, adopted at the Abu Dhabi 2024 conference, stresses the key role of culture and the arts in sustainable development, education and the promotion of social justice. The document is based on the vision that culture and the arts are essential for personal growth, social wellbeing and addressing global challenges such as inequalities, climate change and conflict, with key principles or objectives related to accessibility of culture and the arts for all, inclusiveness and multi-stakeholder participation, lifelong learning, and respect for cultural diversity.

The WHO report (2019) highlights the arts as a value, enhancing creativity, activating sensory experiences, and stimulating cognitive processes, which contribute to health and wellbeing (Fancourt & Finn, 2019). The UNESCO report (UNESCO, 2021) highlights the importance of the arts for social interaction and mental health of children and adolescents in times of pandemic. The OECD (Winner et al., 2013; OECD, 2019a, 2019b) affirms the role of the arts in holistic development but notes the lack of research clearly linking the effects of CEA to improvements in wellbeing. They stress the need to value the arts on the basis of their intrinsic value. A recent UNESCO document (Klepacki et al., 2025) recognises the key role of culture in sustainable development and social justice and emphasises the need for accessibility and inclusion in cultural activities for all.

All these documents highlight the growing interest of the arts sectors in health, which coincides with a number of important developments in global health policy. Building on the "Health in All Policies" approach developed in the early 2000s, the European health policy framework Health 2020, which emphasises the importance of multisectoral collaboration to drive action. This strategic shift has been further emphasised in the recently published WHO Thirteenth General Programme of Work 2019–2023, which also promotes a greater focus on wellbeing and increasing human capital across the life course. In addition, the 2030 Agenda for Sustainable Development includes supporting good health and wellbeing, providing quality education, building sustainable cities and communities, promoting decent work and economic growth, and working in partnership. All these goals, priorities and approaches are integral to engaging with the arts, increasing cultural capital in societies and potentially helping to promote resilience, equity, health and wellbeing across the life course.

3.1.3 Link to the Healthy Lifestyle Construct

The paradigm of health has evolved from a strictly biomedical model to a biopsychosocial and cultural model, acknowledging that wellbeing emerges from the interaction of biological, psychological, social, and environmental factors. Within this expanded framework, art has gained increasing recognition as a determinant of health – a means through which individuals and communities cultivate vitality, emotional balance, and social connection (Fancourt & Finn, 2019; Stuckey & Nobel, 2010).

The large-scale WHO scoping review (Fancourt & Finn, 2019) synthesised over 3,000 studies and concluded that arts participation contributes to both the

promotion of health and the management of illness across the life course. The authors demonstrated that engaging with the arts supports physiological regulation (e. g. reduced cortisol levels, improved immune response), psychological resilience (e. g. reduced anxiety and depression), and behavioural change (e. g. increased motivation for physical activity and social participation). These findings align with Dewey's (1934) and Kroflič's (2007) understanding of aesthetic experience as integrative, dissolving the boundaries between mind and body, thought and feeling, self and world.

Art-based physical activity practices such as dance, music, and theatre integrate physical, emotional, and social processes, making them powerful mediators of health. Research shows that such practices increase adherence to physical activity by linking movement to pleasure, expression, and social bonding (Davies et al., 2014; Dunbar et al., 2012). Participatory art activities have been shown to reduce stress, elevate mood, and enhance physiological regulation through synchronised movement and collective rhythm (Clift, 2012). In this sense, art is not only symbolic representation but also bodily practice that directly shapes the conditions of wellbeing.

Health, moreover, is a social process. Community-based art initiatives enhance social capital, inclusion, and participation – factors that are themselves strong predictors of population health (Macnaughton et al., 2005; Wilkinson, 1996). Artistic participation creates spaces for dialogue, belonging, and collective agency, cultivating empathy and respect for difference (Kroflič, 2007; Matarasso, 1997). These qualities are essential not only for ethical education but also for psychosocial wellbeing and social cohesion.

3.1.4 Empirical Evidence on the Effects of Art on Health

A growing body of research provides robust evidence that engagement with the arts has significant emotional, cognitive, social, and physiological effects across age groups. Studies consistently show that participation in artistic activities enhances emotional regulation, supports mental health, reduces stress, and strengthens social cohesion (Fancourt & Finn, 2019; Cameron et al., 2013; Matarasso, 1997; Putnam, 2000). Experimental, clinical, and longitudinal findings demonstrate that both active and receptive art experiences stimulate multisensory, affective, and cognitive processes, improving psychological flexibility, self-expression, and resilience.

Evidence is particularly strong in youth populations. International data on adolescent mental health reveal substantial increases in psychological distress, loneliness, anxiety, depressive symptoms, and psychosomatic complaints among young people, especially adolescent girls aged 13–15. The 2022 Health Behaviour in School-aged Children (HBSC) study reports declines in life satisfaction, increases in clinically significant mental health problems, and rising levels of physical inactivity and screen time. Slovenian youth exhibit similar trends, with one in six adolescents frequently reporting loneliness and a notable rise in psychosomatic symptoms such as headaches, stomach pain, and sleep difficulties. These findings are consistent with other national studies (Lavrič & Deželan, 2021; Jeriček Klanšček, 2023; UNICEF Slovenija, 2021).

Importantly, some of these studies also show that adolescents identify cultural participation and arts engagement as strategies that help them relax, cope with stress, and enhance overall wellbeing. Research confirms that children and adolescents involved in the arts report greater life satisfaction, fewer symptoms of anxiety and depression, and reduced screen time (Oberle et al., 2020; UNICEF Slovenija, 2021). Artistic involvement fosters creative thinking, identity formation, empathy, and civic engagement, while participatory arts practices have been demonstrably shown to reduce loneliness and improve social functioning (Cameron et al., 2013; Matarasso, 1997). Projects that integrate arts with physical activity also show measurable improvements in children's social and emotional wellbeing (Kokkonen, 2011).

International organisations provide further confirmation. OECD studies highlight that arts education develops critical thinking, creativity, and social competencies (Winner et al., 2013; OECD, 2019a, 2019b), while UNESCO's 2022 and 2024 frameworks emphasise the arts' role in reducing isolation, strengthening social connection, and supporting wellbeing, especially in crisis contexts such as the post-pandemic period. WHO's 2019 evidence review demonstrates that arts engagement supports prevention, treatment, and rehabilitation pathways and enhances psychological resilience.

Slovenian strategic documents reinforce these findings. The National Mental Health Programme (MIRA 2018–2028), adopted by the Republic of Slovenia (2018), emphasises the importance of integrating mental health considerations across various sectors, including culture and the arts, as part of a comprehensive approach to societal wellbeing. The Slovenian Development Strategy 2030 similarly identifies creativity, lifelong learning, and cultural participation as

essential for improving public health and quality of life, particularly for vulnerable groups.

Collectively, these research findings and policy orientations provide compelling evidence that arts engagement significantly contributes to mental health, emotional resilience, social inclusion, and the development of a healthy lifestyle in children, adolescents, and adults alike.

Significance for University Students

University students inhabit a developmental stage marked by accelerated intellectual, emotional, and existential transitions. As they negotiate autonomy, belonging, identity formation, and purpose, the arts offer a unique medium through which they can explore, express, and integrate diverse facets of their inner and social worlds (Frankl, 1963; Ryff & Singer, 2008). Research consistently demonstrates that students who regularly participate in artistic or cultural activities report higher life satisfaction, lower anxiety, and stronger social connectedness (Fancourt et al., 2020; Daykin, 2019). These findings align with contemporary evidence showing that arts participation functions as a significant protective factor for student mental health, particularly during periods of heightened stress and uncertainty (Dai, 2025; Saif, 2024; Agres & Chen, 2025).

Arts engagement supports emotional regulation and coping. Through creative expression, students transform stress, ambiguity, and affective tension into coherent symbolic or aesthetic forms, which enhances psychological integration and resilience (Stuckey & Nobel, 2010; Štirn Janota & Kroflič, 2024). Empirical studies reinforce this mechanism: visual arts practices such as drawing, painting, or mandala work reduce anxiety, depression, and stress; improve mood; and promote relaxation (Raimaini & Zahit, 2023; Liu et al., 2024). Performing-arts interventions – including dance, theatre, and structured creative physical activity – further strengthen physiological self-regulation by synchronising breath, physical activity, and emotion (Karkou & Meekums, 2017). Randomised controlled trials show that such interventions significantly reduce stress and improve overall mental wellbeing in university populations (Agres & Chen, 2025; Liu et al., 2024). These embodied experiences resonate with Csikszentmihalyi's (1990) concept of *flow*, in which focused creative immersion generates intrinsic fulfilment and a sense of unity with action.

Art also nurtures empathy, ethical imagination, and social responsibility. Entering imagined or shared aesthetic spaces allows students to recognise diverse

perspectives, cultivate moral imagination, and engage with questions of justice and community (Nussbaum, 1997; Greene, 1995). Participatory and community-based arts projects – frequently implemented in higher-education contexts – enhance social cohesion, reduce isolation, and support peer relationships (Bungay et al., 2023; Wang et al., 2023). During the COVID-19 pandemic, such creative activities proved essential for maintaining emotional stability and a sense of belonging despite physical distancing (Bungay et al., 2023).

Beyond emotional and relational benefits, arts engagement promotes competencies essential for sustainable and healthy living. Students involved in fine arts, expressive arts, or creative journaling develop stronger self-efficacy, reflective capacity, mindfulness, and problem-solving skills (Xu & Ye, 2022; Pryma & Briegel, 2023). These competencies contribute to healthier lifestyle patterns, including improved stress management, better regulation of study-rest rhythms, and intentional self-care. Evidence from visual-arts courses in medical education shows significant improvements in mindfulness and reductions in perceived stress (Noorily et al., 2023; Sofue, 2023).

Universities that integrate the arts into health promotion, counselling, and curricular design recognise that learning and wellbeing are inseparable. Arts engagement strengthens cognitive, emotional, relational, and existential dimensions of development – dimensions central to holistic education. As Fancourt and Finn (2019) emphasise, the arts operate across prevention, promotion, and rehabilitation. Empirical work further demonstrates that arts-based programmes can enhance mental health literacy, reduce stigma, and provide accessible, non-stigmatising pathways to support (Zhang & Zhao, 2024). Such an approach aligns with the WHO (2021a) and UNESCO (2024) frameworks advocating culturally grounded, participatory, and integrative models of health and education.

Taken together, the evidence affirms that the arts are not ancillary to university life but constitute a vital resource for supporting mental health, fostering resilience, nurturing ethical and social imagination, and enabling students to build sustainable and meaningful ways of living during a formative life stage.

3.2 Wellbeing

3.2.1 Definition of the Area

Wellbeing is increasingly recognised as a complex, multifaceted construct that cannot be reduced to a single indicator such as happiness or the absence of

negative symptoms (Tov, 2018). A literature review reveals that contemporary definitions of wellbeing encompass emotional, psychological, social, and, in some contexts, physical and academic dimensions (Kumari & Thapa, 2025). Accordingly, wellbeing refers to both how individuals feel and how they function in everyday life, integrating momentary experiences with more enduring patterns of coping, relating to others, and engaging with daily demands. It encompasses momentary experiences of affect and vitality, as well as more enduring patterns of coping, relating to others, and engaging with life's demands (Diener et al., 2018).

From a broader perspective, two influential traditions help frame current understandings. The hedonic tradition defines wellbeing in terms of pleasure attainment and pain avoidance, typically measured as life satisfaction and balance of positive over negative affect. The eudaimonic tradition focuses on meaning, self-realisation, and optimal functioning, defining wellbeing as the extent to which a person is fully functioning and living in accordance with deeply held values (Ryan & Deci, 2001). Contemporary work does not treat these perspectives as mutually exclusive; instead, it integrates them within broader, multidimensional frameworks.

Integrative models propose that wellbeing is best understood as a dynamic balance between resources and challenges. Dodge et al. (2012) describe wellbeing as the point at which an individual's psychological, social, and physical resources are sufficient to meet the psychological, social, and physical demands they encounter; when challenges outweigh resources, wellbeing deteriorates, whereas when resources are adequate or abundant, wellbeing tends to be more stable and positive. This balance-oriented view aligns with broader work on subjective wellbeing that conceptualises wellbeing as an ongoing process of adapting to life circumstances rather than a static trait (Diener et al., 2018).

These ideas are closely compatible with the biopsychosocial model of health (Engel, 1977), which underpins the empirical work in this monograph and posits that biological, psychological, and social factors jointly shape health and wellbeing. Within this perspective, wellbeing cannot be attributed solely to internal psychological states or to external conditions; instead, it emerges from the interaction between individuals' internal resources (e. g. emotion regulation, coping skills, sense of coherence) and the social and physical environments in which they live and study (Galderisi et al., 2015).

Another strand of work, rooted in positive psychology, emphasises the importance of personal growth, resilience, positive emotion, engagement, and

meaning as core components of wellbeing. Ryan and Deci (2001) highlight that wellbeing is not only about feeling good but also about functioning in an autonomous, competent, and related way, while Seligman et al. (2009) argue that cultivating positive emotion, engagement, relationships, meaning, and accomplishment can systematically enhance wellbeing and resilience, particularly in educational settings. In the context of higher education, these insights have informed the development of "positive education" approaches that explicitly teach skills for building strengths, regulating emotions, and sustaining meaningful engagement in studies. Such approaches conceptualise wellbeing as involving functioning optimally as a student, not merely avoiding distress, and are particularly relevant considering rising levels of psychological difficulties in university student populations (Douwes et al., 2023; Vršnik Perše & Grafenauer Ekart, 2025).

Integrative models propose that wellbeing is best understood as a dynamic balance between resources and challenges. Dodge et al. (2012) describe wellbeing as the point at which an individual's psychological, social, and physical resources are sufficient to meet the psychological, social, and physical challenges they face. When challenges outweigh resources, wellbeing drops; when resources are adequate or abundant, wellbeing is more stable or flourishing. These ideas are compatible with the biopsychosocial model of health (Engel, 1977), which underpins the empirical work in this monograph and posits that biological, psychological, and social factors jointly shape health and wellbeing. Also, another strand of work emphasises the importance of personal growth, increase of resilience, positive emotion, engagement, and meaning, arguing that teaching of those is possible and involves not only feeling good but also functioning optimally as a student, particularly in the face of rising psychological distress (Seligman et al., 2009).

Within this project, wellbeing is operationalised using the World Health Organization-Five Wellbeing Index (WHO-5), a widely used, psychometrically robust instrument that assesses positive mood, vitality, and general psychological functioning over the previous two weeks (Topp et al., 2015; WHO Regional Office for Europe, 1998). The WHO-5 has demonstrated robust psychometric properties across diverse populations and cultural contexts, with consistently high internal consistency (Cronbach's α typically ranging from 0.80 to 0.95) across multiple language versions and settings (Sischka et al., 2025).

The WHO (2021b) states that wellbeing encompasses both the quality of life and the ability of people and societies to contribute to the world in accordance

with a sense of meaning and purpose. A society's wellbeing can be observed by the extent to which it is resilient, builds capacity for action, and is prepared to transcend challenges. Accordingly, the WHO-5 fits closely with the positive focus of contemporary wellbeing research, as it emphasises the presence of positive mood, vitality, and engagement with life rather than merely the absence of distress (Sischka et al., 2025). It comprises five items that tap central facets of hedonic or subjective wellbeing – namely, positive affect and felt energy – mirroring the hedonic definitions commonly applied in epidemiological and public health studies (Sischka et al., 2025).

In this monograph, we understand wellbeing as a positive, multidimensional and dynamic state, rather than a single feeling or score. It includes feeling well emotionally – for example, feeling cheerful, calm, energetic, and interested in life – but also having a sense that life is meaningful and that you are growing as a person. It is about feeling capable and in control of your own decisions and believing you can handle everyday demands. Wellbeing also depends strongly on relationships: feeling connected to others, supported by friends, family, and peers, and having a genuine sense of belonging in your study programme and university community. Ultimately, it involves the sense that you can manage difficulties and still participate fully in academic and social life, rather than being overwhelmed by challenges.

Aligned with contemporary integrative models, this definition brings together hedonic aspects (positive affect and life satisfaction), eudaimonic aspects (meaning, personal growth, and optimal functioning), and contextual/relational aspects (social connectedness, belonging, and participation). It is consistent with the balance-oriented and biopsychosocial perspectives in which wellbeing reflects the fit between individuals' psychological, social, and physical resources and the demands they face, as well as with positive psychology approaches that highlight resilience, engagement, and the cultivation of strengths.

In this way, wellbeing is more than the absence of problems; it is a broad picture of how students are really doing in their emotional, social, and academic lives. This integrated understanding serves as the starting point for the remainder of the monograph, shaping how we view the connections between wellbeing and a healthy lifestyle, how we utilise and interpret measures such as the WHO-5, and why we argue that promoting student wellbeing is a central task for universities, not just an optional extra.

3.2.2 Link to the Healthy Lifestyle construct

Having established wellbeing as a multidimensional construct encompassing hedonic, eudaimonic, and relational dimensions, we now turn to the question of how wellbeing relates to healthy lifestyle behaviours. The connection between wellbeing and lifestyle is neither incidental nor unidirectional; rather, contemporary research reveals a complex, bidirectional relationship in which psychological wellbeing and health behaviours mutually influence and reinforce one another over time (Steptoe, 2019).

In this section, we will try to synthesise theoretical frameworks and empirical evidence linking wellbeing to healthy lifestyle, establish the rationale for examining these constructs together in university student populations, and outline the conceptual pathways through which they interact.

Several complementary theoretical models explain why and how wellbeing and a healthy lifestyle are interconnected.

First, the biopsychosocial model (Engel, 1977) – already introduced as underpinning our approach to wellbeing – explicitly recognises that health outcomes emerge from the interplay of biological, psychological, and social factors. Within this framework, lifestyle behaviours (physical activity, nutrition, sleep, substance use) represent modifiable pathways through which psychological states influence physical health, while simultaneously, the physiological consequences of health behaviours feedback to shape mood, energy, and cognitive functioning (Ohrnberger et al., 2017). In other words, wellbeing and lifestyle are thus not separate domains, but mutually constitutive parts of a broader health.

Second, Self-Determination Theory (SDT) (Ryan & Deci, 2001) provides a motivational framework for understanding why individuals engage in health-promoting behaviours. SDT posits that when basic psychological needs – autonomy, competence, and relatedness – are satisfied, individuals experience greater wellbeing and are more likely to pursue intrinsically motivated, self-regulated health behaviours (Ntoumanis et al., 2021). From this perspective, wellbeing and healthy lifestyle share common motivational roots: the same psychological conditions that support wellbeing – feeling autonomous, competent, and connected – also support sustained engagement in healthy behaviours.

Third, the resource-and-demand framework introduced by Bakker and Demerouti (2007) provides a dynamic perspective on the interaction between wellbeing and lifestyle. When individuals (especially university students) have

sufficient psychological, social, and physical resources, they are better able to maintain healthy routines – such as regular exercise, balanced nutrition, and adequate sleep – even under academic or social pressure (Mikolajczyk et al., 2009). Healthy lifestyle behaviours then expand resource pools, such as physical activity, which enhances mood and cognitive function (Biddle et al., 2019), adequate sleep, which restores emotional regulation capacity (Walker, 2017), and balanced nutrition, which supports sustained energy and concentration (Gómez-Pinilla, 2008). When demands chronically exceed resources, wellbeing typically declines, and lifestyle behaviours often deteriorate first: students skip meals, cut sleep, reduce physical activity, or turn to alcohol and other substances to cope (Roldán-Espínola et al., 2024). This can trigger a downward spiral in which both wellbeing and health behaviours lessen.

A substantial body of empirical research supports the theoretical proposition that wellbeing and a healthy lifestyle are reciprocally related. Longitudinal and intervention studies demonstrate that the relationship operates in both directions: wellbeing predicts subsequent health behaviours, and health behaviours predict subsequent wellbeing.

Individuals with higher levels of subjective wellbeing, life satisfaction, and positive affect are more likely to engage in health-promoting behaviours across multiple domains. Prospective studies show that greater baseline wellbeing predicts increased physical activity (Piqueras et al., 2011) and better dietary habits (Boehm et al., 2018). The rational is that there are plausible biological, social, and behavioural pathways that allow for positive feelings to get under the skin and influence physical wellness and the mechanisms underlying these effects likely involve multiple pathways, including enhanced self-regulation capacity, greater future-oriented thinking, increased social engagement that facilitates healthy routines, and reduced reliance on maladaptive coping strategies (Pressman et al., 2019).

On the other hand, engagement in healthy lifestyle behaviours predicts improvements in psychological wellbeing. Meta-analyses confirm that regular physical activity reduces symptoms of depression and anxiety and enhances positive affect and life satisfaction across diverse populations (White et al., 2017). Similarly, better diet quality, especially higher intake of fruits, vegetables, and minimally processed foods, leads to higher levels of wellbeing (Nestorowicz et al., 2022).

Importantly, individuals who maintain both high wellbeing and a healthy lifestyle tend to accumulate benefits, whereas those low on both face an elevated risk of poor mental and physical health (Steptoe, 2019).

3.2.3 Healthy Lifestyle and Wellbeing in the University Students Context

For university students, the interplay of wellbeing and lifestyle is especially important. The transition into higher education is a sensitive developmental period marked by new autonomy, academic demands, shifting social networks, and often, separation from family. The transition to higher education represents a critical developmental period characterised by newfound autonomy, academic pressures, social reconfigurations, and – often for the first time – full responsibility for managing one's own health behaviours (El Ansari & Stock, 2010).

At the same time, students gain almost full responsibility for their own daily routines and health behaviours. Lifestyle patterns established during university years tend to persist into adulthood, making this a crucial window for intervention (Kwan et al., 2012). For young adults, the "big three" health behaviours – sleep, physical activity, and diet – have been identified as particularly important, with sleep quality often emerging as the strongest predictor of mental health and wellbeing (Wickham et al., 2020).

Yet research consistently documents that many university students adopt unhealthy lifestyles precisely when they are most vulnerable: irregular sleep schedules, poor dietary habits, insufficient physical activity, and elevated alcohol consumption are widespread in student populations (El Ansari & Stock, 2010).

Drawing on the theoretical models and empirical evidence reviewed above, we propose an integrated framework for understanding the relationship between wellbeing and healthy lifestyle in university students. This framework positions wellbeing and a healthy lifestyle as interdependent components of a dynamic adaptive system, embedded within the broader biopsychosocial context of university life.

3.3 Body Composition

3.3.1 Definition of the Area

Body composition is a key construct in human biology and public health, referring to the relative proportion of fat mass, fat-free mass (including skeletal

muscle), bone mass, and water in the body. Rather than focusing solely on body weight, body composition illustrates how this weight is distributed across tissues that differ markedly in their metabolic and functional roles (Bouchard et al., 2012). From a health perspective, a favourable body composition is typically characterised by lower relative fat mass and higher lean mass, especially skeletal muscle, which supports locomotion, posture, and metabolic regulation throughout the lifespan (Janssen et al., 2000).

The assessment of body composition can be approached indirectly through anthropometric indices and more directly through instrument-based methods. Common anthropometric indicators include body mass index (BMI), percentage of body fat, waist circumference, waist-to-hip ratio, and skinfold thickness at selected sites (Breitenbach et al., 2016; Zdešar Kotnik & Golja, 2012). More advanced techniques, such as bioelectrical impedance analysis (BIA), dual-energy X-ray absorptiometry (DXA), and multi-site skinfold measurements, enable a more detailed analysis of total and segmental fat mass, lean mass, bone mineral content, and visceral fat (Fayad & Dopsaj, 2024; Mendoza-Muñoz et al., 2022). In the empirical work on Slovenian university students, body composition is assessed using the InBody 270 multifrequency bioimpedance device, which provides a comprehensive profile including body fat mass, fat-free mass, skeletal muscle mass, proteins, minerals and visceral fat.

International health organisations emphasise that excess body fat – operationalised as overweight and obesity – has become one of the most pressing global health problems (WHO, 2017). Obesity is strongly linked to cardiovascular disease, type 2 diabetes, some cancers, and musculoskeletal disorders, and is associated with hypertension, dyslipidaemia, systemic inflammation, and metabolic disturbances that impair quality of life and increase premature mortality risk (Blüher, 2019; Hunot et al., 2016; Zamboni et al., 2008). These risks are not confined to older adults: longitudinal and cross-sectional studies show that unfavourable body composition, already present in childhood and adolescence, predicts poorer cardiometabolic health, lower physical fitness, and functional limitations later in life (Ortega et al., 2008).

An increasing number of studies examine how body composition relates to broader constructs such as physical fitness, physical activity and physical literacy. In children and adolescents, higher physical fitness and physical literacy are consistently associated with lower body fat percentage, more favourable fat distribution and higher lean mass (Mendoza-Muñoz et al., 2021; Muñoz-Urtubia et al., 2024; Nezondet et al., 2023). For example, studies in Spanish, Portuguese,

and Chilean youth demonstrate that children with higher physical literacy scores perform better on fitness tests and exhibit healthier BMI, waist-to-height ratios, and skinfold profiles (Domínguez-Martín et al., 2024; Mendoza-Muñoz et al., 2021, 2022; Muñoz-Urtubia et al., 2024). These findings support the view that body composition is not merely a static biomedical outcome but is embedded in a broader behavioural and educational context.

In university populations, body composition has been examined both as a health indicator and as an outcome of lifestyle and environmental changes associated with the transition to adulthood. Research on Hungarian college students, for instance, shows clear links between dietary habits, physical activity patterns and indicators such as BMI and body fat percentage (Breitenbach et al., 2016). Similarly, a Slovenian study of university students from different birth cohorts reports secular changes in body composition, including increases in adiposity, in a context of socio-economic transition (Zdešar Kotnik & Golja, 2012). More recent work among Lebanese sport-science students found that dietary patterns were closely related to body fat percentage and skeletal muscle mass, again measured using multifrequency bioimpedance (Fayad & Dopsaj, 2024).

Within teacher-education programmes, body composition is increasingly recognised as part of the physical domain of physical literacy. Conceptual models interpret physical literacy as a multidimensional construct encompassing physical competence, motivation and confidence, knowledge and understanding, and engagement in physical activity across the life course (Cairney et al., 2019; Whitehead, 2019a, 2019b). Body composition enters this framework as a physiological marker of physical competence and health, reflecting both prior engagement in physical activity and constraining or facilitating future participation. Higher levels of body fat can reduce mobility, increase fatigue and lower self-confidence in physical activity, whereas higher lean mass and adequate body fat support physical efficiency, injury prevention and active living (Bouchard et al., 2012; Mendoza-Muñoz et al., 2021).

Taken together, existing research defines body composition as a central health indicator across the lifespan, shaped by interactions between biological, behavioural and socio-environmental factors. In the specific context of university students – and especially prospective teachers – body composition provides an important empirical bridge between individual lifestyle, educational experiences and their future capacity to model and promote health-enhancing behaviours.

3.3.2 Link to the Healthy Lifestyle construct

A healthy lifestyle is a multidimensional construct that integrates dietary habits, physical activity, sleep, daily routines, stress management, and social-emotional balance. Empirical studies on Slovenian university students operationalise this construct through three main instruments: the Healthy Lifestyle and Personal Control Questionnaire (HLPCQ), the International Physical Activity Questionnaire – Short Form (IPAQ-SF) and the WHO-5 Wellbeing Index. Each captures a different but complementary facet of lifestyle that is theoretically and empirically linked to body composition.

Body composition can be understood as the cumulative outcome of these lifestyle domains over time. The energy balance between dietary intake and energy expenditure through physical activity is a primary determinant of fat mass, but other factors such as sleep, stress and social context also play an important role (Chooi et al., 2019; Johnson et al., 2006). Research synthesized in the manuscript shows that irregular eating patterns, frequent consumption of fast food, snacks and sugar-sweetened beverages, and time pressures that limit the preparation of healthy meals contribute to higher body mass and fat percentage among students (Kremmyda et al., 2008; Mokdad et al., 2003). At the same time, many students spend long hours sitting in front of computers for academic or leisure activities, which reduces overall energy expenditure and increases the risk of weight gain (Mokdad et al., 2003).

Studies confirm that overweight and obesity are spreading rapidly, especially in developed regions, and now affect young people and students at worrying levels (Flegal et al., 2016; WHO, 2017). The university period, often marked by leaving the parental home, new social roles and academic pressures, is particularly critical: weight gain during the first years of studies is commonly reported and has been associated with shifts in eating habits, lower physical activity and higher stress (Mourtakos et al., 2015; Ogden et al., 2015; Rahmani et al., 2015). The Slovenian study of pre-service teachers replicates this concern by identifying a subgroup of students with overweight and obesity who show markedly higher body fat mass and body fat percentage than their normal-weight peers, despite comparable self-reported lifestyle scores.

Within this context, physical activity and physical literacy function as central mechanisms linking lifestyle and body composition. Studies in children and adolescents have demonstrated that higher physical literacy is associated with higher physical activity, better fitness, and more favourable body composition profiles, including lower adiposity and healthier fat distribution (Domínguez-

Martín et al., 2024; Mendoza-Muñoz et al., 2021; Muñoz-Urtubia et al., 2024; Nezondet et al., 2023). Interventions such as the PLBreaks programme show that embedding short, structured physical-literacy-oriented activity into the school day can simultaneously improve physical competence and body composition indicators (Mendoza-Muñoz et al., 2022). These findings illustrate how lifestyle, body composition, and physical literacy operate in a feedback loop: higher literacy promotes more frequent and competent participation in physical activity, which in turn improves body composition, supporting motivation and confidence to remain active.

A second important pathway lies in dietary habits. The study by Breitenbach et al. (2016) on Hungarian college students demonstrates systematic associations between eating habits, smoking, physical activity and indices such as BMI and body fat percentage. Similarly, research among Lebanese active university students has shown that healthier dietary patterns are linked to lower body fat and better skeletal muscle mass, as measured with the InBody 270 (Fayad & Dopsaj, 2024). These findings align with the Slovenian work, where normal-weight students achieved higher HLPCQ scores in domains such as daily routine and overall personal control, suggesting that structured routines and self-regulation support healthier body composition (Bach, 2025; Darviri et al., 2014).

A third pathway between lifestyle and body composition operates through psychological and social aspects. Obesity and overweight are associated not only with physical comorbidities but also with increased risk of depression, anxiety, low self-esteem and social isolation (Hunot et al., 2016; Tomiyama, 2019). Weight stigma itself can negatively affect mental health, as meta-analytic evidence confirms strong associations between experienced stigma and mental-health problems (Emmer et al., 2020). The WHO-5 captures aspects of mood and vitality that can influence both dietary behaviour and physical activity: low wellbeing may reduce motivation to exercise, disrupt sleep, and promote stress-related or emotional eating, further worsening body composition (Tomiyama, 2019).

Interestingly, the Slovenian study finds only modest differences between normal-weight and overweight/obese pre-service teachers in self-reported dietary habits, physical activity and wellbeing, despite large differences in body fat and BMI (Matejek & Kukovica, 2025). This pattern contrasts with studies that report clear behavioural differences between weight groups (e. g. Hansen et al., 2013), and it invites a more nuanced interpretation. Self-reported lifestyle data are vulnerable to recall error and social desirability bias, especially when sen-

sitive topics such as weight and diet are involved (Klesges et al., 2004). Additionally, environmental and socio-economic constraints may limit the extent to which individual intentions translate into health-promoting behaviours, even among students who perceive themselves as leading a healthy lifestyle (Adams, 2020). These findings underline the importance of combining subjective lifestyle questionnaires with objective measures such as body composition, accelerometry and, where possible, dietary assessment using logs or biomarkers.

In summary, body composition is deeply intertwined with the broader concept of a healthy lifestyle. It functions both as a long-term outcome of dietary, physical, psychosocial and environmental influences, and as an active determinant of an individual's capacity and motivation to engage in health-enhancing behaviours. For university students, this interplay is particularly salient during a life phase in which lifestyle habits are being consolidated and may track into mid- and later adulthood.

3.3.3 Significance for University Students

The relationship between body composition and healthy lifestyle holds specific significance in the university context, where young adults navigate substantial developmental, social and academic transitions. First, early adulthood is a critical window for the establishment of long-term health behaviours. Evidence suggests that weight gain in the student years is common and tends to persist, contributing to the global rise in adult obesity and related chronic diseases (Flegal et al., 2016; Ogden et al., 2015; WHO, 2017). When excess body fat accumulates in young adults, cardiometabolic risk factors such as hypertension, dyslipidaemia and insulin resistance may already be present, even in individuals whose BMI is still classified as normal (Hunot et al., 2016; Zamboni et al., 2008). Monitoring body composition among university students serves as an early warning system for potential health problems and a basis for timely preventive action.

Second, body composition directly influences students' functional capacity, participation in physical activity and overall quality of life. Higher levels of adiposity and lower muscle mass are associated with lower physical fitness, increased fatigue, and greater musculoskeletal strain, which can limit engagement in sports, active commuting, and daily physical tasks (Bouchard et al., 2012; Ortega et al., 2008). Conversely, adequate lean mass combined with a moderate body fat percentage supports efficient movement, resilience to stress and participation in a physically active lifestyle, which are important resources

for coping with academic demands and maintaining psychological wellbeing (Johnson et al., 2006; Tomiyama, 2019). In the Slovenian sample of pre-service teachers, normal-weight students reported more days of vigorous physical activity and higher daily routine and Healthy Lifestyle Index (HLPCQ total score), suggesting that more favourable body composition is linked to more structured and active daily patterns.

Third, the university environment offers a unique opportunity – but also a challenge – for shaping one's lifestyle. Students often experience increased autonomy over their diet, daily schedule and leisure time, but this autonomy unfolds in settings characterised by irregular timetables, academic pressures, financial constraints and easy access to energy-dense foods. The studies summarised in the dissertation show that students frequently rely on fast food and convenience meals, have limited time for physical activity, and accumulate long periods of sedentary behaviour, all of which can contribute to unfavourable changes in body composition (Breitenbach et al., 2016; Kremmyda et al., 2008; Mokdad et al., 2003). At the same time, universities may not always provide sufficient structural support for health promotion, such as accessible sports facilities, flexible scheduling for activity, or integrated health-education content in curricula.

Fourth, for university students enrolled in teacher-education programmes, body composition and lifestyle have an additional professional dimension. Future teachers and educators are important role models who influence children's and adolescents' attitudes towards physical activity, nutrition and health. Research on pre-service teachers indicates that those who are more physically literate and who have favourable health behaviours feel more competent and confident in promoting physical activity and health in their future classrooms (Dinham & Williams, 2019; Leung et al., 2024; Stoddart & Selanders, 2022). Evidence suggests that students who understand the connection between physical literacy and body composition, and who maintain healthy body composition parameters themselves, are better equipped to transmit knowledge, skills, and positive attitudes to younger generations (Nezondet et al., 2023). In this sense, improving body composition among pre-service teachers is not only a matter of individual health, but also an investment in the health literacy of future pupils.

Fifth, the specific pattern observed in Slovenian pre-service teachers – large differences in body composition between normal-weight and overweight/obese students, but only modest differences in self-reported lifestyle – raises

important questions for both research and practice. On the one hand, it points to potential biases in self-assessment, including social desirability and limited awareness of what constitutes "healthy" behaviour (Klesges et al., 2004). On the other hand, it suggests that structural factors – such as socio-economic constraints, study-related stress and the organisation of university life – may limit students' capacity to act on their intentions, even when they value health (Adams, 2020). This underlines the need for interventions that move beyond individual information campaigns and address broader determinants, including the design of campus environments, availability of healthy food options and timetabling that enables regular physical activity.

Finally, integrating systematic body composition monitoring and lifestyle counselling into university health-promotion strategies aligns with broader public health goals of reducing obesity and related chronic diseases (Blüher, 2019; WHO, 2017). For faculties of education, this integration can take the form of curriculum elements that combine theoretical content on physical literacy, body composition and health with practical experiences in physical activity, self-monitoring and reflective practice. Such an approach supports students in developing their own healthy lifestyles while simultaneously preparing them to plan, implement and evaluate health-promoting activities in schools (Cairney et al., 2019; Dinham & Williams, 2019; Stoddart & Selanders, 2022). In the long term, strengthening the relationship between healthy lifestyle, favourable body composition and physical literacy among university students – especially prospective teachers – has the potential to contribute to healthier school environments and, ultimately, to a healthier society.

3.4 Physical Activity

3.4.1 Definition of the Area

Physical activity is generally defined as any bodily movement produced by skeletal muscles that results in energy expenditure and contributes to physical fitness and health. It encompasses a broad spectrum of behaviours, ranging from unstructured activities (e. g. walking, climbing stairs, household chores) to organised exercise and sports participation in leisure time, at work, at university, or at home (Bouchard et al., 2012). Within health-related frameworks, physical activity is one of the main behavioural determinants of cardiorespiratory fitness, muscular strength, endurance and body composition, and is therefore regarded as a core component of a healthy lifestyle (Bouchard et al., 2012; Ortega et al., 2008).

Body composition is closely related to physical activity. It reflects the relative proportion of fat mass, fat-free mass and skeletal muscle mass, as well as the distribution of adiposity. Higher levels of habitual physical activity, especially moderate-to-vigorous physical activity (MVPA), are generally associated with more favourable body composition in children, adolescents and adults (Bouchard et al., 2012; Lubans, et al., 2010; Ortega et al., 2008). Bioimpedance analysis (e. g. InBody devices) is commonly used in research with university students to estimate fat mass, fat-free mass and related parameters, enabling researchers to examine how physical activity patterns are reflected in body composition profiles (Breitenbach et al., 2016; Mendoza-Muñoz et al., 2021).

In contemporary approaches to movement and health, physical activity is conceptually embedded in the broader construct of physical literacy. Physical literacy is described as a multidimensional, lifelong process that integrates physical, cognitive, psychological, and social domains, enabling individuals to participate meaningfully and confidently in physical activity throughout their lives (Whitehead, 2010, 2019a; Shearer et al., 2018; Tremblay et al., 2018). It involves physical competence and physical capacities (physical domain), knowledge and understanding about physical activity and health (cognitive domain), motivation, confidence and self-regulation (psychological domain), as well as the ability to interact with others in physical activity contexts (social domain) (Alipour-Anbarani et al., 2023; Lemes et al., 2024; Van Wyk et al., 2024; Whitehead, 2019a).

Within this framework, physical activity is not only an outcome of physical literacy but also a constitutive element and primary context of it. Participation in diverse physical activities provides opportunities to develop motor skills, understand the value of physical activity and build positive affective experiences, which in turn reinforce future engagement (Cairney et al., 2019; Dlugonski et al., 2022; Jerebine et al., 2024; Whitehead, 2019b). Recent reviews highlight a bidirectional relationship: higher physical literacy predicts more frequent and sustained physical activity, while regular physical activity further supports the development of physical literacy components (Boldovskaia et al., 2023; Cairney et al., 2019; Lemes et al., 2024).

When studying university students, physical activity is often assessed with self-report questionnaires such as the International Physical Activity Questionnaire – Short Form (IPAQ-SF). The IPAQ-SF captures time spent in vigorous-intensity and moderate-intensity physical activity, as well as walking and sitting, during the previous seven days, allowing classification into low, moder-

ate, and high physical activity levels. It has been adapted and validated in different languages, including a Slovenian version (Marinšek et al., 2022). However, like all self-reported measures, IPAQ-SF is vulnerable to recall bias and social desirability; comparisons with objective measures show that self-reports often overestimate physical activity and underestimate sedentary time (Meh et al., 2021; Prince et al., 2008).

Taken together, in the context of university students, physical activity can be defined as the spectrum of bodily movements that produce energy expenditure, contribute to physical fitness and body composition, and serve as the main experiential context in which physical literacy develops and is expressed (Bouchard et al., 2012; Cairney et al., 2019; Whitehead, 2010, 2019b).

3.4.2 Link to the Healthy Lifestyle Construct

In research on university students, a healthy lifestyle is frequently operationalized using the Healthy Lifestyle and Personal Control Questionnaire (HLPCQ). The HLPCQ assesses the frequency of positive lifestyle habits across five subscales: healthy dietary choices, dietary harm avoidance, daily routines, organised physical activity and social/mental balance (Darviri et al., 2014). Higher scores indicate greater perceived personal control over lifestyle behaviours. Physical activity is represented explicitly through the "organised physical activity" subscale and implicitly through routines and social-mental balance, underlining its embeddedness in the broader lifestyle pattern (Darviri et al., 2014).

Insufficient physical activity is strongly associated with overweight and obesity, which in turn increases the risk of cardiometabolic diseases, musculoskeletal disorders and reduced quality of life (Adams, 2020; Chooi et al., 2019). Among young adults, the university period is particularly critical: transitions to independent living, changes in dietary habits and high academic demands often lead to decreased physical activity, irregular eating patterns and weight gain (Mokdad et al., 2003; Ogden et al., 2015). Studies among student populations show that unhealthy dietary choices (frequent fast food, energy-dense snacks, sugary drinks) combined with sedentary behaviour contribute to an adverse lifestyle profile and higher prevalence of overweight and obesity (Breitenbach et al., 2016; Kremmyda et al., 2008; Mourtakos et al., 2015).

Stress is a key factor linking lifestyle components. Research among medical and university students indicates that high study-related stress is associated with

emotional eating, disrupted sleep and reduced motivation for physical activity (Dahlin et al., 2005; Tomiyama, 2019). Stress and insufficient sleep can influence the hormonal regulation of appetite and energy balance, thereby increasing the risk of obesity (Tomiyama, 2019). At the same time, regular physical activity acts as a buffer, improving mood, supporting sleep quality, and enhancing perceived energy and wellbeing, thereby facilitating healthier choices in other lifestyle domains (Adams, 2020; Lubans et al., 2010).

Subjective wellbeing in students is often evaluated using the WHO-5 Wellbeing Index, a brief questionnaire that assesses mood, vitality, and general wellbeing. Scores below the recommended cut-off indicate low wellbeing and a need for further mental-health screening (WHO, 2024). In studies using HLPCQ, IPAQ-SF and WHO-5 together, patterns typically show that students who are more physically active report better overall lifestyle control and higher wellbeing, even if BMI differences are modest (Darviri et al., 2014; Meh et al., 2021; Prince et al., 2008).

Evidence from children and adolescents reinforces this integrative perspective. Higher levels of physical literacy are consistently linked with more favourable body composition, better cardiorespiratory fitness and higher physical activity (Jiang et al., 2025; Lubans et al., 2010; Mendoza-Muñoz et al., 2021; Muñoz-Urtubia et al., 2024; Nezondet et al., 2023; Ortega et al., 2008). Studies in school-aged populations have shown that physically literate children exhibit lower obesity indicators (e. g. body fat percentage, waist-to-height ratio), more active lifestyles, and better fitness outcomes (Jiang et al., 2025; Mendoza-Muñoz et al., 2021; Nezondet et al., 2023).

Importantly for the student population, research focusing explicitly on physical literacy, physical activity and sedentary behaviour among university students finds that higher perceived physical literacy is associated with higher levels of MVPA and lower sedentary time (She et al., 2023; Yan et al., 2022). This indicates that physical activity is part of a broader constellation of competencies, beliefs and environmental opportunities that collectively define a healthy lifestyle. Physical literacy provides the motivational and competence-related basis for engaging in physical activity, which in turn reinforces healthy lifestyle patterns, as captured by instruments such as the HLPCQ.

Socio-environmental factors further shape these relations. The availability of healthy food on campus, access to sports facilities, the safety of the environment, and prevailing social norms surrounding weight and activity all influence whether students can translate knowledge and motivation into daily

practice (Adams, 2020; Johnson et al., 2006). Studies show that students in demanding academic environments often rely on convenient but less healthy food options, spend long hours sitting at computers and may use unhealthy eating as a stress-coping mechanism (Kremmyda et al., 2008; Mokdad et al., 2003; Tomiyama, 2019). In such a context, physical activity becomes a critical protective factor, but at the same time, it is one of the behaviours most threatened by time pressure and fatigue.

Overall, physical activity is both a distinct lifestyle behaviour and a core pillar of the healthy lifestyle construct. It appears explicitly in lifestyle measurement tools (HLPCQ, IPAQ-SF), is closely interwoven with diet, stress, sleep and social balance, and is grounded in the broader framework of physical literacy that links everyday physical activity with physical and mental health outcomes (Cairney et al., 2019; Darviri et al., 2014; Santos Souza et al., 2022; Whitehead, 2010, 2019b; Yan et al., 2022).

3.4.3 Significance for university students

The university period is widely recognised as a critical window for the formation of long-term lifestyle patterns. Young adults move away from family environments, assume responsibility for their own meals, time management and health behaviours, and face new academic and social demands. Population data and university-based studies indicate that this transition is often accompanied by weight gain and an increasing prevalence of overweight and obesity (Baum & Ruhm, 2009; Mourtakos et al., 2015; Ogden et al., 2015; Rahmani et al., 2015). These trends are of public health concern because excess weight in early adulthood is associated with an increased risk of cardiometabolic diseases, reduced mobility, and poorer quality of life later in life (Adams, 2020; Chooi et al., 2019; Stenholm et al., 2009).

The study by Matejek and Kukovica (2025) on pre-service teachers in a Slovenian context illustrates these issues. In their sample of 55 pre-service primary teachers, overweight and obese students had significantly higher body fat and fat mass, as expected. However, they also had higher fat-free and skeletal muscle mass, reflecting an overall larger body size (Rahemi et al., 2015; Tallis et al., 2018). Differences in vigorous physical activity and in some lifestyle parameters were present but modest: normal-weight students reported more vigorous physical activity over the previous week and a more structured daily routine, and scored higher on Healthy Lifestyle Index (HLPCQ total score) (Darviri et al., 2014; Prince et al., 2008). These results suggest that even relatively small

differences in physical activity and routine may be associated with meaningful differences in body composition, while self-perceived lifestyle quality can remain consistent across weight groups.

From a student-health perspective, the significance of physical activity extends beyond body weight. Regular activity contributes to psychological wellbeing, stress management and academic functioning. In the context of high study demands, students experience considerable stress, which is linked with depressive symptoms, anxiety and maladaptive coping strategies such as overeating or inactivity (Dahlin et al., 2005; Hunot et al., 2016; Tomiyama, 2019). Physical activity is consistently associated with better mood, greater vitality and higher WHO-5 scores, and can therefore help students cope more effectively with academic pressures (Lubans et al., 2010; WHO, 2024).

For university students in teacher education, physical activity and physical literacy are particularly important because these students are future educators who will influence children's and adolescents' physical activity and health behaviours. Studies show that teachers' own physical literacy and physical activity are associated with their self-efficacy and perceived competence to promote physical activity in educational settings (Dinham & Williams, 2019; Leung et al., 2024; Rutkauskaite et al., 2024; Van Wyk et al., 2024). Physically literate teachers are more likely to integrate physical activity into everyday teaching, encourage active lifestyles among pupils and act as credible role models (Jurak et al., 2023; Shearer et al., 2018; Tremblay et al., 2018).

However, evidence also points to conceptual and practical gaps. Many pre-service teachers equate physical literacy with traditional notions of physical fitness or sport-specific skills, and as a result, they feel less confident about assessing and fostering physical literacy in children (Barnett et al., 2023; Stoddart & Selanders, 2022; Van Wyk et al., 2024). This implies that their own participation in physical activity, while necessary, is insufficient; it needs to be accompanied by structured learning about physical literacy, health promotion and the design of movement-rich learning environments (Corbin, 2016; Whitehead, 2010).

Policy documents in Slovenia further underscore the significance of physical activity for young people. The national guidelines for integrating physical activity in educational settings emphasise that children should have daily opportunities for physical activity, active breaks and a supportive environment that values and enables physical activity throughout the school day (Jurak et al., 2023). For these guidelines to be implemented effectively, it is essential that university programmes themselves offer environments that support healthy,

physically active lifestyles. University students – especially those in teacher-education programs – should experience an institutional environment where physical activity and healthy lifestyle behaviours are emphasised, valued and practically supported through accessible facilities, timetabling and curricular content (Johnson et al., 2006; Jurak et al., 2023).

Methodologically, existing studies on student physical activity and lifestyle habits rely heavily on self-report measures, which can obscure true differences between groups due to over- or under-reporting (Meh et al., 2021; Prince et al., 2008). Combining self-reported questionnaires (HLPCQ, IPAQ-SF, WHO-5) with objective measures of physical activity (e. g. accelerometry) and body composition (e. g. bioimpedance, anthropometry) would allow a more accurate understanding of how students' physical activity behaviours relate to health outcomes (Breitenbach et al., 2016; Mendoza-Muñoz et al., 2022; Muñoz-Urtubia et al., 2024). Such evidence is crucial for designing effective university-level interventions that treat physical activity as an integral part of a healthy lifestyle rather than an optional extracurricular activity.

In summary, physical activity plays a crucial role in maintaining a healthy lifestyle among university students. It influences body composition, physical and mental health, and academic functioning, and in the case of future teachers, it shapes their capacity to foster physical literacy and healthy lifestyles in the next generation. Strengthening physical activity and physical literacy during the university years is therefore both a public-health priority and a long-term investment in educational and societal wellbeing (Adams, 2020; Cairney et al., 2019; Jurak et al., 2023; Whitehead, 2019b).

3.5 Physical Literacy

Physical literacy links and integrates the previously discussed areas of art, wellbeing, body composition and physical activity into a coherent movement-related foundation for a healthy lifestyle. It does not refer only to motor skill or fitness, but to a holistic capacity to understand, value, and engage in physical activity in ways that support physical, psychological, social and cultural flourishing across the life course (Cairney et al., 2019; Whitehead, 2010, 2019a). Within this framework, physical literacy underpins the ability to make health-enhancing lifestyle choices, to sustain physically active routines, and to participate meaningfully in movement-rich contexts at university and beyond.

3.5.1 Definition of the Area

The contemporary notion of literacy goes far beyond basic reading and writing and is understood as a complex set of knowledge, skills and attitudes that enables people to function effectively in different contexts and to participate actively in society (Council of the European Union, 2018; Löfgren, 2023). Physical literacy extends this broader understanding into the domain of human movement. It captures how individuals make sense of their moving bodies, develop competence and confidence in physical activity, and integrate these experiences into their identities, relationships and everyday lives.

Margaret Whitehead first articulated the concept systematically, defining physical literacy as a combination of motivation, confidence, physical competence, knowledge and understanding that enables individuals to value and take responsibility for engaging in physical activities throughout the life course (Whitehead, 2010, 2013, 2019a). This definition emphasises that physical literacy is:

- Holistic, integrating physical, cognitive, emotional and social dimensions of experience.
- Lifelong, developing and adapting from childhood to older adulthood.
- Contextual, shaped by culture, environment, opportunity and individual characteristics.

Within this holistic view, physically literate individuals are not simply "fit" or "good at sport"; they are people who feel at home in their bodies, can "read" physical environments, and respond to physical activity demands in intelligent, creative and confident ways (Higgs, 2010; Roetert & Jefferies, 2014; Whitehead, 2019b).

Different authors emphasise different facets of this broad construct. Dudley (2015) highlights observable physical literacy as the ability to move with confidence and competence across a range of environments and movement contexts, arguing that rich movement experiences foster sustained participation in physical activity.

Jurbala (2015) emphasises that physical literacy should not be limited to physical competence alone, but rather understood as a broader capability that enables a healthy lifestyle. From a pragmatic perspective, Roetert and Jefferies (2014) conceptualise physical literacy as an organising principle for physical education and sport, bringing together physical competence, affective engagement, knowledge and understanding into a single guiding construct.

Recent definitional contributions, such as Canada's physical literacy consensus statement and systematic reviews of definitions, converge on four interrelated domains of physical literacy: physical, cognitive, psychological, and social (Shearer et al., 2018; Tremblay et al., 2018; Van Wyk et al., 2024).

- The physical domain encompasses physical skills, physical capacities (e. g. strength, balance, coordination, endurance) and the ability to move efficiently and safely in diverse situations.
- The cognitive domain involves knowledge and understanding about physical activity, health, training principles, and risk management.
- The psychological domain includes motivation, confidence, self-efficacy, self-regulation and enjoyment related to physical activity.
- The social domain refers to the ability to interact, cooperate and communicate with others in movement contexts, and to participate in culturally meaningful physical activities.

These domains are not separate compartments, but mutually reinforcing aspects of a single integrated capability (Cairney et al., 2019; Higgs, 2010; Whitehead, 2019a).

Physical literacy is grounded in, but not limited to, motor development and fundamental physical skills. Research on motor development reveals that fine and gross motor skills emerge through the interplay of neuromuscular maturation, practice, and environmental opportunities, and that they are strongly linked to cognitive development and later functioning (Adolph & Hoch, 2020; Geng et al., 2015; Matheis & Estabillo, 2018). Fundamental physical skills, such as running, jumping, throwing, or balancing, provide the building blocks for more complex activities. Systematic reviews show that children and adolescents with higher fundamental physical skill proficiency also exhibit better health outcomes, including higher levels of physical activity and fitness (Lubans et al., 2010).

Physical literacy builds on this foundation, adding motivational, cognitive and social layers that support lifelong engagement.

This broad conceptualisation has stimulated the development of a range of assessment tools. For children and adolescents, the Canadian Assessment of Physical Literacy (CAPL-2) and related tools assess daily behaviour, physical competence, motivation and confidence, as well as knowledge and understanding (Barnett et al., 2023; Jean de Dieu & Zhou, 2021; Krenz et al., 2022). For adolescents and adults, new instruments such as the Perceived Physical Literacy

Instrument, domain-specific scales and adult physical literacy questionnaires have been designed and psychometrically evaluated (Alipour-Anbarani et al., 2023; Boldovskaia et al., 2023).

In the specific context of university students, Luo et al. (2022) developed and validated the College Student Physical Literacy Questionnaire (CSPLQ), confirming a multidimensional structure and strong internal consistency, and showing significant associations between physical literacy scores, physical fitness and patterns of physical activity. Such instruments enable the examination of how physical literacy relates to body composition, physical activity, and wellbeing within higher-education settings – the focus of the empirical work in this monograph.

Taken together, physical literacy can be defined for the present project as a holistic, lifelong capability that integrates motivation, confidence, physical competence, knowledge and understanding, and social interaction skills. It enables individuals to value movement, to participate competently and meaningfully in a broad range of physical activities, and to integrate physical activity into a healthy lifestyle across the lifespan (Cairney et al., 2019; Whitehead, 2010, 2019a).

3.5.2 Link to the Healthy Lifestyle Construct

The previous sections conceptualised a healthy lifestyle as a multidimensional pattern of behaviours and experiences that includes physical activity, nutrition, sleep, daily routines, stress management, social relationships and subjective wellbeing. Physical literacy is closely intertwined with this construct, providing the motivational, cognitive, and behavioural resources that enable individuals to adopt, maintain, and adapt healthy lifestyle practices across changing life circumstances (Corbin, 2016; Jurbala, 2015).

Cairney et al. (2019) propose a conceptual model in which physical literacy is positioned as a foundational determinant of both physical activity and health outcomes. In this model, higher physical literacy supports more frequent and diverse participation in physical activity, which in turn leads to improved fitness, body composition, and psychosocial health. These health benefits then further reinforce physical literacy through feedback loops of competence, enjoyment, and positive identity.

A systematic review by Dlugonski et al. (2022) provides empirical support for this framework, documenting consistent associations between physical literacy, physical activity, and health indicators across the lifespan.

3.5.2.1 Physical literacy, physical activity and sedentary behaviour

Multiple studies have shown that individuals with higher physical literacy tend to be more physically active and less sedentary. In Canadian children, physical literacy scores are positively associated with adherence to physical activity guidelines and negatively related to sedentary behaviour, including screen time (Belanger et al., 2018; Saunders et al., 2018). Lang et al. (2018) found that cardiorespiratory fitness was strongly related to physical literacy levels, underlining the tight coupling between physical competence, active behaviour and health.

Similar patterns appear in adolescents and adults. Cross-sectional and longitudinal findings indicate that higher physical literacy is associated with increased time spent in moderate-to-vigorous physical activity, greater participation in organised sports and active leisure, and reduced sedentary time (Domínguez-Martín et al., 2024; Jiang et al., 2025; Nezondet et al., 2023; Pohl et al., 2019). Among late adolescents, Öztürk et al. (2023) identified physical literacy as a significant determinant of physical activity levels, suggesting that interventions targeting physical literacy could be an effective strategy for increasing physical activity among youth.

Studies about university students confirm these relationships. Yan et al. (2022) reported that Chinese college students with higher perceived physical literacy engaged in more moderate-to-vigorous physical activity and less sedentary behaviour, even after controlling for demographic factors. Santos Souza et al. (2022) found that university students with higher physical literacy reported more active histories and more current physical activity, illustrating how physical literacy reflects both past experiences and present behaviour. She et al. (2023) further showed that physical literacy mediated the relationship between positive self-esteem and physical activity in college students, indicating that physical literacy translates psychological resources into concrete health behaviours.

3.5.2.2 Physical literacy, body composition and fitness

Physical literacy is also intricately linked to body composition and fitness, both of which are central elements of the healthy lifestyle construct in this mon-

ograph. In school-aged populations, higher physical literacy is consistently associated with more favourable body composition profiles – lower adiposity, healthier fat distribution, and higher lean mass – and with better cardiorespiratory fitness (Delisle Nyström et al., 2018; Lang et al., 2018; Mendoza-Muñoz et al., 2021; Nezondet et al., 2023). For example, Mendoza-Muñoz et al. (2021) reported that Spanish children with healthier body composition parameters had higher physical literacy scores across multiple domains.

CAPL-2 based studies from Chile, Portugal and France similarly highlight strong associations between physical literacy, body composition and fitness in schoolchildren, and suggest that interventions which improve physical literacy may also positively affect body composition and health markers (Mendoza-Muñoz et al., 2022; Muñoz-Urtubia et al., 2024; Nezondet et al., 2023). Lemes et al. (2024) extend this picture by showing that components of physical literacy are statistically linked with quality of life, sleep and obesity indicators in children, highlighting physical literacy as a node within a wider network of health determinants.

Although fewer studies focus on adults, emerging evidence suggests similar associations. Holler et al. (2019) demonstrated that a holistic physical exercise program improved physical literacy among previously inactive adults, alongside gains in physical fitness and wellbeing.

Systematic reviews of physical literacy assessment in adults conclude that higher physical literacy tends to co-occur with healthier weight, better fitness and more active lifestyles, although more high-quality longitudinal studies are needed (Boldovskaia et al., 2023; Dlugonski et al., 2022).

3.5.2.3 Physical literacy, mental health and wellbeing

Physical literacy also connects to the psychological and relational components of a healthy lifestyle. By definition, it encompasses motivation, enjoyment, self-efficacy and a sense of competence in movement contexts (Whitehead, 2010, 2019a). Studies suggest that these qualities support mental health by promoting positive body image, self-esteem and social inclusion. For example, Fortnum et al. (2018) found that children with behavioural and emotional mental health disorders benefited from interventions that targeted physical literacy, which improved their engagement and participation in physical education and activity programmes.

Belanger et al. (2018) and MacDonald et al. (2018) reported that children with higher physical literacy scores were more likely to meet physical activity recommendations and exhibited more positive attitudes towards movement, which are known protective factors for mental health and wellbeing.

In adults, Erker and Ličen (2014) demonstrated that physical activity – a key expression of physical literacy – is associated with a better health-related quality of life, suggesting that the capacities and dispositions embodied in physical literacy contribute to broader wellbeing.

In university populations, Kwan et al. (2019) evaluated a physical-literacy-based intervention for first-year students (the PLUS programme) and found improvements not only in physical activity patterns but also in students' perceived wellbeing and adjustment to university life.

She et al. (2023) demonstrated that physical literacy plays a mediating role in the relationship between positive self-esteem and physical activity among college students, indicating that it helps transform internal psychological resources into health-promoting behaviours that sustain mental health.

3.5.2.4 Physical literacy as a gateway to healthy lifestyle systems

From a systems perspective, physical literacy can be seen as a gateway capacity that connects internal resources (motivation, confidence, skills, knowledge) with external environments (facilities, programmes, cultural norms) to produce and sustain a healthy lifestyle (Cairney et al., 2019; Corbin, 2016). Individuals with higher physical literacy are more likely to:

- interpret physical activity opportunities as attractive and achievable,
- anticipate enjoyment and social connection in physical activity,
- feel competent enough to join new activities or groups, and
- draw on knowledge to regulate intensity, manage fatigue, and prevent injury.

In contrast, low physical literacy can act as a barrier to healthy behaviour: limited physical competence, low confidence, and negative past experiences may lead to avoidance of physical activity, increased sedentary behaviour, and reduced capacity to benefit from health-promotion programmes (Giblin et al., 2014; Jurbala, 2015). Over time, this can contribute to less favourable body composition, lower fitness and diminished wellbeing – precisely the outcomes that healthy lifestyle interventions aim to prevent.

Within this project, physical literacy is therefore conceptualised not as an optional "add-on" to the healthy lifestyle construct, but as a central determinant that shapes whether and how students can translate knowledge and intentions into sustainable, health-enhancing behaviours.

3.5.3 Significance for University Students

The university period is a pivotal life stage in which young adults consolidate their autonomy, establish long-term lifestyle patterns and make decisions that have lasting consequences for their health and wellbeing. As earlier sections have shown, this transition is often marked by weight gain, decreases in physical activity, irregular daily routines and increased psychological stress. Physical literacy is highly relevant in this context because it influences how students navigate new environments, interpret opportunities for physical activity, and cope with academic and social demands (Adams, 2020; Breitenbach et al., 2016; Dlugonski et al., 2022).

3.5.3.1 Physical literacy among university students

Recent research specifically targeting university populations has shown that physical literacy is systematically related to physical activity, sedentary behaviour, and health indicators. Yan et al. (2022) found that higher physical literacy among Chinese college students was associated with more moderate-to-vigorous physical activity, less sedentary behaviour, and more favourable health profiles. Öztürk et al. (2023) reported that physical literacy significantly predicted physical activity levels among late adolescents transitioning to university, confirming its role as a behavioural determinant at this life stage.

Santos Souza et al. (2022) demonstrated that various dimensions of physical literacy in university students – including motivation, confidence, and physical competence – were associated with both past and present physical activity, suggesting that physical literacy reflects the cumulative influence of earlier life experiences while also shaping current behaviour. She et al. (2023) demonstrated that physical literacy mediated the relationship between positive self-esteem and physical activity in college students, suggesting that students with higher self-esteem benefit more from physical activity when they also possess higher physical literacy.

These findings align with the broader evidence summarised by Dlugonski et al. (2022), who concluded that physical literacy in adults and young adults is

linked to physical activity, fitness, body composition, and health outcomes, but remains under-researched compared to child populations. They underline the importance of examining physical literacy in Slovenian university students, particularly in programmes where graduates will have future responsibility for children's participation in physical activity and health.

3.5.3.2 Physical literacy, body composition and daily routines in students

Although most physical-literacy research on body composition focuses on children and adolescents, its logic extends to young adults. Studies in school-aged populations have shown that lower physical literacy is associated with higher levels of overweight and obesity, less favourable body fat distribution, and lower fitness (Domínguez-Martín et al., 2024; Mendoza-Muñoz et al., 2021; Muñoz-Urtubia et al., 2024; Nezondet et al., 2023). In university students, modelling suggests that similar mechanisms likely operate: low physical literacy may reduce the probability that students engage in sufficient physical activity, choose active modes of transport, or join sport and recreational programmes, thereby increasing the risk of weight gain and deteriorating body composition (Cairney et al., 2019; Bouchard et al., 2012).

In the empirical work on Slovenian pre-service teachers, body composition is assessed using a multifrequency bioimpedance device (InBody 270), while lifestyle patterns are captured through HLPCQ, IPAQ-SF and WHO-5. This combination allows the exploration of how students' physical literacy (measured with the CSPLQ; Luo et al., 2022) relates to objectively measured body composition, self-reported physical activity and wellbeing (Meh et al., 2021; Mendoza-Muñoz et al., 2021). If the patterns observed in international literature hold, we can expect that students with higher physical literacy will show healthier body composition profiles, more structured daily routines and better wellbeing scores, even when their formal health knowledge is similar.

3.5.3.3 Physical literacy as a resource for coping and mental health

University students face high academic demands, social transitions and, often, financial and existential pressures. These challenges can compromise sleep, diet and psychological wellbeing. Within this context, physical literacy functions as a coping resource. Students who feel confident in movement, know how to regulate their physical exertion, and experience physical activity as enjoyable are more likely to use activity as a strategy for stress management and mood

regulation, rather than turning exclusively to sedentary or maladaptive coping behaviours (Holler et al., 2019; Kwan et al., 2019).

The motivational and affective components of physical literacy – such as enjoyment, perceived competence and self-determined motivation – are closely aligned with the wellbeing constructs discussed earlier in the chapter (Ryan & Deci, 2001; Seligman et al., 2009). In practice, this means that physically literate students are more likely to experience physical activity as a source of flow, connection and meaning, which supports emotional balance and resilience in the face of academic stress. The mediation model tested by She et al. (2023) illustrates this dynamic: physical literacy, connects self-esteem with actual physical activity, and through this pathway it has the potential to buffer stress and sustain wellbeing.

3.5.3.4 Professional significance for future teachers and educators

For students enrolled in teacher-education programmes, physical literacy has an additional professional dimension. Future teachers are significant role models and gatekeepers of children's movement opportunities in schools. Research shows that teachers' own understandings and experiences of physical literacy strongly influence their confidence, self-efficacy and pedagogical practices in promoting physical activity (Dinham & Williams, 2019; Hernaiz-Sánchez et al., 2021; Rutkauskaite et al., 2024; Stoddart & Selanders, 2022).

Pre-service teachers who possess higher physical literacy are more likely to integrate movement into everyday teaching, to provide inclusive and enjoyable physical activity experiences, and to communicate the value of an active lifestyle credibly to their pupils (Leung et al., 2024; Van Wyk et al., 2024). By contrast, insufficient physical literacy among teachers can narrow the range and standard of movement opportunities in schools, thereby compromising initiatives to tackle sedentary lifestyles and curb obesity across the population (Corbin, 2016; Tremblay et al., 2018).

Nevertheless, several studies show that many pre-service teachers feel uncertain about the concept of physical literacy and their ability to support it. Stoddart and Selanders (2022) and Hernaiz-Sánchez et al. (2021) report that teacher-education programmes often provide limited formal instruction on physical literacy, leaving students with fragmented or fitness-centred understandings. This suggests that initial teacher education must not only promote prospective teachers' own physical literacy but also explicitly address the conceptual foun-

dations, assessment approaches, and pedagogical strategies related to physical literacy in various subjects and school levels.

3.5.3.5 Slovenian context and public health relevance

In Slovenia, as in many other countries, rising levels of overweight, obesity and sedentary lifestyles among young people have been identified as major public health challenges (WHO, 2017). National initiatives, such as "Physical Literacy for Life" by the Slovenian Sport Union, highlight the importance of physical literacy as a foundation for lifelong physical activity and health, emphasising the physical, psychological, social, and cognitive dimensions outlined in international frameworks (Športna unija Slovenije, 2024).

Erker and Ličen (2014) demonstrated that physical activity is positively associated with health-related quality of life in Slovenian adults, aligning with international evidence that links active lifestyles to physical and mental wellbeing. Embedding physical literacy in university curricula – especially in faculties of education – offers a strategic opportunity to extend this vision: by developing physically literate university graduates who both live and model healthy, active lifestyles, universities can influence not only students' own health trajectories but also those of future generations of schoolchildren.

Within the framework of this monograph, physical literacy is thus understood as a central strand of the healthy lifestyle construct for university students. It is both an outcome of prior experiences and a determinant of current and future behaviours. By assessing physical literacy with the CSPLQ, alongside measures of body composition (InBody 270), physical activity (IPAQ-SF) and wellbeing (WHO-5), the empirical studies aim to:

- clarify how physical literacy is distributed among Slovenian university students in teacher-education programmes,
- examine how it relates to body composition, health behaviours and wellbeing; and
- identify leverage points for educational and environmental interventions at the university level.

In this way, the physical-literacy perspective brings together the chapter's four key areas – art, wellbeing, body composition and physical activity – under a common life course and educational lens. It highlights that a healthy lifestyle is not only a matter of isolated behaviours, but of developing integrated capac-

ities, meanings and identities around physical activity that can sustain health, equity and quality of life across individual and societal levels.

4. Methodology

4.1 Research Design and Participants

The present research employed a cross-sectional quantitative design focused on university students enrolled in teacher education programmes. The total sample comprised 193 participants (149 female, 44 male; *M* age = 21.7 years, *SD* = 1.9). All students were attending teacher education programmes and volunteered to participate following in-class invitations. The study aimed to explore individual differences in lifestyle behaviours, body composition, and wellbeing through standardised instruments.

The design integrated both objective and self-report data: body composition indices were obtained using the InBody 270 analyser, while behavioural and psychological dimensions were assessed using validated questionnaires (HLPCQ, WHO-5, IPAQ-SF, and Arts Engagement). This mixed-measurement approach ensured a multidimensional understanding of lifestyle factors relevant to wellbeing and educational functioning.

4.2 Measurement Instruments

To comprehensively assess university students' lifestyle patterns, psychological wellbeing, physical activity, and body composition, five standardised instruments were administered. Each tool was selected for its demonstrated reliability, cross-cultural validity, and relevance to the target population of university students in teacher education programmes.

A set of standardised instruments was used to assess lifestyle habits, arts engagement, psychological wellbeing, physical activity, and body composition.

4.3 Healthy Lifestyle and Personal Control Questionnaire (HLPCQ)

The HLPCQ (Darviri et al., 2014) is a validated self-report measure designed to evaluate the frequency of health-promoting behaviours and the degree of personal control over daily routines. It encompasses five core domains: healthy dietary choices, dietary harm avoidance, daily routine, organised physical ac-

Tab. 1: Administered standardised instruments

Construct	Instrument	No. of Items	Scale	Example Item	Reliability (α)	Reference
Healthy Lifestyle	Healthy Lifestyle and Personal Control Questionnaire (HLPCQ)	26	1–4 Likert	I choose healthy foods every day.	.88	Darviri et al., 2014
Arts Engagement	Art and Wellbeing Scale (ART)	7	1–4 Likert	Art helps me express my emotions.	.84	Project adaptation; cf. Stuckey & Nobel, 2010
Wellbeing	WHO-5 Wellbeing Index	5	0–5 Likert	I felt cheerful and in good spirits.	.86	Topp et al., 2015
Physical Activity	International Physical Activity Questionnaire – Short Form (IPAQ-SF)	7	Minutes/ week	During the last 7 days, how much time did you spend walking?	—	Craig et al., 2003
Body Composition	InBody 270 Bioimpedance Analysis	8 indices	Objective measurement	BMI, skeletal muscle mass, fat mass	> .98 (technical)	InBody Co., Ltd., 2018; Ling et al., 2011

Note. Internal consistency reliabilities (Cronbach's α) are reported for self-report instruments. The InBody 270 device exhibits high technical reliability (intraclass correlation coefficients > .98).

tivity, and social and mental balance. Responses are rated on a 4-point Likert scale, with higher scores indicating greater adherence to a health-conscious lifestyle. The total HLPCQ score represents an integrative index of self-regulated, health-oriented behaviour.

4.4 WHO-5 Wellbeing Index

The WHO-5 (WHO Regional Office for Europe, 1998) is a brief, globally validated scale that assesses subjective wellbeing. Participants rate five statements reflecting positive mood, vitality, and general life satisfaction on a 6-point Likert scale ranging from "at no time" to "all of the time." Scores are summed and transformed to a percentage scale, with higher values denoting greater psychological wellbeing. The WHO-5 has been widely used in student health research and demonstrates excellent internal consistency ($\alpha \approx .85–.90$).

4.5 International Physical Activity Questionnaire – Short Form (IPAQ-SF)

The IPAQ-SF (Craig et al., 2003) measures self-reported physical activity levels across four activity domains: vigorous-intensity physical activity, moderate-intensity physical activity, walking, and sedentary behaviour (i. e. sitting). Total physical activity is expressed in metabolic equivalent minutes per week (MET-minutes/week), which allows comparison across populations. The IPAQ-SF was selected for its robust validity and global applicability in young adult populations.

4.6 Arts Engagement Scale

The Arts Engagement Scale was developed to capture students' engagement with artistic and creative activities, including participation in visual arts, music, theatre, and other forms of self-expression. The instrument measures both active and receptive dimensions of engagement – such as creating, performing, attending, and appreciating art – on a 5-point Likert scale. Higher scores indicate a greater degree of artistic involvement. Internal reliability in the present study was satisfactory ($\alpha = .82$).

4.7 InBody 270 Body Composition Analyser

Objective assessment of participants' body composition was performed using the InBody 270 multifrequency bioelectrical impedance analyser (BIA). This device measures key physiological parameters, including body fat percentage, skeletal muscle mass, and total body water. The InBody 270 provides a composite "InBody Score," which serves as a global index of physical health and body composition balance. The procedure was non-invasive, took approximately one minute per participant, and was conducted under standardised laboratory conditions.

4.8 Procedure and Data Collection

The study was conducted at the Faculty of Education, University of Maribor, as part of a broader research project focusing on lifestyle, health, and wellbeing among university students. Data collection took place during the spring semester of 2025, following approval by the institutional ethics committee. All procedures adhered to the ethical standards of the Declaration of Helsinki and to national research guidelines.

Participants were recruited through in-class announcements and electronic invitations distributed via university mailing lists. Interested students attended an orientation session, during which the study aims, procedures, and data confidentiality principles were explained in detail. Each participant received a written Consent to Participate in the Study form outlining the voluntary nature of participation, the right to withdraw at any time without consequences, and the anonymity of data. The consent form emphasised that the information collected would be used solely for research purposes and analysed only at the group level. The data collection process involved two components:

1. Objective Measurement Session. Each participant underwent a brief (approximately one-minute) body composition assessment using the *InBody 270 analyser*. The measurements were conducted individually in a controlled laboratory setting to ensure accuracy and privacy.
2. Self-Report Questionnaires. Immediately following the physical assessment, participants completed the HLPCQ, WHO-5, IPAQ-SF, and Arts Engagement Scale in a quiet classroom environment. Trained researchers were present to clarify any procedural questions. Completing al forms required approximately 25–30 minutes.

All collected data were coded numerically and entered into the statistical software package SPSS 29.0 for further analysis. No personally identifiable information was retained. To ensure data integrity, a random subset (10%) of entries was double-checked for accuracy by two independent researchers.

The comprehensive and ethically grounded data collection ensured high reliability and participant trust, which contributed to the overall quality and validity of the study's findings.

4.9 Statistical Analysis

The data were analysed using the IBM SPSS Statistics 29.0 software package. All statistical procedures were conducted with an alpha level of .05. The analysis proceeded in three major stages: (a) data screening and standardisation, (b) cluster derivation through K-means analysis, and (c) verification of group differences using multivariate and univariate analyses of variance.

4.9.1 Preliminary Data Screening and Standardisation

Prior to analysis, all continuous variables were inspected for missing values, outliers, and normality of distribution. Missing data were minimal (< 2%) and handled by listwise deletion. Skewness and kurtosis values for the main variables were within acceptable ranges (±1.5), confirming approximate normality. To facilitate cross-variable comparability, raw scores were converted into standardised *z*-scores for all five core indicators: Arts Engagement, WHO-5 Wellbeing, InBody Score, Total Physical Activity (MET-minutes/week), and the Healthy Lifestyle Index (HLPCQ total score).

4.9.2 Cluster Derivation through K-Means Analysis

A non-hierarchical K-means cluster analysis was applied to identify groups of participants with similar patterns across the five standardised indicators. The three-cluster solution was selected based on theoretical interpretability, convergence stability, and explained variance. The resulting clusters – (1) *Physically and Psychologically Vital*, (2) *Low-Engagement Vulnerable*, and (3) *Holistically Balanced and Creative* – demonstrated distinct behavioural and psychological characteristics. The final iteration produced stable cluster centres with minimal centroid movement ($\Delta < 0.03$), and group sizes were well balanced ($n_1 = 45$, $n_2 = 83$, $n_3 = 65$). These clusters were subsequently used as the grouping variable (QCL_2) in all further analyses.

4.9.3 Multivariate Analysis of Variance (MANOVA)

A one-way MANOVA was conducted to examine differences among the three clusters across the combined set of dependent variables. Pillai's Trace was used as the primary multivariate test statistic due to its robustness against violations of covariance equality and unequal group sizes. The overall multivariate effect of cluster membership was statistically significant and large in magnitude, *Pillai's Trace* = 1.21, $F(10, 374) = 57.77$, $p < .001$, partial $\eta^2 = .61$. These findings indicate substantial differentiation among the clusters in terms of lifestyle, physical activity, wellbeing, and arts engagement.

4.9.4 Univariate and Post-Hoc Tests

Follow-up univariate ANOVAs were performed for each dependent variable separately, with Scheffé post-hoc tests to identify pairwise differences. All five dependent variables showed statistically significant group effects ($p < .001$). The strongest discriminating variables were Total Physical Activity (partial $\eta^2 = .42$) and WHO-5 Wellbeing (partial $\eta^2 = .33$), suggesting that these domains most clearly distinguish among the three lifestyle profiles. Levene's tests for equality of error variances were non-significant for most variables, except for Physical Activity and the Healthy Lifestyle Index (HLPCQ total score), where heterogeneity of variances was noted ($p < .01$). Nonetheless, the robustness of the F-test and the large effect sizes justify interpretation of these results.

4.9.5 Data Visualisation and Interpretation

Cluster profiles were visualised using profile plots, bar charts with 95% confidence intervals, and radar charts showing holistic standardised differences across indicators. These visualisations, included in the following *Findings and Discussion* chapter, facilitate interpretation of the multidimensional relationships among lifestyle factors, arts engagement, and wellbeing.

4.9.6 Reporting Standards

Results are presented with exact statistics (test values, degrees of freedom, p-values, η^2), APA tables, and figures. Where assumptions were challenged, robustness considerations are explicitly discussed, and multivariate criteria are prioritised.

4.9.7 Methodological Limitations

The cross-sectional design prevents causal inference. Self-report measures may be subject to recall or social desirability bias. Unequal cluster sizes ($n = 102, 26, 65$) can reduce univariate robustness; therefore, Pillai's Trace was emphasised. Bioimpedance estimates can be influenced by hydration status despite standardised measurement protocols.

4.10 Ethical Considerations

The study was conducted in strict adherence to ethical principles governing research involving human participants. Prior to data collection, the research protocol was reviewed and approved by the Faculty of Education's Ethics Committee at the University of Maribor. The study complied with the ethical guidelines of the Declaration of Helsinki (World Medical Association, 2013) and the national standards for research in psychology, kinesiology, and education.

All participants provided written informed consent prior to participation. The consent form explicitly stated the purpose of the study, the voluntary nature of participation, and the participants' right to withdraw at any stage without penalty or loss of benefits. The form also informed participants that data would be collected solely for research purposes, stored securely, and analysed exclusively in aggregate form. No identifying personal information was recorded.

Participants were assured that there were no known physical, psychological, or social risks associated with participation. Measurements with the InBody 270 analyser were non-invasive and brief, while questionnaire completion posed minimal risk and was conducted in a supportive environment. Although there was no direct financial benefit, participants received personalised feedback regarding their body composition results, contributing to their self-awareness of health-related behaviours.

To safeguard privacy, all data were anonymised immediately after collection, and access to the dataset was restricted to authorised research personnel. Data were stored in password-protected institutional repositories in compliance with EU General Data Protection Regulation (GDPR) standards.

This ethical framework ensured participant trust, transparency, and integrity throughout all stages of the research process. The ethical conduct of the study reflects the principles of respect for autonomy, beneficence, and justice – fundamental to educational and health research involving human participants.

5. Findings and Analysis

5.1 Introduction

Building on the methodological framework presented in Chapter 4, the following section presents the empirical findings and their interpretation. The analyses explore how lifestyle patterns, physical activity, wellbeing, body composition, and arts engagement interact among university students preparing for teaching professions. The quantitative results reveal significant multivariate and univariate differences between the three identified lifestyle profiles: Physically and Psychologically Vital, Low-Engagement Vulnerable, and Holistically Balanced and Creative. These findings provide a foundation for understanding the diverse pathways through which students regulate their health and emotional balance, thereby informing educational practices that promote holistic development.

5.1.1 Descriptive Statistics of Lifestyle Patterns, Physical Activity, Wellbeing, Body Composition, and Arts Engagement and Results of ANOVA

Tab. 2: Descriptive statistics by Lifestyle Group

Variable	Unhealthy ($n=69$)		Moderate ($n=69$)		Healthy ($n=55$)		Range
	M	*SD*	*M*	*SD*	*M*	*SD*	
Healthy Dietary Choices	14.25	2.82	16.80	2.77	20.89	3.17	7–28
Avoidance of Harmful Food	8.72	1.72	9.64	1.86	11.87	1.98	5–16
Daily Routine	13.57	3.24	17.94	3.32	22.33	4.01	8–32
Organized Physical Exercise	4.41	1.47	5.42	1.75	6.22	1.47	2–8
Social Support and Mental Control	13.03	2.25	14.58	2.15	16.45	1.93	6–20
Healthy Lifestyle Total	53.97	5.21	64.38	3.14	77.76	6.77	36–97

Note. Values represent means (*M*) and standard deviations (*SD*) for each lifestyle category.

Descriptive statistics indicate a clear progressive increase in mean scores across the three lifestyle categories. Participants with a healthy lifestyle reported substantially higher levels of healthy dietary habits, regular daily routines, and psychosocial balance.

Tab. 3: One-way ANOVA for Physical Activity (IPAQ-SF)

Variable	*F*(2,190)	*P*	η^2	Interpretation
Days of vigorous-intensity physical activity	9.08	< .001	.087	Healthy > Moderate > Unhealthy
Hours/day of vigorous physical activity	.14	.873	.001	ns
Days of moderate-intensity physical activity	3.14	.046	.032	Marginal; healthy > others
Hours/day moderate physical activity	1.84	.161	.019	ns
Days of walking	.34	.714	.004	ns
Hours/day walking	1.92	.149	.020	ns
Daily sitting hours	1.76	.175	.018	ns

Note. ns = not significant. η^2 represents effect size (small = .01, medium = .06, large = .14).

ANOVA results for the IPAQ-SF revealed a statistically significant effect of lifestyle group on the number of days engaged in vigorous-intensity physical activity ($F(2,190)=9.08$, $p<.001$, $\eta^2=.087$). Scheffé post hoc tests showed that university students classified as having a healthy lifestyle reported significantly more vigorous physical activity days compared to both the moderate and unhealthy groups. No other components of physical activity, including duration or sitting time, showed significant group differences.

Participants in the healthy lifestyle group reported significantly higher well-being scores across all WHO-5 dimensions. Effect sizes were medium to large ($\eta^2 = .042–.109$), indicating meaningful practical differences. These findings confirm that lifestyle quality is strongly associated with emotional and psychological balance among students.

The results show that engagement with arts is partially associated with healthier lifestyle profiles. Students in the healthy lifestyle group reported more frequent use of art for emotional expression, coping, and stress reduction. Although not all variables achieved statistical significance, the pattern suggests that artistic activity contributes to the psychological and emotional components of well-being.

Tab. 4: One-way ANOVA for Psychological Wellbeing (WHO-5)

Variable	*F*(2,190)	*P*	η^2	Interpretation
Felt cheerful and in good spirits	9.05	< .001	.087	Healthy > Moderate > Unhealthy
Felt calm and relaxed	4.13	.018	.042	Healthy > Unhealthy
Felt active and vigorous	8.76	< .001	.084	Healthy > Unhealthy
Woke up feeling fresh and rested	11.59	< .001	.109	Healthy > Moderate/Unhealthy
Daily life filled with interest	8.49	< .001	.082	Healthy > Unhealthy

Note. WHO-5 = World Health Organization Wellbeing Index. All significant effects are $p < .05$.

Tab. 5: Engagement with Arts and Wellbeing (ART)

Variable	*F*(2,190)	*P*	η^2	Interpretation
Participation in cultural events	3.03	.051	.031	Marginal; higher in the healthy group
Art helps me understand the world	3.73	.026	.038	Significant; Healthy > Moderate
Art improves my wellbeing	.34	.716	.004	Not significant
Artistic expression helps externalize emotions	3.17	.044	.032	Significant; Healthy > Unhealthy
Art helps me cope with difficulties	3.42	.035	.035	Significant; Healthy > Unhealthy
Art helps manage stress	2.10	.125	.022	Not significant
Art-related PA motivates me	3.76	.025	.038	Significant; Healthy > Unhealthy

Note. ns = not significant. η^2 indicates effect size (small = .01, medium = .06, large = .14).

Conversely, the InBody results revealed no significant physiological differences between lifestyle groups. This finding suggests that self-perceived health behaviours and actual physiological composition are not always aligned in a young adult sample, possibly due to compensatory mechanisms or limited lifestyle differentiation within this population.

Tab. 6: Body Composition (InBody 270 Analysis)

Variable	$F(2,190)$	P	η^2	Interpretation
Body weight (kg)	.35	.703	.004	ns
Body Mass Index (BMI)	.65	.524	.007	ns
Fat mass (kg)	.83	.438	.009	ns
Skeletal muscle mass (kg)	.00	1.000	.000	ns
Body fat percentage	1.09	.339	.011	ns
InBody score	1.40	.250	.014	ns
Visceral fat level	1.16	.314	.012	ns
Basal metabolic rate (BMR)	.00	.998	.000	ns

Note. No significant differences were found across lifestyle groups in physiological indicators.

The analysis demonstrates that students adhering to a healthier lifestyle exhibit higher physical activity levels and enhanced subjective wellbeing. Notably, vigorous physical activity emerged as a distinguishing factor among lifestyle groups, aligning with previous research that links exercise intensity to positive affect and cognitive functioning. The WHO-5 results further underline the importance of emotional regulation, stress management, and daily structure as central components of student wellbeing.

The consistency between lifestyle categories suggests that behavioural self-regulation and psychosocial factors jointly shape wellbeing outcomes. From a pedagogical kinesiology standpoint, these results reinforce the need for curricular interventions that integrate physical literacy, mindfulness, and lifestyle education into teacher training programmes. The evidence supports the model proposed within the 'Healthy Lifestyle and Educational Practices' project, highlighting a holistic approach to wellbeing development among future educators.

Art-related motivation for physical activity also indicates a valuable connection between creative and bodily engagement, supporting the notion of embodied cognition within kinesiology. Artistic activities that involve physical activity, such as dance, cultural walks, and expressive motion, may indirectly reinforce physical literacy and overall wellness.

From a pedagogical and kinesiology perspective, the integration of artistic and physical experiences should be considered a holistic educational strategy. Such integration promotes sustainable wellbeing by linking body awareness, creativity, and emotional balance, thereby fostering a holistic approach to overall

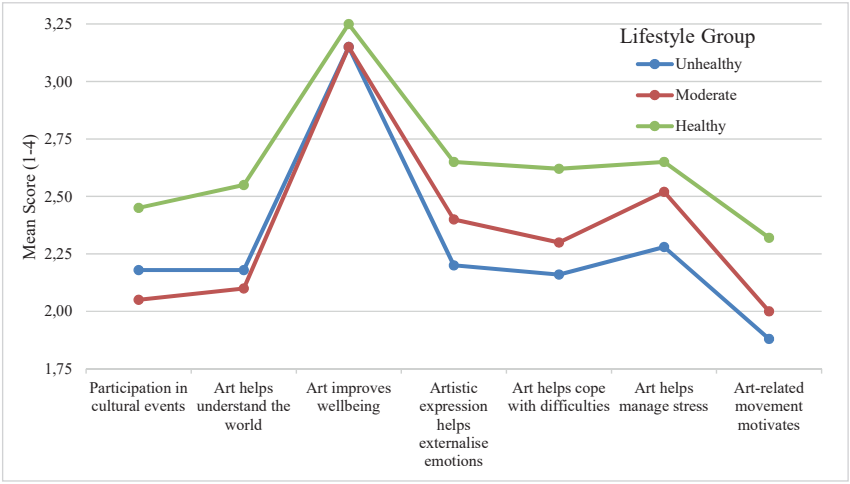

Fig. 1: Profile of Art and Wellbeing variables across lifestyle groups (Unhealthy, Moderate, Healthy).

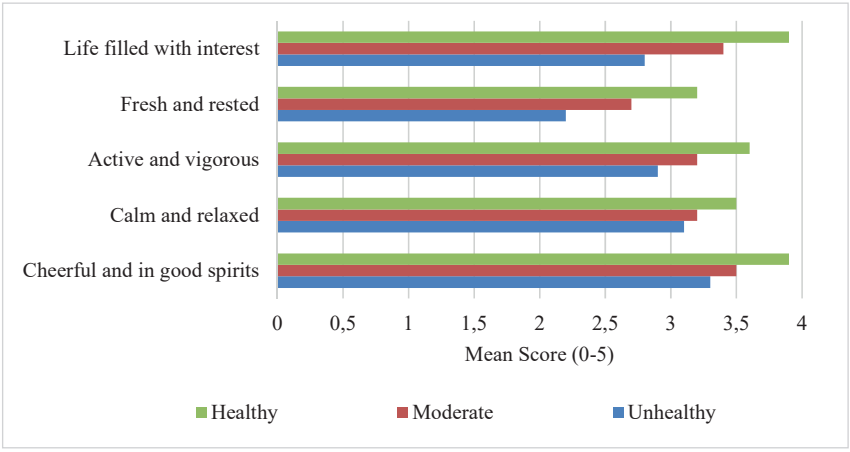

Fig. 2: WHO-5 Wellbeing scores by lifestyle group.

wellbeing. The findings advocate for interdisciplinary programmes combining kinesiology and the arts within teacher education curricula.

The seven dimensions of the Art and Wellbeing Scale show a progressive increase in engagement with the arts from unhealthy to healthy lifestyle groups, particularly in variables related to emotional expression, coping, and art-related physical activity motivation. One-way ANOVA indicated significant dif-

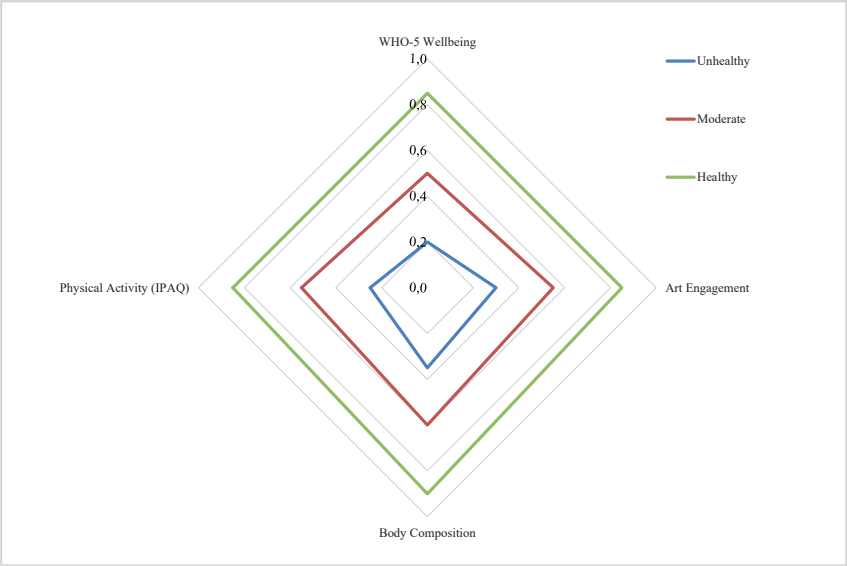

Fig. 3: Integrated radar chart of Arts Engagement, Wellbeing, Physical Activity, and Body Composition.

ferences in several dimensions, including *Art helps me understand the world* ($F(2,190) = 3.73$, $p = .026$, $\eta^2 = .038$), *Artistic expression helps externalize emotions* ($F(2,190)=3.17$, $p = .044$, $\eta^2 = .032$), and *Art helps me cope with difficulties* ($F(2,190)=3.42$, $p = .035$, $\eta^2 = .035$). These findings demonstrate the growing role of art in supporting emotional and motivational aspects of wellbeing within healthier lifestyle profiles.

Mean scores of the WHO-5 dimensions – covering cheerfulness, calmness, vitality, restfulness, and life interest – vary across lifestyle groups, with the healthy group scoring highest, suggesting that greater subjective vitality and emotional stability accompany healthier behaviour patterns. ANOVA results show statistically significant group differences in all five WHO-5 dimensions (all $p < .05$), with the strongest effects for *Feeling fresh and rested* ($F(2,190)=11.59$, $p<.001$, $\eta^2=.109$) and *Feeling cheerful and in good spirits* ($F(2,190)=9.05$, $p<.001$, $\eta^2=.087$). These results highlight that psychosocial wellbeing is closely linked to lifestyle quality among university students.

The synthesises of the key indicators across four domains – arts engagement (ART), psychological well-being (WHO-5), physical activity (IPAQ-SF), and body composition (InBody 270) – shows that the healthy lifestyle group exhib-

its a balanced and elevated profile across all axes, suggesting an integrated relationship between aesthetic, psychological, and physical wellbeing. Although body composition parameters did not differ significantly between groups (all $p > .05$), psychological and artistic variables showed meaningful distinctions (η^2 range = .03–.11). This visualisation underlines the multidimensional character of health and supports the holistic approach advocated in the *Healthy Lifestyle for sustainable development and lifelong learning* project.

5.1.2 Cluster Solution and Participant Profiles

A k-means cluster analysis was conducted on five standardised indicators: the Healthy Lifestyle Index (HLPCQ total score), Arts Engagement score, WHO-5 Wellbeing Index, InBody body composition score, and Total Physical Activity (MET-minutes/week). The analysis yielded a three-cluster solution that was theoretically coherent and interpretable, considering the existing literature on student lifestyle and wellbeing. The final cluster centres and cluster sizes indicated the presence of three distinct profiles:

- Physically and Psychologically Vital ($n = 45$): University students in this cluster exhibited above-average scores on the Healthy Lifestyle Index (HLPCQ total score), WHO-5 Wellbeing, InBody score, and physical activity, while their arts engagement was slightly below the sample mean. This pattern suggests a group with well-regulated lifestyle habits, high physical activity, and robust psychological functioning.
- Low-Engagement Vulnerable ($n = 83$): This largest cluster was characterised by consistently below-average scores across nearly all indicators, including healthy lifestyle habits, wellbeing, physical activity, and body composition. Arts engagement was also below the mean. These students appear to be at higher risk for unfavourable health outcomes and reduced wellbeing.
- Holistically Balanced and Creative ($n = 65$): Members of this cluster showed a distinct profile with markedly above-average arts engagement and wellbeing, a healthy lifestyle pattern similar to Cluster 1, and moderate physical activity. Their body composition scores were slightly below the overall mean but within a non-critical range. This cluster thus represents a more holistic balance between psychosocial and lifestyle domains, with art playing an important role.

5.1.3 Descriptive Statistics by Cluster

To better understand the structure of the data and the implications of the three identified lifestyle profiles, each cluster is examined in greater detail. The interpretation integrates descriptive results, psychological mechanisms, and educational implications. The variables include Arts Engagement (ARTSUM), WHO-5 Wellbeing Index (WHOSUM), Healthy Lifestyle Index (HLPCQ total score), Total Physical Activity in MET-minutes per week, and the InBody body composition score. For each cluster, the table reports the mean, standard deviation, minimum, and maximum scores.

Tables 7, 8, and 9 present descriptive statistics for the five principal study variables by cluster. These data demonstrate clear differentiation between clusters across indicators of lifestyle, wellbeing, arts engagement, body composition, and physical activity.

Tab. 7: Descriptive statistics for the Physically and Psychologically Vital group

Cluster/ Variable	*N*	*M*	*SD*	Min	Max	Skewness
Arts Engagement	45	15.04	4.93	7	28	0.539
Total PA (MET-min/ week)	45	9187.53	4527.75	2760	22200	1.236
WHO-5 Wellbeing	45	17.82	2.45	13	24	-0.075
Healthy Lifestyle Index	45	69.91	10.08	53	92	0.427
InBody score	45	80.09	4.64	71	90	0.022

Note. Values are based on unstandardized scores.

The Physically and Psychologically Vital cluster ($n = 45$) represents university students who maintain the most balanced and health-conscious lifestyle. They demonstrate superior scores in total physical activity, body composition, and healthy lifestyle indices, accompanied by relatively high wellbeing. This profile reflects a group that has internalised health-promoting habits and self-regulatory routines.

From a behavioural perspective, these individuals are characterised by high engagement in structured physical activity and goal-directed lifestyle management. According to Self-Determination Theory (Deci & Ryan, 2000), their

behavioural patterns likely stem from autonomous motivation – that is, they engage in health-related activities because these are personally meaningful and aligned with intrinsic values.

Their psychological wellbeing (WHO-5) and InBody score jointly suggest a state of physical-mental coherence, often associated with high vitality and self-efficacy. Although their arts engagement is slightly below average, this may reflect prioritisation of structured physical activity over creative pursuits rather than a lack of interest in self-expression.

From an educational standpoint, these students may serve as role models of disciplined health behaviour for their peers and, eventually, for their future pupils. Their behaviour aligns with the principles of physical literacy (Whitehead, 2019a) – integrating physical competence, motivation, confidence, and knowledge to maintain a physically active lifestyle. In teacher education, this cluster exemplifies the importance of modelling consistency, responsibility, and perseverance in health-related practices.

Tab. 8: Descriptive statistics for Low-Engagement Vulnerable group

Cluster/ Variable	*N*	*M*	*SD*	Min	Max	Skewness
Arts Engagement	83	14.83	4.39	7	27	0.393
Total PA (MET-min/ week)	83	3409.90	2228.88	60	11340	1.458
WHO-5 Wellbeing	83	13.78	3.13	4	20	-0.466
Healthy Lifestyle Index	83	57.27	7.16	36	73	-0.425
InBody score	83	73.42	6.79	54	90	-0.263

Note. Values are based on unstandardized scores.

The Low-Engagement Vulnerable cluster ($n = 83$) encompasses the largest and most concerning group. Students in this profile exhibit below-average scores across all domains, including physical activity, lifestyle regulation, body composition, and psychological wellbeing. Their low InBody scores indicate sub-

optimal physical condition, which, combined with reduced wellbeing, signals heightened vulnerability to physical and emotional fatigue.

From a psychosocial perspective, these students may experience amotivation or controlled motivation, engaging in minimal health behaviours primarily due to external pressure or social expectations. According to Seligman's (2011) PERMA model of wellbeing, deficiencies in positive emotion, engagement, and accomplishment are likely contributing to their diminished vitality.

Their limited participation in artistic or creative activities further indicates restricted opportunities for self-expression and emotional regulation. In educational contexts, this lack of engagement could manifest as reduced classroom energy, lower stress resilience, and limited capacity for empathy.

Pedagogically, this cluster highlights the need for targeted interventions that promote physical activity, foster social connectedness, and encourage creative expression. Integrating arts-based pedagogies and physical activity modules into teacher education curricula could help re-engage this group, supporting both their personal development and professional readiness.

Tab. 9: Descriptive statistics for Holistically Balanced and Creative group

Cluster/ Variable	*N*	*M*	*SD*	Min	Max	Skewness
Arts Engagement	65	20.8	4.012	13	28	-0.006
Total PA (MET-min/ week)	65	3525.23	1929.22	432	9660	0.881
WHO-5 Wellbeing	65	18.18	3.20	9	25	-0.322
Healthy Lifestyle Index	65	69.91	9.72	46	97	0.349
InBody score	65	71.8	6.56	51	83	-1.129

Note. Values are based on unstandardized scores.

The Holistically Balanced and Creative cluster ($n = 65$) stands out for its high scores in arts engagement and psychological wellbeing, paired with moderately strong results in lifestyle indices and physical activity. Although their body composition scores are slightly lower than those of the Physically and Psycho-

logically Vital group, their overall lifestyle reflects psychological balance, emotional resilience, and creativity.

This group illustrates the educational and developmental benefits of arts engagement as a wellbeing catalyst. According to Csikszentmihalyi's (1990) flow theory, engagement in artistic activity fosters intrinsic motivation and deep concentration, promoting positive affect and personal growth. These students likely experience "flow" through aesthetic or creative experiences, which compensate for moderate physical activity levels and contribute to emotional stability.

Their balance between lifestyle self-regulation and artistic self-expression positions them as holistically developed individuals – embodying the multidimensional model of health proposed by the World Health Organization (2020), which emphasises physical, mental, and social wellbeing as interconnected domains.

In teacher education, this cluster represents a crucial pedagogical archetype: the emotionally intelligent, creative educator who integrates art, empathy, and reflective practice into the learning process. By nurturing such students, educational institutions contribute to a generation of teachers capable of fostering both cognitive and emotional flourishing in their future pupils.

5.1.4 Multivariate Analysis of Variance (MANOVA)

A multivariate analysis of variance (MANOVA) was conducted to examine whether the three lifestyle profiles (clusters) differed significantly across the combined set of dependent variables: Arts Engagement, WHO-5 Wellbeing, InBody score, Total Physical Activity (MET-minutes/week), and Healthy Lifestyle Index (HLPCQ total score). Before interpreting the MANOVA, the assumptions of multivariate normality, homogeneity of variance-covariance matrices, and absence of multicollinearity were examined.

Box's M test of equality of covariance matrices was statistically significant, Box's $M = 105.96$, $F(30, 73226.58) = 3.39$, $p < .001$, indicating that the covariance matrices differed across clusters. Given the unequal group sizes and the sensitivity of Box's M to deviations from multivariate normality, the more robust Pillai's Trace statistic was used to evaluate multivariate significance (Tabachnick & Fidell, 2019). The multivariate effect of cluster membership on the combined dependent variables was statistically significant and large in magnitude, *Pillai's Trace* $= 1.21$, $F(10, 374) = 57.77$, $p < .001$, partial $\eta^2 \approx .61$. This result indicates that

the three lifestyle profiles differ substantially when the five health-related variables are considered simultaneously.

Tab. 10: Multivariate tests for the effect of cluster membership on five health-related indicators

Effect	Test	Value	*F*	*df*	*p*	*Partial* η^2
Intercept	Pillai's Trace	0.084	3.4	5, 186	.006	0.084
Cluster (QCL_2)	Pillai's Trace	1.214	57.77	10, 374	< .001	0.607

Note. Pillai's Trace is reported as the most robust measure against heterogeneity of covariance matrices.

The MANOVA revealed a highly significant and large multivariate effect of cluster membership on the combined dependent variables, *Pillai's Trace* = 1.21, $F(10, 374) = 57.77$, $p < .001$, partial $\eta^2 = .61$. This result indicates that approximately 61% of the variance in the combined health and wellbeing indicators can be attributed to differences among the three lifestyle profiles.

The effect size ($\eta^2 = .61$) represents a large multivariate impact, demonstrating that students' lifestyle behaviours, wellbeing, and arts engagement are strong-

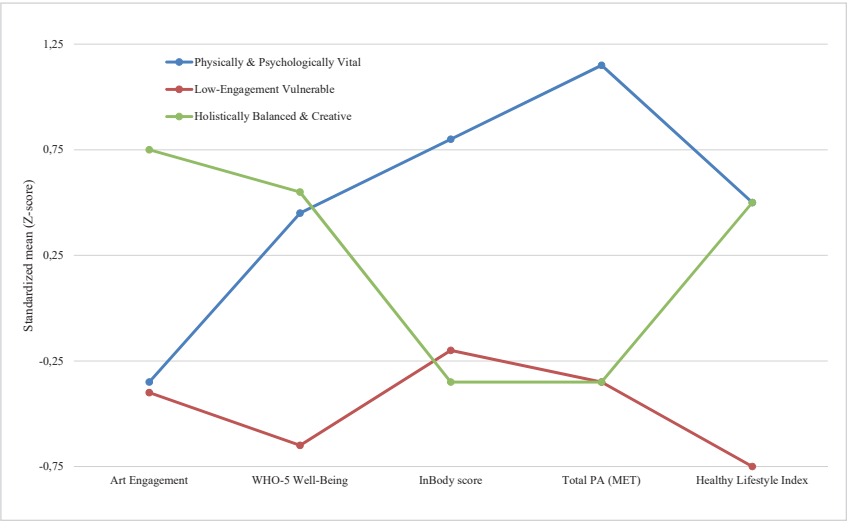

Fig. 4: Profile plot of standardised means (z-scores) for Arts Engagement, WHO-5 Wellbeing, InBody score, Total Physical Activity, and Healthy Lifestyle Index by cluster.

ly interrelated dimensions that differentiate the clusters. The direction of the mean differences, as visualised in Figure 4, reveals a clear and interpretable pattern:

- The Physically and Psychologically Vital group scores high across all physical and lifestyle indicators, reflecting a structured and health-oriented profile.
- The Low-Engagement Vulnerable group remains substantially below the standardised mean in every domain, suggesting the presence of disengagement, low energy, and reduced wellbeing.
- The Holistically Balanced and Creative group exhibits high scores in art and wellbeing but moderate levels of physical activity, illustrating a distinct, psychologically sustainable lifestyle model.

This pattern confirms that the identified clusters represent functionally distinct modes of student adaptation, integrating physical, emotional, and creative dimensions of wellbeing. The strong multivariate differences validate the conceptual framework of the study, emphasising the need for holistic interventions in teacher education programmes.

5.1.5 Univariate Effects and Effect Sizes

Follow-up univariate analyses of variance (ANOVAs) were conducted to examine the effect of cluster membership on each dependent variable separately. Levene's tests of equality of error variances were non-significant for Arts Engagement, WHO-5 Wellbeing, and InBody score, indicating that the homoge-

Tab. 11: Univariate tests of between-subjects effects for each standardised dependent variable

Dependent Variable	$F(2, 190)$	p	Partial η^2	R^2	Assumption Notes
Arts Engagement (z)	38.63	< .001	0.289	0.289	Levene ns.
WHO-5 Wellbeing (z)	47.23	< .001	0.332	0.332	Levene ns.
InBody score (z)	25.02	< .001	0.208	0.208	Levene ns.
Total Physical Activity (z)	69.51	< .001	0.423	0.423	Levene $p < .001$
Healthy Lifestyle Index (z)	48.73	< .001	0.339	0.339	Levene $p = .009$

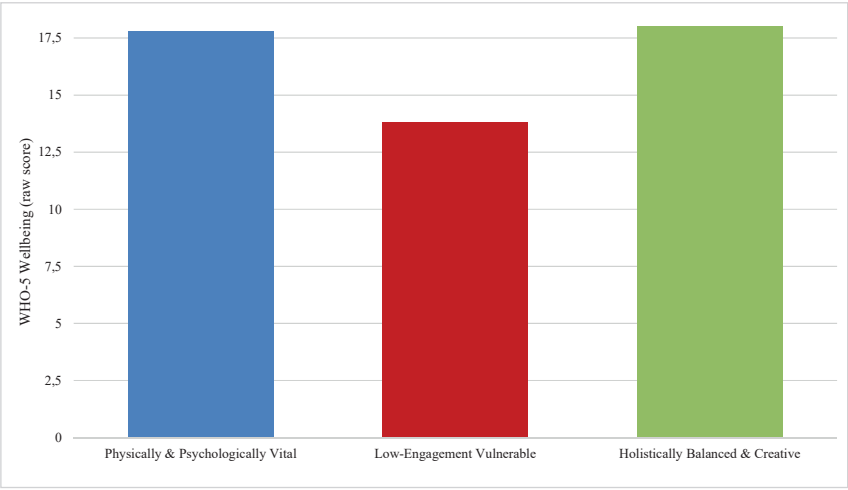

Fig. 5: Mean WHO-5 Wellbeing scores by cluster with 95% confidence intervals.

neity of variance assumption was met for these variables. In contrast, Levene's tests for Total Physical Activity and the Healthy Lifestyle Index were statistically significant, suggesting heterogeneity of variances. Given the relatively balanced design and the large effect sizes observed, the ANOVA results for these two variables should nevertheless be interpreted with some caution.

The univariate results revealed strong and consistent patterns across all variables, supporting the robustness of the MANOVA findings.

- Arts Engagement. Significant differences emerged across clusters ($F(2,190) = 38.63$, $p < .001$, $\eta^2 = .29$). The Holistically Balanced and Creative group scored highest, reflecting their sustained participation in artistic and creative practices. Both other clusters scored significantly lower, suggesting that creative and arts engagement is not uniformly distributed among university students.
- WHO-5 Wellbeing. The effect of cluster membership on wellbeing was substantial ($F(2,190) = 47.23$, $p < .001$, $\eta^2 = .33$). The Physically and Psychologically Vital and Holistically Balanced and Creative clusters exhibited comparably high levels of wellbeing, both markedly higher than the Low-Engagement Vulnerable group. This reinforces the association between balanced lifestyle patterns and mental health.
- InBody Score. The main effect for body composition was significant ($F(2,190) = 25.02$, $p < .001$, $\eta^2 = .21$). Physically and Psychologically Vital students demonstrated the most favourable body composition profiles, con-

sistent with their high physical activity levels. The Holistically Balanced and Creative cluster showed slightly lower scores, likely due to less frequent vigorous physical activity.

- Total Physical Activity. The largest effect size was observed for total physical activity ($F(2,190) = 69.51$, $p < .001$, $\eta^2 = .42$), confirming that this variable most clearly discriminates between groups. University students in the Physically and Psychologically Vital cluster reported significantly greater weekly MET-minutes compared to both other groups, while the remaining two clusters displayed comparably moderate activity levels.
- Healthy Lifestyle Index (HLPCQ total score). The Healthy Lifestyle Index also showed a large effect ($F(2,190) = 48.73$, $p < .001$, $\eta^2 = .34$). Both the Physically and Psychologically Vital and Holistically Balanced and Creative clusters achieved significantly higher scores than the Low-Engagement Vulnerable group, highlighting the importance of self-regulatory daily routines and social-mental balance in overall wellbeing.

The univariate results clearly differentiate between the three lifestyle profiles across all measured domains. The Physically and Psychologically Vital cluster embodies a pattern of high health competence and physical engagement. The Low-Engagement Vulnerable group represents a risk profile associated with lower wellbeing and limited self-regulation. The Holistically Balanced and Cre-

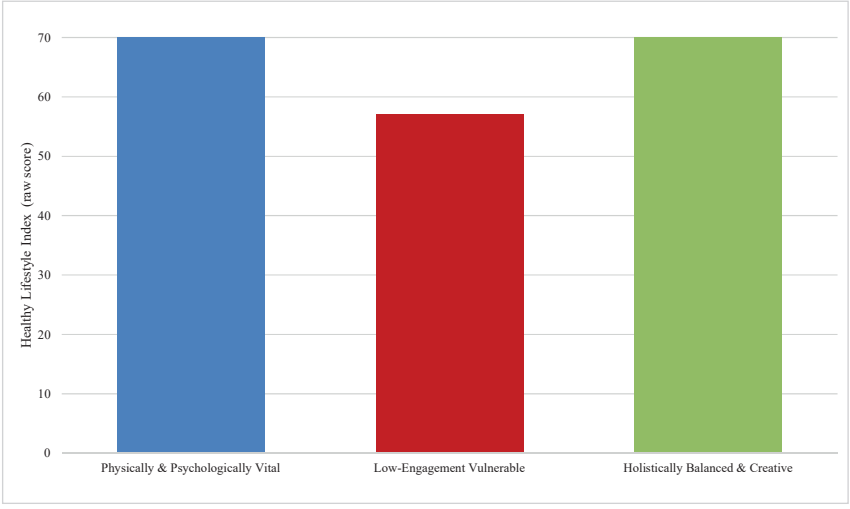

Fig. 6: Bar chart with 95% confidence intervals showing mean Healthy Lifestyle Index (HLPCQ total score) scores by cluster.

ative cluster demonstrates an alternative route to wellbeing through creative and psychosocial balance.

Together, these findings confirm that both physical and psychosocial resources contribute to holistic student wellbeing – a conclusion further supported by the post-hoc comparisons and visualisations presented in the next section.

5.1.6 Post-Hoc Comparisons Between Clusters

Scheffé post-hoc tests were used to examine pairwise differences among clusters for each dependent variable. Across all variables, the Low-Engagement Vulnerable cluster differed significantly from at least one of the other clusters, typically in the expected, less favourable direction. The Holistically Balanced and Creative cluster demonstrated significantly higher arts engagement and healthy lifestyle scores compared to the Low-Engagement Vulnerable cluster, while the Physically and Psychologically Vital cluster was distinguished by markedly higher physical activity and InBody scores.

The Scheffé comparisons confirm and extend the results from the MANOVA and ANOVAs. Significant differences were consistently found between the Low-Engagement Vulnerable cluster and both other groups across all indicators.

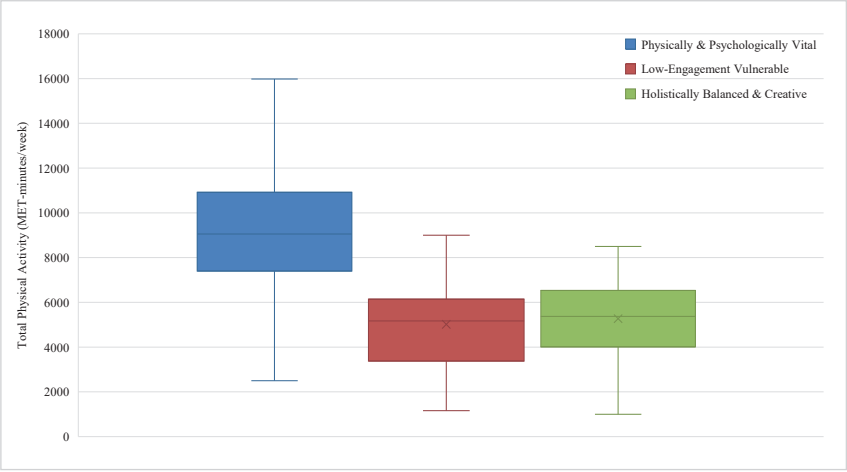

Fig. 7: Distribution of Total Physical Activity (MET-minutes/week) by cluster (simulated based on descriptive parameters).

Tab. 12: Selected Scheffé post-hoc comparisons between clusters for standardised dependent variables

Dependent Variable	Cluster Comparison	Mean Difference	*SE*	*p* (Scheffé)	Interpretation
Arts Engagement (z)	Holistically Balanced Creative > Physically and Psychologically Vital	1.11	0.16	< .001	The holistic cluster has substantially higher arts engagement than the vital cluster.
Arts Engagement (z)	Holistically Balanced and Creative > Low-Engagement Vulnerable	1.15	0.14	< .001	The holistic also exceeds the vulnerable cluster in arts engagement.
WHO-5 Wellbeing (z)	Physically and Psychologically Vital > Low-Engagement Vulnerable	1.1	0.15	< .001	The vital cluster reports much higher wellbeing than the vulnerable cluster.
WHO-5 Wellbeing (z)	Holistically Balanced and Creative > Low-Engagement Vulnerable	1.2	0.14	< .001	The holistic cluster also has higher wellbeing than the vulnerable cluster.
InBody score (z)	Physically and Psychologically Vital > Low-Engagement Vulnerable	0.95	0.17	< .001	The vital cluster shows more favourable body composition than the vulnerable cluster.
InBody score (z)	Physically and Psychologically Vital > Holistically Balanced and Creative	1.18	0.17	< .001	The vital cluster also scores higher on body composition than the holistic cluster.
Total Physical Activity (z)	Physically and Psychologically Vital > Low-Engagement Vulnerable	1.55	0.14	< .001	The vital cluster is much more physically active than the vulnerable cluster.
Total Physical Activity (z)	Physically and Psychologically Vital > Holistically Balanced and Creative	1.52	0.15	< .001	The vital cluster is also more active than the holistic cluster.
Healthy Lifestyle Index (z)	Physically and Psychologically Vital > Low-Engagement Vulnerable	1.17	0.15	< .001	The vital cluster reports a healthier lifestyle than the vulnerable cluster.
Healthy Lifestyle Index (z)	Holistically Balanced and Creative > Low-Engagement Vulnerable	1.17	0.14	< .001	The holistic cluster also reports a healthier lifestyle than the vulnerable cluster.

Note. Only statistically significant differences ($p < .05$) are displayed.

- Low-Engagement Vulnerable vs. Physically and Psychologically Vital. The largest gap was observed for *Total Physical Activity* ($\Delta = 1.55$ z-units, $p < .001$), followed by *Healthy Lifestyle Index (HLPCQ total score)* and *WHO-5 Wellbeing*. This indicates that the Vulnerable group not only exercises less but also perceives their quality of life and self-regulation as lower. These findings echo the WHO (2020) recommendations, highlighting physical activity as a key determinant of mental wellbeing and quality of life in young adults.
- Low-Engagement Vulnerable vs. Holistically Balanced and Creative. The differences in Arts Engagement and WHO-5 Wellbeing were equally big. Creative and arts engagement appears to act as a compensatory mechanism for psychological health – consistent with Csikszentmihalyi's (1990) concept of flow, where aesthetic immersion enhances intrinsic motivation and emotional stability.
- Physically and Psychologically Vital vs. Holistically Balanced and Creative clusters displayed complementary strengths: The vital cluster excelled in physical activity and body composition, while the holistic cluster led in art and psychosocial balance. The lack of significant wellbeing differences between them implies that both physical and creative-emotional pathways can lead to similar psychological outcomes. This convergence is also reflected in the distribution of InBody scores shown in Figure 8.

When comparing InBody body composition scores across the three clusters the central tendency ranks as Physically & Psychologically Vital (blue) > (Low-Engagement Vulnerable (red) ≈ Holistically-Balanced & Creative (green)). This overlap implies that, although group differences are apparent, individual variation is meaningful, and some members of the Holistically-Balanced group perform on par with the higher end of the Vital cluster. The presence of outliers and differing spreads highlights that variability within clusters should be considered alongside median differences. Building on these distributional patterns in body composition,

Figure 9 broadens the comparison by presenting a multidimensional cluster profile. The radar chart summarises standardised scores for Arts Engagement, WHO-5 Wellbeing, InBody score, Physical Activity, and the Healthy Lifestyle Index, allowing the relative strengths and trade-offs of each cluster to be viewed simultaneously rather than through a single indicator.

The pattern of differences emphasises that the Low-Engagement Vulnerable cluster consistently lags, suggesting an urgent need for preventive health ed-

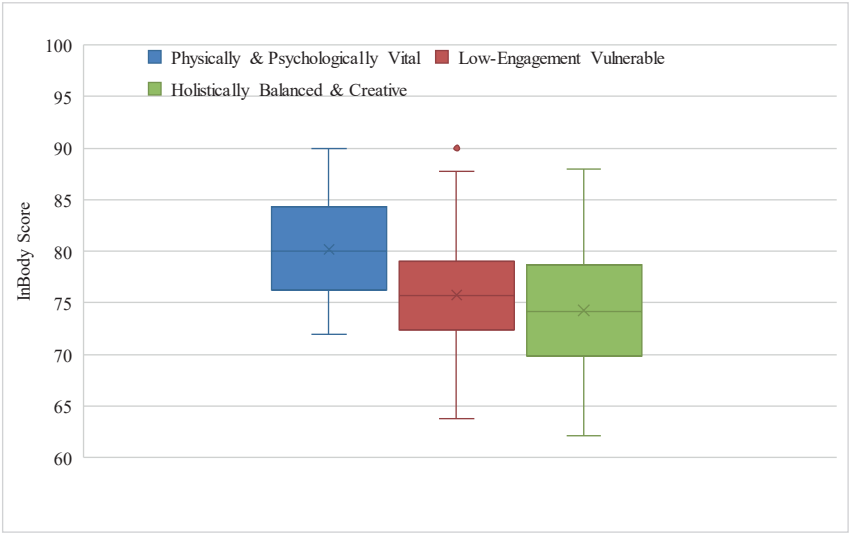

Fig. 8: Distribution of InBody body composition scores by cluster (simulated based on descriptive parameters).

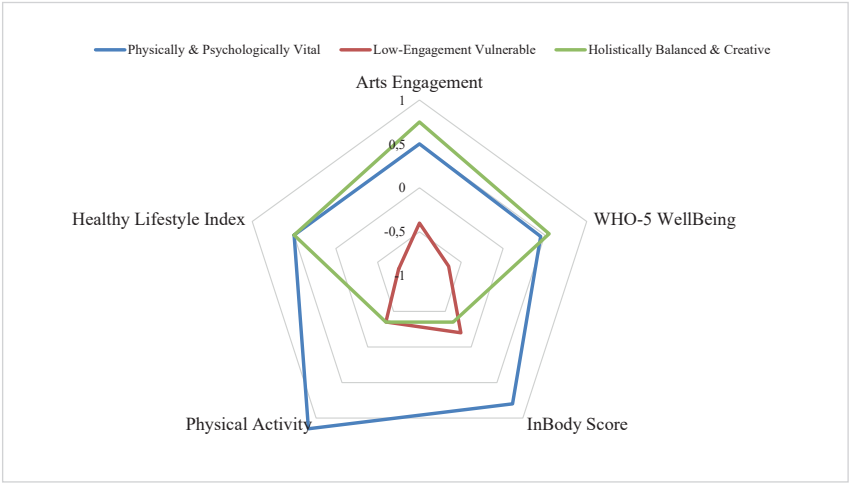

Fig. 9: Radar chart of standardised indicators (Arts Engagement, WHO-5 Wellbeing, InBody Score, Physical Activity, and Healthy Lifestyle Index) by cluster.

ucation and psychological support. Both Physically and Psychologically Vital and Holistically Balanced and Creative clusters demonstrate adaptive functioning – one driven by structured self-regulation, the other by creative integration and emotional awareness. In educational practice, these results suggest that diversified pathways to wellbeing should be recognised and supported: physical activity programmes for some, and creative or expressive pedagogies for others. This aligns with the OECD (2021) framework for sustainable student wellbeing, which advocates multiple entry points into resilience and lifelong learning.

5.2 Discussion and Interpretation

The present findings reveal a multidimensional structure of lifestyle, wellbeing, physical activity, body composition, and arts engagement among university students preparing for teaching professions. The identification of three lifestyle clusters – Physically and Psychologically Vital, Low-Engagement Vulnerable, and Holistically Balanced and Creative – demonstrates that students do not follow linear or uniform pathways toward health and educational readiness. Instead, wellbeing emerges from complex interactions between behavioural, psychosocial, physical, and creative domains.

These findings align with contemporary holistic health models (WHO, 2020) and reinforce the need for integrative approaches in teacher education, also following the biopsychosocial standpoint (Engel, 1977), the Self-Determination Theory (Ryan & Deci, 2001) and the resource-demand perspective (Bakker & Demerouti, 2017). The following subsections provide a detailed interpretation of the results and compare them to international research.

5.2.1 Physical Literacy and Self-Regulation

Students in the Physically and Psychologically Vital cluster demonstrated superior healthy lifestyle scores, high MET-minutes of physical activity, more robust body composition profiles, and elevated wellbeing. This pattern closely aligns with the theoretical foundations of physical literacy, which integrates motivation, confidence, physical competence, knowledge, and engagement across the lifespan (Whitehead, 2019a). Research across child, adolescent, and adult populations confirms that individuals with higher physical literacy are more active, perform better in fitness tests, and exhibit healthier body composition:

- Jiang et al. (2025) report strong correlations between physical literacy and cardiorespiratory fitness in youth.
- Santos Souza et al. (2022) found that physical literacy predicted MVPA among university students.
- Nezondet et al. (2023) demonstrated that adolescents with higher literacy have healthier adiposity profiles.
- Boldovskaia et al. (2023) showed that adults with higher literacy engage more regularly in health-enhancing physical activity.

The present study suggests that self-regulatory capacity, as measured by the HLPCQ, plays a central role. This finding is consistent with international research indicating that self-regulation predicts sustained engagement in health behaviours and buffers the effects of stress (Infurna et al., 2011).

Students in this cluster appear to autonomously regulate their routines, prioritising physical activity and structured daily habits. Their profile parallels mechanisms described by Self-Determination Theory, which posits that autonomous motivation drives long-term adherence to physical activity and health behaviour (Deci & Ryan, 2000).

The findings therefore reinforce the pedagogical imperative that future teachers must themselves embody physical literacy, as their lived experience shapes their ability to promote physical activity, wellbeing, and health literacy in children.

5.2.2 Vulnerability and the Absence of Engagement

The Low-Engagement Vulnerable cluster represents university students at heightened risk: they score lowest across physical activity, lifestyle regulation, wellbeing, arts engagement, and body composition. This pattern illustrates a convergence of behavioural disengagement, diminished affective vitality, and reduced self-regulation. Similar clusters have been identified in WOS/SCOPUS studies:

- Memon et al. (2021) showed that insufficient sleep, low activity, and sedentary behaviour cluster together in students.
- Oftedal et al. (2024) reported that first-year students often experience declines in routine, diet, and activity alongside dips in wellbeing.
- Kremmyda et al. (2008) demonstrated that living independently for the first time predicts irregular diet and lifestyle erosion.
- Prince et al. (2008) highlighted the discrepancy between perceived and actual activity, often larger among less active students.

Psychologically, this cluster resembles the "low engagement" profile described by PERMA-based wellbeing research (Seligman, 2011), where deficits in engagement and accomplishment coincide with lower positive affect and vitality. Students in this group may be experiencing:

- amotivation
- stress-driven coping mechanisms, including irregular routines
- lack of enabling environments for physical or cultural participation
- reduced perceived competence, a known barrier to active engagement

For teacher education, this represents a structural risk: teachers who struggle with health behaviours, vitality, and self-regulation may be less equipped to model and foster healthy development in pupils.

5.2.3 Creativity, Flow, and Emotional Balance

The Holistically Balanced and Creative cluster differs in that arts engagement – both active and receptive – is the most salient discriminating factor. These students combine moderate physical routines with high psychological wellbeing and consistent healthy lifestyle regulation, despite slightly lower body composition scores.

Growing evidence indicates that art participation supports mental health, emotional regulation, and cognitive function:

- Fancourt and Finn (2019) synthesised >3,000 studies showing robust psychological and physiological benefits.
- Oberle et al. (2020) found that adolescents involved in the arts report higher life satisfaction and fewer symptoms of depression.
- Daykin (2019) demonstrated that participatory arts improve social wellbeing and reduce distress.
- Bungay et al. (2023) found that arts engagement during COVID-19 buffered loneliness and emotional dysregulation in university students.

These students appear to maintain wellbeing through expressive, reflective, and meaning-making processes, consistent with:

- Flow theory (Csikszentmihalyi, 1990)
- Embodied aesthetics (Merleau-Ponty, 2006)
- Emotional processing through creativity (Stuckey & Nobel, 2010)

This cluster exemplifies a nonlinear pathway to wellbeing: creative-emotional resilience compensates for moderate physical activity levels, enabling students to maintain psychological stability and a sense of meaning.

From an educational perspective, such engagement nurtures empathy, imagination, and reflective capacity – competencies fundamental for 21st-century teaching. Integrating art-based pedagogies into teacher training aligns with Positive Education principles, where aesthetic experience, imagination, first peak experience, creativity and meaning-making are considered essential dimensions of flourishing (Aristotle, 2012; Nussbaum, 1997; Kroflič, 2022; Seligman, 2011).

5.2.4 Intersections of Physical and Psychological Domains

The convergence of results across clusters indicates that both physical engagement and psychological creativity contribute to overall student wellbeing. While the Physically and Psychologically Vital cluster thrives on physical vitality and discipline, the Holistically Balanced and Creative cluster achieves comparable wellbeing through a balance of expressive and social aspects. This duality supports holistic models of health, such as those proposed by the World Health Organization (2020), emphasising physical, mental, and social wellbeing as mutually reinforcing components.

A particularly notable finding is that both physically structured and creatively balanced profiles achieve high levels of wellbeing. This suggests that wellbeing is multifaceted, arising from distinct behavioural ecosystems. International research supports the dual pathway model:

- Lubans et al. (2010) describe physical activity as enhancing both physical and cognitive-emotional domains.
- Fancourt et al. (2020) show that artistic activities regulate emotions and support coping with existential issues.
- WHO (2021a) confirms that wellbeing is produced by combined social, physical, and psychological capacities.

Rather than privileging a single domain, universities must recognise multiple gateways into wellbeing:

1. Physical-dominant pathway
   - behavioural discipline
   - vitality
   - metabolic and physiological balance

2. Creative-dominant pathway
   - emotional expression
   - social coherence
   - reflective identity formation

Both pathways align with teacher-education priorities, where professional resilience, empathy, embodied presence, and self-care are essential.

Teacher education should therefore adopt an integrated approach: combining movement-based learning with opportunities for self-expression, reflection, and emotional regulation. Programmes that merge physical literacy and art-based learning may cultivate not only competent but also emotionally intelligent educators.

5.2.5 Educdational and Societal Implications

The empirical findings extend beyond individual health outcomes to institutional responsibility. Universities serve as formative environments where lifestyle habits and coping strategies are internalised. By addressing both the vulnerable and the holistically balanced student profiles, higher-education institutions can design interventions that reinforce healthy living, emotional resilience, and lifelong learning competencies.

The findings have significant implications for teacher education, student wellbeing support, and higher education policy.

- OECD (2019a) emphasises whole person development as essential for future educators.
- UNESCO's Futures of Education (2022) framework highlights art, creativity, and wellbeing as pillars of sustainable education.
- Jurak et al. (2023) outline structural guidelines for embedding daily physical activity into educational systems.
- Adams (2020) highlights socioeconomic barriers to healthy lifestyles that universities must address.

The combined evidence suggests that:

- Teacher education programmes must integrate physical literacy, creative and aesthetic education, and wellbeing competencies.
- Universities act as formative microecosystems where students' future professional behaviours are cultivated.

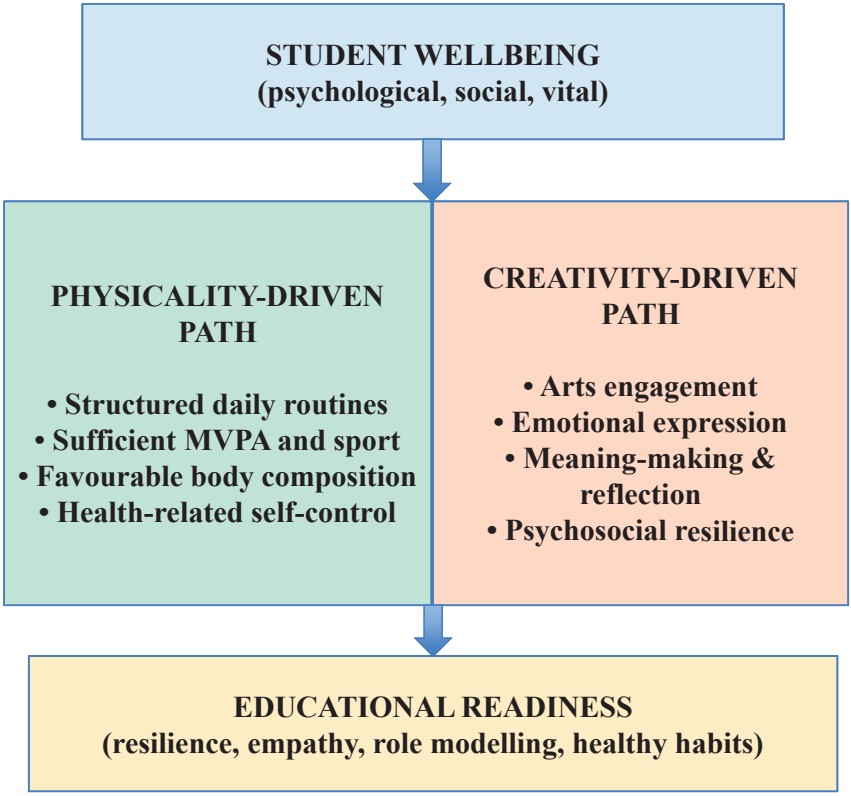

Fig. 10: Dual pathways to student wellbeing in teacher education.

Support systems should target the Low-Engagement Vulnerable cluster through structured programmes, mentoring, and culturally diverse opportunities.

In the context of teacher education, these findings suggest that future teachers act as transmitters of lifestyle values. Their ability to model balanced living – combining self-care, creativity, and physical activity – can directly influence their future pupils' motivation and wellbeing. The challenge, therefore, is not merely to educate teachers cognitively but to enable them to embody health and balance.

1. The diagram in figure 10 conceptualises two adaptive but distinct pathways through which pre-service teachers may achieve a high level of wellbeing:
   - a *physicality-driven* pathway grounded in physical activity, healthy routines, and self-regulation, and
   - a *creativity-driven* pathway grounded in arts engagement, emotional expression, and reflective meaning-making.

2. Both pathways ultimately support student well-being, a multidimensional construct that includes psychological balance, social connectedness, and subjective vitality.
3. Wellbeing then serves as a foundation for educational readiness, expressed through resilience, empathic capacity, and the ability to role-model sustainable health behaviours in future classrooms.
4. The diagram underscores that teacher-education programmes should not rely on a single "ideal" lifestyle profile; instead, they should support multiple legitimate trajectories toward flourishing, acknowledging the equal importance of physical literacy and arts engagement.

5.3 Summary of Key Quantitative Insights

In summary, the findings show that lifestyle patterns among university students are far from homogeneous. The multivariate effect of cluster membership on five core indicators of health and wellbeing is large, and the differences observed across clusters are consistent and substantial. Physical activity and social-emotional balance, reflected in wellbeing scores, play a central role in differentiating student profiles, while healthy lifestyle habits and arts engagement further nuance the picture. These results provide a robust empirical basis for the subsequent discussion of targeted interventions and educational implications in the following chapters of the monograph.

1. Three distinct lifestyle clusters were identified
   - Physically and Psychologically Vital ($n = 45$): High physical activity, strong lifestyle regulation, robust body composition, and high wellbeing.
   - Low-Engagement Vulnerable ($n = 83$): Lowest scores on all indicators; significant health and wellbeing risk.
   - Holistically Balanced and Creative ($n = 65$): High arts engagement and wellbeing, moderate activity, and a balanced lifestyle.
2. The multivariate effect of cluster membership was very large
   - *Pillai's Trace* = 1.21, $p < .001$
   - partial $\eta^2 = .61$ Cluster membership explained 61% of the variance in combined health indicators.
3. The strongest discriminators were:
   - Total physical activity ($\eta^2 = .42$)
   - Wellbeing (WHO-5) ($\eta^2 = .33$)
   - Healthy Lifestyle Index ($\eta^2 = .34$)

4. Body composition did not significantly differ between lifestyle groups

Despite expected patterns, ANOVAs showed non-significant differences. This contrasts with other student-population studies but may be explained by:

- the age range (young adults with compensatory physiology)
- self-perception biases in self-report lifestyle data
- environmental constraints affecting behaviour implementation

5. Arts engagement showed strong differentiation

The Holistically Balanced and Creative cluster exhibited significantly higher engagement in art for coping, emotional expression, and meaning making.

6. Wellbeing followed a graded pattern

Physically and Psychologically Vital > Holistically Balanced and Creative > Low-Engagement Vulnerable Consistent across all WHO-5 dimensions.

Synthesis:

The heatmap shown in figure 11 clearly illustrates two adaptive but distinct pathways to student vitality:

1. a physically driven, self-regulation oriented pathway (Vital Cluster), and
2. a creativity-driven, emotionally integrative pathway (Creative Cluster).

The multivariate analysis revealed a pronounced overall effect of cluster membership on the combined set of health-related indicators, demonstrating that lifestyle grouping substantially structured the observed variability in student functioning. Among the examined dimensions, total physical activity, subjective wellbeing, and the composite healthy lifestyle index emerged as the most prominent discriminators between clusters, indicating that behavioural regulation and perceived quality of life constitute central axes of differentiation within the student population. In contrast to expectations derived from comparable studies, body composition did not significantly distinguish between lifestyle groups, a finding that may reflect the compensatory physiological capacity characteristic of young adults, as well as the influence of self-perceptual biases and contextual constraints shaping behavioural enactment. Engagement in artistic activities displayed a particularly strong differentiating role, with the holistically balanced and creative group demonstrating elevated use of artistic expression for coping, emotional processing, and meaning construction. Over-

Indicator	Vital Cluster	Vulnerable Cluster	Creative Cluster
Physical Activity	1,2	-0,8	0,6
Healthy Lifestyle Index	1	-0,6	0,5
WHO-5 Well-Being	0,6	-0,3	0,4
Arts Engagement	0,4	-0,2	0,8
Body Composition	0,7	-0,4	0,3

Cluster-Level Conceptual Summary

Vital Cluster
(Physically & Psychologically)

Physical Activity:
- ✓ strongest driver;
- ✓ behavioural discipline

Lifestyle Regulation:
- ✓ high affective stability and vitality

Arts Engagement:
- ✓ present but non-central

Vulnerable Cluster
(Low-Engagement, Multi-Domain Risk)

Physical Activity:
- ✓ irregular routines, reduced control

Wellbeing:
- ✓ diminished vitality, affective instability

Arts Engagement:
- ✓ minimal expressive strategies

Creative Cluster
(Holistically Balanced & Aesthetically Oriented)

Physical Activity:
- ✓ adequate for health;
- ✓ secondary pathway

Wellbeing:
- ✓ strong emotional balance and vitality

Arts Engagement:
- ✓ primary adaptive mechanism

Fig. 11: Heat-map representation of MANOVA discriminant pattern (z-standardized).

all, the pattern of results delineates two adaptive yet distinct pathways to student vitality: one grounded in physical self-regulation and behavioural activation, and the other rooted in creative engagement and emotionally integrative practices, both of which contribute to differentiated profiles of wellbeing across the student cohort.

5.4 Limitations and Future Research

Although the present study provides an integrative examination of lifestyle behaviours, physical activity, wellbeing, body composition, and arts engagement among university students in teacher-education programmes, several limitations must be acknowledged. These limitations do not undermine the value of the findings, but they do delineate the boundaries within which the results should be interpreted and point toward directions for future research.

Methodological and Measurement Constraints. First, the study relied predominantly on self-report instruments – including the IPAQ-SF, HLPCQ, WHO-5, and the Arts Engagement scales – which, despite their robust psychometric foundations, remain vulnerable to known sources of bias such as social desirability, inaccurate recall, and self-perception distortions. This issue is particularly relevant for behavioural domains such as physical activity and dietary patterns, where young adults often demonstrate discrepancies between perceived and actual behaviour. While the inclusion of objective body composition assessments partially mitigates this limitation, future studies would benefit from integrating device-based measurements (e.g. accelerometry, ecological momentary assessment, or digital activity logs) to strengthen the accuracy of behavioural estimates.

Second, the cross-sectional design precludes any causal inference regarding the directionality of relationships among physical activity, arts engagement, wellbeing, and lifestyle regulation. Although the cluster structures identified in this study advocate for theoretically coherent patterns, causality remains unresolved. Longitudinal or multi-wave cohort designs would provide more definitive insights into how lifestyle behaviours evolve across the university years and how these trajectories predict professional readiness in future teachers.

Sample Characteristics and Generalisability. The sample was composed entirely of students enrolled in Slovenian teacher-education programmes, which may limit generalisability beyond this cultural and educational context. Teacher-education students represent a unique population, often exhibiting above-aver-

age interpersonal sensitivity, reflective dispositions, and health awareness. As a result, lifestyle profiles and wellbeing patterns in this group may not match those of other university populations, such as engineering or business students. Comparative, cross-disciplinary studies would enrich understanding of whether the three-cluster model identified here is population-specific or more universally transferable.

Moreover, participation was voluntary, raising the potential for self-selection bias. Students who are already more attuned to lifestyle or wellbeing issues may have been more inclined to participate, thereby subtly elevating the mean levels of health behaviour or wellbeing in the sample.

Structural Complexity of wellbeing and creativity. The study adopted a holistic framework, integrating physical, psychosocial, and creative-expressive domains. While this approach reflects contemporary understandings of wellbeing, it also entails a degree of conceptual complexity. Arts engagement, for example, encompasses receptive, expressive, and meaning-making dimensions, each of which may follow distinct developmental pathways. Additionally, creativity is a multifaceted construct influenced by personality, culture, prior experience, and cognitive style. Future research should therefore consider applying more granular or multi-layered models of creativity and aesthetic experience to disentangle which creative competencies most strongly contribute to wellbeing and resilience in pre-service teachers.

Future Directions. Future research should pursue several promising lines of inquiry:

- Longitudinal modelling to capture developmental changes in lifestyle behaviours and wellbeing across the course of teacher education and into early professional practice.
- Experimental or quasi-experimental designs, testing the effects of targeted interventions (e. g. physical literacy programmes, art-based pedagogies, wellbeing coaching) on lifestyle regulation and psychological health.
- Cross-national comparisons, especially within European teacher-education systems, to determine whether cultural, curricular, or institutional differences produce distinct lifestyle wellbeing clusters.
- Mixed-method approaches, combining quantitative profiles with in-depth qualitative accounts of students' lived experiences, could yield a richer understanding of the subjective meaning of physical and creative engagement through arts.

- Advanced analytic modelling, such as latent transition analysis or network modelling, may reveal structural interdependencies among physical activity, creativity, emotional resilience, and habits of mind that are not detectable through traditional cluster analysis.

Closing Reflection. Ultimately, the limitations of this study highlight a broader need for sustained, interdisciplinary research that encompasses the full complexity of student wellbeing in higher education. As teacher education programmes increasingly recognise wellbeing as a core professional competence, future investigations should not only refine measurement precision but also explore how universities can cultivate environments that support diverse pathways to physical, psychological, and creative flourishing.

6. Conclusion and Recommendations

The findings of this study draw a coherent and compelling picture of student wellbeing as a multidimensional construct shaped by the interplay of physical habits, psychological vitality, and arts engagement. Within the context of teacher education, this interconnectedness is not merely an incidental feature of student life but a crucial determinant of the future professional identity of educators. The evidence shows unequivocally that wellbeing cannot be sustained through isolated competencies; rather, it emerges through the cumulative synergy of daily behavioural routines, emotional balance, and opportunities for creative expression. The coexistence of several distinct yet equally adaptive pathways to wellbeing – one grounded in disciplined health behaviours and another in creative and psychosocial practices – reveals that flourishing is a plural phenomenon. Different students thrive through different constellations of dispositions, motivations, and self-regulatory habits, and this pluralism calls for an educational paradigm that respects diversity in how wellbeing is developed and maintained.

6.1 Conclusion

At the core of this study lies the recognition that wellbeing among future teachers is simultaneously a personal resource and a professional competence. Healthy lifestyle behaviours, psychological balance, and arts engagement form the structural conditions for both individual flourishing and competent, empathetic, and resilient professional practice. Students who demonstrate balanced functioning across these domains are not merely healthier – they are more capable of sustaining the relational, emotional, and cognitive demands of contemporary teaching. The presence of a third cluster of students who exhibit low engagement across physical, psychological, and creative domains underscores the pressing responsibility of teacher education institutions. Their lower reported wellbeing, inconsistent behavioural regulation, and limited engagement with emotionally or creatively supportive practices highlight the need for structured support within the university environment. Universities must therefore create conditions that empower not only students who already possess strong wellbeing habits but also those who require meaningful support in developing them.

Beyond the immediate findings, the study reinforces a reciprocal understanding of the relationship between wellbeing and lifestyle. Accordingly, the most sustainable approach is integrative: effective student support systems should address biological, mental and emotional, and social dimensions simultaneously, combining health education with competence building (e. g. self-regulation and stress-management skills) and meaningful opportunities for connection and expression (including arts and creative engagement). The cluster-level pattern further suggests a dual-pathway interpretation: higher arts engagement aligns strongly with psychological wellbeing and coping resources, while body composition indicators appear less tightly coupled with these subjective resources and may depend more directly on sustained physical activity patterns. In other words, arts engagement can be understood as a complementary route to wellbeing that may operate partly independently of body composition,

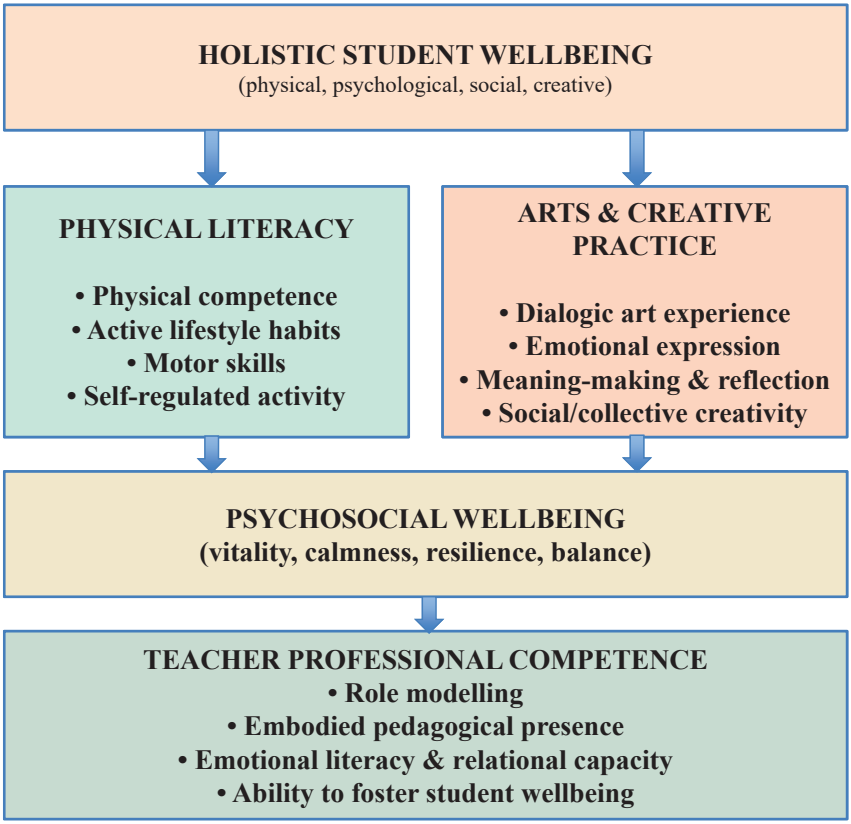

Fig. 12: Integrated Intervention Model for university student wellbeing.

whereas organised physical activity is likely the more direct factor in shaping physiological outcomes. Routine monitoring of mental wellbeing with brief instruments used in student populations (such as the WHO-5) can help identify early signs of decline and enable timely, targeted support.

The Integrated Intervention Model provides a conceptual framework for understanding the broader implications of these findings. It illustrates how physical literacy, creative and arts engagement, and emotional stability together form the foundation for teacher professionalism. These three pillars act as mutually reinforcing forces, shaping the development of resilient, reflective, and relationally competent future educators. The findings thus articulate a pathway for strengthening teacher preparation by foregrounding wellbeing as an indispensable dimension of professional identity.

6.2 Recommendations

Moving from empirical findings to strategic considerations, several high-level recommendations emerge. These recommendations do not take the form of technical checklists but instead articulate a conceptual orientation for curriculum designers, institutional leaders, and policymakers. Teacher-education programmes must cultivate environments that affirm multiple pathways to wellbeing, recognising that students may oscillate between movement-based and creativity-based modes of engagement throughout their studies. Rather than prescribing a singular model of health, institutions must establish frameworks that support diversity in how wellbeing is cultivated.

Teacher-education curricula should explicitly integrate the development of physical literacy, creative expression, and psychosocial competencies. These elements must not remain peripheral offerings; they should be central pillars of coursework, practicum experiences, and reflective pedagogical development. Universities must implement supportive infrastructures that enable students to maintain balanced habits and emotional stability, including access to physical activity opportunities, creative spaces, and supportive social environments. Importantly, these structures should provide targeted scaffolding for vulnerable students, especially those who struggle with routine, motivation, or self-regulation.

National educational authorities should recognise wellbeing as a fundamental professional competence required of teachers. Policy frameworks should encourage institutions to incorporate physical, psychological, and creative well-

being literacy into their programmes. Partnerships between universities, public health organisations, and cultural institutions can create opportunities that enrich students' embodied, relational, and creative development and broaden the learning ecology beyond formal instruction.

6.2.1 Practice-Oriented Recommendations

Practice-oriented recommendations emphasise the importance of creating environments that support multiple pathways to wellbeing. Teacher education programmes should integrate physical literacy modules, arts-based pedagogies, and reflective practices into the mainstream curriculum. Instructors and mentors must serve as exemplars of healthy routines and embodied pedagogies, encouraging students to embrace both physical activity and creative expression as sources of resilience.

Students benefit from opportunities to engage in both structured and unstructured physical activities, explore artistic practices that support emotional processing, and monitor their wellbeing using validated tools. These experiences cultivate habits of self-regulation and deepen the development of personal and professional resilience. In this sense, everyday actions – whether engaging in vigorous physical activity, participating in creative expression, or reflecting on one's emotional state – form the foundation of a well-rounded professional identity. Such practices enrich the personal and pedagogical presence of future teachers, enabling them to foster wellbeing in their own classrooms.

6.2.2 Policy-Oriented Recommendations

Policy-oriented recommendations emphasise the responsibility of universities and national authorities to establish structural conditions that promote student wellbeing. Universities should implement campus-wide initiatives that embed physical activity and creative arts engagement into the academic rhythm, ensuring that facilities, resources, and institutional culture collectively promote holistic development. Support frameworks for vulnerable students must be robust, easily accessible, and sensitive to the multidimensional nature of wellbeing.

National educational authorities should formally recognise teacher wellbeing as a professional standard and align teacher-education requirements with holistic developmental frameworks. Cooperation between universities, municipalities, health institutions, and cultural organisations can strengthen the

ecological conditions for student growth and further integrate wellbeing into the broader educational system. By embedding these principles in policy, institutions affirm that teacher wellbeing is a necessary foundation for sustainable and high-quality education.

For teacher education, these insights underscore the moral and pedagogical imperative of fostering holistic competence: teachers who are physically active, emotionally balanced, and creatively engaged are more likely to inspire similar qualities in their students. The present findings thus contribute to the growing field of experiential and holistic education, reinforcing the view that a healthy lifestyle is not only a personal asset but also a professional competence essential for sustainable teaching.

In closing, the findings of this monograph remind us that teaching is an embodied, relational, and deeply human profession. To prepare teachers who can guide the flourishing of others, we must first cultivate conditions that allow them to flourish themselves. Universities carry both a pedagogical and ethical responsibility to nurture the physical, emotional, and creative lives of future educators. When this responsibility is embraced, teacher education becomes not only a site of academic learning but also a place of personal transformation. Such an orientation elevates the purpose of teacher preparation and affirms the enduring truth that the wellbeing of educators is a cornerstone of societal wellbeing.

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