Routledge
Taylor & Francis Group

Health Psychology Review

ISSN: 1743-7199 (Print) 1743-7202 (Online) Journal homepage: https://www.tandfonline.com/loi/rhpr20

Self-compassion, physical health, and health behaviour: a meta-analysis

Wendy J. Phillips & Donald W. Hine

To cite this article: Wendy J. Phillips & Donald W. Hine (2019): Self-compassion, physical health, and health behaviour: a meta-analysis, Health Psychology Review, DOI: 10.1080/17437199.2019.1705872

To link to this article: https://doi.org/10.1080/17437199.2019.1705872

Accepted author version posted online: 16 Dec 2019.
Published online: 22 Dec 2019.

HEALTH PSYCHOLOGY REVIEW
https://doi.org/10.1080/17437199.2019.1705872

Routledge
Taylor & Francis Group

ORIGINAL ARTICLES

Self-compassion, physical health, and health behaviour: a meta-analysis

Wendy J. Phillips and Donald W. Hine

School of Psychology, University of New England, Armidale, Australia

ABSTRACT

This meta-analysis investigated relationships between self-compassion and (1) physical health and (2) health-promoting behaviour in a large pooled sample ($N = 29{,}588$) sourced from 94 peer-reviewed articles. As hypothesised, omnibus analyses revealed positive associations between self-compassion and both physical health ($r = .18$) and health behaviour ($r = .26$). Moderation analyses using 290 effects found that both associations varied according to health domain, participant age, intervention duration, and self-compassion measure. Self-compassion predicted outcomes in most health domains, with the strongest effects observed on global physical health, functional immunity, composite health behaviour, sleep, and danger avoidance. It did not predict frailty, maladaptive bodily routines, and substance abuse. Multi-session interventions designed to boost self-compassion predicted increased physical health and health behaviour, thereby supporting causal links between self-compassion and health outcomes. The effects of single-session inductions were non-significant. The mean effect of self-compassion on physical health was non-significant for young participants (12.00–19.99) and its effect on health behaviour was weakest among older participants (40.00+). Results support the proposition that self-compassion can promote better physical health. Practical implications of these findings are discussed.

ARTICLE HISTORY
Received 16 May 2019
Accepted 13 December 2019

KEYWORDS
Self-compassion; physical health; health behaviour; wellbeing; self-compassion interventions

Self-compassion is a positive attitude toward the self that can be applied during difficult times to alleviate suffering (Gilbert, 2009a; Neff, 2003b). Although it has been conceptualised in several ways, most self-compassion researchers have focussed on Neff's (2003b) model. According to Neff, self-compassion includes three dimensions: *self-kindness* versus *self-judgement*, *common humanity* versus *isolation*, and *mindfulness* versus *overidentification*. Self-kindness entails providing oneself with warmth, support, and understanding rather than imposing harsh self-judgement. Common humanity involves recognising that suffering connects us with others rather than causing isolation. Finally, mindfulness involves being aware of our suffering with clarity and balance without over-identifying with negative thoughts and emotions. The dimensions are usually assessed by subscales of the Self-Compassion Scale (SCS; Neff, 2003a), which also generates a total self-compassion score that represents an individual's trait-like propensity to respond with self-compassion, but self-compassion has also been successfully induced as a state (Phillips, 2018).

Taking a compassionate perspective toward oneself in response to adversity has been consistently associated with many and varied indicators of positive psychological functioning and mental health (MacBeth & Gumley, 2012; Zessin, Dickhäuser, & Garbade, 2015). Although less extensive, a growing

CONTACT Wendy J. Phillips wphilli4@une.edu.au
Supplemental data for this article can be accessed https://doi.org/10.1080/17437199.2019.1705872.

literature suggests that the benefits of self-compassion may extend to better physical health (Friis, Consedine, & Johnson, 2015; Sirois & Rowse, 2016) and greater engagement in health-promoting behaviour (Rahimi-Ardabili, Reynolds, Vartanian, McLeod, & Zwar, 2018; Sirois & Hirsch, 2019; Sirois, Kitner, & Hirsch, 2015). To fully appreciate and appropriately apply self-compassion in the health context, there is a need to quantify, classify, and consolidate current knowledge of this research area.

Self-compassion, physical health, and health behaviour

Compared to individuals with low self-compassion, highly self-compassionate individuals have reported better physical health in several areas, including physical fitness (Arts-de Jong et al., 2018), few symptoms of illness (Hall, Row, Wuensch, & Godley, 2013), low pain intensity (Allen, Goldwasser, & Leary, 2012), and adaptive physiological responses to stress (Breines et al., 2014). Self-compassion may influence physical health by alleviating stress (Homan & Sirois, 2017) and by fostering resilience (Neff, Kirkpatrick, & Rude, 2007), adaptive coping (Allen & Leary, 2010), adaptive emotions (Sirois et al., 2015), and health-promoting behaviour (Sirois & Rowse, 2016). Cognitive variables, like perceived stress, are important mediators of the relationship between self-compassion and physical health, but health behaviour arguably represents the most important mechanism because it has been identified as a stronger (Delahanty et al., 2013; Vingilis, Wade, & Seeley, 2002) and more proximal (Lodi-Smith et al., 2010; O'Leary, 1992) predictor of health outcomes.

Individuals with high levels of self-compassion tend to engage in a range of health-promoting behaviours (Rahimi-Ardabili et al., 2018; Sirois & Hirsch, 2019; Sirois et al., 2015) that may subsequently promote physical health (Homan & Sirois, 2017). Engaging in health behaviours, such as doing physical exercise and eating nutritious food, has been associated with reduced risk of disease (Chiuve, McCullough, Sacks, & Rimm, 2006; Penedo & Dahn, 2005). Conversely, engaging in unhealthy behaviours, like smoking or drinking alcohol, has been associated with greater risk of disease and reduced life expectancy (Bagnardi et al., 2014; Manuel et al., 2016). Other predictors of unhealthy behaviour include negative emotions, stress, and shame (Baumeister, Zell, & Tice, 2007; Michels et al., 2012; Mustapic, Marcinko, & Vargek, 2015).

It has been suggested that self-compassion decreases unhealthy behaviour by acting upon these factors; by ameliorating negative emotions, self-criticism, shame, and stress, and fostering the realisation that everyone can make mistakes, fail to reach goals, or experience misfortune (Leary, Tate, Adams, Allen, & Hancock, 2007; Sirois, 2015a). Self-compassion may simultaneously promote healthy behaviours by eliciting positive emotions that provide motivation to attain health goals, prompting the use of adaptive coping strategies that facilitate movement toward these goals, and by invoking feelings of self-kindness that manifest in the desire to take care of one's body (Sirois, 2015b; Sirois et al., 2015).

Existing literature reviews

To our knowledge, only one article (Brown, Huffman, & Bryant, 2019) has reviewed studies that have examined the relationship between self-compassion and physical health. The authors concluded that self-compassion facilitates good adjustment to poor physical health, but their review included only three studies with older-aged samples and their effects were not meta-analysed. Similarly, although several literature reviews have synthesised observed associations between self-compassion and health behaviour (Biber & Ellis, 2017; Braun, Park, & Gorin, 2016; Friis et al., 2015; Mantzios & Egan, 2017; Rahimi-Ardabili et al., 2018; Sirois & Hirsch, 2019; Sirois et al., 2015), none of them were comprehensive. Some focussed narrowly on specific subsets of health behaviours, others assessed composite measures only, and only two statistically quantified the association.

Sirois et al. (2015) meta-analytically examined the relationship between self-compassion and health behaviour in fifteen of their own datasets. Across the student and community samples, they found that self-compassion was associated with the practice of a set of health-promoting

behaviours, such as eating habits, exercise frequency, and sleep behaviours, and observed indirect effects via lower negative affect and higher positive affect. More recently, Sirois and Hirsch (2019) determined that self-compassion was associated with medical adherence across five samples of individuals with self-reported diagnoses of fibromyalgia, chronic fatigue syndrome, and cancer (current or remitted), and that lower perceived stress partially explained this relationship. These two studies found small to medium omnibus effect sizes of $r = .25$ and $r = .22$, respectively.

Three reviews have focussed on relationships between self-compassion and eating behaviours. Braun et al. (2016) systematically reviewed 28 studies that had examined associations between self-compassion and poor body image and eating pathology in a variety of samples, including undergraduates, community women, female undergraduates, female athletes, and female patients. They concluded that self-compassion might protect against disordered eating by directly decreasing disordered eating behaviour, preventing its occurrence in the first place, buffering the deleterious effects of other risk factors, or interrupting mediational chains through which they operate. In a selective review, Friis et al. (2015) similarly concluded that self-compassion might promote positive outcomes for diabetes patients by assisting self-regulation of diet and medication. However, in an opinion piece, Mantzios and Egan (2017) presented literature to support the possibility that self-compassion may not always lead to healthy eating behaviours because sometimes behaviours that comfort and soothe the mind may be damaging to physiological health (e.g., eating junk food or drinking to relieve stress).

Other researchers have aimed to review the effects of self-compassion interventions on health behaviour (Biber & Ellis, 2017; Rahimi-Ardabili et al., 2018). In a systematic narrative review, Biber and Ellis (2017) examined seven studies, including four randomised controlled trials, and concluded that the interventions had reduced disordered eating, reduced smoking, and increased physical activity, and were at least as effective as other behavioural interventions in a variety of samples. Similarly, Rahimi-Ardabili et al. (2018) reviewed six interventions and noted beneficial effects on body image, eating pathology, nutrition behaviours, and weight loss. However, these two narrative reviews evaluated the effects of interventions on both physical health behaviours and psychological health-related constructs (e.g., body image), and included interventions that did not specifically target self-compassion (e.g., mindfulness, acceptance commitment therapy). To date, the pooled effects of interventions that focus on increasing self-compassion, such as the Mindful Self-Compassion programme (Neff & Germer, 2013) and Compassion Focussed Therapy (Gilbert, 2009b), on physical health and health behaviours have not been quantified and assessed by meta-analysis.

Unanswered questions

While several studies support an association between self-compassion and physical health, their combined results have not yet been reviewed, organised, or quantified, either alone or in relation to health behaviour. Additionally, although the above-mentioned reviews present a relatively consistent evaluation of observed relationships between self-compassion and health behaviour, they have been limited in the following ways.

Health domains

Individual studies and reviews of relationships with self-compassion have tended to investigate distinct areas of physical health (e.g., pain, symptoms, heart rate variability), specific health behaviours (e.g., diet, exercise, seeking medical attention), or composite variables that group together diverse health behaviours (Sirois & Hirsch, 2019; Sirois et al., 2015). This approach provides information that may guide certain applications of self-compassion, but it makes broader patterns of relationships difficult to identify. Classification systems that group together specific indicators of physical health or health behaviour into domains may facilitate our understanding of factors that underlie these diverse relationships. For example, health behaviour domains identified by Nudelman and Shiloh (2015) have been associated with distinct cognitive profiles (Nudelman & Shiloh, 2016) and expectations

(Nudelman & Shiloh, 2018) which may inform the design of health messages and interventions. Identifying relationships with self-compassion within a domain might also allow us to predict when self-compassion is likely to influence unassessed specific indicators of health or health behaviour, insofar as factors within a domain share similar characteristics.

Nudelman and Shiloh's (2015) hierarchical taxonomy of perceived health behaviours offers a comprehensive classification system which groups behaviours into physical and psychosocial domains. The physical domain comprises seven types of behaviours: bodily routines, sleep, medical practices, nutrition and exercise, environmental risk factors, substance abuse, and danger avoidance. Domains have also been identified and used by researchers to evaluate indicators of physical health. For example, in their meta-analysis of studies on the physical health of carers, Vitaliano, Zhang, and Scanlan (2003) investigated various domains that included global self-reported health, number of physical symptoms, functional immunity, stress hormones and neurotransmitters, cardiovascular fitness, and metabolic measures; and Vermeulen, Neyens, van Rossum, Spreeuwenberg, and de Witte (2011) identified indicators of physical frailty in older people.

Sample types

Existing studies have used samples from different populations, which makes it difficult to determine whether the predictive effects of self-compassion differ in non-medical and medical populations (i.e., individuals with a specific health problem). Studies that have directly compared medical and non-medical samples have sometimes reported inconsistent results. For example, Ferreira, Pinto-Gouveia, and Duarte (2013) found stronger effects in a clinical eating disorder sample than a non-clinical sample; Kelly, Vimalakanthan, and Carter (2014) found that self-compassion conveyed positive effects only in their non-clinical student sample; and Dewsaran-van der Ven et al. (2018) observed a similar relationship between self-compassion and physical symptoms in somatoform patients and the general population. To support the use of self-compassion as a potential resource to treat vulnerable populations, it would be desirable to observe a large mean correlation across medical samples.

Measures

Most studies have used self-report measures of self-compassion, such as the SCS (Neff, 2003a). However, cross-sectional correlational studies that have employed these measures cannot provide support for a possible causal relationship between self-compassion and health. Rather, to support causal inferences, this meta-analysis will need to find a significant mean predictive effect of experimentally induced state self-compassion and self-compassion interventions.

Sample age

This body of research includes samples that vary greatly in age. Self-compassion has been positively associated with successful aging (Phillips & Ferguson, 2013) and with age (Neff & Vonk, 2009). Meta-analyses that reviewed the predictive associations of self-compassion on psychopathology (MacBeth & Gumley, 2012) and psychological well-being (Zessin et al., 2015) found that age moderated each relationship to a near significant degree ($p = .08$ and $p = .09$, respectively), with the latter reporting stronger effects among older participants. Similarly, Hwang, Kim, Yang, and Yang (2016) found a significantly stronger relationship between self-compassion and subjective well-being among older participants. However, no study to date has examined whether the predictive effects of self-compassion on physical health and health behaviour may also increase with age.

The current study

The current study aimed to address these questions by meta-analytically determining the relative strength of association between self-compassion and (1) physical health and (2) health behaviour. We hypothesised that self-compassion would be positively associated with physical health and with health-promoting behaviour but made no prediction regarding the relative strength of the

two associations. We also explored whether the relationships may vary as a function of domain (physical health or health behaviour), sample type, self-compassion measure, intervention duration, and age group. An overriding aim of this study was to quantify and elucidate observed relationships with self-compassion, in order to inform the suitability and design of self-compassion interventions to promote better physical health.

Method

Inclusion criteria

This meta-analysis followed the PRISMA statement for transparent and comprehensive reporting of methodology and results (Moher et al., 2015). Studies were required to involve (1) measurement of an indicator of physical health (e.g., blood pressure, pain, symptoms) or health behaviour (e.g., physical exercise, diet, substance use), and (2) measurement of dispositional, state, or induced self-compassion, or a self-compassion intervention. Peer reviewed articles were sourced from the PsycINFO database and references of relevant articles were searched to find additional studies. Search terms for physical health articles included widely-researched health conditions, and indicators of physical health identified by Vermeulen et al. (2011) and Vitaliano et al. (2003). Specifically, the search terms were self-compassion AND physical health, disabil*, disease, illness, cancer, HIV, menopause, balance, exhaust*, aging, ageing, physical fitness, cardio*, heart, metabol*, physiolog*, blood pressure, obes*, diabet*, immun*, mortality, symptom*, chronic conditions, pain, antibod*, hormone*, and neurotransmit*. Search terms for health behaviour articles included synonyms for health behaviour, and various health behaviours identified by Nudelman and Shiloh (2015). Specifically, the search terms were self-compassion AND health behaviour, health behavior, self-care, health maintenance, hygiene, clean, teeth, sleep, medical, medical adherence, vaccine, nutrition, food, diet, vegetable, fruit, meal, eating, exercise, physical exercise, physical activity, weight, risk*, risk avoidance, sun, sex, violence, road safety, hazard*, danger*, substance abuse, alcohol, drugs, smok*, and injury.

After duplicates were removed, the search returned 234 articles that were published between 2009 and 2019. Correlational studies that were eligible for inclusion in the meta-analysis were assessed for methodological quality using guidelines developed by Loney, Chambers, Bennett, Roberts, and Stratford (1998). All studies met at least three of the six recommended criteria and were included in the meta-analysis. Studies that evaluated the effects of a randomised controlled trial of a self-compassion induction or intervention were evaluated using Cochrane's bias tool (Higgins et al., 2016). The overall risk of bias was low, so all were retained (see online supplement).

Effects based on measures that assessed psychological constructs related to health behaviour were excluded, such as eating concern and body image. However, several effects based on measures that included both behavioural and psychological items were retained if the behavioural items could not be isolated (e.g., Eating Disorder Examination Questionnaire, Fairburn & Beglin, 1994; The Eating Attitudes Test, Garner, Olmsted, Bohr, & Garfinkel, 1982). Appropriate statistics (e.g., correlations, *t*-tests, means, and standard deviations) were required to be reported in the article or available from the corresponding author.

After screening, 94 articles were retained for analysis, from which 290 effect sizes were acquired from 123 samples. The resulting pooled sample comprised 30,129 participants with a mean age of 30.77 years. Table 1 contains a summary of the included studies, and notes calculation methods used where correlations were not available. A flow diagram of the eligibility screening and exclusion process and references for the included studies can be found in the online supplement.

Moderator coding

Effect sizes were coded by six potential moderators.

Table 1. Summary of included studies*.

Author	*N*	Sample Type	*M* Age	Health DV	Measure	Domain	*r*	*SE*
Allen et al. (2012) – Study 1	132	Older adults 67–90		PH	SCS	Lack of pain	.25	.09
Allen et al. (2012) – Study 1	132	Older adults 67–90		PH	SCS	General health	.17	.09
Allen et al. (2012) – Study 1	132	Older adults 67–90		PH	SCS	Mobility	−.05	.09
Allen et al. (2012) – Study 1	132	Older adults 67–90		PH	SCS	Hearing	−.03	.09
Allen et al. (2012) – Study 1	132	Older adults 67–90		PH	SCS	Medical problems	−.03	.09
Allen et al. (2012) – Study 2	71	Older adults 63–97		PH	SCS	Lack of impairment	.26	.12
Allen et al. (2012) – Study 2	71	Older adults 63–97		PH	SCS	Walking	.08	.12
Allen et al. (2012) – Study 2	71	Older adults 63–97		PH	SCS	Hearing	−.03	.12
Allen et al. (2012) – Study 2	71	Older adults 63–97		PH	SCS	Memory	.06	.12
Altenburg et al. (2011)	94	Adults with vs without ulcers		PH	SCS	Without ulcers	.12	.10
Arambasic, Sherman, and Elder (2019)	82	Women with breast cancer	58.46	PH	SCS	Physical health	.10	.11
Arch et al. (2014)[l]	105	Undergraduate women	19.53	PH	Induced	Low salivary alpha-amylase	.22	.10
Arch et al. (2014)[l]	105	Undergraduate women	19.53	PH	Induced	Low salivary cortisol	.00	.10
Arch et al. (2014)[d,l]	105	Undergraduate women	19.53	PH	Induced	Small HRV reduction – prep stress test	.05	.10
Arch et al. (2014)[e,l]	105	Undergraduate women	19.53	PH	Induced	Small HRV reduction – during stress test	.00	.10
Arch et al. (2014)[f,l]	105	Undergraduate women	19.53	PH	Induced	Small HRV reduction – recovery phase	.05	.10
Arts-de Jong et al. (2018)	165	Women with BRCA1/2	49.60	PH	SCS-SF	Lack of climacteric symptoms	.23	.08
Arts-de Jong et al. (2018)	165	Women with BRCA1/2	49.60	PH	SCS-SF	Lack of vasomotor symptoms	.03	.08
Arts-de Jong et al. (2018)	165	Women with BRCA1/2	49.60	PH	SCS-SF	Physical fitness	.23	.08
Barnett and Sharp (2016) – Study 2	398	Undergraduates aged 18–30		HB	SCS	Lack of disordered eating	.12	.05
Beekman, Stock, and Howe (2017)	121	College women	19.47	HB	SCS	Lack of restrictive eating	.32	.09
Bellosta-Batalla et al. (2018)[i,p]	31	Adults	45.71	PH	Intervention	Reduced immunological symptoms	.30	.19
Bellosta-Batalla et al. (2018)[i,p]	31	Adults	45.71	PH	Intervention	Reduced cardiovascular symptoms	.18	.19
Bellosta-Batalla et al. (2018)[i,p]	31	Adults	45.71	PH	Intervention	Reduced respiratory symptoms	.12	.19
Bellosta-Batalla et al. (2018)[i,p]	31	Adults	45.71	PH	Intervention	Reduced gastrointestinal symptoms	.22	.19
Bellosta-Batalla et al. (2018)[i,p]	31	Adults	45.71	PH	Intervention	Reduced neurosensory symptoms	.18	.19
Bellosta-Batalla et al. (2018)[i,p]	31	Adults	45.71	PH	Intervention	Reduced muscular symptoms	.19	.19
Bellosta-Batalla et al. (2018)[i,p]	31	Adults	45.71	PH	Intervention	Reduced dermatological symptoms	.19	.19
Bellosta-Batalla et al. (2018)[i,p]	31	Adults	45.71	PH	Intervention	Reduced genital-urinary symptoms	.06	.19

(*Continued*)

Table 1. Continued.

Author	*N*	Sample Type	*M* Age	Health DV	Measure	Domain	*r*	*SE*
Bellosta-Batalla et al. (2018)[i,p]	31	Adults	45.71	PH	Intervention	Reduced perceived somatic symptoms	.28	.19
Bellosta-Batalla et al. (2018)[i,p]	31	Adults	45.71	PH	Intervention	Increased IgA – pre-first to post-last	.10	.19
Bellosta-Batalla et al. (2018)[i,p]	31	Adults	45.71	PH	Intervention	Reduced cortisol – pre-first to post-last	.29	.19
Bellosta-Batalla et al. (2018)[i,p]	31	Adults	45.71	PH	Intervention	Increased IgA – pre-post first session	.08	.19
Bellosta-Batalla et al. (2018)[i,p]	31	Adults	45.71	PH	Intervention	Increased IgA – pre-post last session	.13	.19
Bellosta-Batalla et al. (2018)[i,p]	31	Adults	45.71	PH	Intervention	Reduced cortisol – pre-post first session	.21	.19
Bellosta-Batalla et al. (2018)[i,p]	31	Adults	45.71	PH	Intervention	Reduced cortisol – pre-post last session	.33	.19
Bluth et al. (2016)[f]	28	Adolescents	13.21	PH	SCS	Systolic BP low increase – prep	.22	.20
Bluth et al. (2016)[f]	28	Adolescents	13.21	PH	SCS	Systolic BP low increase – speech	.29	.20
Bluth et al. (2016)[f]	28	Adolescents	13.21	PH	SCS	Systolic BP low increase – math	.23	.20
Bluth et al. (2016)[f]	28	Adolescents	13.21	PH	SCS	Diastolic BP low increase – prep	.08	.20
Bluth et al. (2016)[f]	28	Adolescents	13.21	PH	SCS	Diastolic BP low increase – speech	.04	.20
Bluth et al. (2016)[f]	28	Adolescents	13.21	PH	SCS	Diastolic BP low increase – math	.11	.20
Bluth et al. (2016)[f]	28	Adolescents	13.21	PH	SCS	Heart rate low increase – prep	.12	.20
Bluth et al. (2016)[f]	28	Adolescents	13.21	PH	SCS	Heart rate low increase – speech	.15	.20
Bluth et al. (2016)[f]	28	Adolescents	13.21	PH	SCS	Heart rate low increase – math	.24	.20
Bluth et al. (2016)[f]	28	Adolescents	13.21	PH	SCS	Low salivary cortisol	.09	.20
Bluth et al. (2016)[f]	28	Adolescents	13.21	PH	SCS	High heart rate variability – prep	−.01	.20
Bluth et al. (2016)[f]	28	Adolescents	13.21	PH	SCS	High heart rate variability – speech	.01	.20
Bluth et al. (2016)[f]	28	Adolescents	13.21	PH	SCS	High heart rate variability – math	−.02	.20
Breines, Toole, et al. (2014) – Study 1[g]	95	Female undergraduates	20.05	HB	SCS-mod	Lack of disordered eating	.14	.10
Breines, Toole, et al. (2014) – Study 2	158	Female undergraduates	20.82	HB	SCS-mod	Lack of anticipated disordered eating	.36	.08
Breines, Toole, et al. (2014) – Study 2[f]	158	Female undergraduates	20.82	HB	SCS-mod	Few chocolates eaten	.05	.08
Breines et al. (2014)[f]	41	Young adults	21.17	PH	SCS	Low Interleukin-6 – baseline day 1	.15	.16
Breines et al. (2014)[f]	41	Young adults	21.17	PH	SCS	Interleukin-6 low increase – day 1	.40	.16
Breines et al. (2014)[f]	41	Young adults	21.17	PH	SCS	Low Interleukin-6 – baseline day 2	.31	.16
Breines et al. (2014)[f]	41	Young adults	21.17	PH	SCS	Interleukin-6 low increase – day 2	−.02	.16
Breines et al. (2014)[f]	41	Young adults	21.17	PH	SCS	Interleukin-6 habituation	.40	.16
Breines et al. (2015)[f]	33	Community adults	21.12	PH	SCS	Low sAA Baseline – day 1	−.09	.18
Breines et al. (2015)[f]	33	Community adults	21.12	PH	SCS	Low sAA Baseline – day 2	−.18	.18
Breines et al. (2015)	33	Community adults	21.12	PH	SCS	Low sAA – day 1	.46	.18
Breines et al. (2015)	33	Community adults	21.12	PH	SCS	Low sAA – day 2	.38	.18
Breines et al. (2015)[f]	33	Community adults	21.12	PH	SCS	sAA habituation	−.21	.18

(*Continued*)

Table 1. Continued.

Author	*N*	Sample Type	*M* Age	Health DV	Measure	Domain	*r*	*SE*
Brion, Leary, and Drabkin (2014)[h]	187	HIV-infected individuals	45.90	HB	SCS-mod	Wearing a condom	.17	.07
Brion, Leary, and Drabkin (2014)[h]	187	HIV-infected individuals	46.90	HB	SCS-mod	Getting needed care	.36	.07
Brion, Leary, and Drabkin (2014)[h]	187	HIV-infected individuals	47.90	HB	SCS-mod	Adhering to treatment	.25	.07
Brion, Leary, and Drabkin (2014)[h]	187	HIV-infected individuals	48.90	HB	SCS-mod	Getting information about HIV	.24	.07
Brion, Leary, and Drabkin (2014)[h]	161	HIV-infected individuals	49.90	HB	SCS-mod	4-day adherence to medical regimen	.07	.08
Brion, Leary, and Drabkin (2014)[h]	174	HIV-infected individuals	50.90	HB	SCS-mod	Less time since missing medication	.08	.08
Brooks et al. (2012)	77	Adults with alcohol dependence	38.51	HB	SCS	Less alcohol use – baseline	−.01	.12
Brown, Bryant, Brown, Bei, and Judd (2014)	206	Women	53.64	PH	SCS	Fewer hot flushes and night sweats	.23	.07
Brown, Bryant, Brown, Bei, and Judd (2016)	517	Women	52.11	PH	SCS	Physical health	.16	.04
Carvalho et al. (2018)	231	Women with chronic pain	48.51	PH	SCS-Pos	Low pain	.09	.07
Dawson Rose et al. (2014)[j]	1211	Sexually active adults	43.00	HB	SCS-SF	Lack of sexual risk behaviour	.01	.03
Dewsaran-van der Ven et al. (2018)[f]	472	Adults with & without somatoform	40.70	PH	SCS	Low number of symptoms	.25	.05
Dewsaran-van der Ven et al. (2018)[f]	472	Adults with & without somatoform	40.70	PH	SCS	Health-related quality of life	.23	.05
Dowd and Jung (2017)	220	Adults with celiac disease	44.02	HB	SCS	Self-regulatory efficacy – gluten T1	.16	.07
Dowd and Jung (2017)	220	Adults with celiac disease	44.02	HB	SCS	Concurrent self-reg efficacy – gluten T1	.36	.07
Dowd and Jung (2017)	220	Adults with celiac disease	44.02	HB	SCS	Celiac dietary adherence T1	−.32	.07
Dowd and Jung (2017)	200	Adults with celiac disease	44.01	HB	SCS	Self-reg efficacy – gluten longitudinal	.09	.07
Dowd and Jung (2017)	200	Adults with celiac disease	44.01	HB	SCS	Conc self-reg efficacy – gluten longitudinal	.15	.07
Dowd and Jung (2017)	200	Adults with celiac disease	44.01	HB	SCS	Celiac dietary adherence – longitudinal	−.25	.07
Dowd and Jung (2017)	200	Adults with celiac disease	44.01	HB	SCS	Self-regulatory efficacy – gluten T2	.11	.07
Dowd and Jung (2017)	200	Adults with celiac disease	44.01	HB	SCS	Concurrent self-reg efficacy – gluten T2	.18	.07
Dowd and Jung (2017)	200	Adults with celiac disease	44.01	HB	SCS	Celiac dietary adherence – T2	−.30	.07
Dunne, Sheffield, and Chilcott (2016)	147	Undergraduates	32.28	PH	SCS	Physical health symptoms	.27	.08
Dunne, Sheffield, and Chilcott (2016)	147	Undergraduates	32.28	HB	SCS	Health promoting behaviours	.26	.08
Eller et al. (2014)[a]	1766	Adults living with HIV		HB	SCS-SF	HIV symptom management	.51	.02
Ellingwood et al. (2018)[i]	84	Undergraduates		HB	SCS	Less drinking	−.22	.11
Ellingwood et al (2018)[i]	61	Undergraduates		HB	SCS	Less binge drinking	−.19	.13
Ellingwood et al (2018)[i]	53	Undergraduates		HB	SCS	Less social drinking	−.27	.14
Ferrari, Cin, and Steele (2017)	310	Adults with diabetes	37.60	HB	SCS-SF	Dietary care	.36	.06
Ferrari, Cin, and Steele (2017)	310	Adults with diabetes	37.60	HB	SCS-SF	Physical activity	.31	.06
	310	Adults with diabetes	37.60	HB	SCS-SF	Healthcare use	.21	.06

(*Continued*)

Table 1. Continued.

Author	*N*	Sample Type	*M* Age	Health DV	Measure	Domain	*r*	*SE*
Ferrari, Cin, and Steele (2017)								
Ferrari, Cin, and Steele (2017)	310	Adults with diabetes	37.60	HB	SCS-SF	Glucose management	.15	.06
Ferrari, Cin, and Steele (2017)	310	Adults with diabetes	37.60	PH	SCS-SF	Low HbA1c blood glucose	.23	.06
Ferreira et al. (2014)[a]	34	Eating disorder patients	24.56	HB	SCS	Lack of eating disorder symptoms	.48	.18
Ferreira, Oliveira, and Mendes (2017)[a]	490	Women	24.76	HB	SCS-Pos	Lack of restrained eating	.08	.05
Ferreira et al. (2013)[a]	102	Women with eating disorders	23.62	HB	SCS	Lack of bulimia symptoms	.33	.10
Ferreira et al. (2013)[a]	102	Women with eating disorders	23.62	HB	SCS	Lack of drive for thinness	.45	.10
Ferreira et al. (2013)[a]	123	Women	23.54	HB	SCS	Lack of bulimia symptoms	.24	.09
Ferreira et al. (2013)[a]	123	Women	23.54	HB	SCS	Lack of drive for thinness	.34	.09
Friis et al. (2017)[b,i]	42	Adults recruited via university	24.95	HB	Induced	Teeth flossing time	−.27	.16
Friis et al. (2017)[b,i]	42	Adults via university	25.95	HB	Induced	Decision to use flossing fork	−.10	.16
Friis, Johnson, et al. (2016)[g,l]	63	Adults with diabetes	42.87	PH	Intervention	Low HbA1c – 8 weeks	.16	.13
Friis, Johnson, et al. (2016)[g,l]	63	Adults with diabetes	42.87	PH	Intervention	Low HbA1c – 3 months FU	.15	.13
Gale et al. (2014)[k,p]	96	Adults with eating disorders	28.10	HB	Intervention	Less dietary restraint	.69	.10
Gale et al. (2014)[k,p]	62	Adults with eating disorders	28.10	HB	Intervention	Less anorexic dietary behaviours	.38	.13
Gale et al. (2014)[k,p]	62	Adults with eating disorders	28.10	HB	Intervention	Less bulimic dietary behaviours	.57	.13
Gale et al. (2014)[k,p]	79	Adults with eating disorders	28.10	HB	Intervention	Less binge eating	.33	.11
Gale et al. (2014)[k,p]	83	Adults with eating disorders	28.10	HB	Intervention	Less vomiting	.24	.11
Gale et al. (2014)[k,p]	85	Adults with eating disorders	28.10	HB	Intervention	Less laxative use	.18	.11
Gale et al. (2014)[k,p]	87	Adults with eating disorders	28.10	HB	Intervention	Less diuretic use	.20	.11
Gale et al. (2014)[k,p]	86	Adults with eating disorders	28.10	HB	Intervention	Less excessive exercise	.32	.11
Gedik (2019)	423	Undergraduates	19.81	HB	SCS	Health responsibility	.09	.05
Gedik (2019)	423	Undergraduates	19.81	HB	SCS	Physical activity	.13	.05
Gedik (2019)	423	Undergraduates	19.81	HB	SCS	Nutrition	.13	.05
Gouveia, Canavarro, and Moreira (2019)	245	Overweight/obese adolescents	14.48	HB	SCS-SF	Lack of emotional eating	.38	.06
Gouveia, Canavarro, and Moreira (2018)	572	Adolescents	15.33	PH	SCS-SF	Presence of health conditions	.00	.04
Gouveia, Canavarro, and Moreira (2018)	572	Adolescents	16.33	HB	SCS-SF	Lack of emotional eating	.28	.04
Gregory, Glazer, and Berenson (2017)[i]	64	Female undergraduates	19.40	HB	SCS	Lack of self-injury	.57	.13
Gregory, Glazer, and Berenson (2017)[i]	64	Female undergraduates	19.40	HB	SCS-ST	Lack of self-injury	.29	.13
Gregory, Glazer, and Berenson (2017)	32	Female students with self-injury	19.40	PH	SCS-ST	Low initial pain intensity	−.46	.19
Gregory, Glazer, and Berenson (2017)	32	Female students with self-injury	19.40	PH	SCS-ST	Low final pain intensity	−.36	.19
Gregory, Glazer, and Berenson (2017)	32	Female students with self-injury	19.40	PH	SCS-ST	Low pain threshold	.07	.19
	32		19.40	PH	SCS-ST	Low pain endurance	.15	.19

(*Continued*)

Table 1. Continued.

Author	*N*	Sample Type	*M* Age	Health DV	Measure	Domain	*r*	*SE*
Gregory, Glazer, and Berenson (2017)		Female students with self-injury						
Gregory, Glazer, and Berenson (2017)	32	Female students without self-injury	19.40	PH	SCS-ST	Low initial pain intensity	.02	.19
Gregory, Glazer, and Berenson (2017)	32	Female students without self-injury	19.40	PH	SCS-ST	Low final pain intensity	.23	.19
Gregory, Glazer, and Berenson (2017)	32	Female students without self-injury	19.40	PH	SCS-ST	Low pain threshold	.09	.19
Gregory, Glazer, and Berenson (2017)	32	Female students without self-injury	19.40	PH	SCS-ST	Low pain endurance	.10	.19
Hall et al. (2013)[a]	182	Students		PH	SCS	Lack of common physical symptoms	.20	.07
Hallion, Taylor, Roberts, and Ashe (2018)	169	Adults aged 40–65 years	50.81	HB	SCS	Physical activity (MET)	.10	.08
Hallion, Taylor, Roberts, and Ashe (2018)	169	Adults aged 40–65 years	50.81	PH	SCS	Perceived good health	.26	.08
Harrison et al. (2017)[i]	129	Adults with and without COPD	68.66	PH	SCS-SF	Lack of COPD	.22	.09
Herriot, Wrosch, and Gouin (2018)	233	Community older adults	76.00	PH	SCS-SF	Low cortisol	.14	.07
Herriot, Wrosch, and Gouin (2018)	233	Community older adults	76.00	PH	SCS-SF	Cortisol slope	.00	.07
Herriot, Wrosch, and Gouin (2018)	233	Community older adults	76.00	PH	SCS-SF	Lack of physical health problems	.12	.07
Herriot, Wrosch, and Gouin (2018)	233	Community older adults	76.00	PH	SCS-SF	Low functional disability	.06	.07
Herriot, Wrosch, and Gouin (2018)	233	Community older adults	76.00	HB	SCS-SF	Non-smoking	−.01	.07
Homan and Sirois (2017)	176	Adults – online panel	31.60	PH	SCS-SF	General health	.46	.08
Homan and Sirois (2017)	176	Adults – online panel	31.60	HB	SCS-SF	General health behaviours	.49	.08
Hu et al. (2018) – Study 1	142	Undergraduates	20.07	HB	SCS-SF	Sleep quality	.23	.08
Huysmans and Clement (2017)	117	College athletes	19.50	PH	SCS-SF	Low injury severity	−.04	.09
Huysmans and Clement (2017)	117	College athletes	20.50	PH	SCS-SF	Low injury frequency	.00	.09
James et al. (2016)[a]	936	1st year female undergraduates	18.25	HB	SCS	Lack of eating restraint	.05	.03
James et al. (2016)[a]	936	1st year female undergraduates	18.25	HB	SCS	Lack of eating disinhibition	.07	.03
James et al. (2016)[a]	936	1st year female undergraduates	18.25	HB	SCS	Lack of hunger	.04	.03
Jiang et al. (2016)	525	High school students	12.97	HB	SCS	Low non-suicidal self-injury – wave 1	.30	.04
Jiang et al. (2016)	525	High school students	13.76	HB	SCS	Low non-suicidal self-injury – wave 2	.19	.04
Jiang, You, Zheng, and Lin (2017)	658	High school students	13.58	HB	SCS	Low non-suicidal self-injury	.35	.04
Jiang, You, Ren, et al. (2017)	508	Adolescents	13.58	HB	SCS	Low non-suicidal self-injury	.30	.04
Kearney and Hicks (2016)	122	Adults with scleroderma	46.90	PH	SCS	Low hyper-arousal	.43	.09
Kearney and Hicks (2017)	23	Women with breast cancer	54.00	PH	SCS	Low hyper-arousal	.49	.22
Kelly and Carter (2014)	87	Adults with eating disorders	45.00	HB	SCS	Low dietary restraint – baseline	.29	.11
Kelly and Carter (2015)	41	Adults with eating disorders	45.00	HB	SCS	Few binge episodes – baseline	.32	.16
Kelly and Carter (2015)	41	Adults with eating disorders	45.00	HB	SCS	Few binge days – baseline	.00	.16

(*Continued*)

Table 1. Continued.

Author	*N*	Sample Type	*M* Age	Health DV	Measure	Domain	*r*	*SE*
Kelly and Carter (2015)	41	Adults with eating disorders	45.00	HB	SCS	Lack of disordered eating	.45	.16
Kelly and Carter (2015)[i,l]	23	Adults with eating disorders	45.00	HB	Intervention	Less binge episodes – week 1	.17	.22
Kelly and Carter (2015)[i,l]	23	Adults with eating disorders	45.00	HB	Intervention	Less binge episodes – week 2	.29	.22
Kelly and Carter (2015)[i,l]	23	Adults with eating disorders	45.00	HB	Intervention	Less binge episodes – week 3	.29	.22
Kelly and Carter (2015)[i,l]	23	Adults with eating disorders	45.00	HB	Intervention	Less binge days – week 1	.49	.22
Kelly and Carter (2015)[i,l]	23	Adults with eating disorders	45.00	HB	Intervention	Less binge days – week 2	.56	.22
Kelly and Carter (2015)[i,l]	23	Adults with eating disorders	45.00	HB	Intervention	Less binge days – week 3	.57	.22
Kelly and Carter (2015)[i,l]	23	Adults with eating disorders	45.00	HB	Intervention	Less disordered eating EDE – week 1	.46	.22
Kelly and Carter (2015)[i,l]	23	Adults with eating disorders	45.00	HB	Intervention	Less disordered eating EDE – week 2	.49	.22
Kelly and Carter (2015)[i,l]	23	Adults with eating disorders	45.00	HB	Intervention	Less disordered eating EDE – week 3	.48	.22
Kelly, Carter, Zuroff, and Borrairi (2013)	74	Adults with an eating disorder	27.50	HB	SCS-SF	Lack of disordered eating	.59	.12
Kelly and Stephen (2016) – Between persons	92	Female undergraduates	19.70	HB	SCS-SF	Intuitive eating	.47	.11
Kelly and Stephen (2016) – Between persons	92	Female undergraduates	19.70	HB	SCS-SF	Low restrained eating	.24	.11
Kelly and Waring (2018)[i,l]	40	Women	21.60	HB	Intervention	Less eating disorder symptoms – 1 week	.04	.16
Kelly and Waring (2018)[i,l]	40	Women	21.60	HB	Intervention	Less eating disorder symptoms – 2 weeks	.07	.16
Kelly, Wisniewski, et al. (2017)[i,m]	22	Adults with an eating disorder	31.92	HB	Intervention	Less eating disorder symptoms – 4 weeks	.43	.23
Kelly, Wisniewski, et al. (2017)[i,m]	22	Adults with an eating disorder	31.92	HB	Intervention	Less eating disorder symptoms – 8 weeks	.59	.23
Kelly, Wisniewski, et al. (2017)[i,m]	22	Adults with an eating disorder	31.92	HB	Intervention	Less eating disorder symptoms – 12 weeks	.62	.23
Kelly et al. (2014)[f]	154	Female undergraduates	20.00	HB	SCS-SF	Low dietary restraint	.42	.08
Kelly et al. (2014)[f]	82	Female eating disorder patients	28.00	HB	SCS-SF	Low dietary restraint	−.22	.11
Kelly, Vimalakanthan, and Miller (2014)	153	Undergraduates	20.20	HB	SCS	Low dietary restraint	.29	.08
Kelly et al. (2010)[n]	119	Current smokers	24.42	HB	Intervention	Fewer cigarettes per day	.19	.09
Kemper, Mo, and Khayat (2015)	213	Health professionals	28.30	HB	SCS-SF	Lack of sleep disturbance	.24	.07
Kemper, Mo, and Khayat (2015)	213	Health professionals	28.30	PH	SCS-SF	Physical health	.33	.07
Kleinstäuber et al. (2018)[d]	48	Adults with unexplained symptoms		PH	Induced	Symptoms less intense	.04	.15
Kleinstäuber et al. (2018)[d]	48	Adults with unexplained symptoms		PH	Induced	Symptoms less annoying	.01	.15
Kleinstäuber et al. (2018)[d]	48	Adults with unexplained symptoms		PH	Induced	Symptoms more tolerated	.01	.15
Kleinstäuber et al. (2018)[d]	48			PH	Induced	Feel stronger	.02	.15

(*Continued*)

Table 1. Continued.

Author	*N*	Sample Type	*M* Age	Health DV	Measure	Domain	*r*	*SE*
		Adults with unexplained symptoms						
Kleinstäuber et al. (2018)[d]	48	Adults		PH	Induced	Symptoms less intense	.09	.15
Kleinstäuber et al. (2018)[d]	48	Adults		PH	Induced	Symptoms less annoying	.06	.15
Kleinstäuber et al. (2018)[d]	48	Adults		PH	Induced	Symptoms more tolerated	.09	.15
Kleinstäuber et al. (2018)[d]	48	Adults		PH	Induced	Feel stronger	.03	.15
Lianekhammy et al. (2018)[f]	138	Health care social workers	42.44	PH	SCS	Health status	.24	.09
Mantzios and Egan (2018)	152	Undergraduates BMI ≥ 18	24.40	HB	SCS	Mindful eating	.42	.08
Mantzios, Egan, et al. (2018)	546	Undergraduates BMI ≥ 18	21.20	HB	SCS	Low fat and sugar consumption	.06	.04
Mantzios, Egan, et al. (2018)	546	Undergraduates BMI ≥ 18	22.20	HB	SCS	Mindful eating	.38	.04
Mantzios, Wilson, Linnell, and Morris (2015)	97	Male military – BMI ≥ 18.5	21.03	HB	SCS	Weight loss	.60	.10
Mantzios and Wilson (2014) – Study 1	243	Undergraduates		HB	SCS	Weight loss	.42	.06
Mantzios and Wilson (2014) – Study 3[i,o]	98	Undergraduates	23.30	HB	Intervention	Weight loss – post, 5 weeks	−.05	.10
Mantzios and Wilson (2014) – Study 3[i,o]	98	Undergraduates	23.30	HB	Intervention	Weight loss – follow-up, 3 months	.20	.10
Mantzios and Wilson (2015)[i,l]	63	Military recruits	22.03	HB	Intervention	Cumulative weight loss – 5 weeks	.23	.13
Mantzios and Wilson (2015)[i,l]	63	Military recruits	22.03	HB	Intervention	Cumulative weight loss – 6 months	.40	.13
Mantzios and Wilson (2015)[i,l]	63	Military recruits	22.03	HB	Intervention	Cumulative weight loss – 1 year	.06	.13
Mantzios and Wilson (2015)[i,l]	63	Military recruits	22.03	HB	Intervention	Weight loss – 5 weeks to 6 months	.19	.13
Mantzios and Wilson (2015)[i,l]	63	Military recruits	22.03	HB	Intervention	Weight loss – 6 months to 1 year	−.35	.13
Marta-Simões and Ferriera (2018)	387	Women	21.64	HB	SCS	Low disordered eating	.26	
Matos, Duarte, et al. (2017)[i,p]	93	General community	23.34	HB	Intervention	Increased HRV – 2 weeks	.21	.11
Miron, Orcutt, Hannan, and Thompson (2014)	667	Undergraduates	18.71	HB	SCS	Fewer alcohol problems	.13	.04
Pace et al. (2009)[k,q]	33	Adults	18.50	PH	Intervention	Lower IL-6 response – post stressor	.12	.18
Pace et al. (2009)[k,q]	33	Adults	18.50	PH	Intervention	Lower cortisol concentration	−.06	.18
Pinto-Gouveia, Ferreira, and Duarte (2014)	225	Women	23.60	HB	SCS	Lack of drive for thinness	.59	.07
Phelps et al. (2018)[i]	477	Online community adults	31.00	HB	SCS	Low risk of substance use disorder	.39	.05
Ramos Salazar (2018)	522	Undergraduates & graduates	38.00	HB	SCS-SF	Illness education	.18	.04
Ramos Salazar (2018)	522	Undergraduates & graduates	38.00	HB	SCS-SF	Assertiveness	.24	.04
Ramos Salazar (2018)	522	Undergraduates & graduates	38.00	HB	SCS-SF	Mindful-noncompliance	−.09	.04
Raque-Bogden et al. (2011)	208	Undergraduates	20.00	PH	SCS	Physical health	−.18	.07
	69		31.81	PH	SCS		.02	.12

(*Continued*)

Table 1. Continued.

Author	*N*	Sample Type	*M* Age	Health DV	Measure	Domain	*r*	*SE*
Raque-Bogden and Hoffman (2015)		Women – primary infertility				Fewer months trying to conceive		
Raque-Bogden and Hoffman (2015)	69	Women – primary infertility	31.81	HB	SCS	Have sought treatment	−.14	.12
Raque-Bogden and Hoffman (2015)	53	Women – secondary infertility	33.76	PH	SCS	Fewer months trying to conceive	.09	.14
Raque-Bogden and Hoffman (2015)	53	Women – secondary infertility	33.76	HB	SCS	Have sought treatment	−.10	.14
Schoenefeld and Webb (2013)	322	College women	19.48	HB	SCS	Intuitive eating	.39	.06
Sirois (2015)	403	Young adults	20.37	HB	SCS	Health promoting behaviours	.27	.05
Sirois and Hirsch (2019) – Sample 1	319	Adults with fibromyalgia	47.89	HB	SCS-SF	Medical adherence	.21	.06
Sirois and Hirsch (2019) – Sample 2	152	Adults with fibromyalgia	41.51	HB	SCS-SF	Medical adherence	.13	.08
Sirois and Hirsch (2019) – Sample 3	61	Adults with Chronic Fatigue	33.91	HB	SCS-SF	Medical adherence	.31	.13
Sirois and Hirsch (2019) – Sample 4	55	Cancer patients	61.24	HB	SCS-SF	Medical adherence	.26	.14
Sirois and Hirsch (2019) – Sample 5	122	Cancer patients in remission	61.47	HB	SCS-SF	Medical adherence	.31	.09
Sirois et al. (2015) – Sample 1	145	Undergraduates	21.27	HB	SCS	Study behaviours – meals/sleep	.31	.08
Sirois et al. (2015) – Sample 2	93	Community adults	36.90	HB	SCS	Health promoting behaviours	.31	.11
Sirois et al. (2015) – Sample 3	395	Undergraduates	21.16	HB	SCS	Health promoting behaviours	.24	.05
Sirois et al. (2015) – Sample 4	139	Community adults	32.61	HB	SCS	Health promoting behaviours	.45	.09
Sirois et al. (2015) – Sample 5	238	Undergraduates	23.46	HB	SCS	Health promoting behaviours	.20	.07
Sirois et al. (2015) – Sample 6	195	Community adults	32.09	HB	SCS	Health promoting behaviours	.27	.07
Sirois et al. (2015) – Sample 7	339	Undergraduates	21.68	HB	SCS	Health promoting behaviours	.24	.05
Sirois et al. (2015) – Sample 8	189	Undergraduates	22.41	HB	SCS	Health promoting behaviours	.29	.07
Sirois et al. (2015) – Sample 9	349	Undergraduates	21.75	HB	SCS	Eating fruit and vegetables	.17	.05
Sirois et al. (2015) – Sample 10	113	Community adults	31.16	HB	SCS	Health promoting behaviours	.31	.10
Sirois et al. (2015) – Sample 11	120	Community adults	33.70	HB	SCS	Health promoting behaviours	.23	.09
Sirois et al. (2015) – Sample 12	290	Undergraduates	21.07	HB	SCS	Health promoting behaviours	.27	.06
Sirois et al. (2015) – Sample 13	139	Community adults	41.75	HB	SCS-SF	Health promoting behaviours	.31	.09
Sirois et al. (2015) – Sample 14	403	Community adults	28.22	HB	SCS-SF	Health promoting behaviours	.18	.05
Sirois et al. (2015) – Sample 15	105	Community adults	30.32	HB	SCS-SF	Health promoting behaviours	.30	.10
Sirois, Nauts, and Molnar (2019) – Study 1	134	Community adults & students	20.22	HB	SCS	Low bedtime procrastination	.28	.09
Sirois, Nauts, and Molnar (2019) – Study 1	134	Community adults & students	20.22	HB	SCS	Little trouble falling asleep	.29	.09
Sirois, Nauts, and Molnar (2019) – Study 1	134	Community adults & students	20.22	HB	SCS	Little poor quality sleep	.36	.09
	646	Adults	30.74	HB	SCS		.31	.04

(*Continued*)

Table 1. Continued.

Author	*N*	Sample Type	*M* Age	Health DV	Measure	Domain	*r*	*SE*
Sirois, Nauts, and Molnar (2019) – Study 2						Low bedtime procrastination		
Skinta, Fekete, and Williams (2018)	90	Gay men with HIV	43.50	PH	SCS-SF	Self-rated health	.22	.11
Skinta, Fekete, and Williams (2018)	90	Gay men with HIV	43.50	PH	SCS-SF	Fewer HIV symptoms	.28	.11
Smith (2015)	102	Independent older adults	82.10	PH	SCS-SF	Health	.29	.10
Stapleton and Nikalje (2013)	216	Undergraduates	21.06	HB	SCS	Unconditional permission to eat	.31	.07
Stapleton and Nikalje (2013)	216	Undergraduates	21.06	HB	SCS	Eating for physical reasons	.09	.07
Stapleton and Nikalje (2013)	216	Undergraduates	21.06	HB	SCS	Reliance on internal eating cues	.15	.07
Stutts and Blomquist (2018) – T0	765	Commencing undergraduates		HB	SCS-SF	Lack of disordered eating	.23	.04
Stutts and Blomquist (2018) – T0	765	Commencing undergraduates		HB	SCS-SF	Eating control	.20	.04
Stutts and Blomquist (2018) – T2	765	First year undergraduates		HB	SCS-SF	Lack of disordered eating	.22	.04
Stutts and Blomquist (2018) – T2	743	First year undergraduates		HB	SCS-SF	Eating control frequency	.23	.04
Stutts and Blomquist (2018) – T2	754	First year undergraduates		HB	SCS-SF	Eating control severity	.26	.04
Stutts and Blomquist (2018) – T4	617	Second year undergraduates		HB	SCS-SF	Lack of disordered eating	.20	.04
Stutts and Blomquist (2018) – T5	555	Third year undergraduates		HB	SCS-SF	Eating control frequency	.17	.04
Stutts and Blomquist (2018) – T5	559	Third year undergraduates		HB	SCS-SF	Eating control severity	.24	.04
Stutts and Blomquist (2018) – T2 (SCS T2)	755	First year undergraduates		HB	SCS-SF	Lack of disordered eating	.23	.04
Stutts and Blomquist (2018) – T2 (SCS T2)	743	First year undergraduates		HB	SCS-SF	Eating control frequency	.22	.04
Stutts and Blomquist (2018) – T2 (SCS T2)	754	First year undergraduates		HB	SCS-SF	Eating control severity	.24	.04
Stutts and Blomquist (2018) – T4 (SCS T2)	617	Second year undergraduates		HB	SCS-SF	Lack of disordered eating	.16	.04
Stutts and Blomquist (2018) – T5 (SCS T2)	555	Third year undergraduates		HB	SCS-SF	Eating control frequency	.17	.04
Stutts and Blomquist (2018) – T5 (SCS T2)	559	Third year undergraduates		HB	SCS-SF	Eating control severity	.20	.04
Svendsen et al. (2016)	53	Undergraduates	23.63	PH	SCS	High heart rate variability	.31	.14
Svendsen et al. (2016)	53	Undergraduates	23.63	PH	SCS	High heart rate variability – 24 hrs	.30	.21
Tanaka et al. (2011)	117	Maltreated adolescents	18.10	HB	SCS	Lack of excessive drinking	.21	.09
Tanaka et al. (2011)	117	Maltreated adolescents	18.10	HB	SCS	Lack of substance abuse	.11	.09
Tanaka et al. (2011)	117	Maltreated adolescents	18.10	HB	SCS	Lack of suicide attempts	.30	.09
Taylor, Daiss, and Krietsch (2015)	150	Students	19.23	HB	SCS-SF	Mindful eating	.34	.08
Taylor, Daiss, and Krietsch (2015)	150	Students	19.23	HB	SCS-SF	Lack of dieting	.23	.08
Taylor, Daiss, and Krietsch (2015)	150	Students	19.23	HB	SCS-SF	Lack of bulimia & food preoccupation	.11	.08
Taylor, Daiss, and Krietsch (2015)	150	Students	19.23	HB	SCS-SF	Low oral control	−.09	.08
	196	Community adults	41.30	PH	SCRI	Health status	.26	.07

(*Continued*)

Table 1. Continued.

Author	*N*	Sample Type	*M* Age	Health DV	Measure	Domain	*r*	*SE*
Terry et al. (2013) – Study 1								
Terry et al. (2013) – Study 2	117	Community adults	22.00	HB	SCS-SF	Immediately seek medical attention	.23	.09
Terry et al. (2013) – Study 3	182	Community adults	30.90	HB	SCS-SF	Immediately seek medical attention	.21	.07
Terry et al. (2013) – Study 3	182	Community adults	30.90	HB	SCS-SF	Fast to seek medical attention	.18	.07
Terry et al. (2013) – Study 4	241	Adults	36.40	HB	SCS-SF	Proactive health	.38	.06
Terry et al. (2013) – Study 4	241	Adults	36.40	PH	SCS-SF	Low impact of health problem	.39	.06
Terry et al. (2013) – Study 4	241	Adults	36.40	HB	SCS-SF	Follow doctor's orders	.14	.06
Thakur and Joshi (2016)[i]	60	Adolescents aged 14–19		HB	SCS	Gym membership	.22	.13
Tylka, Russell, and Neal (2015)	435	Community adults	28.14	HB	SCS-SF	Lack of disordered eating	.39	.05
Webb and Forman (2013)	215	Undergraduates	19.81	HB	SCS	Less binge eating	.21	.07
Webb and Hardin (2018)	333	Undergraduates	19.40	HB	SCS	Intuitive eating	.39	.06
Webel et al. (2015)	2183	Adults living with HIV	45.10	PH	SCS-SF	Low symptom intensity	.28	.02
Wong and Mak (2016)[i,l]	65	Students	20.70	PH	Intervention	Lack of physical symptoms – 1 month	−.04	.13
Wong and Mak (2016)[i,l]	65	Students	20.70	PH	Intervention	Lack of physical symptoms – 3 months	−.05	.13
Wren et al. (2012)	88	Obese adults with pain	53.93	PH	SCS	Less pain disability	.29	.11
Wren et al. (2012)	88	Obese adults with pain	53.93	PH	SCS	Less pain intensity	.18	.11
Wren et al. (2012)	88	Obese adults with pain	53.93	PH	SCS	Less pain unpleasantness	.10	.11
Wren et al. (2012)	88	Obese adults with pain	53.93	PH	SCS	Less pain self-efficacy	.25	.11
Wren et al. (2012)	88	Obese adults with pain	53.93	PH	SCS	Less pain catastrophising	.40	.11
Xavier, Pinto-Gouveia, and Cunha (2016)	643	Adolescents	15.24	HB	SCS	Low risk taking & self-harm (NSSI)	.37	.04

Notes: HB = Health behaviour; PH = Physical health; SCS = Self-Compassion Scale; SCS-SF = Self-Compassion Scale-Short Form; SCS-ST = State Self-Compassion Scale; SCS-mod = modified Self-Compassion Scale; SCS-Pos = SCS positive scales only; Induced = Self-Compassion induction; SCRI = Self-Compassionate Reactions Inventory.

*Some reference details are given only in the supplemental material.

Effect size:

[a]calculated by averaging SCS subscales.

[b]based on comparison between self-compassion and self-critical induction.

[c]based on SCS positive subscales only.

[d]based on Cohen's *d*.

[e]zero entered because a non-significant result was reported but no statistics were available.

[f]based on standardised beta.

[g]based on *t* value.

[h]controlled for gender.

[i]calculated from means and standard deviations.

[j]based on logged odds.

[k]based on *F* value.

[l]based on comparison with control group.

[m]based on comparison with treatment as usual group.

[n]based on comparison with self-monitoring group.

[o]based on comparison with mindfulness group.

[p]based on pre and post scores.

[q]based on comparison with health discussion control group.

Physical health domain

Each effect on physical health was coded into one of eight domains: global health (e.g., overall health), physical symptoms (e.g., medical problems, symptoms of illnesses, injury frequency), frailty (e.g., mobility, hearing, lack of impairment, memory, strength), pain (e.g., intensity, frequency), functional immunity (e.g., Interleuken 6), stress hormones and neurotransmitters (e.g., salivary alpha-amylase, salivary cortisol, hyperarousal), cardiovascular (e.g., physical fitness, blood pressure, heart rate), or metabolism (e.g., blood glucose), (Vermeulen et al., 2011; Vitaliano et al., 2003).

Health behaviour domain

Behaviours were grouped into the following seven domains: bodily routines (e.g., hygiene, teeth brushing), sleep (e.g., quality, duration), medical practices (e.g., check-ups, medical adherence), nutrition and exercise, danger avoidance (e.g., risky sex, road safety), substance abuse (e.g., alcohol, drugs, smoking), or composite measures that assess more than one health behaviour (Nudelman & Shiloh, 2015).

Sample type

Effect sizes were classified according to whether the sample was medical (e.g., comprising individuals with a specific health problem) or non-medical (e.g., community, students, general population).

Self-compassion measure

Effect sizes were grouped into eight categories according to the type of self-compassion measure that was employed: SCS (Neff, 2003a), SCS-SF (Raes, Pommier, Neff, & Van Gucht, 2011), SCS-State (Breines & Chen, 2013), SCS-modified, SCS positive scales only, Self-Compassionate Reactions Inventory (SCRI, Leary, Terry, Allen, & Guadagno, 2011), induced state self-compassion (i.e., a paradigm to elicit self-compassion in a single session), or self-compassion intervention (i.e., a therapeutic self-compassion programme delivered in more than one session).

Intervention duration

Effects on outcomes assessed during or at the end of each intervention were further coded by intervention duration (<6 weeks, 6 weeks to <12 weeks, and ≥12 weeks). Follow-up intervention effects were not coded because there were too few to statistically analyse.

Age group

Effect sizes were grouped into three categories according to the mean age of participants in the respective study: between 12.00 and 19.99 years (27.9%), 20.00 and 39.99 years (37.2%), and 40.00 years and over (30.7%). Effects were not coded if age was not reported in the published article (4.1%).

Inter-coder reliability

Effect sizes were calculated and coded by two independent researchers. Coder 1 calculated and coded all articles and Coder 2 calculated and coded a random selection of 20% of effects ($n = 59$). Inter-coder consistency on all categorical variables was assessed by Cohen's Kappa ($\kappa_{\text{single rater}}$) and consistency on continuous variables was assessed by Intraclass Correlation Coefficient ($\text{ICC}_{\text{absolute agreement}}$). Coding consistency was perfect on age group, self-compassion measure, and physical health vs health behaviour ($\kappa = 1.00$), and on health behaviour effect and mean age (ICC = 1.00). Consistency was excellent on physical health effect (ICC = .99), sample *N* (ICC = .93), health behaviour domain ($\kappa = .97$), physical health domain ($\kappa = .93$), and sample type ($\kappa = .94$). Coders

subsequently discussed and resolved all discrepancies, and Coder 1 then double-checked all other effects and made adjustments that were indicated by the coding discussions.

Statistical analyses

Most studies used several measures, which enabled more than one effect size to be calculated. To avoid problems associated with data dependencies, the initial omnibus analyses were conducted using average effect sizes for each sample. Specifically, the omnibus analyses assessed average effect sizes for self-compassion in relation to each dependent variable for each sample (Physical health, $N = 44$; Health Behaviour, $N = 91$). However, all effect sizes were included in the moderator analyses (Physical Health, $N = 118$; Health Behaviour, $N = 172$). Forest plots of the omnibus effects can be found in the online supplement.

Pearson's *r* was used as the effect size index. Effect sizes were calculated according to the guidelines provided by Lipsey and Wilson (2001), and were reversed where necessary to indicate relationships between self-compassion and better physical health or greater engagement in health-promoting behaviour. If a study reported effect sizes for the SCS subscales (self-kindness, self-judgement, common humanity, isolation, mindfulness, and over-identification) but not for the full scale, the subscale correlations were averaged to calculate an effect size for the full scale. If correlations were not available, alternative methods were used (see Table 1). For between-group differences, effect sizes were calculated from means and standard deviations, *d* values, *F* values, or *t* values. Logged odds and standardised beta regression coefficients were also used ($r = \beta$). When other variables had been assessed with self-compassion in a regression, the standardised beta coefficient for self-compassion was transformed using the formula $r = \beta$ when β was negative and $r = \beta + .05$ when β was non-negative (Peterson & Brown, 2005). We entered zero for one relationship that was reported as non-significant but there was insufficient information to calculate an effect size. Inverse variance weighting was applied to effect sizes ($w = 1/SE$). Fisher's transformations of *r* (z_r) were used in the analyses, and *r* and *CI* values were then transformed back from z_r values. Homogeneity analyses were conducted using the *Q* statistic.

Results

The likelihood of publication bias was estimated by Meta-Essentials (Suurmond, van Rhee, & Hak, 2017). Funnel plots of precision were acceptably symmetrical (see online supplement), trim and fill methods identified no missing studies, and Eggers test was negative and non-significant for both datasets. We therefore concluded that publication bias was unlikely to significantly impact the meta-analysis. Acknowledging heterogeneity in the datasets (physical health, $I^2 = 70.6\%$; health behaviour, $I^2 = 86.4\%$) we used random effects models to produce conservative estimates (Lipsey & Wilson, 2001).

Overall analyses

The meta-analysis was conducted using dedicated macros for SPSS (Wilson, 2006). Initial omnibus analyses (using one average effect size per sample) revealed significant positive overall weighted effect sizes of $r = .18$ for physical health and $r = .26$ for health behaviour. As shown in Table 2, an

Table 2. Overall effect sizes and initial homogeneity analysis.

			CI 95%			Homogeneity analysis		
Random effect size model	*n*	*r*	Lower	Upper	*p*	Q_{within}	*df*	*p*
Physical health	44	.18	.13	.23	<.001	28.77	43	.95
Health behaviour	91	.26	.22	.29	<.001	91.34	90	.44

Note: $N = 135$. $Q_{between}$ (1) = 5.53, $p = .02$. Homogeneity analysis based on Fisher's *r*, *r* values based on inverse transformation of Fisher's *r*.

Table 3. Moderation analyses for domains.

			CI 95%			Homogeneity analysis		
Domains	*n*	*r*	Lower	Upper	*p*	Q_{within}	*df*	*p*
Physical Health								
Global health	12	.22	.15	.30	<.001	15.99	11	.14
Physical symptoms	34	.15	.09	.20	<.001	22.17	33	.92
Frailty	9	.04	−.06	.14	.43	2.85	8	.94
Pain	15	.14	.05	.22	.003	21.06	14	.10
Functional immunity	9	.20	.07	.33	.003	5.05	8	.75
Stress hormones & neurotransmitters	17	.14	.06	.23	<.001	23.46	16	.10
Cardiovascular	19	.14	.05	.22	.002	6.40	18	.99
Metabolism	3	.19	.03	.36	.03	0.21	2	.90
Health Behaviour								
Bodily routines	2	−.19	−.50	.12	.23	0.31	1	.58
Sleep	6	.29	.16	.43	<.001	0.44	5	.99
Medical practices	23	.20	.13	.27	<.001	18.93	22	.65
Nutrition & exercise	104	.24	.21	.28	<.001	138.04	103	.01
Danger avoidance	10	.29	.18	.39	<.001	7.74	9	.56
Substance abuse	10	.06	−.05	.17	.28	12.80	9	.17
Composite	17	.30	.22	.38	<.001	4.29	16	.99

Notes: Physical Health: $Q_{between}(7) = 8.77$, $p = .27$. Health Behaviour: $Q_{between}(6) = 21.29$, $p = .002$. Homogeneity analysis based on Fisher's *r*, *r* values based on inverse transformation of Fisher's *r*.

initial moderation analysis indicated that the overall mean effect of self-compassion on health behaviour was significantly larger than its mean effect on physical health.

Domain moderator analyses

Moderation analyses (using all effect sizes) were conducted to determine whether domain (physical health or health behaviour) influenced the relationships between self-compassion and physical health and health behaviour (see Table 3). Domains represented by more than two effect sizes were included in these analyses. Physical health domain did not moderate the relationship between self-compassion and physical health, with most domains yielding small, positive, and significant mean effects. Studies that assessed global health and functional immunity generated the strongest effect sizes. However, the effect was non-significant for studies that examined frailty. Health behaviour domain moderated the association between self-compassion and health behaviour. The associations between self-compassion and health behaviour were small to medium, positive, and significant across most domains, but the relationships were non-significant for studies that assessed bodily routines or substance abuse. Measures that assessed sleep, danger avoidance, or composite health behaviours produced the strongest effect sizes.

Sample type moderator analyses

Table 4 presents the results of the sample type moderation analysis. Non-significant homogeneity analyses indicated that the average effect sizes for physical health and health behaviour did not

Table 4. Moderation analyses for sample.

			CI 95%			Homogeneity analysis		
Sample type	*n*	*r*	Lower	Upper	*p*	Q_{within}	*df*	*p*
Physical Health								
Non-medical	88	.14	.11	.18	<.001	73.30	87	.85
Medical	30	.18	.12	.23	<.001	36.23	29	.17
Health Behaviour								
Non-medical	102	.22	.19	.25	<.001	92.21	101	.72
Medical	70	.26	.21	.30	<.001	113.88	69	<.001

Notes: Physical Health: $Q_{between}(1) = 1.14$, $p = .29$. Health Behaviour: $Q_{between}(1) = 1.65$, $p = .20$. Homogeneity analysis based on Fisher's *r*, *r* values based on inverse transformation of Fisher's *r*.

differ significantly between sample types. Self-compassion positively predicted physical health and health behaviour in non-medical and medical samples, with mean effects that were small in magnitude. Moderation analyses of each domain separately found a near significant difference ($p = .05$) in effects relating to nutrition and exercise between medical samples ($n = 49$, $r = .28$) and non-medical samples ($n = 55$, $r = .21$). Larger associations were also found in medical samples in several other domains but the differences were not significant.

Self-compassion measure moderator analyses

Measures represented by more than one effect size were included in the self-compassion measure moderation analyses (see Table 5). The relationship between self-compassion and physical health varied significantly according to the measurement strategy used. Small but significant positive effects were found in studies that used the SCS or SCS-SF, or evaluated a self-compassion intervention, but the association was non-significant across studies that induced self-compassion or assessed SCS-state self-compassion. Measurement strategy also moderated the association with health behaviour. Significant small to medium positive effects were found for studies that utilised the SCS, SCS-SF, modified SCS, or a self-compassion intervention, but the relationship was negative and non-significant for studies that induced self-compassion.

A second-order analysis of effects observed during and immediately after a self-compassion intervention ($n = 41$) found that intervention duration moderated the association between self-compassion and health (physical health and health behaviour combined). As shown in Table 6, interventions of all durations produced significant average effects on health that were small to medium in magnitude. Interventions of ≥ 12 weeks duration produced a stronger mean effect than shorter interventions, but overlapping confidence intervals indicate that the difference fell short of significance.

Age group moderator analyses

The age group moderation analyses for physical health and health behaviour were significant (see Table 7). The average relationship between self-compassion and physical health was positive and significant for the two older age groups (20.00–39.99 and 40.00+) but it was non-significant for the younger age group (12.00–19.99). Self-compassion was positively associated with health behaviour for all three age groups, but confidence intervals indicate that the mean effect generated by the older age group (40.00+) was significantly smaller than the mean effect for the 20.00–39.99 group.

Table 5. Moderation analyses for measure.

			CI 95%			Homogeneity analysis		
Self-Compassion Measure	*n*	*r*	Lower	Upper	*p*	Q_{within}	*df*	*p*
Physical Health								
SCS	54	.17	. 12	.21	<.001	51.71	53	.52
SCS-SF	19	.19	.13	.25	<.001	24.46	18	.14
SCS-State	8	−.03	−.18	.12	.73	10.53	7	.16
Induced	17	.08	−.01	.16	.08	4.06	16	.99
Intervention	18	.14	.05	.23	.003	5.74	17	.99
Health Behaviour								
SCS	77	.22	.18	.26	<.001	103.31	76	.02
SCS-SF short form	52	.24	.19	.29	<.001	41.15	51	.84
SCS-modified	9	.20	.08	.31	<.001	4.12	8	.84
Induced	2	−.19	−.50	.12	.23	0.31	1	.58
Intervention	30	.31	.23	.39	<.001	42.53	29	.05

Notes: Physical Health: $Q_{between}(4) = 10.77$, $p = .03$. Health Behaviour: $Q_{between}(4) = 11.18$, $p = .03$. Homogeneity analysis based on Fisher's *r*, *r* values based on inverse transformation of Fisher's *r*.

Table 6. Moderation analyses for intervention duration.

			CI 95%			Homogeneity analysis		
Sample type	*n*	*r*	Lower	Upper	*p*	Q_{within}	*df*	*p*
Physical Health and Health Behaviour (combined)								
<6 weeks	18	.25	.14	.35	<.001	16.40	17	.50
6 weeks to <12 weeks	14	.20	.07	.32	.002	5.65	13	.96
≥12 weeks	9	.42	.29	.54	<.001	12.94	8	.11

Notes: $Q_{between}(2) = 6.77$, $p = .03$. $N = 41$, measurements taken during or immediately after a self-compassion intervention. Homogeneity analysis based on Fisher's *r*, *r* values based on inverse transformation of Fisher's *r*.

Discussion

This meta-analysis investigated observed relationships between self-compassion and better physical health and engagement in health-promoting behaviour in a large pooled sample sourced from 94 peer reviewed articles. As hypothesised, results of omnibus analyses indicated that self-compassion was positively associated with both physical health ($r = .18$) and health behaviour ($r = .26$). A moderation analysis revealed that the mean effect on health behaviour was significantly larger than the effect on physical health. Although quite small in size, these significant mean effects provide empirical support for the proposition that self-compassion is associated with better physical well-being (Biber & Ellis, 2017; Braun et al., 2016; Friis et al., 2015; Rahimi-Ardabili et al., 2018; Sirois & Hirsch, 2019; Sirois et al., 2015). Varied effect sizes were also identified by exploratory analyses that examined potential moderators of the two relationships.

Moderation analyses

Health behaviour domain moderated the association between self-compassion and health behaviour. On average, the positive effects were significant for studies that assessed sleep, medical practices, nutrition and exercise, danger avoidance, or a composite measure of health behaviours, but the relationship was non-significant for studies that assessed bodily routines or substance abuse. Physical health domain did not moderate the relationship between self-compassion and physical health, with positive and significant mean effects found for studies that assessed global health, physical symptoms, pain, functional immunity, stress hormones and neurotransmitters, cardiovascular fitness, or metabolism. However, the average effect was non-significant for studies that examined frailty.

Self-compassion exerted its strongest effects in studies that used global indicators of physical health and composite measures of health behaviours. The magnitude of the average association with composite health behaviour is consistent with two meta-analyses conducted by Sirois and colleagues (Sirois & Hirsch, 2019; Sirois et al., 2015) of effects observed in their own datasets. Indeed, 15 of the 17 effect sizes for composite health behaviour in the current meta-analysis were drawn from the same datasets, with most dependent variables assessing four behaviours (eating, exercise, sleep,

Table 7. Moderation analyses for age.

			CI 95%			Homogeneity analysis		
Age group	*n*	*r*	Lower	Upper	*p*	Q_{within}	*df*	*p*
Physical Health								
12–19.99	31	.05	−.02	.11	.16	18.89	30	.94
20–39.99	23	.20	.13	.26	<.001	44.60	22	.003
≥40	54	.18	.15	.22	<.001	35.30	53	.97
Health Behaviour								
12–19.99	50	.21	.17	.26	<.001	57.61	49	.19
20–39.99	85	.26	.23	.30	<.001	115.34	84	.01
≥40	35	.16	.10	.22	<.001	56.09	34	.009

Notes: Physical Health: $Q_{between}(2) = 14.92$, $p < .001$. Health Behaviour: $Q_{between}(2) = 9.46$, $p = .009$. Homogeneity analysis based on Fisher's *r*, *r* values based on inverse transformation of Fisher's *r*.

and stress management). The current meta-analysis provides a comparative context for these previous meta-analytic findings, by indicating that self-compassion tends to exhibit similar associations with most, but not all, specific health behaviours. Sirois et al. (2015) also found indirect effects via affect, which support the view that self-compassion tempers negative emotions that undermine health-related self-regulation, and promotes positive emotions that motivate individuals to attain health goals. However, a non-significant total indirect effect was observed for one variable that assessed only diet and sleep. This finding suggests that self-compassion may exert its effects on different specific health behaviours via different mechanisms. Thus, although composite measures are reliable, economical, and tend to exhibit moderate associations with self-compassion, measures of specific health behaviours may be needed when testing moderation or mediation hypotheses.

Of the assessed specific health behaviour domains, the strongest mean effects were on sleep and danger avoidance, while studies that examined functional immunity generated the largest average effect size among the assessed specific physical health domains. Although apparently disparate, sleep and functional immunity share an important predictor: *stress*. Stress can prevent the down-regulation of inflammation (Evers et al., 2014) and decrease immune responses (De Andres-Garcia, Moya-Albiol, & Gonzalez-Bono, 2012), thereby increasing the incidence or severity of illnesses such as cardiovascular disease (Steptoe & Kivimaki, 2012), arthritis (Evers et al., 2014), and diabetes (Lloyd, Smith, & Weinger, 2005). Sleep quality can also be adversely affected by stressful circumstances, such as negative social interactions or work stress (Han, Kim, & Shim, 2012).

Taking a self-compassionate perspective may lower stress by countering the effects of difficult circumstances (Neff, 2003b) and prompting individuals to employ adaptive, rather than maladaptive, coping strategies (Allen & Leary, 2010; Neff, Hsieh, & Dejitterat, 2005). For example, Neff et al. (2005) found that highly self-compassionate students tend to use adaptive emotion-focussed strategies of acceptance, positive reinterpretation and venting of negative emotions, rather than maladaptive avoidance-oriented strategies, to cope with receiving an unsatisfactory midterm grade. Accordingly, self-compassion has been associated with low levels of perceived stress (Homan & Sirois, 2017; Sirois & Hirsch, 2019), increased immunoglobulin (i.e., a protective antibody protein) (Bellosta-Batalla et al., 2018), and low sympathetic nervous system activation, high heart rate variability, and decreased interleukin 6 (i.e., stress-induced inflammation) following a stressor (Arch et al., 2014; Breines et al., 2014, 2015). Self-compassion has also been found to buffer the deleterious effects of stressful events on sleep. For example, in a 2-week diary study, Hu, Wang, Sun, Arteta-Garcia, and Purol (2018) found that students with low self-compassion who experienced stressful events during the day took a relatively long time to fall asleep at night, whereas highly self-compassionate students did not. Self-compassionate students also reported lower perceived stress following stressful events, which in turn was associated with good mood and alertness upon waking. The reductive effects of self-compassion on stress may similarly underlie significant mean associations found in several health domains examined in this study (e.g., medical adherence, see Sirois & Hirsch, 2019).

The finding of a significant meta-analytic association with nutrition and exercise is consistent with conclusions drawn in previous reviews of observed relationships between self-compassion and behavioural and psychological eating disorder outcomes (Braun et al., 2016) and the effects of self-compassion and related interventions on eating behaviour (Biber & Ellis, 2017; Rahimi-Ardabili et al., 2018). Specifically, our result supports the view that self-compassion may directly prevent disordered eating and promote greater gains in treatment. This meta-analysis extends earlier reviews by determining that an association exists when outcomes are confined to behavioural variables. The larger mean association found in medical versus non-medical samples also supports Braun et al.'s (2016) similar observation, and different associations with restrained eating found in students and eating disorder patients (Kelly et al., 2014). The current finding suggests that self-compassion may exert stronger effects on efforts to decrease disordered eating or to manage an existing health condition, than on eating well and exercising to prevent disease or maintain good health. Experimental research is needed to explore this possibility by comparing the effects of self-compassion training on various forms of nutrition and exercise in medical and non-medical samples, after controlling for

relevant covariates. Research could also test whether compassion-related motivation to eat and exercise in these populations may also differ (e.g., compassion for one's suffering versus self kindness manifesting in self-care).

The non-significant negative mean effect for bodily routines should be considered with caution, because it reflects only two effect sizes drawn from a single study. In that study, Friis, Johnson, and Consedine (2017) found that a brief self-compassion induction (compared to a self-critical induction) decreased participants' teeth flossing behaviour after receiving critical feedback about their teeth flossing method. The authors suggested that this finding might indicate that some preventative health behaviours are prompted by negative feelings, which may be inhibited by the soothing positive feelings invoked by self-compassion. A similar point is raised by Mantzios and Egan (2017), who note that self-compassion may provide a form of justification for certain unhealthy behaviours, where a desire to soothe the self may lead some individuals to engage in comforting unhealthy behaviours (e.g., eating or drinking) or to avoid unpleasant healthy behaviours. More research is needed to investigate potential relationships between self-compassion and various bodily routines, to confirm and elucidate an apparent lack of association with this form of self-care. The non-significant meta-analytic effect of self-compassion on substance abuse is also consistent with Mantzios and Egan's perspective, and suggests that self-compassion may not sufficiently counter the powerful effects of addiction on behaviour.

Nudelman and Shiloh (2018) examined perceived characteristics of three broad health behaviour categories: risk avoidance (environmental risk factors, substance abuse, and danger avoidance), health maintenance (bodily routines, sleep, and medical practices), and nutrition. It is possible that self-compassion interacts with these characteristics to influence health behaviour. For example, according to their Israeli sample, nutrition is more effortful, less habitual, more public, and more likely to arouse negative affect and feelings of pleasure deprivation than the other two categories. Self-compassion may mitigate the inhibitory effect of effort on health behaviour through its association with greater intrinsic motivation (Neff et al., 2005), motivation to change a personal weakness (Breines & Chen, 2012), setting of mastery goals (Neff et al., 2005), and engagement with new goals in response to perceived inadequacy (Neely, Schallert, Mohammed, Roberts, & Chen, 2009). Similarly, as observed by Sirois et al. (2015), self-compassion may mitigate the effects of negative affect on behaviour because it has been linked to adaptive affect regulation (Neff et al., 2005). Future research may explore whether differences in the predictive effects of self-compassion across various health behaviours may be explained by differences in their perceived characteristics.

An interesting pattern of results emerged from the age group moderation analyses. On average, self-compassion was associated with better physical health for participants aged 20 years and over but was not associated with physical health among younger participants.

Given that adolescence is characterised by relatively good physical health compared to later life stages (Case & Deaton, 2005), it is possible that adolescents have less need for self-compassionate responding in a health context. Conversely, although self-compassion predicted health-promoting behaviour in all age groups, the mean effect was weakest among older participants (aged 40+). This result is surprising, given that the relationship between self-compassion and psychological well-being has been found to strengthen with age (Hwang et al., 2016; Zessin et al., 2015). A possible explanation may be found in a qualitative study in which older women's comments suggested that the physical realities of aging and the inability to retain societal ideals of feminine beauty make self-compassion challenging and unrealistic in relation to the aging body (Bennett, Hurd Clarke, Kowalski, & Crocker, 2017). Future research may explore this possibility, and whether a reciprocal model may apply – where an age-related decline in mobility impairs one's ability to engage in certain health behaviours (e.g., physical exercise) irrespective of their self-compassionate attitude.

The effects of self-compassion on physical health and health behaviour also varied as a function of how self-compassion was operationalised. For studies that used self-report trait measures, self-compassion significantly predicted physical health and health behaviour, as did studies that employed extended interventions (conducted over more than one session) to boost self-compassion.

However, studies that attempted to prime self-compassion in a single session generated average effects that failed to reach significance. This pattern of results suggests that trait self-compassion predicts both physical health and health-promoting behaviour, and that these links are likely to be causal – based on the results of studies in which self-compassion training was provided across multiple sessions.

Practical implications

Previous reviewers had concluded that self-compassion and related interventions may confer beneficial outcomes on health behaviour and health-related psychological constructs (Biber & Ellis, 2017; Rahimi-Ardabili et al., 2018). The results of this meta-analysis indicate that this conclusion applies even when evaluations are confined to interventions that specifically target self-compassion (e.g., Neff & Germer, 2013), and that positive outcomes extend to various indicators of physical health. Unlike previous reviews, the current study quantified the effects of self-compassion interventions, revealing a medium sized mean effect of self-compassion on health behaviour and a small but significant effect on physical health, which provide support for their utility.

The current finding that multi-session self-compassion interventions produced significantly larger effects than single-session inductions suggest that longer and sustained self-compassion training may be required to influence physical health and health behaviour. Our moderation analysis of the effects of intervention studies on physical health and health behaviour (combined) supports this possibility, by revealing that interventions of at least twelve weeks duration generated a larger mean effect than shorter interventions, although these differences fell short of significance. Thus, our results suggest that self-compassion interventions of at least twelve weeks duration may be optimal, but further confirmatory research is required.

Results of the domain moderator analyses suggest that self-compassion interventions may not reliably reduce frailty, maladaptive bodily routines, or substance abuse. Indeed, the two studies that have examined the effect of a self-compassion intervention on substance use have yielded inconsistent results. One three-week intervention reduced daily smoking faster than a baseline self-monitoring condition (Kelly, Zuroff, Foa, & Gilbert, 2010) but another increased opioid cravings more than a wait-list control condition (Carlyle et al., 2019). To our knowledge, no previous study has examined the effects of a self-compassion intervention on bodily routines or frailty. This represents an important direction for future research.

It should be noted that most self-compassion intervention studies included in this meta-analysis employed very small samples, leaving them underpowered and susceptible to bias. Additionally, the studies evaluated interventions that varied in format, used various samples, did not all use a control group, and those with control groups used a variety of comparison conditions. Accordingly, considerable heterogeneity in the effects of self-compassion interventions on health behaviour suggests that the effectiveness of interventions varies according to format and sample. For example, the current age group moderation results suggest that self-compassion interventions may not effectively increase the physical health of adolescents. Further research is needed to compare and evaluate different self-compassion interventions in various health contexts.

Limitations

Most studies included in this meta-analysis used the SCS (Neff, 2003a) or a derivative, and we calculated effect sizes based on SCS total scores. We note recent debate regarding the structure of the SCS and the validity of the total score (Muris & Petrocchi, 2017) and acknowledge an apparent resolution to this issue, in the form of a bifactor model that has exhibited good fit in several samples (Neff et al., 2019). We confined this meta-analysis to SCS total scores because they have been found to explain 95% of the reliable variance in several populations (Neff et al., 2019). Most of the included studies

(77.6%) were correlational and could not establish the direction of effects. Thus, our results do not preclude the possibility that having high levels of physical health or health behaviour facilitates the formation of a self-compassionate attitude. It is also possible, and likely, that self-compassion mediates or moderates the effects of other causal factors on health outcomes (e.g., Hu et al., 2018), and that including key covariates such as gender may change the observed patterns of mean effects. These questions were beyond the scope of this paper.

Conclusion

This meta-analysis found small to medium statistically reliable positive associations between self-compassion and physical health and health-promoting behaviour in a large pooled sample. Its strongest effects were on measures of global health and composite health behaviour, and on the specific domains of functional immunity, sleep, and danger avoidance. However, self-compassion did not predict physical health among young participants (12.00–19.99) and its effect on health behaviour was weaker (although still significant) among older participants (40.00+). Studies that used experimental methods to induce self-compassion in a single session did not generate significant mean effects. However, causal relationships were supported by reliable associations observed between interventions conducted over multiple sessions and health outcomes, with interventions of at least twelve weeks duration generating the strongest effect. While self-compassion predicted outcomes in most assessed physical health and health behaviour domains, three non-significant effects suggest that self-compassion interventions may not reliably reduce frailty, maladaptive bodily routines, or substance abuse. Nevertheless, similar mean effects found in medical and non-medical samples support the application of self-compassion in many therapeutic health contexts and in healthy daily living.

Disclosure statement

No potential conflict of interest was reported by the authors.

ORCID

Donald W. Hine http://orcid.org/0000-0002-3905-7026

References

Allen, A. B., Goldwasser, E. R., & Leary, M. R. (2012). Self-compassion and well-being among older adults. *Self and Identity*, *11*(4), 428–453. doi:10.1080/15298868.2011.595082

Allen, A. B., & Leary, M. R. (2010). Self-compassion, stress, and coping. *Social and Personality Psychology Compass*, *4*(2), 107–118. doi:10.1111/j.1751-9004.2009.00246.x

Arch, J. J., Brown, K. W., Dean, D. J., Landy, L. N., Brown, K. D., & Laudenslager, M. L. (2014). Self-compassion training modulates alpha-amylase, heart rate variability, and subjective responses to social evaluative threat in women. *Psychoneuroendocrinology*, *42*, 49–58. doi:10.1016/j.psyneuen.2013.12.018

Arts-de Jong, M., van Westerop, L. L., Hoogerbrugge, N., Massuger, L. F., Maas, A. H., van Beek, M. H., & de Hullu, J. A. (2018). Self-compassion, physical fitness and climacteric symptoms in oophorectomized BRCA1/2 mutation carriers. *Maturitas*, *108*, 13–17. doi:10.1016/j.maturitas.2017.11.002

Bagnardi, V., Rota, M., Botteri, E., Tramacere, I., Islami, F., Fedirko, V., … La Vecchia, C. (2014). Alcohol consumption and site-specific cancer risk: A comprehensive dose–response meta-analysis. *British Journal of Cancer*, *112*, 580–593. doi:10.1038/bjc.2014.579

Baumeister, R. F., Zell, A. L., & Tice, D. M. (2007). How emotions facilitate and impair self-regulation. In J. J. Gross (Ed.), *Handbook of emotion regulation* (pp. 408–426). New York, NY: The Guilford Press.

Bellosta-Batalla, M., Ruiz-Robledillo, N., Sariñana-González, P., Capella-Solano, T., Vitoria-Estruch, S., Hidalgo-Moreno, G., … Moya-Albiol, L. (2018). Increased salivary IgA response as an indicator of immunocompetence after a mindfulness and self-compassion-based intervention. *Mindfulness*, *9*(3), 905–913. doi:10.1007/s12671-017-0830-y

Bennett, E. V., Hurd Clarke, L., Kowalski, K. C., & Crocker, P. R. E. (2017). "I'll do anything to maintain my health": How women aged 65–94 perceive, experience, and cope with their aging bodies. *Body Image*, *21*, 71–80. doi:10.1016/j.bodyim.2017.03.002

Biber, D. D., & Ellis, R. (2017). The effect of self-compassion on the self-regulation of health behaviors: A systematic review. *Journal of Health Psychology*, 1359105317713361. doi:10.1177/1359105317713361

Braun, T. D., Park, C. L., & Gorin, A. (2016). Self-compassion, body image, and disordered eating: A review of the literature. *Body Image*, *17*, 117–131. doi:10.1016/j.bodyim.2016.03.003

Breines, J. G., & Chen, S. (2012). Self-compassion increases self-improvement motivation. *Personality and Social Psychology Bulletin*, *38*(9), 1133–1143. doi:10.1177/0146167212445599

Breines, J. G., & Chen, S. (2013). Activating the inner caregiver: The role of support-giving schemas in increasing state self-compassion. *Journal of Experimental Social Psychology*, *49*(1), 58–64. doi:10.1016/j.jesp.2012.07.015

Breines, J. G., McInnis, C. M., Kuras, Y. I., Thoma, M. V., Gianferante, D., Hanlin, L., … Rohleder, N. (2015). Self-compassionate young adults show lower salivary alpha-amylase responses to repeated psychosocial stress. *Self and Identity*, *14*(4), 390–402. doi:10.1080/15298868.2015.1005659

Breines, J. G., Thoma, M. V., Gianferante, D., Hanlin, L., Chen, X., & Rohleder, N. (2014). Self-compassion as a predictor of interleukin-6 response to acute psychosocial stress. *Brain, Behavior, and Immunity*, *37*, 109–114. doi:10.1016/j.bbi.2013.11.006

Brown, L., Huffman, J. C., & Bryant, C. (2019). Self-compassionate aging: A systematic review. *The Gerontologist*, *59*(4), e311–e324. doi:10.1093/geront/gny108

Carlyle, M., Rockliff, H., Edwards, R., Ene, C., Karl, A., Marsh, B., … Morgan, C. J. A. (2019). Investigating the feasibility of brief compassion focused therapy in individuals in treatment for opioid use disorder. *Substance Abuse: Research and Treatment*, *13*, 1178221819836726. doi:10.1177/1178221819836726

Case, A., & Deaton, A. S. (2005). Broken down by work and sex: How our health declines. In D. A. Wise (Ed.), *Analyses in the Economics of aging* (pp. 185–212). Chicago, IL: University of Chicago Press.

Chiuve, S. E., McCullough, M. L., Sacks, F. M., & Rimm, E. B. (2006). Healthy lifestyle factors in the primary prevention of coronary heart disease among men: Benefits among users and nonusers of lipid-lowering and antihypertensive medications. *Circulation*, *114*(2), 160–167. doi:10.1161/circulationaha.106.621417

De Andres-Garcia, S., Moya-Albiol, L., & Gonzalez-Bono, E. (2012). Salivary cortisol and immunoglobulin A: Responses to stress as predictors of health complaints reported by caregivers of offspring with autistic spectrum disorder. *Hormones and Behavior*, *62*(4), 464–474. doi:10.1016/j.yhbeh.2012.08.003

Delahanty, L. M., Peyrot, M., Shrader, P. J., Williamson, D. A., Meigs, J. B., & Nathan, D. M. (2013). Pretreatment, psychological, and behavioral predictors of weight outcomes among lifestyle intervention participants in the diabetes prevention program (DPP). *Diabetes Care*, *36*(1), 34–40. doi:10.2337/dc12-0733

Dewsaran-van der Ven, C., van Broeckhuysen-Kloth, S., Thorsell, S., Scholten, R., De Gucht, V., & Geenen, R. (2018). Self-compassion in somatoform disorder. *Psychiatry Research*, *262*, 34–39. doi:10.1016/j.psychres.2017.12.013

Evers, A. W., Verhoeven, E. W., van Middendorp, H., Sweep, F. C., Kraaimaat, F. W., Donders, A. R., … van Riel, P. L. (2014). Does stress affect the joints? Daily stressors, stress vulnerability, immune and HPA axis activity, and short-term disease and symptom fluctuations in rheumatoid arthritis. *Annals of the Rheumatic Diseases*, *73*(9), 1683–1688. doi:10.1136/annrheumdis-2012-203143

Fairburn, C. G., & Beglin, S. J. (1994). Assessment of eating disorders: Interview or self-report questionnaire? *The International Journal of Eating Disorders*, *16*(4), 363–370.

Ferreira, C., Pinto-Gouveia, J., & Duarte, C. (2013). Self-compassion in the face of shame and body image dissatisfaction: Implications for eating disorders. *Eating Behaviors*, *14*(2), 207–210. doi:10.1016/j.eatbeh.2013.01.005

Friis, A. M., Consedine, N. S., & Johnson, M. H. (2015). Does kindness matter? Diabetes, depression, and self-compassion: A selective review and research agenda. (Report). *Diabetes Spectrum*, *28*(4), 252–257. doi:10.2337/diaspect.28.4.252

Friis, A. M., Johnson, M. H., & Consedine, N. S. (2017). Paradoxical effects of self-compassion on mood and teeth flossing behavior in an experimental setting. *Mindfulness*, *8*(1), 150–158. doi:10.1007/s12671-016-0585-x

Garner, D. M., Olmsted, M. P., Bohr, Y., & Garfinkel, P. E. (1982). The eating attitudes test: Psychometric features and clinical correlates. *Psychological Medicine*, *12*(4), 871–878.

Gilbert, P. (2009a). Compassion and cruelty: A biopsychosocial approach. In P. Gilbert (Ed.), *The compassionate mind: A new approach to life's challenges* (pp. 9–74). Oakland, CA: New Harbinger.

Gilbert, P. (2009b). Introducing compassion-focused therapy. *Advances in Psychiatric Treatment*, *15*(3), 199–208. doi:10.1192/apt.bp.107.005264

Hall, C. W., Row, K. A., Wuensch, K. L., & Godley, K. R. (2013). The role of self-compassion in physical and psychological well-being. *The Journal of Psychology: Interdisciplinary and Applied*, *147*(4), 311–323. doi:10.1080/00223980.2012.693138

Han, K. S., Kim, L., & Shim, I. (2012). Stress and sleep disorder. *Experimental Neurobiology*, *21*(4), 141–150.

Higgins, J. P. T., Sterne, J. A. C., Savović, J., Page, M. J., Hróbjartsson, A., Boutron, I., … Eldridge, S. (2016). A revised tool for assessing risk of bias in randomized trials. In J. Chandler, J. McKenzie, I. Boutron, & V. Welch (Eds.), *Cochrane methods. Cochrane database of systematic reviews* (Vol. 10, pp. 29–32). doi:10.1002/14651858.CD201601

Homan, K. J., & Sirois, F. M. (2017). Self-compassion and physical health: Exploring the roles of perceived stress and health-promoting behaviors. *Health Psychology Open*, *4*(2), 9. doi:10.1177/2055102917729542

Hu, Y., Wang, Y., Sun, Y., Arteta-Garcia, J., & Purol, S. (2018). Diary study: The protective role of self-compassion on stress-related poor sleep quality. *Mindfulness*, *9*(6), 1931–1940. doi:10.1007/s12671-018-0939-7

Hwang, S., Kim, G., Yang, J.-W., & Yang, E. (2016). The moderating effects of age on the relationships of self-compassion, self-esteem, and mental health. *Japanese Psychological Research*, *58*(2), 194–205. doi:10.1111/jpr.12109

Kelly, A. C., Vimalakanthan, K., & Carter, J. C. (2014). Understanding the roles of self-esteem, self-compassion, and fear of self-compassion in eating disorder pathology: An examination of female students and eating disorder patients. *Eating Behaviors*, *15*(3), 388–391. doi:10.1016/j.eatbeh.2014.04.008

Kelly, A. C., Zuroff, D. C., Foa, C. L., & Gilbert, P. (2010). Who benefits from training in self-compassionate self-regulation? A study of smoking reduction. *Journal of Social and Clinical Psychology*, *29*(7), 727–755. doi:10.1521/jscp.2010.29.7.727

Leary, M. R., Tate, E. B., Adams, C. E., Allen, A. B., & Hancock, J. (2007). Self-compassion and reactions to unpleasant self-relevant events: The implications of treating oneself kindly. *Journal of Personality and Social Psychology*, *92*(5), 887–904. doi:10.1037/0022-3514.92.5.887

Leary, M. R., Terry, M. L., Allen, A. B., & Guadagno, J. (2011). *Self-compassionate reactions inventory* (Unpublished manuscript). Durham, NC: Duke University Press.

Lipsey, M. W., & Wilson, D. B. (2001). *Practical meta-analysis*. Thousand Oaks, CA: SAGE.

Lloyd, C., Smith, J., & Weinger, K. (2005). Stress and diabetes: A review of the links. *Diabetes Spectrum*, *18*(2), 121–127. doi:10.2337/diaspect.18.2.121

Lodi-Smith, J., Jackson, J., Bogg, T., Walton, K., Wood, D., Harms, P., & Roberts, B. W. (2010). Mechanisms of health: Education and health-related behaviours partially mediate the relationship between conscientiousness and self-reported physical health. *Psychology & Health*, *25*(3), 305–319. doi:10.1080/08870440902736964

Loney, P. L., Chambers, L. W., Bennett, K. J., Roberts, J. G., & Stratford, P. W. (1998). Critical appraisal of the health research literature: Prevalence or incidence of a health problem. *Chronic Diseases in Canada*, *19*(4), 170–176.

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. doi:10.1016/j.cpr.2012.06.003

Mantzios, M., & Egan, H. H. (2017). On the role of self-compassion and self-kindness in weight regulation and health behavior change. *Frontiers in Psychology*, *8*(229). doi:10.3389/fpsyg.2017.00229

Manuel, D. G., Perez, R., Sanmartin, C., Taljaard, M., Hennessy, D., Wilson, K., … Rosella, L. C. (2016). Measuring burden of unhealthy behaviours using a multivariable predictive approach: Life expectancy lost in Canada attributable to smoking, alcohol, physical Inactivity, and diet. *PLoS Medicine*, *13*(8), e1002082–e1002082. doi:10.1371/journal.pmed.1002082

Michels, N., Sioen, I., Braet, C., Eiben, G., Hebestreit, A., Huybrechts, I., … De Henauw, S. (2012). Stress, emotional eating behaviour and dietary patterns in children. *Appetite*, *59*(3), 762–769. doi:10.1016/j.appet.2012.08.010

Moher, D., Shamseer, L., Clarke, M., Ghersi, D., Liberati, A., Petticrew, M., … PRISMA-P Group. (2015). Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) 2015 statement. *Systematic Reviews*, *4*(1), 1–9. doi:10.1186/2046-4053-4-1

Muris, P., & Petrocchi, N. (2017). Protection or vulnerability? A meta-analysis of the relations between the positive and negative components of self-compassion and psychopathology. *Clinical Psychology and Psychotherapy*, *24*(2), 373–383. doi:10.1002/cpp.2005

Mustapic, J., Marcinko, D., & Vargek, P. (2015). Eating behaviours in adolescent girls: The role of body shame and body dissatisfaction. *Eating and Weight Disorders - Studies on Anorexia, Bulimia and Obesity*, *20*(3), 329–335. doi:10.1007/s40519-015-0183-2

Neely, M. E., Schallert, D. L., Mohammed, S. S., Roberts, R. M., & Chen, Y.-J. (2009). Self-kindness when facing stress: The role of self-compassion, goal regulation, and support in college students' well-being. *Motivation and Emotion*, *33*(1), 88–97. doi:10.1007/s11031-008-9119-8

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

Neff, K. D. (2003b). Self-compassion: An alternative conceptualization of a healthy attitude toward oneself. *Self and Identity*, *2*, 85–101. doi:10.1080/15298860390129863

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. doi:10.1002/jclp.21923

Neff, K. D., Hsieh, Y., & Dejitterat, K. (2005). Self-compassion, achievement goals, and coping with academic failure. *Self and Identity*, *4*, 263–287. doi:10.1080/13576500444000317

Neff, K. D., Kirkpatrick, K. L., & Rude, S. S. (2007). Self-compassion and adaptive psychological functioning. *Journal of Research in Personality*, *41*, 139–154. doi:10.1016/j.jrp.2006.03.004

Neff, K. D., Toth-Kiraly, I., Yarnell, L. M., Arimitsu, K., Castilho, P., Ghorbani, N., … Mantzios, M. (2019). Examining the factor structure of the self-compassion scale in 20 diverse samples: Support for use of a total score and six subscale scores. *Psychological Assessment*, *31*(1), 27–45. doi:10.1037/pas0000629

Neff, K. D., & Vonk, R. (2009). Self-compassion versus global self-esteem: Two different ways of relating to oneself. *Journal of Personality*, *77*(1), 23–50. doi:10.1111/j.1467-6494.2008.00537.x

Nudelman, G., & Shiloh, S. (2015). Mapping health behaviors: Constructing and validating a common-sense taxonomy of health behaviors. *Social Science & Medicine*, *146*, 1–10. doi:10.1016/j.socscimed.2015.10.004

Nudelman, G., & Shiloh, S. (2016). Understanding behavioural clusters: Identifying differences between clusters of health behaviours on key constructs. *Psychology & Health*, *31*(12), 1375–1390. doi:10.1080/08870446.2016.1208822

Nudelman, G., & Shiloh, S. (2018). Connectionism and behavioral clusters: Differential patterns in predicting expectations to engage in health behaviors. *Annals of Behavioral Medicine*, *52*(10), 890–901. doi:10.1093/abm/kax063

O'Leary, A. (1992). Self-efficacy and health: Behavioral and stress-physiological mediation. *Cognitive Therapy and Research*, *16*(2), 229–245. doi:10.1007/bf01173490

Penedo, F. J., & Dahn, J. R. (2005). Exercise and well-being: A review of mental and physical health benefits associated with physical activity. *Current Opinion in Psychiatry*, *18*(2), 189–193.

Peterson, R. A., & Brown, S. P. (2005). On the use of beta coefficients in meta-analysis. *Journal of Applied Psychology*, *90*(1), 175–181. doi:10.1037/0021-9010.90.1.175

Phillips, W. J. (2018). Past to future: Self-compassion can change our vision. *Journal of Positive Psychology and Wellbeing*, *2*(2), 168–190. Retrieved from https://www.journalppw.com/index.php/JPPW/article/view/163

Phillips, W. J., & Ferguson, S. J. (2013). Self-compassion: A resource for positive aging. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, *68*(4), 529–539. doi:10.1093/geronb/gbs091

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

Rahimi-Ardabili, H., Reynolds, R., Vartanian, L. R., McLeod, L. V. D., & Zwar, N. (2018). A systematic review of the efficacy of interventions that aim to increase self-compassion on nutrition habits, eating behaviours, body weight and body image. *Mindfulness*, *9*(2), 388–400. doi:10.1007/s12671-017-0804-0

Sirois, F. M. (2015a). Is procrastination a vulnerability factor for hypertension and cardiovascular disease? Testing an extension of the procrastination-health model. *Journal of Behavioral Medicine*, *38*(3), 578–589. doi:10.1007/s10865-015-9629-2

Sirois, F. M. (2015b). A self-regulation resource model of self-compassion and health behavior intentions in emerging adults. *Preventive Medicine Reports*, *2*, 218–222. doi:10.1016/j.pmedr.2015.03.006

Sirois, F. M., & Hirsch, J. K. (2019). Self-compassion and adherence in five medical samples: The role of stress. *Mindfulness*, *10*(1), 46–54. doi:10.1007/s12671-018-0945-9

Sirois, F. M., Kitner, R., & Hirsch, J. K. (2015). Self-compassion, affect, and health-promoting behaviors. *Health Psychology*, *34*(6), 661–669. doi:10.1037/hea0000158

Sirois, F. M., & Rowse, G. (2016). The role of self-compassion in chronic illness care. *Journal of Clinical Outcomes Management*, *23*(11), 521–527.

Steptoe, A., & Kivimaki, M. (2012). Stress and cardiovascular disease. *Nature Reviews Cardiology*, *9*(6), 360–370. doi:10.1038/nrcardio.2012.45

Suurmond, R., van Rhee, H., & Hak, T. (2017). Introduction, comparison and validation of meta-essentials: A free and simple tool for meta-analysis. *Research Synthesis Methods*, *8*(4), 537–553. doi:10.1002/jrsm.1260

Vermeulen, J., Neyens, J. C., van Rossum, E., Spreeuwenberg, M. D., & de Witte, L. P. (2011). Predicting ADL disability in community-dwelling elderly people using physical frailty indicators: A systematic review. *BMC Geriatrics*, *11*, 33. doi:10.1186/1471-2318-11-33

Vingilis, E. R., Wade, T. J., & Seeley, J. S. (2002). Predictors of adolescent self-rated health. *Canadian Journal of Public Health*, *93*(3), 193–197. doi:10.1007/BF03404999

Vitaliano, P. P., Zhang, J., & Scanlan, J. M. (2003). Is caregiving hazardous to one's physical health? A meta-analysis. *Psychological Bulletin*, *129*(6), 946–972. doi:10.1037/0033-2909.129.6.946

Wilson, D. B. (2006). Meta-analysis macros for SAS, SPSS, and Stata. Retrieved from http://mason.gmu.edu/~dwilsonb/ma.html

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. doi:10.1111/aphw.12051