UNIVERSITY OF TURKU

THE EFFECTS OF MINDFULNESS AND SELF-COMPASSION ON THE WELL-BEING OF UPPER SECONDARY EDUCATION STUDENTS

Oskari Lahtinen

TURUN YLIOPISTON JULKAISUJA – ANNALES UNIVERSITATIS TURKUENSIS
SARJA – SER. B OSA – TOM. 529 | HUMANIORA | TURKU 2021

UNIVERSITY OF TURKU

THE EFFECTS OF MINDFULNESS AND SELF-COMPASSION ON THE WELL-BEING OF UPPER SECONDARY EDUCATION STUDENTS

Oskari Lahtinen

TURUN YLIOPISTON JULKAISUJA – ANNALES UNIVERSITATIS TURKUENSIS
SARJA – SER. B OSA – TOM. 529 | HUMANIORA | TURKU 2021

University of Turku

Faculty of Social Sciences
Department of Psychology and Speech-Language Pathology
Division of Psychology
Doctoral Program in Inequalities, Interventions and New Welfare State

Supervised by

Professor Christina Salmivalli
Department of Psychology and Speech-Language Pathology
University of Turku
Turku, Finland

Reviewed by

Professor Judson Brewer
Mindfulness Center
Brown University
Providence, RI, USA

Professor Raimo Lappalainen
Department of Psychology
University of Jyväskylä
Jyväskylä, Finland

Opponent

Professor Judson Brewer
Mindfulness Center
Brown University
Providence, RI, USA

The originality of this publication has been checked in accordance with the University of Turku quality assurance system using the Turnitin OriginalityCheck service.

Cover image: Tita logo by Joona Puurunen (Copyright: Turun yliopisto)

ISBN 978-951-29-8335-3 (Print)
ISBN 978-951-29-8336-0 (PDF)
ISSN 0082-6987 (Print)
ISSN 2343-3191 (Online)
Painosalama Oy, Turku, Finland 2021

To life, love and awareness.

UNIVERSITY OF TURKU
Faculty of Social Sciences
Department of Psychology and Speech-Language Pathology
Division of Psychology
OSKARI LAHTINEN: The Effects of Mindfulness and Self-compassion on the Well-being of Upper Secondary Education Students
Doctoral Dissertation, 83 pp.
Doctoral Program in Inequalities, Interventions and New Welfare State
January 2021

ABSTRACT

Mindfulness practice is empirically linked to beneficial effects on adults and increasingly on children and adolescents. A common definition of mindfulness is self-regulation of attention in a curious, open, and accepting way. Mindfulness practice has been shown to result in lowered anxiety and depression, and improved coping with pain. A smaller body of research has looked at increased happiness or flourishing deriving from the practice. In addition to mindfulness practice, this thesis examines the effects of developing and having self-compassion, i.e., compassion towards oneself. In this thesis I examine how practicing mindfulness and self-compassion affects both suffering (e.g., anxiety and depression) and flourishing (e.g., psychological quality of life and happiness) of Finnish upper secondary education students. We conducted a nationwide randomized controlled trial of a digital mindfulness-based program I developed as a doctoral student: Tita (Study I; n = 1349). Tita benefitted participants in terms of lowered anxiety and increased happiness. Weaker evidence supported lowered depression and improved psychological quality of life. We also looked at 1) whether the effects Tita has happen as steady week-by-week improvements or whether they are more sudden or nonlinear, and 2) whether experienced well-being leads to participants practicing more in the following week. This investigation was made possible by collecting ecological momentary assessment data via smartphones during the RCT, and was likely to be the first of its kind in the field (Study II; n = 457). The evidence base for mindfulness research has been building for some time now, whereas that for self-compassion is only now beginning to emerge. A small research literature now ties self-compassion to benefits in terms of psychological well-being. To boost the potential of Tita to help adolescents in emotion regulation, self-compassion was also included as a program component. In Study III, we looked at the protective potential of having self-compassion. Specifically, we examined whether having self-compassion could buffer students from depression induced by adversity (n = 2383). Put together the studies in the thesis yield a novel look at how digital teaching of mindfulness and self-compassion impact student well-being. The studies were subject to moderate methodological issues, most notably the lack of an active treatment control for the RCT, another being its 41.5 % attrition rate. The studies indicate that Tita appears to help upper secondary education students to both decrease mental health problems and increase well-being. The benefit from Tita doesn't happen all of a sudden, but rather accumulates during the 8-week period, and seems to follow from continuous practice, which in turn is predicted by previous well-being. Participants increased their self-compassion, and in Study III, having self-compassion was linked to protection from adversity-related depressive symptoms. In conclusion, practicing mindfulness and self-compassion using Tita appears to benefit adolescents in terms of increased well-being.

KEYWORDS: Mindfulness, self-compassion, well-being, anxiety, students

TURUN YLIOPISTO
Yhteiskuntatieteellinen tiedekunta
Psykologian ja logopedian laitos
Psykologian oppiaine
OSKARI LAHTINEN: Mindfulnessin ja itsemyötätunnon vaikutukset toisen asteen opiskelijoiden hyvinvointiin
Väitöskirja, 83 s.
Eriarvoisuuden, interventioiden ja hyvinvointivaltion tutkimuksen tohtoriohjelma
Tammikuu 2021

TIIVISTELMÄ

Mindfulnessin harjoittamisen on osoitettu hyödyttävän aikuisia. Myös lapsia ja nuoria koskevia etuja puoltava tutkimusnäyttö on viime vuosina vahvistunut. Yleinen määritelmä mindfulnessille on huomion itsesäätely, jolle on ominaista utelias, avoin ja hyväksyvä asenne. Mindfulness-harjoittamisen on osoitettu lievittävän harjoittajien ahdistuneisuutta ja masentuneisuutta sekä vahvistavan kykyä elää kivun kanssa. Toistaiseksi mindfulness-tutkimuksessa on kiinnitetty vähemmän huomiota mindfulnessin potentiaaliin vahvistaa inhimillistä hyvinvointia kärsimyksen lievittämisen ohella. Viimeaikainen tutkimusnäyttö on tukenut myös mindfulnessin sukulaiskäsitteen itsemyötätunnon hyvinvointivaikutuksia. Tässä väitöskirjatyössä tutkin mindfulnessin ja itsemyötätunnon vaikutuksia ja yhteyksiä sekä kärsimykseen (kuten ahdistuneisuuteen ja masentuneisuuteen) että hyvinvointiin (kuten psykologiseen elämänlaatuun ja onnellisuuteen). Tutkimuksien koehenkilöt olivat toisen asteen opiskelijoita Suomen lukioista ja ammattioppilaitoksista. Mindfulnessin ja itsemyötätunnon vaikutuksia opiskelijoiden hyvinvointiin selvitettiin osana randomisoitua kontrollitutkimusta, jossa verrattiin toisiinsa kehittämääni digitaalista mindfulness-ohjelmaa Titaa sekä odotuslistakontrolliryhmää (Osatutkimus 1; n = 1349). Titan osallistujien ahdistuneisuus väheni ja onnellisuus lisääntyi kontrolliryhmään verrattuna. Lisäksi heikompi näyttö osoitti Titan vähentävän osallistujien masentuneisuutta ja lisäävän psykologista elämänlaatua. Tutkin väitöskirjatyössä myös minkälaisin mekanismein ohjelman vaikutus syntyy. Osatutkimuksessa 2 (n = 457) selvitimme, 1) ilmeneekö Titan hyvinvointivaikutus kumulatiivisesti viikoittain vai mahdollisesti äkkinäisemmin ja 2) onko harjoittajan hyvinvoinnilla harjoittamista lisäävä vaikutus seuraavalla viikolla. Selvitimme tätä älypuhelimien välityksellä kerätyllä kokemusotannalla osana Titan randomisoitua kontollitutkimusta. Tulokset tukivat sekä mekanismia 1 että 2. Kolmannessa osatutkimuksessa (n = 2383) tutkimme, millä tavoin korkeampi itsemyötätunto voi suojata toisen asteen opiskelijoita vastoinkäymisistä johtuvalta masentuneisuudelta. Itsemyötätuntolla oli suojaava vaikutus vaikeuksien ja masennusoireiden välisessä yhteydessä. Kaiken kaikkiaan väitöskirjan osatutkimukset antavat kotimaassa ainutlaatuisen kurkistuksen tapaan, jolla mindfulnessin ja itsemyötätunnon opettaminen toisen asteen opiskelijoille mahdollisesti tuo mukanaan hyvinvointihyötyjä. Metodologisesti Titan vaikuttavuustutkimusta olisi voinut yhä parantaa sisällyttämällä aktiivikontrolliryhmän sekä pyrkimällä vähentämään randomisoidun kontrollitutkimuksen katoa (41,5 %) entisestään. Tulokset osoittivat tutkittavien hyötyneen mindfulnessin ja itsemyötätunnon harjoittamisesta ja Titan olleen toimiva väline näiden taitojen opettamiseen.

ASIASANAT: Mindfulness, itsemyötätunto, hyvinvointi, ahdistuneisuus, opiskelija

Acknowledgements

I'd like to thank everyone who has made this thesis possible, and do this first in English, then in Finnish. First, I want to thank Dr. Judson Brewer for reviewing the thesis and taking on the duties of an opponent. I have appreciated Dr. Brewer's work on many fronts. He ran the UMass Center for Mindfulness when I did their MBSR teacher training. His group has done pioneering work in both mindfulness app design and research. I think I first encountered him through his TED talk, but especially appreciated his appearance on the Waking Up app. His agreeing to the job was a wonderful surprise. Thank you, Dr. Jud!

I'd also like to thank all the English-speaking people in our research team and at the psychology department. Also, thanks to the international sangha with whom I got to do the MBSR teacher training in 2017-2018. Thank you to all my meditation teachers, in particular, Sayadaw U Tejaniya and also Sam Harris, whom I haven't properly met, but whose nondual teaching has had a large impact on my practice. I'd also like to thank Jon Kabat-Zinn for his impact on the world and for inspiring me to practice and research secular mindfulness. Thank you to Geoff Cumming for his work on the New Statistics. Thank you to all my coauthors and thank you to everyone else who has helped me complete this thesis.

Suomeksi haluan kiittää professori Raimo Lappalaista toimimisesta tämän väitöskirjan tarkastajana. Haluan myös kiittää kollegoitani, erityisesti Jukka Hyönää, Armi Hakasta, Jarno ja Irene Tuomista, Otso Rantosta ja Jani Kajanojaa. Haluan myös kiittää jokaista ihmistä Christina Salmivallin tutkimusryhmässä, KiVa Koulussa, Opintokamussa, INVEST-lippulaivassa ja psykologian oppiaineessa.

Erityisesti haluan kiittää Christina Salmivallia, joka on yksi joukosta porilaisia ja melkein porilaisia naisia, joilla on ollut suuri vaikutus tähänastiseen elämääni. Christina oli ensimmäinen kanssani keskustellut ihminen psykologian laitoksella, kun tapasimme pääsykoehaastattelussa 2003. Vuonna 2014 hän tarjosi minulle töitä ryhmässään ja tämä väitöskirja on ollut mahdollinen, koska Christina on luottanut minuun vuosien ajan. Olen siitä hyvin kiitollinen. Kiitos Christina.

Haluan kiittää perheenjäseniäni: Isä, äiti, Veikka, Jukka, ja Kalle – kiitos olemassaolostanne, seurastanne ja tuestanne elämäni ajan. Rakastan teistä jokaista.

Kiitos Sonjalle kaikesta tuestasi ja jaetusta elämästä väitöskirjan teon aikana. Kiitos kummitädilleni Tuulalle, kummisedälleni Vesa-Pekalle, serkuilleni, isovanhemmilleni, muille sukulaisilleni ja läheisilleni sekä menneille polville. Kiitos kosmokselle näistä suotuisista olosuhteista, joissa saamme elää juuri nyt.

Oku

Table of Contents

List of Original Publications

This thesis is based on following original peer-reviewed publications. In the text they are referred to as Studies I–III.

I Lahtinen O. & Salmivalli C. (2020). An effectiveness study of a digital mindfulness-based program for upper secondary education students. *Mindfulness,* 1–12. https://doi.org/10.1007/s12671-020-01462-y

II Lahtinen, O., & Salmivalli, C. (2020). The relationship between mindfulness meditation and well-being during 8 weeks of ecological momentary assessment. *Mindfulness*, *11*(1), 255–263. https://doi.org/10.1007/s12671-019-01248-x

III Lahtinen, O., Järvinen, E., Kumlander, S., & Salmivalli, C. (2020). Does self-compassion protect adolescents who are victimized or suffer from academic difficulties from depression?. *European Journal of Developmental Psychology*, 17(3), 432–446. https://doi.org/10.1080/17405629.2019.1662290

1 Introduction

Conceptualizing well-being has owed much to the "medical model" of identifying a disease or a disorder in a person and then attempting to treat it via, e,g., medication or counselling (Shah & Mountain, 2007). Thus, we know quite a lot about suffering, i.e., depression, anxiety, and loneliness of adolescents, but less about their resilience and emotion regulation skills, or their empathy and compassion towards themselves and others. However, in conjunction with a trend towards positive psychology in adults, social and emotional learning (SEL) in schools has seen growing interest in the West (Seligman et al., 2005). An expanding evidence base indicates that adolescents need both academic and emotional support to thrive (Durlak et al., 2011). More attention is now being directed towards how to preventively help adolescents cultivate qualities that promote resilience and balance in their daily life.

Mindfulness, the ability to self-regulate attention in a curious, open, and accepting way, has been a focus of particularly intense interest from educators and program designers (Bishop et al., 2004; Huppert & Johnson, 2010; Kuyken et al., 2013). School-based mindfulness programs have been developed and some have either been, or are currently being, evaluated (e.g., Kuyken et al., 2017; Schonert-Reichl et al., 2015). Mindfulness-based programs (MBPs) for students promise to yield better concentration, emotion regulation, better ability to cope with stress and worry, and possibly enhanced social skills. It remains an empirical question to which degree the programs achieve these results. Most MBPs have been implemented face-to-face. This can be contrasted with everyday life in the 2020s, where, especially in times of a global pandemic, people increasingly begin their mindfulness practice using smartphone apps.

In 2014, I began conceptualizing a digital MBP named Tita (an abbreviation of "Tietoisuustaitopohjainen hyvinvointikurssi", "Mindfulness-based well-being course"; sometimes I abbreviate it to "Tietoisuustaidot," "Mindfulness". I will use the pronoun "I" when I did something essentially or entirely by myself. Otherwise I will use "we".) I thought creating a digital MBP for young people might be the most effective and scalable way for me to contribute to increasing happiness and decreasing suffering in the world, though of course it would need to be rigorously evaluated at first.

Tita was set to consist of guided meditations and brief online lectures and its intended audience were Finnish upper secondary school and vocational institution students (aged mostly 16-19). The larger context for developing Tita was another SEL program our research group was developing at the time ("Opintokamu" / "Well-being for upper secondary education") for the Finnish Ministry of Education and Culture. Even though Opintokamu was a group effort, I essentially designed Tita all by myself from start to finish, with the exception of technical aspects like coding, animation, recording and filming done by other parties. Both the larger program and Tita are now (as of August 2020) used by approximately two thirds of Finnish upper secondary education institutions. Finnish students currently encounter Tita as a subunit within the Opintokamu SEL program, but in Studies I and II of the thesis Tita was offered as a completely stand-alone MBP.

Tita was designed to train students in basic mindfulness meditation and also introduce them to a related practice, self-compassion. Self-compassion was included to further enhance emotion regulation skills in students (Diedrich et al., 2014). Practicing mindfulness is easily misunderstood as only having to do with awareness, attention or concentration even though acceptance of self (though meaning of "self" may alter as a result of practice) and cultivating positive affect have been an important part of evidence-based MBPs (Birnie et al., 2010; Kabat-Zinn, 1990). When MBPs are digital, it is probably all the more important to ensure the "heart" component (i.e., cultivating warm affect and compassion) is properly included in curricula.

Tita was piloted in the spring of 2016 in Turku and Helsinki and the final version was finished by the fall of 2017. The pilot study gathered quantitative and qualitative data from a quasi-randomized sample (n = 32), and the results indicated the MBP was suitable for the population and possibly resulted in benefit to students who practiced regularly during the study. Moving from piloting a version of Tita to finalizing the full MBP also marked a move from "program design" to "rigorous program evaluation" in the dissertation work. That was when we began a nationwide, preregistered randomized controlled trial (RCT) with 1349 active participants (after the study began, but prior to any post-MBP results, the protocol was preregistered: Lahtinen & Salmivalli, 2017). In addition to three waves of questionnaire data, we collected daily ecological momentary assessment (EMA) data via smartphones. The data gathered in the 2017-2018 RCT are also the basis for this thesis (Studies I and II employ the RCT data). During this time, I conducted close to 100 % of day-to-day Tita/RCT operations and essentially ran the nationwide study alone, though I had access to support from my supervisor when I needed it.

Tita's development was guided by a research literature that, by 2014, had begun to consolidate around benefits from mindfulness practice (Goyal et al., 2014). Mindfulness and the effects of practicing mindfulness have been studied in

thousands of published research articles (Goleman & Davidson, 2017). Critics have pointed out methodological flaws in much of the literature and cautioned against "mindfulness hype" (Van Dam et al., 2018). However, in aggregate, the published studies have reported benefit from practice, in both face-to-face and digital contexts (Goyal et al., 2014; Spijkerman et al., 2016).

The studies in this thesis represent an attempt to conduct methodologically robust research on whether a digital MBP (that includes self-compassion practice) promotes upper secondary education student well-being. We looked at main effects of the Tita MBP on well-being, measured via changes in primary outcomes anxiety, depression, school burn-out, psychological quality of life and secondary outcomes satisfaction with life, self-compassion, mindfulness, sleep problems, and happiness. Primary outcomes were selected on basis of effects found in prior literature, secondary outcomes were selected for exploratory reasons. An MBP group and a waitlist control group were compared in an RCT setting to determine program main effects on outcomes (Study I).

In Study II, we evaluated weekly smartphone reports from students, collected via EMA methodology. We were interested in finding out, whether students who practiced mindfulness during the Tita RCT were benefiting on a weekly basis, as indicated by their levels of anxiety, sleep problems, and happiness. In addition, we evaluated whether a lack of well-being would predict less practice in a given week. These data were collected as part of the Tita RCT.

In addition to looking at whether mindfulness and self-compassion training benefitted upper secondary education students, we examined benefits of having self-compassion. In Study III, we investigated self-compassion as a moderator of the association between encountering adversity (academic difficulties and victimization) and depressive symptoms among upper secondary education students. We were interested in whether self-compassion would act as a buffer against depressive symptoms among students who encounter difficulties. Such a protective effect would give an additional empirical reason for teaching upper secondary education students self-compassion, as Tita does.

1.1 Mindfulness

The Buddhist term mindfulness comes from the Pali word "sati". The term's exact original meaning is multifaceted and debated, but historically it has been seen to connote a presence of mind, bare attention, and a recollection of what is ethical (for more on the etymology of sati, see Gethin, 2011). In layman terms, mindfulness means being aware of one's experience right now. In academic terms, mindfulness is an umbrella term lacking a clear-cut definition (Van Dam et al., 2018). Best-known attempts for defining mindfulness have been "paying attention in a particular

way: on purpose, in the present moment, and nonjudgmentally" and a two-component definition of 1) self-regulation of attention, and 2) curious, open, and accepting orientation towards experience (Bishop et al., 2004; Kabat-Zinn, 1994; I use the two-component definition). In everyday use, the word "mindfulness" can refer to at least 1) the trait of being (or the ability to be) mindful (in the thesis I refer to this meaning unless otherwise stated), 2) formal mindfulness practice (a type of meditation), and 3) informal mindfulness practice, i.e., the process of being mindful in everyday situations.

Mindfulness (trait) is practiced and strengthened by meditation, whether formal or informal. There are two common formal ways to practice. The first involves paying attention to a particular object in awareness, like the breath, and returning attention to the object when the mind wanders. The second involves broadening attention to notice whatever one is experiencing, be it seeing, listening, smelling, tasting, feeling, or thinking. Formal mindfulness meditation is often practiced as part of MBPs like Mindfulness-based stress reduction (MBSR; Kabat-Zinn, 1990) or Mindfulness-based cognitive therapy (MBCT; Teasdale et al., 2000), in Buddhist or other traditional contexts, or by oneself – perhaps with the help of a mindfulness app. Informal practice involves adapting mindfulness practice to any everyday situation. E.g., one may maintain awareness in the body or on hearing sensations while engaged in conversation. Informal practice employs in essence the same kind of mindfulness as formal practice, just without stimuli filtered out (e.g., by closing eyes, sitting still, or going to a quiet environment to practice). Formal practice is used to build and cultivate the ability to be mindful and informal practice involves applying this ability in life.

Both empirical and theoretical research articles have attempted to tease apart the mechanisms through which mindfulness practice has its beneficial effects (Gu et al., 2015; Shapiro et al., 2006). Shapiro et al (2006) proposed that a "reperceiving" of experience takes place due to mindfulness practice. They further argued this general process is enhanced by four other consequences of practice: improved self-regulation, values clarification, increased cognitive, emotional, and behavioral flexibility, and exposure to experience. Empirical meta-analytic evidence indicates the main mediator between MBSR/MBCT (most common MBPs) and positive outcomes is reactivity (that is, reflexively reacting to stimuli like thoughts and emotions instead of taking time to carefully respond to them; Gu et al., 2015). Moderate consistent evidence exists for improved (trait) mindfulness and lessened worry and rumination as mediators of beneficial effects of practicing mindfulness. In conclusion, mindfulness practice can be said to lead to lessened reactivity and worry (perhaps due to reperceiving of experience) which then predict improved well-being.

Practicing mindfulness meditation has been shown to consistently result in modest benefit in the form of (at least) alleviated depression and anxiety and better ability to cope with pain (Goyal, 2014; de Vibe, 2017). Particularly good evidence supports using mindfulness in treating recurrent depression (Kuyken et al., 2016). Evidence is weaker for children and adolescents, though the effects have thus far been of comparable size to those in adults (e.g., Carsley et al., 2018). Neuroscientific evidence suggests that people who have practiced the most have also benefited the most (Goleman & Davidson, 2017).

There is an important distinction to be made between what benefits or effects have been shown to result from mindfulness practice in meta-analyses and those claimed in single studies. In the thesis, I give low weight to single studies as evidence of mindfulness-related claims. I also always privilege meta-analyses as evidence, even though even meta-analyses are only as good as the studies that constitute them.

Whereas meta-analyses support a comparably narrow range of benefits from mindfulness practice, single studies have hinted at diverse benefits ranging from lowered blood pressure to better immune function to recovery from psoriasis to improved academic skills (Davidson et al., 2003; Kabat-Zinn et al., 1998; Mrazek et al., 2013; Palta et al., 2012). This is happening against the backdrop of a replication crisis in psychology, where less than half of published research results can be confirmed in replication attempts (Open Science Collaboration, 2015). As in many other domains of social, behavioral, and life science research, main effects in mindfulness research literature are likely to be inflated by publication bias (Coronado-Montoya et al., 2016). In addition, the field of mindfulness research is only emerging from its infancy and has thus far suffered from poor methodology with only approximately 1 % of published mindfulness research deemed sufficiently reliable by leading experts in the field (Goleman & Davidson, 2017).

Most of mindfulness research has been done with adults, and less than 10 % of studies have involved under 18-year-old subjects (Felver & Jennings, 2016). Similarly, until recently, only a small fragment of the studies has looked at digital tools for teaching mindfulness meditation. Much of the early research on MBPs has been marred by suboptimal methodology. Many studies have lacked control groups, employed minuscule samples, and were not pre-registered to counter publication bias (Felver & Jennings, 2016; Goleman & Davidson, 2017). Studies that were better designed have often lacked proper follow-up measurement. Few studies have made midway assessments to investigate what happens during the program.

In research presented in the thesis we aimed to improve on previous methodological flaws in MBP research and 1) chose outcomes that allow replication of previous findings in the literature, 2) preregistered the study to counter publication bias (see Appendix 2 for the preregistration), 3) focused on adolescent subjects who have been underrepresented in previous research, 4) conducted follow-up

assessments, 5) recruited a far larger sample than is customary in the field. A further improvement would have been to employ an active control group which we unfortunately were unable to do under resource constraints.

In addition to paying attention the methodological research matters, I wanted to ensure that the studied MBP, like the contemplative traditions it partly derives from, imparts to participants more than just an ability to self-regulate attention. Practices like compassion and loving-kindness are not always explicitly, or even implicitly, taught in MBPs. The studies in the thesis examined an MBP where participants were given explicit instructions on how to practice compassion towards others and themselves.

1.2 Self-compassion

The second major component in Tita after mindfulness, self-compassion, is an even more novel concept in scientific research than its bigger brother mindfulness. Beginning in 2003, the early self-compassion research has begun to point to improved psychological well-being for self-compassionate adults and adolescents (Zessin et al., 2015). However, there has been little replication of studies in this new field. Few self-compassion promoting programs and interventions have been properly studied, virtually none of them digital. What is true of the methodological shortcomings in mindfulness studies is doubly true with regard to the fledgling field of self-compassion research.

Self-compassion was first conceptualized by Kristin Neff in 2003, and she also developed the first scale for measuring self-compassion (The Self-Compassion Scale (SCS); Neff, 2003; Raes et al., 2011). Neff's conception of self-compassion (adopted in the thesis) consists of three components: 1) self-kindness, 2) common humanity, and 3) mindfulness. SCS also includes three negative factors representing the counterparts of the three positive ones: 4) self-judgment, 5) isolation, and 6) overidentification. As mindfulness is a part of the definition, a conceptual overlap exists between self-compassion and mindfulness. Research thus far has indicated that having and practicing self-compassion appears to be related to psychological well-being and reduced suffering (anxiety, depression, and stress; Macbeth & Gumley, 2012; Neff & Germer, 2013).

A point of contention in the self-compassion literature has been the factor structure of the SCS and whether it is valid to employ the SCS total score obtained by adding together items across the various factors (Muris et al., 2019). We have published research arguing that the total score is a compromised metric for self-compassion, and that confirmatory factor analyses rather support a two-factor solution where positive and negative items load on positive and negative factors, respectively (Kumlander et al., 2018; also see Brenner et al., 2017). As most self-

compassion research has been done using the SCS total score, the legitimacy of this body of research hangs in the balance.

Research presented in the thesis takes the dual structure of self-compassion as a philosophical starting point, and thus in Study III we treat self-compassion and self-coldness separately. Self-compassion comprises the positive self-kindness, common humanity, and mindfulness items of the SCS, and self-coldness the negative self-judgment, isolation, and overidentification items. Self-coldness is thus defined as an umbrella construct for the negative SCS subscales. Another weakness inherent in the SCS worth mentioning is the substantial conceptual overlap of self-coldness and psychopathology, such as depression (Muris et al., 2019). Finally, Neff's conceptualization of self-compassion as comprising the three parts, self-kindness, mindfulness, and common humanity, should by no means be taken as definitive and other conceptualizations of self-compassion can and probably should be proposed in the future.

The mechanism through which self-compassion has its beneficial effect is currently not well known. Preliminary evidence points to self-compassion acting as a buffer between adversity and psychological problems (e.g., Trompetter et al., 2017). Self-compassion involves directing kindness, mindfulness, and a sense of shared humanity towards one's own suffering. As mindfulness by itself is an adaptive self-regulation strategy supported by empirical evidence (e.g., Gu et al., 2015), self-compassion's conceptual overlap with mindfulness should by itself yield some positive effect. It is an open empirical question how self-kindness and a sense of common humanity contribute to psychological resilience. The role of self-compassion (as defined by Neff) in emotion regulation is likely multifaceted, consisting of a bit of mindfulness, a bit of kindness, and a bit of feeling like a part of something larger than the self.

1.3 Adolescent mental health and interventions

Altogether 13.9 % of Finnish upper secondary school and 11.1 % of vocational institution students report moderate or severe anxiety. However, there is a gap between sexes so that 5.5 % of boys but 19.7 % of girls in upper secondary schools report anxiety (School Health Promotion Survey, 2019). A similar gap can be found in the percentages of upper secondary school students who report worrying over their mood: boys 21.2 % and girls 50.6 %, and both numbers are on the rise from 2017. 18.2 % of upper secondary education students and 15.4 % of vocational institution students report depressive symptoms, with similar sex imbalance as for anxiety. The lifetime prevalence for major depressive disorder in US adolescents (aged 13-18 years) is 11.0 %.

In addition to already suffering from clinical variants of anxiety or depression, there is a larger proportion of the population who have subclinical depressive symptoms. A still larger proportion of adolescents encounter life difficulties and setbacks, which can then lead to depression or other mental health problems later in life (Pine et al., 2002). It is thus important to offer preventive mental health interventions for adolescents to cut the risk of future depression in youth who encounter adversity (Hammen, 2005).

Thus far, published studies indicate that MBPs are moderately effective in helping adolescents with depression and anxiety (Chi et al., 2018; Kallapiran et al., 2015). Digital MBPs have not been studied much with adolescents, but early evidence indicates they are useful in reducing anxiety and depression at least in adult participants (Sevilla-Llewellyn-Jones et al., 2018; Spijkerman et al., 2016). Self-compassion has been associated with well-being in adolescents, but RCT evidence with meaningful sample sizes (say, $n > 50$ per group) is lacking for self-compassion building programs in the age group (Neff & McGehee, 2010).

Future mindfulness and self-compassion programs for adolescents are likely to make increasing use of digital components (Mrazek et al., 2019). Programs can be delivered via apps or some future technology yet unconceived. Smartphones have superior reach and are already a part of the lives of almost every adolescent. Several mindfulness apps exist but there are still relatively few digital MBPs that were developed by mental health professionals. Given the enormous popularity of apps, there is a pressing need for high quality digital mindfulness-based tools devised by professionals with proper understanding of the challenges adolescents face. However, recent years have also seen experts voice concern over youth overexposure to smartphones and in particular social media. At present, the evidence is still emerging and does not warrant strong conclusions in either direction (Coyne et al., 2020; Keles et al., 2020). However, in designing the MBP, I made the conservative assumption screen time is likely a net negative for youth and designed the program to involve as little time spent on staring at a screen as possible.

1.4 Tita

Tita (short for “Tietoisuustaitopohjainen hyvinvointikurssi” or just “Tietoisuustaidot”) is an 8-week digital MBP that was piloted in early 2016 and studied in an RCT in 2017-2018. It is loosely modelled on Mindfulness-based stress reduction and Mindfulness-based cognitive therapy, but does not include interaction with a teacher or a group (MBSR/MBCT; Kabat-Zinn, 1990; Teasdale et al., 2000). In addition to mindfulness, Tita also teaches participants self-compassion and includes brief lectures on topics like stress and happiness. Tita includes seven guided meditations: 5, 10, and 20-minute-length sitting mindfulness practices, a 20-minute

guided body scan, brief walking meditation instructions, a brief 5-minute self-compassion exercise, and a guided 12-minute loving-kindness meditation.

A guiding philosophy in designing Tita was to avoid pitfalls of previous MBPs for adolescents, mainly by emphasizing the utmost importance of practice from the very start. A major challenge in designing MBPs for adolescents is to make sure participants practice and understand the importance of practice (Huppert & Johnson, 2010). Thus, the emphasis in developing Tita was to maximize the time participants practice and conversely minimize the relative time they spend passively imbibing lectures. This was done, e.g., by offering instructions for a 1-minute meditation to lower the threshold for practicing for those who feel 5 minutes is too much. We also offered all the guided meditations at the beginning of the course and stressed that they (not the lectures) essentially *are* the program. The RCT version of Tita also included daily smartphone prompts that queried participants how much they had practiced the previous day. We also asked about their well-being (anxiety, sleep problems, and happiness) once a week.

Mindfulness-based cognitive therapy -type components were included in lectures on mindful cognition (Teasdale et al., 2000). Out of the 9 lectures, four were on the theme of "thoughts, emotions, and the body". In addition to having been piloted by upper secondary education students in 2016, Tita content was evaluated and commented on by psychologists and other professionals in the Salmivalli lab during 2015-2017. During the RCT, I also gave access to the program to a small number of school staff, whose students had enrolled in the study and who had themselves gotten curious about the MBP and wanted to try it out.

Tita was entirely extracurricular so no integration in school curricula was necessary. Schools advertised Tita to their students via email or the Wilma parents-school communications system. As Tita is a self-study program, particular care was taken to inform students with serious mental health issues that they should not take part without consulting a mental health professional first. Exclusion criteria to Tita were given as psychosis, trauma, and depression that has a meaningful impact on the student's life. Students with any mental health issues were instructed to begin with the briefest practices and quit if they felt adverse effects. Some empirical evidence is now emerging on possible adverse effects of mindfulness practice, though the effects seem to mostly appear on intensive silent retreat where it is common for participants to practice 8 hours per day or more (Lindahl et al., 2017).

I recorded the guided meditations and conducted the teaching in the lectures, the video for which was shot in a professional studio. Tita lectures also feature light-intensity animated content, which was scripted by me with an animator who then designed the content. My teacher qualifications at the time of developing Tita were roughly 550 hours of mindfulness practice (a week on intensive silent retreat), .b (a standardized classroom-based face-to-face MBP) teacher training, and being a

qualified psychologist. The program was finalized during the summer of 2017 and the RCT began in early September of that year.

2 Thesis Aims

The aim of this thesis was to answer the following research questions:

1. What are the main effects of the Tita mindfulness-based program on well-being when compared to a waitlist control condition? (Study I)
2. What are the secondary effects of the Tita mindfulness-based program in addition to possible well-being improvement? More specifically, does taking part in Tita lead to increases in mindfulness and self-compassion? (Study I)
3. Is there ongoing weekly benefit from practicing mindfulness in Tita or do benefits occur more nonlinearly? (Study II)
4. Does lack of well-being predict less mindfulness practice in a week? Conversely, does well-being predict more practice in a week? (Study II)
5. What are the protective qualities of self-compassion? More specifically, does self-compassion protect adolescents from adversity-related depression? (Study III)

3 Method

3.1 Data in Studies I–III

The three studies used different data sets:

1. Study I used data from the Tita RCT sample. We ran the RCT in 2017-2018 and the final sample consisted of 1349 students who answered the study questionnaire on at least one time point (out of three possible time points).
2. Study II used an ecological momentary assessment data set from the RCT. These data were collected via the smartphone app Paco and the final sample consisted of 457 students who answered at least one question on the app.
3. Study III used a data set from another effectiveness study we ran for the Opintokamu program, in which Tita is included. The final sample were 2383 students who answered the study questionnaire.

3.2 Participants

Participants in Study I were 1349 upper secondary education students (median age 17). 1147 (85.7 %) were female. 984 (73.4 %) were upper secondary school students (356 vocational institution students, 9 N/A). Participants were volunteers responding to an ad describing the Tita MBP. The ad had been distributed to educational institution staff who in turn distributed it to students. Students were randomized to either receive the program right away in October of 2017 or to wait till February of 2018 to receive the program. Participants in Study II were 457 students out of the sample for Study I, who were randomized into the RCT arm and downloaded the Paco app for EMA data collection. Participants in Study III were 2383 upper secondary education students. 1249 (52.4 %) were girls. 1356 (56.9 %) were upper secondary school students. Schools were recruited for the study and participants were students in the schools. Before filling questionnaires, participants were asked to give informed consent to participate.

3.3 Procedure

In Study I, data were collected on three time points: before (T_1) and after (T_2) the program and at a 3-month follow-up (T_3). Students answered a web-based questionnaire. Students were either randomized to start the Tita MBP immediately or to be on the waitlist, set to begin the MBP in the following school term.

In Study II, students answered two daily questions on the Paco smartphone app: 1) whether, and 2) how many minutes they had practiced the previous day. They also answered a weekly well-being questionnaire about anxiety, sleep problems, and happiness.

In Study III, participants answered a study questionnaire once. A planned missingness protocol was used to shorten questionnaire length and ease student burden of answering (for details: Little & Rhemtulla, 2013). Essentially items were divided into pools and randomly distributed to students so that each student only answered a little over two thirds of the items. The missingness was completely at random (MCAR) and thus could be dealt with multiple imputation with minimal error. A hundred movie tickets and an iPad Mini 4 were raffled among participants as prizes.

3.4 Measures and analyses

All studies in the thesis employed self-report measures (Tables 1 and 2; see original articles in Appendix 1 for references). In Study I, main analyses were 2-way ANOVAs (time*treatment), where the MBP arm was compared to the waitlist with different outcome variables. As there was some attrition (41.5 %), a multiple imputation protocol was used to impute missing values in order to obtain intention-to-treat estimates of treatment effects. This missingness was not MCAR and thus added noise to the results, as non-MCAR imputation often does. We erred on the side of caution by making the exceedingly conservative assumption that drop-outs in effect had not taken part in the MBP at all. In reality, many dropouts likely participated in the MBP for weeks or even completed it and just failed to fill out the post-study questionnaire for various reasons. Our conservative assumption thus likely diluted the intention-to-treat effect sizes from what they would have been had everyone filled out the post-study questionnaire. Main analyses were conducted with the SPSS software. The R statistical software was used for minor analyses (omega and initial effect size calculation).

In Study II, main analyses were conducted as a 9-timepoint path model using the Mplus software (Muthén & Muthén, 2017). We looked at regression effects from mindfulness practice in the previous week to well-being outcomes in the next week. We also looked at paths from well-being outcomes in the previous week to mindfulness practice in the following week.

In Study III, main analyses were moderation analyses with SPSS, using hierarchical regression. Follow-up probing of effects was conducted using the PROCESS add-on (Hayes, 2012).

Table 1. Information about measures used in Study I. Primary variables in **in bold**.

STUDY	MEASURE	SCALE NAME	ABBREVIATION	ITEMS	MIN–MAX
1	**Anxiety**	Brief generalized anxiety measure	GAD-7	7	0–3
	Depression	Revised Beck depression inventory	R-BDI	12	0–4
	School burnout	School burnout inventory	SBI	9	0–5
	Psychological quality of life	The World Health Organization Quality of Life Questionnaire-BREF psychological quality of life subscale	WHOQoL-BREF	6	0–4
	Satisfaction with life	Satisfaction with life scale	SWLS	5	0–4
	Mindfulness	Child and adolescent mindfulness measure	CAMM	10	0–4
	Self-compassion	Self-compassion scale (short form)	SCS-SF	12	0–4
	Sleep problems	Combined measure	-	5	0–4
	Happiness	World Happiness Report	-	1	0–10

Table 2. Information about measures used in Studies II and III.

STUDY	MEASURE	SCALE NAME	ABBREVIATION	ITEMS	MIN–MAX
2	Anxiety	Brief generalized anxiety measure	GAD-7	7	0–3
	Sleep problems	Single item	-	1	0–4
	Happiness	World Happiness Report	-	1	0–10
3	Self-compassion	Self-compassion scale (positive)	SCS	13	0–4
	Self-coldness	Self-compassion scale (negative)	SCS	13	0–4
	Victimization	Revised Olweus bully/victim questionnaire	OBVQ	8	0–4

4 Overview of Studies

Study I

Lahtinen O. & Salmivalli C. (2020). An effectiveness study of a digital mindfulness-based program for upper secondary education students. *Mindfulness*, 1-12. https://doi.org/10.1007/s12671-020-01462-y

Mindfulness-based programs (MBPs) have been shown to reduce anxiety and depression. MBPs can also be helpful as universal programs for healthy subjects. Few studies have looked at how beneficial MBP effects transfer to digital MBPs. In this study, we evaluated the effectiveness of a universal digital MBP, Tita. The study was a randomized controlled trial with 1349 participants aged mostly 16-19 (85.7 % females). The digital MBP was compared to a waitlist condition. Online questionnaire data were collected pre-program, post-program, and at 3-month follow-up. Intention-to-treat analyses were conducted, first using multiple imputation to account for missing values, and then comparing the conditions over time in a 2-way ANOVA. In this preregistered study, we were mainly interested in main effects on primary outcomes: anxiety, depression, school burnout, and psychological quality of life. Taking part in the MBP resulted, on average, in a 10.0 % reduction in anxiety (d = .15; intention-to-treat analysis). The effects were larger for participants who did not drop out during the 8-week course of the MBP: 16.1 % reduction in anxiety (d = .26). In addition, for MBP nondropouts, there were small benefits in terms of lessened depression (d = .15) and improved psychological quality of life (d = .16). Out of secondary outcomes, happiness was most impacted by the program (ITT: d = .23; nondropouts: .22). Frequency of practice predicted increased benefit. Attrition rate in the study was 41.5 %. The results suggest that digital MBPs can be successful in delivering at least some of the benefits characteristic of face-to-face MBPs. In conclusion, the study provides evidence that taking part in Tita, the digital MBP, results in modest well-being improvements, mostly in terms of alleviated anxiety, that get larger the more students commit to practice. Benefits were detectable in students both suffering less (lowered anxiety and depression) and flourishing more (improved happiness and psychological quality of life). The average reduction in anxiety was large enough to be clinically significant for most participants above the clinical threshold. Effects held regardless of sex or whether the participant went to upper secondary school or vocational institution. The results

already have direct real-world implications, as Tita is now on offer in approximately two thirds of upper secondary education institutions in Finland.

Study II

Lahtinen, O., & Salmivalli, C. (2020). The relationship between mindfulness meditation and well-being during 8 weeks of ecological momentary assessment. *Mindfulness*, *11*(1), 255-263.

The main effects of 8-week mindfulness-based programs (MBP) on anxiety and depression are now supported by reasonably robust evidence. Study I of this thesis bolsters this evidence for digital MBPs like Tita. However, few to no studies have looked at whether and how these main effects come to be over the course of the MBP. The goal of the present study was to look at how meditation practice predicted changes in well-being, and vice versa, at a weekly level, within an 8-week online MBP. The participants were 457 (88.0 % females) Finnish upper secondary education students who underwent the 8-week online Tita MBP. The participants thus largely overlapped with the treatment arm in Study I: they were the Tita participants who in addition were able to download an app and answer daily and weekly questions during the 8-week program. App-based ecological momentary assessment data were collected on how many minutes the participants practiced meditation (daily) and their anxiety, happiness, and sleep problems (weekly). These data were analyzed using a longitudinal (nine time point) path model. Participants' weekly minutes of mindfulness meditation were a consistent, albeit weak, predictor of decreases in anxiety and increases in happiness in the following week. During the course of the study, answer rates declined from 75.7 % (Time 0) to 27.4 % (Time 8) for anxiety, happiness, and sleep and from 80.5 % to 37.0 % for meditation minutes. Main effect benefits in terms of lessened anxiety were pronounced in the study sample: whereas the MBP group in Study I experienced, on average, a 10.0 % decline in anxiety (ITT: vs. waitlist), the MBP group who answered smartphone queries experienced a 31.8 % decline in anxiety (nondropouts vs. waitlist). Most participants whose anxiety was above the "clinical" threshold (10 points or more on the anxiety measure) experienced a reduction to subclinical levels (73.9 % of the subsample). The results suggest well-being improvement from mindfulness meditation is an ongoing process and that EMA is a promising methodology for studying it. The results also raise questions as to how much effects from meditation practice can be improved via, e.g., daily smartphone communication with MBP participants via well-being and practice queries. In conclusion, taking part in Tita resulted in some weekly benefit, though most of the effects were not statistically significant towards the end of the program. However, the effect sizes did not diminish even when statistical significance was lost – the confidence intervals just get larger as the sample size got smaller. We also found weak evidence that lack of well-being, at least having trouble with sleeping, may have contributed to not practicing mindfulness as much.

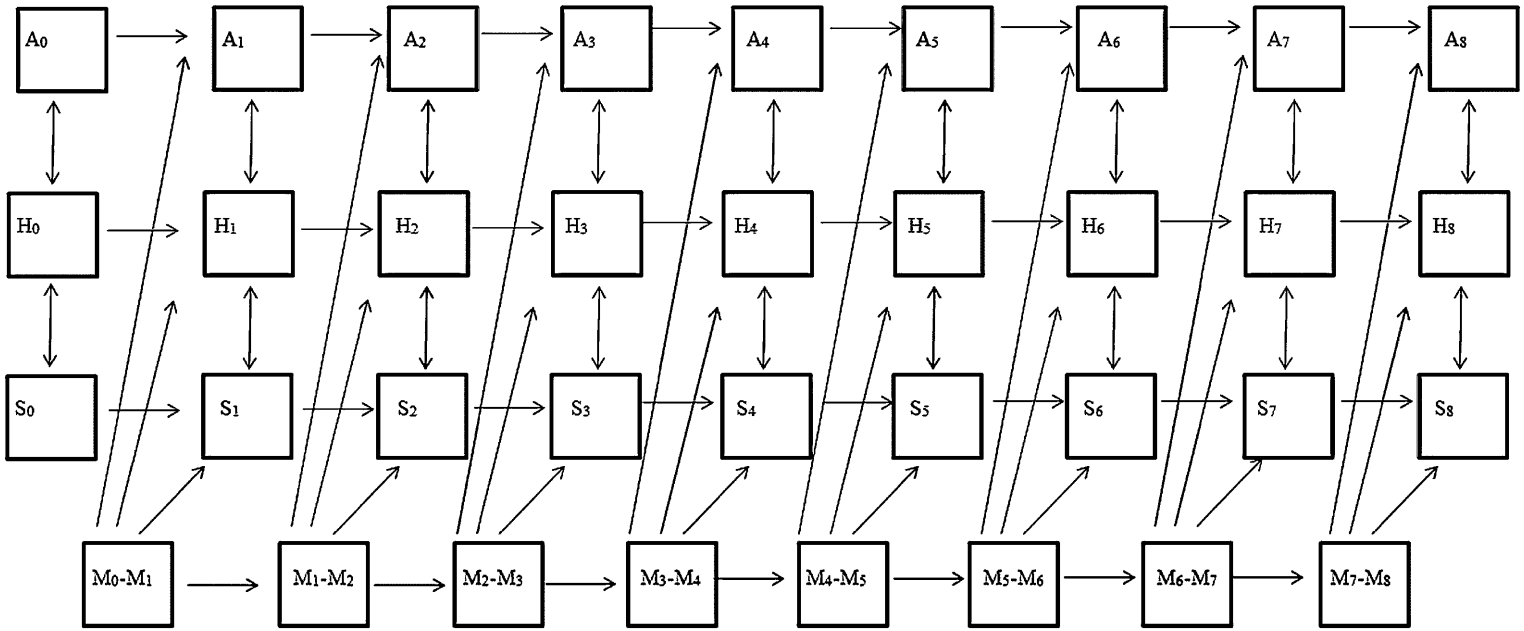

Figure 1. Path model for Study II outcomes (*A*, anxiety; *H*, happiness; *S*, sleep problems) and meditation (*M*). Subscript numbers denote time points (0 = before program, 8 = after program; e.g., H_0, happiness at T_0; M_2–M_3, meditation between T_2 and T_3). Paths predicting meditation from outcomes were omitted for clarity.

Study III

Lahtinen, O., Järvinen, E., Kumlander, S., & Salmivalli, C. (2020). Does self-compassion protect adolescents who are victimized or suffer from academic difficulties from depression?. *European Journal of Developmental Psychology*, 1-15.

Adolescents face many social and academic difficulties which, if not managed properly, can lead to depression. Self-compassion, a kind and caring orientation towards oneself, has emerged as a possible resilience factor alleviating depression. Self-compassion comprises two factors: self-compassion and self-coldness. The present study set out to investigate whether self-compassion weakens or self-coldness strengthens the association between depression and two difficult circumstances: victimization and academic difficulties (ADs). The sample consisted of 2383 students who had recently made the transition to upper secondary education. The study was cross-sectional and employed a hierarchical regression analysis approach. Strongest interactions were followed up with simple slope analysis. Self-compassion (inversely), self-coldness, ADs, and victimization were statistically significant predictors of depression. Self-compassion weakened the association between ADs and depression. The results suggest encountering difficulties in adolescence and depression are related and that self-compassion may moderate the association. The study also provided evidence that self-compassion and self-coldness may be distinct entities. In the study, only self-compassion, and not self-coldness, had a moderating role in the adversity-depression association. The study provides preliminary evidence that teaching adolescents self-compassion may also protect them from depressive symptoms.

5 Discussion

The empirical studies in the thesis set out to find answers to a variety of questions involving the effectiveness of the Tita digital mindfulness-based program for upper secondary education students. In Study I, we obtained estimates of Tita main effects on well-being when comparing MBP participants to waitlist controls. Tita lowered participant anxiety and depression, and appeared to also improve psychological quality of life, at least in students who did not drop out during the program. When examining secondary outcomes, we further learned Tita improved participant happiness and self-compassion. Primary effects obtained in the study were similar, though slightly lower, than in a meta-analysis of previous digital MBP studies (Spijkerman et al., 2016).

In addition to these main effects we investigated how Tita produced its effects during the course of the program (Study II). Mindfulness practice was measured via ecological momentary assessment, using a smartphone app, on a daily basis and combined with weekly well-being data that were also obtained via smartphones. We learned that taking part in Tita resulted in some weekly benefit, though most of the effects were not statistically significant towards the end of the program. However, a trend remained and the effect sizes did not diminish as the program continued – their confidence intervals just got larger as the sample size got smaller. This suggests effects that might be lost if p-values were taken as the ultimate arbiter of significance, which they are not (Cumming, 2013). We were also interested in whether well-being or lack of well-being contribute to how much participants practice mindfulness in a following week. We found weak evidence that lack of well-being, at least having trouble with sleeping, may contribute to practicing less.

It was established in Study I, that self-compassion increased in Tita participants – at least if they did not drop out during the program. In Study III we examined whether having self-compassion can buffer against depression. We looked at students who were victimized or struggled in their studies. We found that students with academic difficulties who had more self-compassion were less likely to be depressed than the ones with less self-compassion. Because the study was cross-sectional, we took this as a hypothesis to be further researched and did not infer causal relations based on the results. However, this is in keeping with previous

research in the field (Trompetter et al., 2017). Interestingly, happiness increased in Tita participants, and the effect size was near-identical in both completer and ITT analyses. A universal program like Tita that was made for healthy subjects and not tailored to any particular patient group, may thus perhaps have as large an impact on positive emotions and flourishing as it has on suffering.

Taken together, the thesis aims provide evidence that taking part in Tita, the digital MBP, resulted in modest well-being improvements, mostly in terms of alleviated anxiety, that got larger the more students committed to practice. Benefits were detectable in students both suffering less (lowered anxiety and depression) and flourishing more (improved happiness and psychological quality of life). Effects held regardless of gender, and whether the participant went to upper secondary school or vocational institution.

The results already have direct real-world implications, as many upper secondary education institutions started offering Tita after the RCT in 2018, and it is now on offer in around two thirds of upper secondary education institutions in Finland. An average ten percent reduction (intention-to-treat analysis; otherwise 16 %) in anxiety vs. the control group translates to people just above the clinical threshold of 10 GAD-7 points improving approximately 1 GAD-7 point which is a (minimally) clinically significant reduction in anxiety (Richards & Borglin, 2011). The above is a conservative estimate as the effect size includes people who dropped out of the program. On average, nondropouts just above the 10-point threshold could expect to have their anxiety reduced to well below 9. Apps specifically designed for anxious people have reported even larger decreases in anxiety than found in Studies I and II (48-57 %; Roy et al., 2020). However, Tita is a universal, light MBP and the population in the study did not have particularly high baselines in anxiety. Thus the 10-16 % reduction can be considered an achievement. Anxiety in the EMA group dropped 31.8 % (vs. waitlist; within-group 39.7 %).

Tita participants also developed more self-compassion (ITT: d = .10, nondropouts: d =.14). The thesis also provided preliminary evidence that having self-compassion may act as a buffer against depression. Thus far, self-compassion programs in upper secondary education have been in short supply and virtually nonexistent in Finland. When they have been offered to students, it has been mostly for the college population (e.g., Smeets et al., 2014). Tita may be the first program easily accessible to upper secondary students that teaches how to cultivate self-compassion. Coming back to the "medical model" (see first sentence of Introduction), Tita appears to both ease mental health problems and have a role in building resilience. Both effects are modest, which is what you would expect from a universal, light MBP, not tailored to specific populations (anxious people, addicts, etc.).

Benefit from Tita was somewhat evenly distributed across participants, with few differences between easily distinguishable categories (boys vs girls, present mental health problems vs without, upper secondary school vs vocational institution etc.). Acceptability of the program was moderate, as 41.5 % of participants dropped out – the figure could have been higher but it also could have been lower. A selection bias was detected with girls (vs boys) and upper secondary school students (vs vocational institution students) being more likely to register.

In relation to the replication crisis and recent methodological criticisms in the field, the studies in the thesis represent an attempt to improve on the first decades of mindfulness and self-compassion research (Goleman & Davidson, 2017; Van Dam et al., 2018). The main RCT succeeded in holding itself accountable via preregistration, and also in recruiting a large sample size, and thus guarding against obtaining chance results. We were careful to look at effect sizes instead of p-values to further avoid witting or unwitting "p-hacking" (Cumming, 2013). We were also mindful and explicit of what definition of mindfulness (and self-compassion) we were using, as suggested by Van Dam et al (2018). Our use of EMA was also a strength, as its use is still fairly rare in the field. Some notable mindfulness studies have used EMA (e.g., Killingsworth & Gilbert, 2010). EMA made it possible to record more ecologically valid estimates of effects than in a standard pre-post RCT design.

5.1 Limitations

Some criticisms of the work presented in the thesis are in order. First, the main RCT only employs a waitlist control. It has been persuasively argued in the field that modern, robust studies should make use of active control groups (e.g., Davidson & Kaszniak, 2015; Goleman & Davidson, 2017). We only had a waitlist condition due to resource shortage. I designed the Tita program as part of thesis work at the University of Turku and was the only person working on it full time. A limit had to be drawn somewhere and given a nationwide 1000+ sample RCT already felt like enough of a feat to pull off, an active control was not created. In addition, there would have been an ethics concern to offer an untested, unsupervised long-distance active control program. Given the evidence base for MBPs, these was less of a concern for the safety of Tita and the RCT protocol passed the ethics review at the University of Turku.

Second, two of the samples in the thesis had a heavy female bias. This was a feature of the nationwide, volunteer-based sampling process. We allowed all participants in and females were five times more likely to enroll as males. This information may be useful when designing well-being programs for this age group – it takes extra effort to reach males. Upper secondary school students were more

likely to enroll than vocational institution students, in part because upper secondary school students are also more likely to be female. As boys can equally benefit from mindfulness, sorting out the reach issue is important (Sibinga et al., 2013).

Third, one of the three studies (Study III) was cross-sectional. To truly investigate whether self-compassion acts as a buffer against depression a longitudinal study with two or more time points is needed. Our results point to self-compassion being a possibly worthwhile well-being indicator that perhaps should be taught in schools: either as part of a program or integrated into a school subject.

Fourth, considerable attrition occurred in the first two studies in the thesis. In the RCT, 41.5 % of participants dropped out during the program. In Study II, more than half of participants stopped responding during the course of the study. Attrition did not occur in Study III as filling out the questionnaire was supervised and done during class. The analyses that relied on nondropout data likely yielded results with a degree of bias. Around 40 % of participants dropping out in a digital MBP study is not unheard of and there are reports of even larger attrition in similar studies (Morledge et al., 2013). Also, attrition could not be predicted from RCT baselines so it appears it is not just the worse-off who drop out. Still, minimizing attrition should be a major goal in designing and improving any MBT and Tita is no exception.

Fifth, all the studies relied on self-reports. They are an imperfect way to measure study variables. Mindfulness self-report questionnaires in particular are famously unreliable, reporting for instance that binge drinking positively correlates with mindfulness practice or failing to distinguish between highly experienced and novice meditators (Goleman & Davidson, 2017; Leigh et al., 2005). Given two of our sample sizes were in the thousands, experimental assessment of mindfulness or other qualities was not practical with the resources we had. However, a brief test of mindfulness ability operationalized as counting breaths could probably be programmed and administered on an automated digital platform as well (Goleman & Davidson, 2017).

Sixth, as Tita is currently a universal MBP offered to any upper secondary student who wants to use it, effects across different domains are likely to be smaller than what they could perhaps be, if the content was tailored. For instance, Tita for depressed youth could present content specifically designed to benefit this particular population. Tailoring the content to particular subpopulations would have likely made the program better and could be an important improvement to future versions of the MBP. This would perhaps involve having participants fill out short questionnaires for depression, anxiety, and stress symptoms at the outset and then receiving a version of Tita best suited to their needs, with some core content common to all, complemented with content specific to alleviating particular forms of suffering like depression.

5.2 Future directions

There is a mindfulness trend sweeping the West and more and more interest is directed towards self-compassion as well. Empirical evidence indicates practicing these qualities results in beneficial effects. At the same time, benefit from practice takes time to develop and initial effects are likely to be modest, and on the state rather than trait level (Goleman & Davidson, 2017). MBPs should not overpromise in terms of fast benefits and on the contrary ought to introduce mindfulness as a beneficial routine practice somewhat like brushing one's teeth: having a regular practice guards against suffering and, in time, bigger differences appear between people who practice and people who don't.

Meditation is likely not for everyone and there is a contraindication for people with trauma backgrounds and psychosis for instance (Lindahl et al., 2017). However, mindfulness practice can conceivably benefit even these populations if offered in the proper clinical context (Chadwick, 2014). We did not offer Tita to these populations, as it is currently empirically unclear what safeguards should be in place. Further research ought to clarify how mindfulness is to be offered to these populations that would likely benefit from integrated, holistic treatments like MBPs.

It is also good to keep in mind that though the scientific community finds empirical evidence of benefit from practice, in a cognitive psychology or neuropsychology sense we still have only a rudimentary idea of how mindfulness ought to be defined and how its different aspects manifest in the brain (Tang et al., 2015; Van Dam et al., 2018). In order to further hone components in MBPs, a clearer conceptual and physiological understanding of what mindfulness is and what it does would be useful and should be on future research agendas.

Most importantly, the mindfulness research community will need to pay increasing attention to better methodology. There have been sobering overviews of the 5000+ published mindfulness studies from top scholars in recent years (Goleman & Davidson, 2017; Goyal et al., 2014; Van Dam et al., 2018). When only around 1 % of papers in a field are methodologically robust enough, the emphasis needs to shift to quality, not quantity. Since prominent voices have raised these concerns, research funding and journal space are already more likely to go to studies that advance quality. Researching mindfulness comes with two major integrity requirements: 1) to balance modern science with ancient contemplative traditions in order to teach and practice mindfulness in appropriate ways, and 2) to study the subject (privately dear to many researchers) in a thoroughly honest, critical, robust, and rigorous way. Put more poetically, clear seeing can be reciprocal: as mindfulness practice leads to clearer seeing of experience, we the researchers should also aim at seeing mindfulness clearly – with properly designed protocols and carefully calibrated instruments.

List of References

Birnie, K., Speca, M., & Carlson, L. E. (2010). Exploring self-compassion and empathy in the context of mindfulness-based stress reduction (MBSR). *Stress and Health*, *26*(5), 359-371. https://doi.org/10.1002/smi.1305

Bishop, S. R., Lau, M., Shapiro, S., Carlson, L., Anderson, N. D., Carmody, J., ... & Devins, G. (2004). Mindfulness: A proposed operational definition. *Clinical psychology: Science and Practice*, *11*(3), 230-241. https://doi.org/10.1093/clipsy.bph077

Brenner, R. E., Heath, P. J., Vogel, D. L., & Credé, M. (2017). Two is more valid than one: Examining the factor structure of the Self-Compassion Scale (SCS). *Journal of Counseling Psychology*, *64*(6), 696. https://doi.org/10.1037/cou0000211

Carsley, D., Khoury, B., & Heath, N. L. (2018). Effectiveness of mindfulness interventions for mental health in schools: A comprehensive meta-analysis. *Mindfulness*, *9*(3), 693–707. https://doi.org/10.1007/ s12671-017-0839-2

Chadwick, P. (2014). Mindfulness for psychosis. *The British Journal of Psychiatry*, *204*(5), 333-334. https://doi.org/10.1192/bjp.bp.113.136044

Chi, X., Bo, A., Liu, T., Zhang, P., & Chi, I. (2018). Effects of mindfulness-based stress reduction on depression in adolescents and young adults: a systematic review and meta-analysis. *Frontiers in Psychology*, *9*, 1034. https://doi.org/10.3389/fpsyg.2018.01034

Coronado-Montoya, S., Levis, A. W., Kwakkenbos, L., Steele, R. J., Turner, E. H., & Thombs, B. D. (2016). Reporting of positive results in randomized controlled trials of mindfulness-based mental health interventions. *PloS One*, *11*(4). http://dx.doi.org/10.1371/journal.pone.0153220

Coyne, S. M., Rogers, A. A., Zurcher, J. D., Stockdale, L., & Booth, M. (2020). Does time spent using social media impact mental health?: An eight year longitudinal study. *Computers in Human Behavior*, *104*, 106160. https://doi.org/10.1016/j.chb.2019.106160

Cumming, G. (2013). *Understanding the new statistics: Effect sizes, confidence intervals, and meta-analysis*. Routledge. http://dx.doi.org/10.4324/9780203807002

Davidson, R. J., Kabat-Zinn, J., Schumacher, J., Rosenkranz, M., Muller, D., Santorelli, S. F., ... & Sheridan, J. F. (2003). Alterations in brain and immune function produced by mindfulness meditation. *Psychosomatic Medicine*, *65*(4), 564-570. http://dx.doi.org/10.1097/01.PSY.0000077505.67574.E3

Davidson, R. J., & Kaszniak, A. W. (2015). Conceptual and methodological issues in research on mindfulness and meditation. *American Psychologist*, *70*(7), 581. http://dx.doi.org/10.1037/a0039512

de Vibe, M., Bjørndal, A., Fattah, S., Dyrdal, G. M., Halland, E., & Tanner-Smith, E. E. (2017). Mindfulness-based stress reduction (MBSR) for improving health, quality of life and social functioning in adults: a systematic review and meta-analysis. *Campbell Systematic Reviews*, *13*(1), 1–264. https://doi.org/10.4073/csr.2017.11

Diedrich, A., Grant, M., Hofmann, S. G., Hiller, W., & Berking, M. (2014). Self-compassion as an emotion regulation strategy in major depressive disorder. *Behaviour Research and Therapy*, *58*, 43–51. http://dx.doi.org/10.1016/j.brat.2014.05.006

Durlak, J. A., Weissberg, R. P., Dymnicki, A. B., Taylor, R. D., & Schellinger, K. B. (2011). The impact of enhancing students' social and emotional learning: A meta-analysis of school-based universal

interventions. *Child Development*, *82*(1), 405–432. https://doi.org/10.1111/j.1467-8624.2010.01564.x

Felver, J.C., Jennings, P.A. Applications of Mindfulness-Based Interventions in School Settings: an Introduction. *Mindfulness* 7, 1–4 (2016). http://dx.doi.org/10.1007/s12671-015-0478-4

Gethin, R. (2011). On some definitions of mindfulness. *Contemporary Buddhism*, *12*(1), 263–279. http://dx.doi.org/10.1080/14639947.2011.564843

Goleman, D., & Davidson, R. J. (2017). *Altered traits: Science reveals how meditation changes your mind, brain, and body*. Penguin.

Goyal, M., Singh, S., Sibinga, E. M., Gould, N. F., Rowland-Seymour, A., Sharma, R., ... & Ranasinghe, P. D. (2014). Meditation programs for psychological stress and well-being: a systematic review and meta-analysis. *JAMA Internal Medicine*, *174*(3), 357-368. http://dx.doi.org/10.1001/jamainternmed.2013.13018

Gu, J., Strauss, C., Bond, R., & Cavanagh, K. (2015). How do mindfulness-based cognitive therapy and mindfulness-based stress reduction improve mental health and well-being? A systematic review and meta-analysis of mediation studies. *Clinical Psychology Review*, *37*, 1–12. https://doi.org/10.1016/j.cpr.2015.01.006

Hammen, C. (2005). Stress and Depression. *Annual Review of Clinical Psychology, 1,* 293–391. http://dx.doi.org/10.1146/annurev.clinpsy.1.102803.143938

Hayes, A. F. (2012). PROCESS: A versatile computational tool for observed variable mediation, moderation, and conditional process modeling.

Huppert, F. A., & Johnson, D. M. (2010). A controlled trial of mindfulness training in schools: The importance of practice for an impact on well-being. *The Journal of Positive Psychology*, *5*(4), 264–274. http://dx.doi.org/10.1080/17439761003794148

Kabat-Zinn, J. (1990). Full catastrophe living: The program of the stress reduction clinic at the University of Massachusetts Medical Center.

Kabat-Zinn, J. (1994). Wherever you go, there you are: Mindfulness meditation in everyday life. *Hyperion*, 78–80.

Kabat-Zinn, J., Wheeler, E., Light, T., Skillings, A., Scharf, M. J., Cropley, T. G., ... & Bernhard, J. D. (1998). Influence of a mindfulness meditation-based stress reduction intervention on rates of skin clearing in patients with moderate to severe psoriasis undergoing photo therapy (UVB) and photochemotherapy (PUVA). *Psychosomatic Medicine*, *60*(5), 625–632. http://dx.doi.org/10.1097/00006842-199809000-00020

Kallapiran, K., Koo, S., Kirubakaran, R., & Hancock, K. (2015). Effectiveness of mindfulness in improving mental health symptoms of children and adolescents: a meta-analysis. *Child and Adolescent Mental Health*, *20*(4), 182–194. http://dx.doi.org/10.1111/camh.12113

Keles, B., McCrae, N., & Grealish, A. (2020). A systematic review: the influence of social media on depression, anxiety and psychological distress in adolescents. International Journal of Adolescence and Youth, 25(1), 79–93. https://doi.org/10.1080/02673843.2019.1590851

Killingsworth, M. A., & Gilbert, D. T. (2010). A wandering mind is an unhappy mind. Science, 330(6006), 932–932. https://doi.org/10. 1126/science.1192439

Kuyken, W., Weare, K., Ukoumunne, O. C., Vicary, R., Motton, N., Burnett, R., ... & Huppert, F. (2013). Effectiveness of the Mindfulness in Schools Programme: non-randomised controlled feasibility study. *The British Journal of Psychiatry*, *203*(2), 126–131. http://dx.doi.org/10.1192/bjp.bp.113.126649

Kuyken, W., Warren, F. C., Taylor, R. S., Whalley, B., Crane, C., Bondolfi, G., ... & Segal, Z. (2016). Efficacy of mindfulness-based cognitive therapy in prevention of depressive relapse: an individual patient data meta-analysis from randomized trials. *JAMA Psychiatry*, *73*(6), 565–574. https://doi.org/10.1001/jamapsychiatry.2016.0076

Kuyken, W., Nuthall, E., Byford, S., Crane, C., Dalgleish, T., Ford, T., ... & Williams, J. M. G. (2017). The effectiveness and cost-effectiveness of a mindfulness training programme in schools compared

with normal school provision (MYRIAD): study protocol for a randomised controlled trial. *Trials*, *18*(1), 194. http://dx.doi.org/10.1186/s13063-017-1917-4

Lahtinen, O., & Salmivalli, C. (2017). *Assessing the efficacy of a mindfulness-based online program for students in upper secondary education.* Retrieved from osf.io/axm6y. Accessed 21st August 2020.

Leigh, J., Bowen, S., & Marlatt, G. A. (2005). Spirituality, mindfulness and substance abuse. *Addictive Behaviors*, *30*(7), 1335–1341. http://dx.doi.org/10.1016/j.addbeh.2005.01.010

Lindahl, J. R., Fisher, N. E., Cooper, D. J., Rosen, R. K., & Britton, W. B. (2017). The varieties of contemplative experience: A mixed-methods study of meditation-related challenges in Western Buddhists. *PloS One*, *12*(5), e0176239. http://dx.doi.org/10.1371/journal.pone.0176239

Little, T. D., & Rhemtulla, M. (2013). Planned missing data designs for developmental researchers. *Child Development Perspectives*, *7*(4), 199–204. http://dx.doi.org/10.1111/cdep.12043

MacBeth, A., & Gumley, A. (2012). Exploring compassion: A meta-analysis of the association between self-compassion and psychopathology. *Clinical Psychology Review*, *32*(6), 545–552. http://dx.doi.org/10.1016/j.cpr.2012.06.003

Morledge, T. J., Allexandre, D., Fox, E., Fu, A. Z., Higashi, M. K., Kruzikas, D. T., ... & Reese, P. R. (2013). Feasibility of an online mindfulness program for stress management—a randomized, controlled trial. *Annals of Behavioral Medicine*, *46*(2), 137–148. http://dx.doi.org/10.1007/s12160-013-9490-x

Mrazek, M. D., Franklin, M. S., Phillips, D. T., Baird, B., & Schooler, J. W. (2013). Mindfulness training improves working memory capacity and GRE performance while reducing mind wandering. *Psychological Science*, *24*(5), 776–781. http://dx.doi.org/10.1177/0956797612459659

Mrazek, A. J., Mrazek, M. D., Cherolini, C. M., Cloughesy, J. N., Cynman, D. J., Gougis, L. J., ... & Schooler, J. W. (2019). The future of mindfulness training is digital, and the future is now. *Current Opinion in Psychology*, *28*, 81–86. http://dx.doi.org/10.1016/j.copsyc.2018.11.012

Muris, P., Otgaar, H., & Pfattheicher, S. (2019). Stripping the forest from the rotten trees: compassionate self-responding is a way of coping, but reduced uncompassionate self-responding mainly reflects psychopathology. *Mindfulness*, *10*(1), 196–199. http://dx.doi.org/10.1007/s12671-018-1030-0

Muthén,L.K. and Muthén, B.O. (1998-2017). Mplus User's Guide. Eighth Edition. Los Angeles, CA: Muthén and Muthén https://www.statmodel.com/download/usersguide/MplusUserGuideVer_8.pdf. Accessed: 21 August 2020

Neff, K. D. (2003). The development and validation of a scale to measure self-compassion. *Self and Identity*, *2*(3), 223–250. http://dx.doi.org/10.1080/15298860309027

Neff, K. D., & Germer, C. K. (2013). A pilot study and randomized controlled trial of the mindful self-compassion program. *Journal of Clinical Psychology*, *69*(1), 28–44. http://dx.doi.org/10.1002/jclp.21923

Neff, K. D., & McGehee, P. (2010). Self-compassion and psychological resilience among adolescents and young adults. *Self and Identity*, *9*(3), 225-240. http://dx.doi.org/10.1080/15298860902979307

Open Science Collaboration (2015). Estimating the reproducibility of psychological science. *Science*, *349*(6251), aac4716. http://dx.doi.org/10.1126/science.aac4716

Palta, P., Page, G., Piferi, R. L., Gill, J. M., Hayat, M. J., Connolly, A. B., & Szanton, S. L. (2012). Evaluation of a mindfulness-based intervention program to decrease blood pressure in low-income African-American older adults. *Journal of Urban Health*, *89*(2), 308–316. http://dx.doi.org/10.1007/s11524-011-9654-6

Pine, D. S., Cohen, P., Johnson, J. G., & Brook, J. S. (2002). Adolescent life events as predictors of adult depression. *Journal of Affective Disorders*, *68*(1), 49–57. http://dx.doi.org/10.1016/S0165-0327(00)00331-1

Raes, F., Pommier, E., Neff, K. D., & Van Gucht, D. (2011). Construction and factorial validation of a short form of the self-compassion scale. *Clinical Psychology & Psychotherapy*, *18*(3), 250–255. http://dx.doi.org/10.1002/cpp.702

Richards, D. A., & Borglin, G. (2011). Implementation of psychological therapies for anxiety and depression in routine practice: two year prospective cohort study. *Journal of Affective Disorders, 133*(1–2), 51–60. http://dx.doi.org/10.1016/j.jad.2011.03.024

Schonert-Reichl, K. A., Oberle, E., Lawlor, M. S., Abbott, D., Thomson, K., Oberlander, T. F., & Diamond, A. (2015). Enhancing cognitive and social–emotional development through a simple-to-administer mindfulness-based school program for elementary school children: A randomized controlled trial. *Developmental Psychology*, *51*(1), 52. http://dx.doi.org/10.1037/a0038454

School Health Promotion Study (Kouluterveyskysely) (2019). Retrieved from: https://sampo.thl.fi/pivot/prod/fi/ktk/ktk1/summary_aluevertailu2. Accessed: 26th August 2020.

Sevilla-Llewellyn-Jones, J., Santesteban-Echarri, O., Pryor, I., McGorry, P., & Alvarez-Jimenez, M. (2018). Web-based mindfulness interventions for mental health treatment: systematic review and meta-analysis. *JMIR Mental Health*, *5*(3), e10278. http://dx.doi.org/10.2196/10278

Seligman, M. E., Steen, T. A., Park, N., & Peterson, C. (2005). Positive psychology progress: empirical validation of interventions. *American Psychologist*, *60*(5), 410. http://dx.doi.org/10.1037/0003-066X.60.5.410

Shah, P., & Mountain, D. (2007). The medical model is dead–long live the medical model. *The British Journal of Psychiatry*, *191*(5), 375–377. http://dx.doi.org/10.1192/bjp.bp.107.037242

Shapiro, S. L., Carlson, L. E., Astin, J. A., & Freedman, B. (2006). Mechanisms of mindfulness. *Journal of clinical psychology*, *62*(3), 373–386. http://dx.doi.org/10.1002/jclp.20237

Sibinga, E. M., Perry-Parrish, C., Chung, S. E., Johnson, S. B., Smith, M., & Ellen, J. M. (2013). School-based mindfulness instruction for urban male youth: A small randomized controlled trial. *Preventive Medicine*, *57*(6), 799–801. http://dx.doi.org/10.1016/j.ypmed.2013.08.027

Spijkerman, M. P. J., Pots, W. T. M., & Bohlmeijer, E. T. (2016). Effectiveness of online mindfulness-based interventions in improving mental health: A review and meta-analysis of randomised controlled trials. *Clinical psychology review*, *45*, 102–114. http://dx.doi.org/10.1016/j.cpr.2016.03.009

Smeets, E., Neff, K., Alberts, H., & Peters, M. (2014). Meeting suffering with kindness: Effects of a brief self-compassion intervention for female college students. *Journal of Clinical Psychology*, *70*(9), 794–807. https://doi.org/10.1002/jclp.22076

Tang, Y. Y., Hölzel, B. K., & Posner, M. I. (2015). The neuroscience of mindfulness meditation. *Nature Reviews Neuroscience*, *16*(4), 213–225. http://dx.doi.org/10.1038/nrn3916

Teasdale, J. D., Segal, Z. V., Williams, J. M. G., Ridgeway, V. A., Soulsby, J. M., & Lau, M. A. (2000). Prevention of relapse/recurrence in major depression by mindfulness-based cognitive therapy. *Journal of consulting and clinical psychology*, *68*(4), 615. http://dx.doi.org/10.1037/0022-006X.68.4.615

Trompetter, H. R., de Kleine, E., & Bohlmeijer, E. T. (2017). Why does positive mental health buffer against psychopathology? An exploratory study on self-compassion as a resilience mechanism and adaptive emotion regulation strategy. *Cognitive Therapy and Research*, *41*(3), 459–468. http://dx.doi.org/10.1007/s10608-016-9774-0

Van Dam, N. T., van Vugt, M. K., Vago, D. R., Schmalzl, L., Saron, C. D., Olendzki, A., ... & Fox, K. C. (2018). Mind the hype: A critical evaluation and prescriptive agenda for research on mindfulness and meditation. *Perspectives on Psychological Science*, *13*(1), 36–61. http://dx.doi.org/10.1177/1745691617709589

Zessin, U., Dickhäuser, O., & Garbade, S. (2015). The relationship between self-compassion and well-being: A meta-analysis. *Applied Psychology: Health and Well-Being*, *7*(3), 340–364. http://dx.doi.org/10.1111/aphw.12051

Appendix: RCT Preregistration

Background and study design: The research group developed an online mindfulness-based program (MBP) "Tita" (short for "tietoisuustaidot", the Finnish word for mindfulness). Tita is an 8 week MBP very loosely modelled on the MBSR and was designed to be suitable for Finnish upper secondary education students (aged 15 to 19 years). The study has an RCT design and a large sample size (n > 1000). The efficacy of Tita is tested vs. a waitlist control. Questionnaire data is collected on three measurement points: 1) pre-intervention (in September, 2017), 2) post-intervention (Nov 26th to Dec 10th, 2017), and 3) follow-up (Feb 25th to Mar 11th, 2018). In addition, ecological momentary assessment (EMA) data are collected daily during the intervention phase.

When beginning using Tita, students are given seven guided mp3 meditations, which they are encouraged to practice daily. A major intention in designing Tita was to attempt to maximize the likelihood students would start and cultivate a practice routine, no matter how few minutes of practice a day, with the expectation that this routine may then expand naturally in the future.

The durations of the meditations range from 5 to 20 minutes and they cover sitting, body scan, walking, and compassion practices. Written instructions are also presented for a one minute meditation, for students who feel 5 minutes exceeds their daily capacity to practice. Beginning of every new intervention week, the students are presented with a 10–20-minute video mindfulness lecture (with some low-intensity animated content) that also deal with compassion, stress, reactivity, thoughts, emotions, routine development etc.

Sample: Participants were recruited from all upper secondary education institutions (both upper secondary schools and vocational institutions) in Finland (number of schools: 500-600; contacts were obtained from the Ministry of Education and Culture). Recruitment emails thus had a reach of 50 000-200 000 students. 1617 students asked to be registered for the course, 1245 students completed at least a part of the pre-intervention questionnaire, and 1163 students filled out the questionnaire in its entirety.

Participants were randomized into either the intervention group or a waitlist control group, who will take the MBP in March of 2018. To even out group sizes, our algorithm randomized every other participant and then added the other

participant to the group with fewer participants. During the writing of this text (Nov 1st 2017), the RCT has just entered its 5th week.

Hypothesis and outcomes: Tita's hypothesized effect is improved well-being and alleviated ill-being (in line with other MBIs and online MBIs; e.g., Gotink et al., 2015; Spijkerman et al., 2016). The effect is expected to be proportional to amount of practice.

Primary outcomes for the study are 1) anxiety (GAD-7, 7 items), 2) depression (R-BDI, without the self-harm item, 12 items), 3) school burnout (SBI, 9 items), and 4) psychological quality of life (WHOQoL, 6 items). If dealing with null-hypothesis significance testing, the .05 threshold will be divided by the number of primary outcomes, resulting in $\alpha = .0125$. Secondary outcomes are 1) satisfaction with life (SWLS, 5 items), 2) mindfulness (CAMM, 10 items), 3) self-compassion (SCS-SF, 12 items), 4) sleep quality (combined scales, 8 items), and 5) happiness (WHO, 1 global item). Participants were also asked for summary demographical info (age, gender, whether they go to upper secondary school or vocational institution, and grade (e.g., second year in vocational school)).

In addition to the above, ecological momentary assessment (EMA) data is collected from the intervention group via a mobile app (Paco). Participants answer two daily questions ("Did you meditate yesterday?" [yes/no] and "How many minutes did you meditate yesterday?" [number]) and nine weekly questions: 1) global sleep item, 2)-8) anxiety (GAD-7), and 9) five letter identifier to link the EMA data to the survey data.

Ethics: Ethical review of the study plan was conducted by the University of Turku Ethics Committee. The Committee approved the plan with minor suggestions to improve the protocol. Tita is entirely extracurricular (i.e., not part of school activities) and thus separate permits from schools or guardians are not required for the age group in Finland.

Because Tita is a self-study course for adolescents, particular care was taken to communicate at the outset of the program that students with history of trauma, psychosis/schizophrenia, or those suffering from depression they feel has a significant effect on their life, should seek help from a school nurse, psychologist, or other safe adult before participating on the course. Students with diagnosed or self-suspected mental problems were also advised to start with the briefest meditations (one minute to five minutes) and discontinue practice if they have difficult experiences.

(from https://osf.io/mt5qc/wiki/home/)

UNIVERSITY OF TURKU

Painosalama Oy, Turku, Finland 2021

ISBN 978-951-29-8335-3 (Print)
ISBN 978-951-29-8336-0 (PDF)
ISSN 0082-6987 (Print)
ISSN 2343-3191 (Online)