

Appendix A

Supplementary Materials

Supplementary 1. Database Searches

SCOPUS Search:

1. mental* PRE/2 health*
 2. “wellness” OR “wellbeing” OR “well being” OR “positive psych*” OR “resilien*” OR “flourish*” OR “languish*” OR “optimis*” OR “eudemonic” OR “hedonic” OR “resilien*” OR “positivism*” OR “protective factor*” OR “happy” OR “happiness” OR “pleasur*” OR “positive emotion*” OR “positive affect*” OR “life satisfaction” OR “self accept*” OR “personal growth” OR “autonomy” OR “positive relations*” OR “psychological endurance” OR “mental endurance” OR “mastery”
 3. “social” PRE/2 (“acceptance” OR “actuali?ation” OR “contribution” OR “coherence” OR “integration”)
 4. “self” PRE/2 (“concept”* OR “perception” OR “confidence” OR “efficacy” OR “esteem”)
 5. “PhD student” OR “doctorate student” OR “doctoral student” OR “postgraduate student” OR “graduate student”
- (#1 OR #2 OR #3 OR #4) AND #5

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PsycINFO Search:

- 1 mental health/ OR community mental health/ OR well being/
- 2 positive psychology/ OR optimism/ OR positivism/
- 3 "resilience (psychological)"/ OR protective factors/ OR psychological endurance/
- 4 happiness/ OR pleasure/
- 5 Hedonism/
- 6 (mental* adj2 health*).tw.
- 7 (wellness OR wellbeing OR well being OR positive psych* OR resilien* OR flourish* OR languish* OR optimis* OR eudamonic OR hedonic OR resilien* OR positivism* OR protective factor* OR happy OR happiness OR pleasur* OR positive emotion* OR positive affect* OR life satisfaction OR self accept* OR personal growth OR autonomy OR positive relations* OR psychological endurance OR mental endurance OR mastery).tw.
- 8 (social adj2 (acceptance OR actuali?ation OR contribution OR coherence OR integration)).tw.
- 9 life satisfaction/
- 10 self perception/ OR self confidence/ OR self efficacy/ OR self esteem/
- 11 (self adj2 (concept* OR perception OR confidence OR efficacy OR esteem)).tw.
- 12 or/1-11
- 13 postgraduate students/
- 14 (PhD OR doctorate student OR doctoral student OR postgraduate student OR graduate student).tw.
- 15 13 or 14
- 16 12 and 15

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ProQuest Search:

1. (mental* adj2 health*).tw.
 2. (wellness OR wellbeing OR well being OR positive psych* OR resilien* OR flourish* OR languish* OR optimis* OR eudamonic OR hedonic OR resilien* OR positivism* OR protective factor* OR happy OR happiness OR pleasur* OR positive emotion* OR positive affect* OR life satisfaction OR self accept* OR personal growth OR autonomy OR positive relations* OR psychological endurance OR mental endurance OR mastery).tw.
 3. (social adj2 (acceptance OR actuali?ation OR contribution OR coherence OR integration)).tw.
 4. (self adj2 (concept* OR perception OR confidence OR efficacy OR esteem)).tw.
 5. (PhD OR doctorate student OR doctoral student OR postgraduate student OR graduate student).tw.
- (#1 OR #2 OR #3 OR #4) AND #5

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Supplementary 2. Instrument Descriptions (Table 3)

Table 3. Descriptions of the well-being measures used in each study.

Author (Year)	Constructs of interest	Measure Description
Anttila et al. (2015)	Experienced well-being	MED NORD questionnaire (Lonka et al. 2008), modified for doctoral studies. Four subscales: Stress, Anxiety, Exhaustion, and Lack of Interest. Items ranked on a 1 (do not agree) to 5 (fully agree) scale. Examples include: 'I often fear I will fail in my doctoral studies', 'It is difficult for me to find meaning in my doctoral studies'.
Caesens et al. (2014)	Job satisfaction and perceived stress	Job satisfaction: Items from Eisenberger, Cummings, Armeli, and Lynch (1997). Four items measuring agreement to job satisfaction statements, e.g. "All in all, I am very satisfied with my current job". Responses on a likert-type scale, from 1 ("Strongly disagree") to 7 ("Strongly agree"). Perceived stress: Items from the Perceived Stress Scale (Cohen, Kamarck, & Mermelstein, 1983). Four items measuring frequency of stress-related experiences, e.g. "In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?" Responses on a likert-type scale, from 1 ("Never") to 5 ("Very often").
De Clercq et al. (2019)	Social support (affective and instrumental)	Developed their own items, based on questionnaires used by Belmont, Skinner, Wellborn, and Connell (1988), Dupont, Galand, and Nils (2015), Martinsuo and Turkulainen (2011), and Overall, Deane, and Peterson (2011). Supervisor support: Seven items completed in relation to the person that supervises them the most, e.g. "My mentor reassures me when I need it". Academic peers support: Five items completed in relation to the support that other PhD students provide, e.g. "The other PhD students in my research environment give me good advice on my doctoral research". Relatives support: Three items completed in relation to the support that family and friends provide, e.g. "My relatives sometimes help me in carrying out tasks related to my PhD".
Devine and Hunter (2017)	Emotional exhaustion and	Emotional exhaustion: Scale from Maslach and Jackson (1981)

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	supportive supervision	Seven items, e.g. “I feel emotionally drained from my work.” Supportive supervision: Scale from Oldham and Cummings (1996) Eight items, e.g. “My supervisor encourages graduate students to participate in important decisions.”
Hunter and Devine (2016)	Emotional exhaustion	Emotional exhaustion: Scale from Maslach and Jackson (1981)
Juniper et al. (2012)	United Kingdom	PhD Student well-being: Developed a 58-item questionnaire (originally 75 items) Encompasses students’ perceptions of seven domains: development, facilities, home & health, research, social, supervisor, and the university. Responses on a likert-type scale, from 1 (“not at all important and bothersome”) to 5 (“extremely important and bothersome”).
Levecque et al. (2017)	mental health problems	General Health Questionnaire (GHQ) (Goldberg & Williams, 1988) Twelve items in relation to the respondent’s experience in recent weeks compared to his or her usual experience. Responses on a 4-point Likert-type scales. Scored using a bimodal 0-0-1-1 scheme, with the total number of 1 scores indicating of the number of symptoms experienced
Lipson et al. (2016)	Depression, anxiety, suicidal ideation, nonsuicidal self-injury, any mental health problem	Depression and Anxiety: Patient Health Questionnaire-9 (Kroenke, Spitzer, & Williams, 2001) A self-administered version of the PRIME-MD diagnostic instrument for common mental disorders. Scored as the number of symptoms present. The authors created a binary measure (positive/negative screen) using the PHQ-9 standard algorithm. Suicidal ideation: Single-item “In the past year, did you ever seriously think about committing suicide?” with responses being either “yes” or “no” Nonsuicidal self-injury: Single-item Single item assessing whether the respondent has performed self-injury behaviours, e.g “cut myself”, “pulled my hair” Scored as either having performed any of the behaviours or not. Any mental health problem: Scored as the presence or absence of one or more of the previously mentioned problems.
Lonka et al. (2019)	well-being incorporating stress,	MED NORD questionnaire (Lonka et al. 2008), modified for doctoral studies.

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	exhaustion anxiety, lack of interest	
Lynch et al. (2018)	motivation, environmental support, and dispositional autonomy	<p>Internal and external motivation: Self-Regulation for Learning (SRQ-L) (Black & Deci, 2000) Three items to measure internal motivation, two items for external motivation. Measures how much people relate to specific tasks, e.g. “I write a scholarly text (thesis, article, etc.),” “I organize and collect data for research”. Responses on a Likert-type scale, from 1 (“completely disagree”) to 5 (“completely agree”). Scores for internal and external motivation calculated by averaging the relevant items.</p> <p>Environmental support for satisfying needs: Psychological Need Supports (La Guardia, Ryan, Couchman, & Deci, 2000) Nine items measuring autonomy, competence, and relatedness in the contexts of close relationships, peer colleagues /classmates, research supervisor, and in class. Responses on a Likert-type scale, from 1 (“completely inaccurate”) to 7 (“completely accurate”). Scores calculated by averaging the three items for each need across the administrations.</p> <p>Dispositional autonomy: Index of Autonomous Functioning (IAF) (Weinstein et al., 2012) Authors included two subscales of the IAF: self-authorship and low susceptibility to control. Five items per subscale with responses on a Likert-type scale, from 1 (“strongly disagree”) to 5 (“strongly agree”). Scores calculated by averaging the items.</p>
Marais et al. (2018)	Stress, depression, anxiety, subjective and psychological well-being, motivation types, PhD- student specific well-being	<p>Depression, Anxiety and Stress: DASS-21 (Lovibond & Lovibond, 1995) 21 items measuring the extent that the respondents experienced certain symptoms over the past week. Responses on a Likert-type scale, from 0 (“Did not apply to me at all”) to 3 (“Applied to me very much, or most of the time”). Scores are summed for each subscale.</p> <p>Subjective and psychological well-being: Warwick-Edinburgh Mental Well-Being Scale (Tennant et al., 2007) 14 items measuring how respondents are feeling in relation to hedonic and eudaimonic aspects of well-being, e.g. “I’ve been feeling confident”, “I’ve been feeling useful.”. Responses on a Likert-type scale, from 1 (“none of the time”) to 5 (“all of the time”). Scores are added to obtain the overall score.</p> <p>Motivation: Motivation for PhD (Litalien et al., 2015)</p>

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		<p>15 items asking respondents to rate the extent to which each items corresponds to their reasons for persisting with their PhD, e.g. “For the satisfaction I have in facing challenges in my studies.”</p> <p>Responses on a likert-type scale, from 1 (“does not correspond at all”) to 5 (“corresponds exactly”).</p> <p>PhD student-specific well-being: Juniper PhD well-being scale (Juniper et al., 2012)</p>
Moate et al. (2019)	Emotional well-being	<p>Life Satisfaction: Satisfaction with Life Scale (Diener et al., 1985)</p> <p>Five items to assess satisfaction with life globally.</p> <p>Responses on a Likert-type scale from 1 (“strongly disagree”) to 7 (“strongly agree”).</p> <p>Perceived stress: Perceived Stress Scale (Cohen et al., 1983)</p> <p>Positive and Negative Experience: Scale of Positive and Negative Experience (Diener et al., 2010)</p> <p>12 items to assess how frequently respondents have felt positive and negative feeling, e.g. “afraid”, “joyful,” and “contented.”</p> <p>Responses on a Likert-type scale from 1 (“very rarely or never”) to 5 (“very often or always”).</p>
Pychyl and Little (1998)	subjective well-being	<p>Positive and negative affect: Composite affect scale developed by Diener and Emmons (1984)</p> <p>Nine items assessing frequency of feelings, e.g. "happy", "joyful", "depressed", "unhappy".</p> <p>Responses on a seven-point Likert-type scale from 1 (“not at all”) to 7 (“extremely much”).</p> <p>Scores calculated by summing the responses for the relevant items on the two subscales.</p> <p>Life satisfaction, Satisfaction with Life Scale (Diener et al., 1985)</p> <p>Domain-specific satisfaction: Palys and Little (1983)</p> <p>“In general, how satisfied or dissatisfied are you with your (specific domain) life as it is right now?” on seven domains (one per item), e.g. life as a whole, academic life, social life.</p> <p>Responses on a six-point Likert-type scale from 1 (“completely dissatisfied”) to 6 (“completely satisfied”).</p> <p>Each item scored separately.</p>
Pyhältö and Keskinen (2012)	Experienced socio-psychological well-being	<p>MED NORD questionnaire (Lonka et al. 2008), modified for doctoral studies.</p>
Rummell (2015)	stress and satisfaction	<p>The author's questionnaire to measure depressions and anxiety</p> <p>Thirty-five items (14 items for anxiety, 21 for depression), e.g. “Difficulty falling or staying asleep,” “Difficulty concentrating,” “Irritability,”</p> <p>Response options from “never” to “multiple times per week”.</p> <p>Life experiences; Inventory of College Students’ Recent Life Experiences (Kohn, Lafreniere, & Gurevich, 1990)</p>

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		49-item scale assessing extent to which respondents experienced various life events within the past month, e.g. “social rejection”, “not enough leisure time”. Responses on a four-point Likert scale, from 1 (“not at all”) to 4 (very much”). Perceived Stress Scale (Cohen et al., 1983)
Stubb et al. (2011)	stress, exhaustion and anxiety	MED NORD questionnaire (Lonka et al. 2008), modified for doctoral studies
Stubb et al. (2012)	Experienced socio-psychological well-being	MED NORD questionnaire (Lonka et al. 2008), modified for doctoral studies
Sverdluk and Hall (2019)	Psychological health and motivation	Depression: Center for Epidemiological Studies Depression Scale (Radloff, 1997) 20 items assessing how often respondents felt a certain way, e.g. “I felt depressed” and “I had trouble keeping my mind on what I was doing”. Responses on Likert-type scale, from 1 "rarely or none of the time (less than 1 day a week)" to 4 "most of the time (5–7 days a week)". Perceived stress: 10-item Strain scale (Cohen, 1988) 10 items measuring frequency of strenuous thoughts and feelings. e.g. “have you felt unable to control the important things in life?” and “have you felt difficulties were piling up so high that you could not overcome them”. Responses on Likert-type scale, from 1 ("never") to 5 ("very often"). Motivation: Motivation for PhD (Litalien et al., 2015)
Zahniser et al. (2017)	Well-being, stress, and affect	Flourishing Scale (Diener et al., 2010) Eight items measuring respondent’s perceived success in various areas, e.g. relationships and purpose. Responses on a seven-point Likert-type scale from 1 ("strongly disagree") to 7 ("strongly agree") Perceived Stress Scale (Cohen et al., 1983) Positive and Negative Affect Schedule (Watson, Clark, & Tellegen, 1988) 20 items to rate extent that they feel 10 positive and 10 negative emotions, e.g. upset, jittery, inspired. Responses on a Likert-type scale, from 1 (“very slightly or not at all”) to 5 (“extremely”). Scores are added to calculate overall score for each subscale.

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