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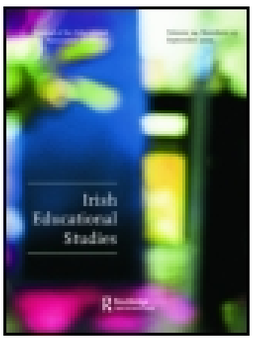
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REVIEW

Levels of wellbeing, resilience, and physical activity amongst Irish pre-service teachers: a baseline study[§]

Niamh O' Brien [a], Martin Lawlor[b†], Fiona Chambers [a], Gavin Breslin [c] and Wesley O' Brien [a*]

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The current study examines the wellbeing, resilience and physical activity (PA) levels among Irish pre-service teachers. Participants were a sample of 128 higher education students (29% male; 71% female; mean age range 18–27 years old) who completed a self-report questionnaire, using a combination of established instruments for wellbeing, resilience, and PA. Descriptive data revealed that 39.1% presented with low levels of resilience, and 74% were not meeting the PA guidelines for health. One sample *t*-tests further revealed the sample population of higher education students had lower wellbeing (t (127) = −3.05, p = .003) and resilience (t (127) = −6.48, p = .003) levels, when compared to the population normative data. Results from the existing study suggest that a structured mental health and PA education awareness intervention for Irish pre-service teachers may be warranted, specifically to increase the lower than expected levels of resilience. The existing sample of pre-service teachers are at a critical time of transition, as they move forward into a profession where self-awareness of wellbeing is required at the beginning of their careers to sustain health both inside and outside of the classroom.

Keywords: wellbeing; resilience; physical activity; pre-service teachers; intervention

Introduction

Higher education and mental health

While higher education can be an environment for positive and supportive student learning, for some, there are risks and potential adverse consequences (Bewick et al. 2010). A previous study in Ireland highlighted that students attending higher education were more likely to be involved in risk-taking behaviours, and less likely to use positive coping strategies when dealing with anxiety and depression (Hope,

[§]Niamh O' Brien and Dr. Wesley O'Brien implemented this study, analysed the research data, and drafted the manuscript. Dr. Martin Lawlor participated in the research design, the selection of the methodological quantitative instruments, and served as an external collaborator outside of University College Cork. Dr. Gavin Breslin helped with the analysis of data and contributed to the writing of this paper.

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Dring, and Dring 2005). In higher education, students represent an important, and distinct population with regards to mental health awareness and suicide prevention (Karwig, Chambers, and Murphy 2015). Recent data from the 'My World Survey' profiled the mental health of young people all over Ireland and found that approximately 62% of young adults (18–25-year-olds) attend higher education in Ireland, of which 40% report elevated levels of depression and anxiety, with a low likelihood of help-seeking behaviour (Dooley and Fitzgerald 2012). To add to this finding, Cannon et al. (2013) assert by the age of 24 years, up to 1 in 5 young people will have experienced suicidal ideation. Cannon et al. (2013) also offer internationally comparable data which suggests that the lifetime rates of mental health disorders experienced among 19–24-year-olds in Ireland (56%) are similar to the United States of America and significantly higher than Germany (39%) and Britain (43.8%). Consequently, the increasing prevalence of young people with mental health problems attending higher education in Ireland has been described as an 'over-whelming tsunami', as the college resources are unable to respond adequately (Murphy, McKernan, and Heelan, 2016). Globally, young people carry the burden for mental ill health experiences, as research suggests that approximately half of all life time disorders start by the mid-teen period, and three quarters by the mid 20's period (Gore et al. 2011; Kessler et al. 2007). For this study, the demographic referred to as young people are recognised as 'emerging adults' (Arnett 2000, 2007). Emerging adults are individuals (18–29 years old) who are flagged as a vulnerable age group in modern society, as they are experiencing more personal and social pressures at a much younger age, while taking on the roles of adulthood (examples include parenthood, marriage) at a much later chronological age (Arnett 2000, 2007). Many emerging adults thrive on the freedom of having fewer obligations previously structured by older adults, while some feel lost and experience mental health problems (Arnett 2007).

This stage, therefore, is perceived in the research as a significant opportunity for personal development, through the teaching of positive mental health education skills, and resilience for wellbeing (O'Connor et al. 2014). The promotion of positive student mental, emotional and social health is of critical importance in education (Weare 2000), alongside the pursuit of high academic standards. Specifically, within higher education settings, there is a unique opportunity to educate student teachers about mental health, and to develop the skills and capabilities of individuals as a strategy to prevent ill mental health experiences (Holdsworth, Turner, and Scott-Young 2017).

Wellbeing

Wellbeing has been described as a difficult concept to define cross culturally due the dynamic, multifaceted constructs that constitute wellbeing (Dodge et al. 2012). In 2018, the World Health Organization (WHO) defined the concept of positive wellbeing as synonymous with the term mental health, consistently maintaining that 'mental health is defined as a state of wellbeing' (WHO 2018). Positive mental health is positively associated with wellbeing and is considered an essential component of effective functioning at both the individual, and a community level (Galderisi et al. 2015; Vaillant 2012; WHO 2005). Dodge et al. (2012) maintain that wellbeing is not static and that instead a balance point exists between an individual's resources and the challenges faced. This is portrayed as a see-saw portraying 'wellbeing is when

individuals have the psychological, social and physical resources they need to meet a particular psychological, social and/or physical challenge' (Dodge et al. 2012, 230). Therefore, there are more challenges than resources in life, the see-saw dips, along with wellbeing, and vice-versa.

Resilience

Resilience is well accepted as the ability to bounce back from negative emotional experiences or recover from stress (Smith et al. 2008; Tugade and Fredrickson 2011). The concept of resilience is a dynamic process, encompassing positive adaptation within the context of significant adversity (Luthar, Cicchetti, and Becker 2000). These adversities may be life-threatening, traumatic experiences (such as losing a loved one), surviving a natural disaster, or they may also be ongoing, such as enduring poverty, or bullying (Southwick et al. 2014). Resilience is an explanation of our individual vulnerability and capacity to coping with stress, of which the determinants can change over the lifespan (Southwick et al. 2014). An appropriate response to stress is often considered a prerequisite to swift recovery from mental health disturbances (Rutten et al. 2013).

Decreasing stress and increasing resilience can help us respond to adversity appropriately by using techniques which are consequently central to maintaining wellbeing through the medium of experiencing positive emotions (Southwick et al. 2012). Positive emotions and wellbeing can be increased and explored through mindfulness, meditation, socialising, optimistic thinking, writing letters of gratitude, and regular physical activity (PA) participation (Rutten et al. 2013; Sharma, Madaan, and Petty 2006).

Physical activity The behaviour of PA involves a full range of human movement, ranging from hobbies to competitive sport, or activities that are a part of daily living (Miles 2007). PA is 'any bodily movement produced by skeletal muscles that result in an increase in metabolic rate over resting energy expenditure' (Bouchard, Blair, and Haskell 2012). PA levels and patterns can be categorised in terms of frequency, duration, intensity, and type. In Ireland, the national guidelines on PA levels, advise that adults should take part in at least 150 min of moderate intensity PA, or 75 min of vigorous intensity PA per week (WHO 2010). In 2015, a survey carried out by the Irish Sports Monitor reported that 30.2% of Irish people are highly active (Irish Sports Monitor 2015). More recently, 'The Healthy Ireland Survey' of 2016 indicated similar findings, with 32% of Irish people being identified as sufficiently active (Department of Health 2016). The Student Activity and Sports Study Ireland (SASSI) report found that 71% of males and 58% of females attending higher education were categorised as highly active, while 36% (29% male: 42% female) were categorised as insufficiently active to meet the recommended PA guidelines (Murphy et al. 2016).

Wellbeing, resilience and physical activity

Research has shown that regular PA participation is associated with positive mental health, as the behaviour appears to reduce anxiety, negative moods and depression through improved self-esteem, and cognitive function (Callaghan 2004; Eime et al. 2013; Mikkelsen et al. 2017; Sharma, Madaan, and Petty 2006). Regular PA

participation has shown a positive association with resilience. Recent studies investigating regular exercise with emotional resilience in healthy adults showed physically active individuals' response to stress had a smaller decline in positive affect than those identified as sedentary (Childs and de Wit 2014). Evidence has also shown that resilience is associated with several physiological benefits, including faster cardiovascular recovery, and lower salivary cortisol levels (a stress hormone) in the morning (Ulrick-Lai and Herman 2010).

Aims of the study

The study aims to evaluate the levels of wellbeing, resilience and PA participation amongst Irish pre-service teachers (or emerging adults) in a higher education setting. *Pre-service teachers* refers to students specifically attending higher education institutions to become qualified teaching professionals. A quantitative methodology is used as part of this study design to collect data, using standardised, reliable, and validated instruments. The study outcomes will determine the justifcation for the development of a specified wellbeing intervention programme for pre-service teachers in higher education. Accurate measurement of young people's mental health and functioning is a critically important factor to inform policy development and provisions (Houghton et al. 2011).

Two specific research questions will investigate: (1) if wellbeing, resilience and PA levels conform with normative population expectations, and (2) if there is a positive association between meeting the recommended PA guidelines, with levels of wellbeing and resilience. In relation to pre-service teachers, specifically in the Irish context, the combined focus of wellbeing, resilience and PA levels are an under-reported area of research in Higher Education Teacher Education contexts.

Methods

Population and setting

A clustered, convenience sample of pre-service teacher educators ($N = 160$) from a selected Irish higher education setting were invited to participate towards the end of the students' second semester within year one of their postgraduate studies (March 2017). This particular higher education setting was chosen based on the proximity and accessibility to the research participants. Recruitment procedures involved local networking with the university department to provide the researcher with an opportunity to carry out the data collection. From the invited higher education students eligible to partake ($N = 156$), an 82% response rate was achieved, and a final research sample size of 128 participants (29% male; 71% female) completed the surveys. In terms of age, 77% of the participants were in the age range of 18–27 years old, and 23% of the sample was aged 27 years and older.

Ethics

All participants invited to partake in the research were informed of their right to withdraw from the proceedings at any stage. Each participant was supplied with an information sheet, and written consent was provided prior to the completion of the self-report questionnaire. The University College Cork (UCC) Social Research Ethics Committee (SREC) approved the study early in 2017.

Procedures and measures

Self-report questionnaire

The self-report questionnaires were completed independently by each of the participants. The questionnaire included basic data on gender, age, education, interest in PA, level of PA per week, and three evidence-based self-report assessments of wellbeing and resilience; including the WHO-5 Wellbeing Index (World Health Organization 1998), The Warwick-Edinburgh Mental Wellbeing scale (WEMBWBS), (Tennant et al. 2007) and The Brief Resilience Scale (BRS) (Smith et al. 2008). The WHO-5 Wellbeing Index and the WEMWB Scale measure subjective perception of wellbeing, with a focus entirely on positive aspects of mental health (Tennant et al. 2007;Topp et al. 2015). The WEWMBS and the WHO-5 have been used previously in the university setting in Ireland (Davoren et al. 2013; Downs et al. 2017; Karwig, Chambers, and Murphy 2015). The Brief Resilience Scale (BRS) (Smith et al. 2008) is used to measure resilience, or 'the ability to bounce back or recover from stress'. The BRS has also been used in the university context within previous studies and has been established as a valid and reliable instrument when examining resilience levels among higher education students (Amat et al. 2014; Lai and Yue 2014; Smith et al. 2008).

Measurement scales used in this study

(1) *The WHO-5 Wellbeing Index (WHO- 5)*. The WHO-5 (WHO 1998) scale has been validated as both a screening tool for clinicians and as a method to assess wellbeing in research studies over time (Topp et al. 2015). It is a reliable instrument, demonstrative of good test-retest reliability, and can assess all age groups above nine years old. This positively worded questionnaire comprises of a five-item rating on a 5-point Likert scale from 0 (= At no time) to 5 (= All of the time). The raw score is calculated by totaling the figures of the five answers, and a percentage ranging from 0 to 100 is obtained by multiplying the raw score by 4. The lower the total score is, the more likely the person is to be experiencing poor health and wellbeing. The higher the total score, the better the indicator of physical and psychological health. The WHO-5 categorises data into symptom indicator cut-off scores (De Wit et al. 2007). A score of below 28 indicates symptoms of depression, where an individual would be advised to seek medical attention. A score of below 50 suggests poor emotional wellbeing, while above 50 represents good emotional wellbeing (De Wit et al. 2007). In the current study the WHO-5 wellbeing Index scale suggested good internal consistency. A Cronbach alpha value above .8 is preferable and acceptable to conduct further analysis in research (Pallant 2016). The WHO-5 has a Cronbach alpha Value of .82, as outlined in the summary of the respective self-report instruments (See Table 1).

(2) *The Warwick-Edinburgh Mental Wellbeing Scale (WEMWBS)*. The WEMWBS (Taggart, Stewart-Brown, and Parkinson 2008) is a positive rating scale intended to support mental health promotion initiatives (Tennant et al. 2007). This instrument is recognised as an appropriate, reliable, valid tool to measure mental wellbeing at both a group, and individual level for mental health interventions (Coughlan et al. 2013; Maheswaran et al. 2012; Taggart, Stewart-Brown, and Parkinson 2008; Tennant et al. 2007). The WEMWBS is a 14-item scale, with five response categories

Table 1. Cronbach alpha values of self- report instruments.

Reliability statistics WHO-5 Wellbeing Index		
Cronbach's alpha	Cronbach's alpha based on standardised items	*N* of items
.816	.819	5
Reliability statistics Warwick Edinburgh Mental Wellbeing Scale		
Cronbach's alpha	Cronbach's alpha based on standardised items	*N* of items
.884	.888	14
Reliability statistics Brief Resilience Scale		
Cronbach's alpha	Cronbach's alpha based on standardised items	*N* of items
.880	.881	6

on a Likert scale 1 (= At no time) to 5 (= All of the time). The results are calculated by the sum of the answers combined, a minimum score of 14 and a maximum score of 70. The results of the WEMWBS are presented as mean scores in the descriptive analysis only, as the WEMWBS was not designed to identify or screen levels with cut-off scores ofwellbeing (Fellow, Stewart-Brown, and Taggart 2015). Similar to the WHO-5, in the current study, the WEMWBS suggested good internal consistency with a Cronbach alpha coefficient of .88 (see Table 1).

(3) *The Brief Resilience Scale (BRS)*. The BRS (Smith et al. 2008) measures resilience or 'the abillty to bounce back form adversity'. The instrument consists of six items; three negative and three positive items. Respondents are asked to answer each question by indicating their agreement with each statement by rating 1 (= strongly disagree), to 5 (= strongly agree) (Smith et al. 2008). The BRS was scored using reverse-coding on the negatively phrased items 2, 4 and 6. The sum of the responses was then divided by the total number of questions answered. The scores were then interpreted, as outlined by Smith et al. (2013) protocol; for example, a score between 1 and 2.99 represented low resilience, a score of 3.00–4.30 represented normal resilience, and scores between 4.31 and 6.00 represented high resilience. The instrument has demonstrated satisfactory internal consistency, and test-retest reliability in other studies (Rodríguez-Rey, Alonso-Tapia, and Hernansaiz-Garrido 2016; Smith et al. 2008). In the current study, the BRS also suggested good internal consistency, with a Cronbach alpha coefficient of .88 (see Table 1).

(4) *Physical activity.* A self-report PA item questionnaire measured participant time spent engaging in intentional moderate to vigorous physical activity (MVPA), per week. A single item, multiple choice measure was developed and modified for this research. Consistent with other instruments, such as the Godin Leisure-Time Exercise Questionnaire (Godin and Shephard 1997), the Global Physical Activity Questionnaire (World Health Organization 2010) and the International Physical Activity Questionnaire (Craig et al. 2003) a seven day recall of average minutes per week was used to measure leisure time of MVPA (moderate to vigorous physical activity). The wording of the single question was:

> Which box below represents the duration of time on average you spend each week doing intentional moderate to vigorous exercise per week? (for example, team sports, cycling, running, swimming)

Seven multiple choice responses were provided. Participants selected one of the following: (a) No time at all (b) up to 30 min per week (c) up to 60 min per week (d) up to 90 min per week (e) up to 120 min per week (f) up to 150 min per week and (g) more than 150 min per week.

Data analysis

Data were analysed using the Statistical Package for the Social Sciences, Version 24.0 on 128 usable participant responses (with fully available data), out of a total 131 collected participant responses (98% of total sample). Where data were incomplete, the responses were excluded from that specific point of the data analysis. Descriptive data were analysed to summarise the perceived mean levels of wellbeing, resilience and minutes of PA participation per week among the sample of participants. Data categorised the percieved levels of wellbeing and resilience, ranging from low to high category levels (as detailed in the above measurement scale protocol for wellbeing and resilience).

The mean scores for each measurement scale were normally distributed in this sample population. One sample *t*-tests were used to determine whether the sample mean is statistically different from the normative population mean of the WHO-5, the WEMWBS, and the BRS. Gender differences in wellbeing, resilience, and PA were investigated using independent sample *t*-tests. For minutes of weekly PA participation, a binary variable was created, specifically composed of (1) those who met the recommended PA guidelines per week (150 min MVPA), and (2) those who did not meet the recommended PA guidelines per week (<150 min MVPA). An additional independent sample *t*-test was conducted to compare the mean levels of wellbeing and resilience according to the identified two PA classification groups. Chi-Square ($\square^2$) tests for independence were also used to identify whether differences in the categories of wellbeing and resilience differed by PA classification groups (meeting and not meeting the PA guidelines per week).

Results

Descriptive results

The sample population mean score of wellbeing using the WHO-5 Wellbeing Index was 64.94 (± .69), the mean score for the WEMWBS was 48.29 (± 7.84), and the mean score for resilience, using the BRS, was 3.24 (±.79). In terms of the continuous PA variable, the mean number of weekly minutes of moderate-to-vigorous PA participation was 69.02 (±53.21) minutes. These descriptive data for the sample are further detailed in Table 2.

The WHO-5, the BRS, and the self-reported weekly minutes of PA participation were computed and categorised into identified subgroups across the pre-service teacher participant sample. A moderate to high prevalence of participants demonstrate good emotional wellbeing (78.9%), and normal to high resilience (60.9%), while the remaining figures illustrate that 21.1% of the pre-service teacher participants

Table 2. The mean scores for wellbeing, resilience and physical activity.

	N	Minimum	Maximum	Mean	Std. Deviation
WHO-5	128	.00	100.00	64.9376	.68955
WEMWBS	127	27.00	70.00	48.2913	7.83977
BRS	128	1.00	5.00	3.2435	.79750

have depressive to poor emotional wellbeing, and 39.1% of participants have low levels of resilience. Over a quarter (26%) of the participants report meeting the weekly PA guidelines for health. The prevalence of wellbeing categories (depressive symptoms, poor emotional wellbeing, and good emotional wellbeing), resilience categories (low, normal and high) and PA categories (not meeting, and meeting MVPA guidelines) are presented in Figures 1–3 below.

Comparing wellbeing and resilience to the normative population mean

An alpha level of .05 was used for all statistical tests. In calculating the mean participant WHO-5 wellbeing score ($M = 64.94$, $SD = .69$), a one-sample *t*-test revealed that the mean wellbeing for the current participants was significantly lower than the normative population ($t(127) = -3.053$, $p = .003$). Similarly, when using the WEMWBS instrument for a mean wellbeing score ($M = 48.29$, $SD = 7.84$), a significant difference was again observed ($t(126) = -2.600$, $p = .010$); the mean WEMWBS wellbeing score for the current participants was significantly lower than that of the normative population. In analysis of the BRS mean population score ($M = 3.24$, $SD = 0.79$), the current participants displayed significantly lower levels of resilience, when compared to that of the normative population ($t(127) = -6.476$, $p = .000$).

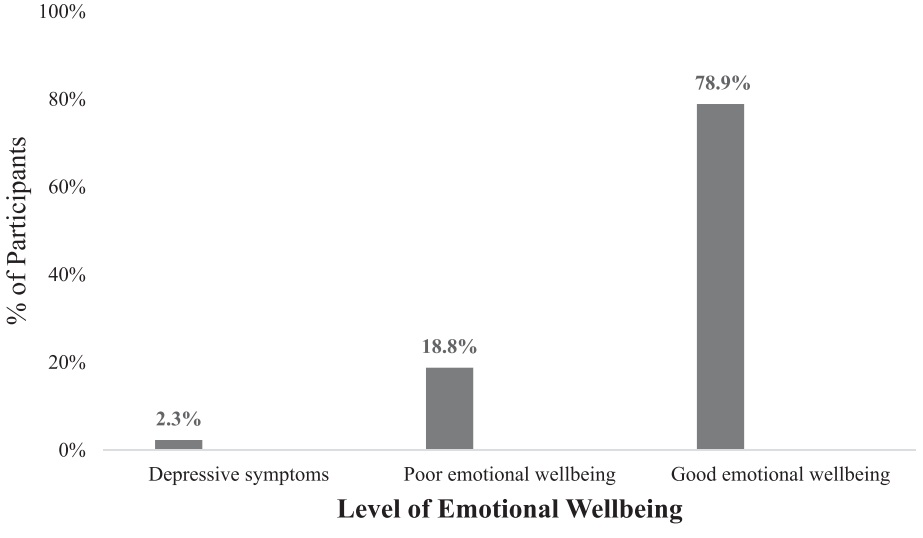


Figure 1. The WHO-5 Wellbeing Index: prevalence and categories of wellbeing.

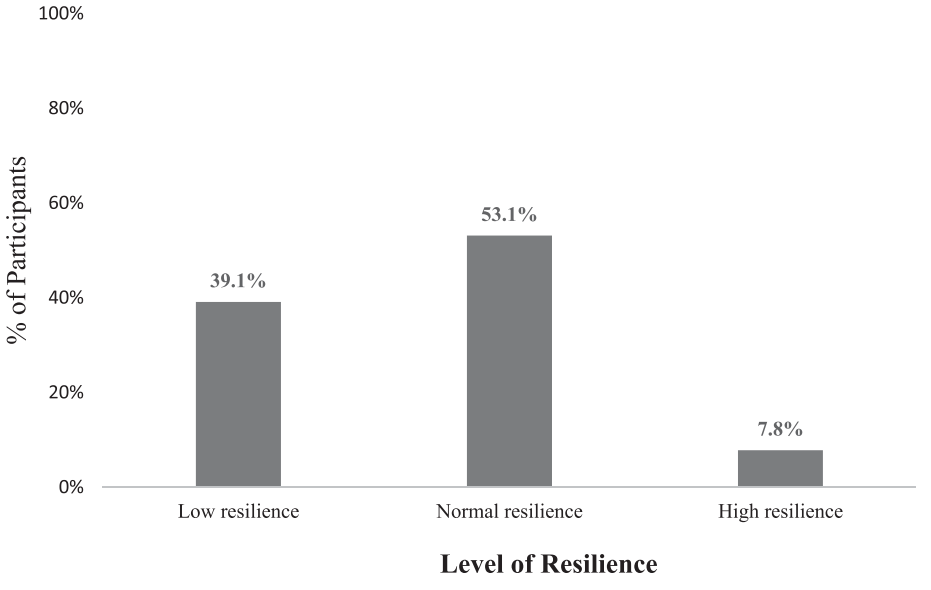


Figure 2. The Brief Resilience Scale: prevalence and categories of resilience.

Gender differences – wellbeing, resilience and physical activity

An independent sample *t*-test was conducted to compare the mean wellbeing, resilience and PA self-reported scores, as differentiated by gender. There were no significant differences in the mean wellbeing scores for males and females in the WHO-5 (t (126) = .761, p = .448), the WEMWBS (t (125) = –.691, p = .491), the BRS (t (126), = –.165, p = .861), or the mean PA self-reported minutes per week (t (126) = –.014, p = .989).

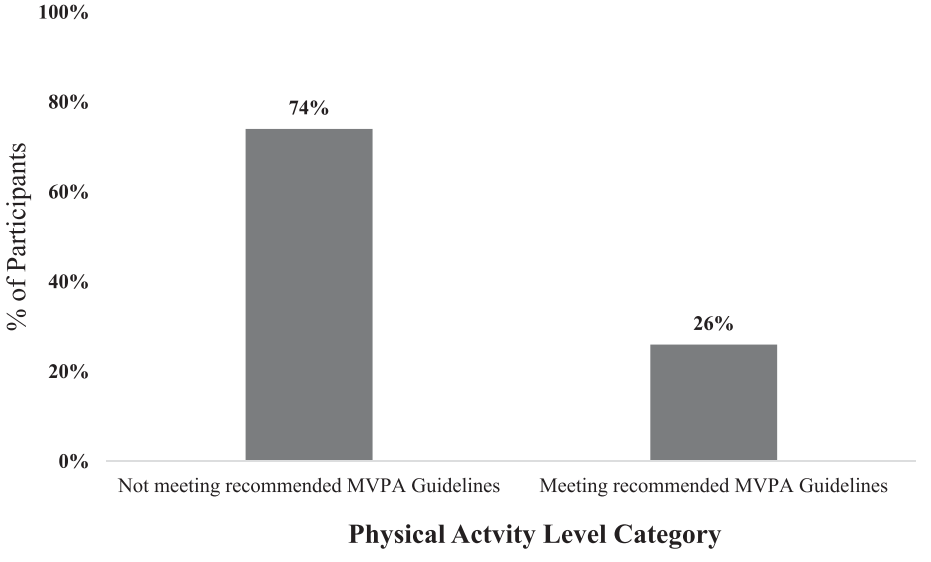


Figure 3. The prevalence of those meeting and not meeting the moderate-to-vigorous physical activity (MVPA) guidelines.

A chi-square test for independence (with Yates Continuity Correction), however, revealed a significant association between gender and PA guideline classifications x^2 (1, $n = 9.402$) = .156, $p = .002$. Specifically, more males ($n = 46\%$) reported meeting the recommended weekly MVPA guidelines than their female counterparts (20%).

Meeting the physical activity guidelines – relationship with wellbeing and resilience

Over 70% of the pre-service teacher participant sample reported that they did not meet the recommended PA guidelines per week. Furthermore, an independent sample *t*-test observed a significant difference in wellbeing (WHO-5 instrument); ($t(125) = -2.689$, $p = .008$), between those meeting and not meeting the PA guidelines per week. Specifically, the independent sample *t*-test revealed that those who meet the PA guidelines are more likely to have a higher sense of wellbeing when compared to those who do not meet the PA guidelines. No statistical significance, however, was observed in meeting the PA guidelines and wellbeing using the WEMWBS instrument (t (124) = −.605, $p = .484$), or resilience, using the BRS instrument (t (125) = 1.34, $p = .183$).

Using a chi-square test to investigate the perceived categorical levels of wellbeing and resilience, alongside the two categories of students who meet and do not meet MVPA guidelines, the results found no significant association between PA guideline achievement and wellbeing, x^2 (2, $n = 127$) = 3.78, $p = .151$, phi = .173. A moderate statistical association, however, was observed between PA guideline achievement and categories of resilience, x^2 (2, $n = 127$) = 7.00, $p = .030$, phi = .24. When examined further, the Cramer' V analysis was interpreted in line with Cohen (1998, as cited in Gravetter and Wallnau 2013), suggesting that those who are meeting the PA guidelines may have lower levels of resilience, than those who do not meet the PA guidelines.

Discussion

The wellbeing, resilience and PA levels of higher education students

This study aimed to evaluate the positive mental health, resilience and PA levels amongst Irish higher education pre-service teacher participants (emerging adults) in a university setting. In a recent systematic review of the WHO-5 wellbeing index literature, Topp et al. (2015) provide comparable findings to our results, with their general population sample ($n = 14{,}787$) in Danish suburban and adult population studies reporting WHO-5 wellbeing mean score of 70. In the current study, the pre-service teacher's mean score of the WHO-5 wellbeing index is 64.9, slightly lower than that of the Danish population sample, as referred to by Topp et al. (2015). The current findings concur with a previous study in Ireland ($n = 2{,}286$), which reported that the adult mean WHO-5 wellbeing index was 67.8 (Delaney et al. 2007). Furthermore, using the WEMWBS instrument as an additional wellbeing indicator of positive mental health, the existing study findings ($M = 48.29$) again correlate with other general adult populations, and university student population studies (aged 16 and above, $n = 2{,}075$) (Fellow, Stewart-Brown, and Taggart 2015). Stewart-brown and Janmohamed (2008) previously reported validated mean scores of 50.1 and 50.2, for ages 16–24 years old, and 25–34 years old, respectively. These findings highlight that our existing sample cohort may have slightly lower wellbeing when compared to that of the normative, comparative data. More specifically, the existing WEMWBS mean scores show similar patterns to other Irish research (Davoren et al. 2013) investigating

the wellbeing of a representative sample of undergraduate higher education students ($n = 2044$, male wellbeing $M = 50.2$, female wellbeing $M = 49.3$). The current study findings observed that the majority of pre-service teachers in higher education present good emotional wellbeing (79%), and resilience (61%), while 21% of the sample were presented with poor wellbeing. In light of these descriptive findings for wellbeing, recent national data has outlined that one in five young people experience a mental health problem, at any one time in a general population (Cannon et al. 2013). The reported positive wellbeing levels of postgraduate pre-service teachers in the current study, however, were higher when compared to that of Dooley and Fitzgerald's (2012) research, whereby 40% of the higher education student sample in Ireland reported low WHO-5 wellbeing scores. In studies where wellbeing scores have been noted as much lower than the general population (Murphy et al. 2016), research suggests that higher education students have an increased likelihood of mental ill health problems, due to the stressors of education, paid employment, along with personal, social and developmental issues (Karwig, Chambers, and Murphy 2015). It is very plausible that these stressors also exist for the current research cohort. Interestingly, the resilience scores of the existing pre-service teacher sample were slightly lower, when compared to a previous undergraduate student population sample ($n = 128$, $M = 3.53$) as outlined in another international study conducted by the BRS creators (Smith et al. 2008). Resilience is well-established in the literature as the ability to bounce back and cope with stress (Smith et al. 2008). McMillan (2016) highlights that the stress levels in university often overwhelm students, which may be linked to the increasing prevalence of poor mental health among young adults, specifically attending higher education. While McMillan (2016) investigates the resilience of Higher Education students and not the impact of resilience on mental health, it can be noted from other literature that low resilience combined with increased stressors augments the likelihood of poor mental health and wellbeing (Goh and Agius 2010; Rutten et al. 2013).

The importance of wellbeing awareness for pre-service teachers

The current higher education, pre-service teacher sample are pursuing a profession that has been reported to have one of the highest work-related stress environments, and in particular, where newly qualified teachers (NQTs) in Ireland experience elevated levels of stress during the inception to their professional careers (Buckley, Abbott, and Franey 2017). It is reasonable to assume that the wellbeing of these existing pre-service teachers may soon evolve on the continuum to the low levels of wellbeing of Irish NQTs. The current levels of wellbeing observed amongst the existing sample may not only impact themselves but also the educational experiences of young learners in their care (Roffey 2012). 'Well teachers, promote well students' asserts McCallum and Price (2010), and awareness of wellbeing within postgraduate educational training may be an important stepping stone for Teacher Education, and NQTs in higher education institutional environments. When broken down by gender, no significant differences emerged in the mean wellbeing and resilience scores for males and females, and this may be possible on account of the heavily skewed female sample participation. This is not unexpected in Irish education, where the teaching profession has predominantly more females than males (Eurostat 2015). In terms of pre-service teachers, levels of resilience may also be considered an important

element of personal development, which impacts life in the classroom. McCallum and Price (2010) discuss the protective influence of resilience factors, such as support networks, peer learning, professional development, and a healthy lifestyle on NQTs.

The relationship between PA participation, wellbeing and resilience

Numerous studies continue to show a positive association between exercise participation and resilience levels (Hamer and Steptoe 2016; Ho et al. 2015). Childs and de Wit (2014) have previously identified a strong association between positive mood and healthy PA participation in adults. Other research suggests that PA is consistent with stress resilience, due to an enhanced regulation in responding to stress (Hegberg and Tone 2015). Converse to this international evidence, surprisingly, our findings seem to suggest that moderate to high levels of resilience have little association with weekly PA participation. These unexpected findings highlight that there may be other psychological factors associated with resilience, independent of PA frequency, duration, and intensity. Factors such as social engagement, self-esteem, self-efficacy, and the belief in one's capabilities may be the more probable mediators associated between PA participation and mental health (Gaudlitz et al. 2013). Furthermore, other research has ascertained that an association between resilience, coping behaviour, goal orientation, and academic passion in higher education students may exist (McMillan 2016). The existing sample cohort appears to have different circumstances when compared to the typical undergraduate student profile. It may be plausible that the existing participants are more goal-oriented for a career in secondary school teaching, and perhaps use other resources of resilience, such as social networks and experience. This emphasises the combined and dynamic biopsychosocial factors which contribute to an individual's level of resilience, and which changes over our lifetime (Lupien et al. 2009). While it is well-established that exercise may help increase resilience and wellbeing (Childs and de Wit 2014; Hegberg and Tone 2015), research does suggest that resilience building is a multidimensional process, where one harnesses various strategies and resources to sustain wellbeing (Southwick et al. 2014).

Among the current pre-service teacher sample, the average self-reported amount of minutes spent engaging in weekly PA participation were well below the expected weekly guidelines (26% meeting the recommended guideline only). This finding was in part unexpected, as other Irish research has previously outlined that two-thirds of the student population meet the recommended PA guidelines (Murphy et al. 2016). Considering these previous research findings, it can be noted that most of those who participated in the Murphy et al. (2016) study were undergraduate students ($n = 32{,}228$). The current sample, however, included postgraduate pre-service teachers only.

When compared by gender, male and female participants closely aligned in terms of weekly MVPA participation (approximately 70 min total), yet statistically, male participants were more likely to achieve the recommended MVPA guidelines, when compared to that of female participants. This finding supports other recent Irish research highlighting that there is an increased likelihood of decreased PA participation among young women (Irish Sports Monitor 2015; Murphy et al. 2016). It seems reasonable to assume that there were no gender differences in weekly PA minutes, possibly on account of the heavily represented female sample majority.

Finally, an association between meeting the recommended PA guidelines, and higher levels of wellbeing using the WHO-5 instrument among the current pre-service teacher sample did emerge. While there was no association between wellbeing and the PA guideline achievement using the WEMWBS instrument, the finding from the WHO-5 instrument supports the identified and thoroughly supported scientific research on the positive effects for exercise on mental health (Mikkelsen et al. 2017). The lack of an association found in the current study between PA and the WEMWBS instrument supports that of Davoren et al. (2013). In this previous Irish study, Davoren et al. (2013) reported, however, that a positive association between PA, improved mood and a reduction in symptoms of depression does exist in higher education students.

Limitations

The existing cross-sectional baseline study has several limitations, despite the strength of accessing a relatively large convenience sample of postgraduate pre-service teachers in a university setting. Specific limitations included restricted access to balanced gender distribution. A heavily skewed female sample participated in the research, which could impact the representativeness and generalisability of findings. An increased, representative mixed-gender sample size may have allowed the research team to extrapolate more findings. However, the existing sample size does not undermine internal and external validity. It may be noted, however, that in Ireland the gender gap in secondary school teachers is largely represented by women (29% v 71%) (Eurostat 2015). Self-reported PA participation was measured using a research designed question, rather than using widely accepted subjective, or objective PA measurement instruments. For these reasons, there are some potential sources of self-perception awareness bias, which may have affected some outcomes of the study. All self-report PA questions are vulnerable to measurement inaccuracies, subjectivity, such as social desirability bias, and external factors, such as seasonal variation and questionnaire complexity (Sylvia 2015).

Conclusion

The findings of this research are somewhat unusual, specifically as they have taken both expected and unexpected turns in the process of investigation. As partly expected, there was an association between positive wellbeing and PA participation amongst Irish -service teachers, or emerging adults, in the university setting. It was, however, unpredicted to observe that those identified as sufficiently active would have lower levels of resilience when compared to those who were insufficiently active for their health.

The results suggest that males are more physically active than females, a finding consistent with most adult PA-based research. Continuation of this research will endeavour to design a mental health awareness programme, specifically to address the particular needs of pre-service teachers in Ireland. Recent research investigating the effect of mental health training with higher education students encourages engagement in learning about mental health, specifically to enable students to support and offer help to someone else (Breslin et al. 2018).

McCallum and Price (2010) suggest that a focus on wellbeing during Initial Teacher Education (ITE), and in the early years of a teacher's professional career,

may positively influence and enable NQTs to respond to the demands of their profession in a more productive and beneficial capacity. This highlights the role of the teacher educator in defining and promoting pre-service teacher wellbeing, and to facilitate to develop knowledge about mental health and strategies to maintain positive, mental health throughout their challenging, yet rewarding careers. This approach is a mutually beneficial endeavour, whereby what is in the best interest of the young pre-service teacher's wellbeing, is also in the best interest of their future students'wellbeing in the classroom and beyond.

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Data availability statement

Data available on request from the authors: The data that support the findings of this study are available from the corresponding author, [WO'B], upon reasonable request.

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