



A Systematic Review on Mediation Studies of Self-Compassion and Physical Health Outcomes in Non-Clinical Adult Populations

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Abstract

Objectives Growing research indicates that self-compassion is associated with key physical health outcomes in non-clinical adult populations. This systematic review was designed to characterize the mediators linking self-compassion to physical health outcomes, evaluate study quality and theoretical evidence, compare findings to the mental health literature, and provide directions for future research.

Methods We searched *Embase*, *Medline*, *APA PsycInfo*, *Scopus*, *AMED*, and *Web of Science* for relevant articles (including the inclusion of formal statistical mediation tests) from 2003 to February 2022. Study quality was assessed with *Downs and Black Checklist for Measuring Quality* and *Mediation Quality Checklist* tools.

Results We screened 6439 articles for title and abstracts, assessed 101 full texts for eligibility, and included 20 relevant articles. A range of mediators were categorized as testing psychological or behavioral factors. Perceived stress ($n=5$), emotion regulation ($n=5$), negative affect ($n=3$), and coping strategies ($n=3$) were the most frequently assessed mediators. In general, self-compassion had a significant indirect effect on physical health via negative affect and perceived stress (in the absence of overlapping affective mediators). Findings for emotion regulation and coping strategies were mixed.

Conclusions The mediational evidence linking self-compassion to physical health via psychological and behavioral factors remains underdeveloped and focused on the measures of affect and emotion regulation. Future studies need to broaden the scope of mediators to include other self-regulatory factors indicated by theory (e.g., motivational and physiological indices) and implement designs other than cross-sectional/correlational.

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Keywords Systematic review · Self-compassion · Mediation · Mechanism · Physical health

A growing body of evidence suggests that self-compassion is associated with better mental health and psychosocial well-being (e.g., Zessin et al., 2015). While there are multiple definitions and measures of self-compassion (Mascaro et al., 2020), for the purposes of this systematic review, self-compassion is defined as a way of responding to the self in times of suffering, characterized by *self-kindness* versus

self-judgment, *common humanity* versus *isolation*, and *mindfulness* versus *over-identification* or *avoidance* (detailed descriptions of each component can be found in Neff, 2003). Meta-analyses have found that greater self-compassion was associated with greater overall and psychological well-being (Zessin et al., 2015) and lower mental health symptoms such as stress, anxiety, and depression (MacBeth & Gumley, 2012; Marsh et al., 2018). These findings were largely consistent with self-compassion interventional data (Ferrari et al., 2019; Kirby et al., 2017). Taken together, the evidence from cross-sectional and interventional studies suggests that the development of self-compassion has benefits for psychosocial and mental health outcomes.

Although less intensively researched, studies have indicated that self-compassion may predict key physical health outcomes and health behaviors (Phillips & Hine, 2019; Sirois et al., 2015). For example, self-compassion has been

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associated with health-promoting behaviors (Gedik, 2019; Li et al., 2020; Sirois, 2015) such as medical adherence (Sirois & Hirsch, 2019), seeking medical care (Terry et al., 2013), healthy eating (Adams & Leary, 2007; Schoenefeld & Webb, 2013), and exercise (Magnus et al., 2010). Other studies have linked self-compassion with key physical health indices, including good sleep quality (Brown et al., 2020), reports of fewer physical symptoms (i.e., fatigue, headaches, shortness of breath; Dunne et al., 2018; Hall et al., 2013; Terry et al., 2013), and lower physiological responses to stress (Arch et al., 2014; Breines et al., 2014).

However, despite increasing evidence for the benefits of self-compassion, the mechanisms behind it remain unclear. Both as a trait characteristic and in terms of how self-compassion is reflected in the content of interventions, self-compassion is a complicated, multi-component construct. One systematic review has suggested that emotion regulation strategies underpin the links between self-compassion and mental health (Inwood & Ferrari, 2018). Other studies of potential pathways in mental health have tested a range of possible psychosocial mediators, predominantly in cross-sectional, correlational designs. Mediators thought to link self-compassion to mental health and psychosocial outcomes include aspects of rumination and worry (Arimitsu & Hofmann, 2015; Fresnics & Borders, 2017; Hodgetts et al., 2020; Johnson & O'Brien, 2013; Raes, 2010; Tandler et al., 2020), emotion regulation (Chishima et al., 2018; Meyer & Leppma, 2019), coping (Hamrick & Owens, 2019; Li et al., 2021), perceived stress (Luo et al., 2019), positive and negative affect (Schmidt et al., 2019), subjective happiness (Booker & Dunsmore, 2019), gratitude (Nguyen et al., 2020), and depressive symptoms (Kelliher Rabon et al., 2018).

In contrast to this rapid expansion of evidence and debate regarding the key mediators in mental health research, evidence regarding possible mediators in *physical* health contexts remains less well-developed. As noted, self-compassion is a complex construct and it is possible that self-compassion may influence physical health outcomes via similar, different, or multiple pathways (Homan & Sirois, 2017). Indeed, it is unclear whether the same mediators and pattern of findings seen between self-compassion and *mental* health will explain the pathways between self-compassion and *physical* health outcomes.

To date, theoretical discussion of the putative mechanisms behind self-compassion has predominantly occurred in the context of mental health. Several theories have been offered, focusing on possible roles for cognitive processes, for example, reductions in automatic thinking, cognitive fusion, cognitive appraisal (Arimitsu & Hofmann, 2015; Basharpour et al., 2021; Chishima et al., 2018), and ruminative depression (Fresnics & Borders, 2017; Fresnics et al., 2019). In such views, because self-compassionate

individuals are less self-critical or judgemental, they are less likely to experience negative affect (or perceived stress) following challenging events or ruminate less about the possible negative implications.

However, perhaps the broadest theoretical framework used to understand self-compassion's effects (and the most overtly relevant to physical health) is found in theories of self-regulation (Baumeister & Heatherton, 1996; Homan & Sirois, 2017; Sirois et al., 2015, 2019). Approaches in the line, such as the self-regulation resource model (SRRM; Sirois et al., 2015), suggest that self-compassion may “free up” the individuals' resources for self-regulation by reducing engagement with negative affect while generating positive affect to support healthy self-regulation and promote good health.

In this light, the aims of the current review were three-fold. Firstly, it was designed to systematically review and characterize the *range* of mediators that have been empirically assessed in physical health contexts. Summarizing the frequency with which different *types* of mediators have been assessed is important in terms of identifying areas of focus and omission in this field. Secondly, we evaluated study quality and risk of bias, and assessed the quality of the mediational approaches currently being used. Lastly, we evaluated the extent to which the mediators assessed to date are (a) similar or different to the mediators evaluated in mental health contexts and (b) are reflective of the mediators hypothesized to be important in theories of self-compassion.

Methods

This systematic review was conducted according to the PRISMA guidelines (Liberati et al., 2009; Rethlefsen et al., 2021). The search for articles was conducted using six online databases including *Embase*, *Medline*, *APA PsycInfo*, *Scopus*, *AMED*, and *Web of Science* from 2003 to February 2022.

In the interests of transparency, it is worth noting that the initial PROSPERO registration (CRD42021241915) was amended to change the search focus from “psychosocial health” to “physical health,” approximately one-month after the initial pre-registration but prior to data extraction. In brief, this change was implemented because initial psychosocial health searches led to a near-exclusive capturing of psychological mediators, impairing our ability to address questions regarding different *types* of mediators.

Search Strategy

An initial search strategy was developed and reviewed by a subject librarian on 11th November 2020, as well as drawing

from the search terms employed in prior systematic reviews in related areas (Inwood & Ferrari, 2018; Wilson et al., 2019). Given the limited number of studies around mediators of self-compassion, only the synonyms and keywords relating to self-compassion were searched. This approach was adopted as restricting the number of elements in a search strategy optimizes recall and minimizes the chance of missing relevant references (Bramer et al., 2018). As a result, the strategy included *selfcompassion** or *self compassion** or *compassion* adj3 self** and, based on the search strategy used in a systematic review and meta-analysis on self-compassion (Wilson et al., 2019), the terms *self-kindness* or *self kindness* were also included. Reference checks and forward citation searches for the selected studies were conducted.

Definition of Terms

Due to the limited number of studies evaluating the mediators linking self-compassion with physical health outcomes, a broad criterion of “physical health” was used. The broad criterion ranged from commonly evaluated key physical health outcomes and health behaviors in the self-compassion literature (Dunne et al., 2018; Sirois et al., 2015; Terry & Leary, 2011) including sleep quality, stress, physical symptoms, health-promoting behaviors, and substance-related problems. We did not include certain eating-related outcomes (e.g., disordered eating or intuitive eating), given the close psychological overlap between those variables and mental health factors. Given the purpose of this review, we did not impose any restrictions on the type of mediators evaluated.

Inclusion Criteria

We included studies that met the following criteria: studies published in English, original peer-reviewed articles published in an academic journal, published in or after 2003 (the publication of the first standardized measure of self-compassion; Neff, 2003) quantitative studies (self- or other-report), observational studies (cross-sectional or longitudinal), experimental or randomized controlled trials, individuals aged 18 + years, subjective and/or objective measures of physical health as reported outcomes, and analyses of the *total* self-compassion score (either state or trait; Neff, 2003).

While ongoing discussions around the conceptualization and measurement of self-compassion are clearly important (e.g., Ferrari et al., 2022; Khoury, 2019; Muris & Otgaar, 2020; Neff, 2022), our pre-registered inclusion criteria only captured studies using the *total* Self-Compassion Scale (SCS) score; including the full SCS (Neff, 2003) and the SCS short-form (Raes et al., 2011). Given the heterogeneity in both mediators and outcome types, maintaining consistency in the indices of self-compassion was critical

to facilitating interpretation and synthesis. Therefore, we elected to focus on the best-established and most widely used measure, only including studies representing this *specific* conceptualization and measurement of self-compassion. Using omega index estimates, Neff (2016) found that the overall self-compassion score accounted for at least 90% of reliable variance across all populations. In more recent findings, Neff (2022) suggested that the *total* self-compassion score most comprehensively represents the self-compassionate approach to suffering. It is thus possible that future works evaluating broader or different conceptualizations of self-compassion will produce distinct mediators.

Given our focus on mediators, we only included studies including a formal statistical test of mediation in which studies had to demonstrate an indirect effect — mediated $a*b$ pathway (Hayes, 2013). Mediation analyses could be conducted using well-established methods, including multiple regression and structural equation modelling. Tests of indirect effects could include a range of established methods such as bootstrap confidence interval and Monte Carlo methods.

Although some argue that intervention studies such as randomized controlled trials (RCT) or other prospective designs are more valid designs to test mediation (Kraemer et al., 2002), the underdeveloped nature of this research area meant that most studies were cross-sectional. However, mediation analysis can be conducted even where causality cannot be established due to design limitations (Hayes, 2013); theory and solid arguments can form the initial basis for subsequent causal claims. We did not distinguish between complete and partial mediation, as recent works have suggested this distinction is not meaningful (Hayes, 2013; Rucker et al., 2011). Finally, while we included studies that evaluated self-compassion both as a predictor and mediator in different models, we only reported and interpreted the results of the mediation models that included self-compassion as the predictor.

Exclusion Criteria

Studies were excluded if they comprised reports of qualitative designs, systematic reviews, meta-analyses, letters, commentaries, thesis manuscripts, editorials, corrections, errata, reviews, editorials, abstracts-only, conference abstracts or book chapters. Studies administering or testing subscale measures of self-compassion were excluded based on concerns described in the inclusion criteria. Studies with participants aged under 18 years were excluded, as were studies of those meeting the diagnostic criteria (current or within the last 5 years) for a mental health disorder (according to DSM-5) and/or a chronic illness diagnosis (according to ICD-11). We focused on non-clinical adult samples (including student samples

and young adults over 18) as there are marked differences between clinical and non-clinical samples in self-compassion-related constructs, such as self-criticism and fears of compassion, particularly in their association with mental health outcomes such as depression (Gilbert et al., 2014). Given the strong links between mental and physical health (Nabi et al., 2008; Surtees et al., 2008), other confounding factors may exist in clinical populations. Disentangling the mediators of self-compassion that are specific to the non-clinical population, in the absence of other co-morbid and confounding variables that are common in clinical populations, could help elucidate the *actual* associations between self-compassion and physical health.

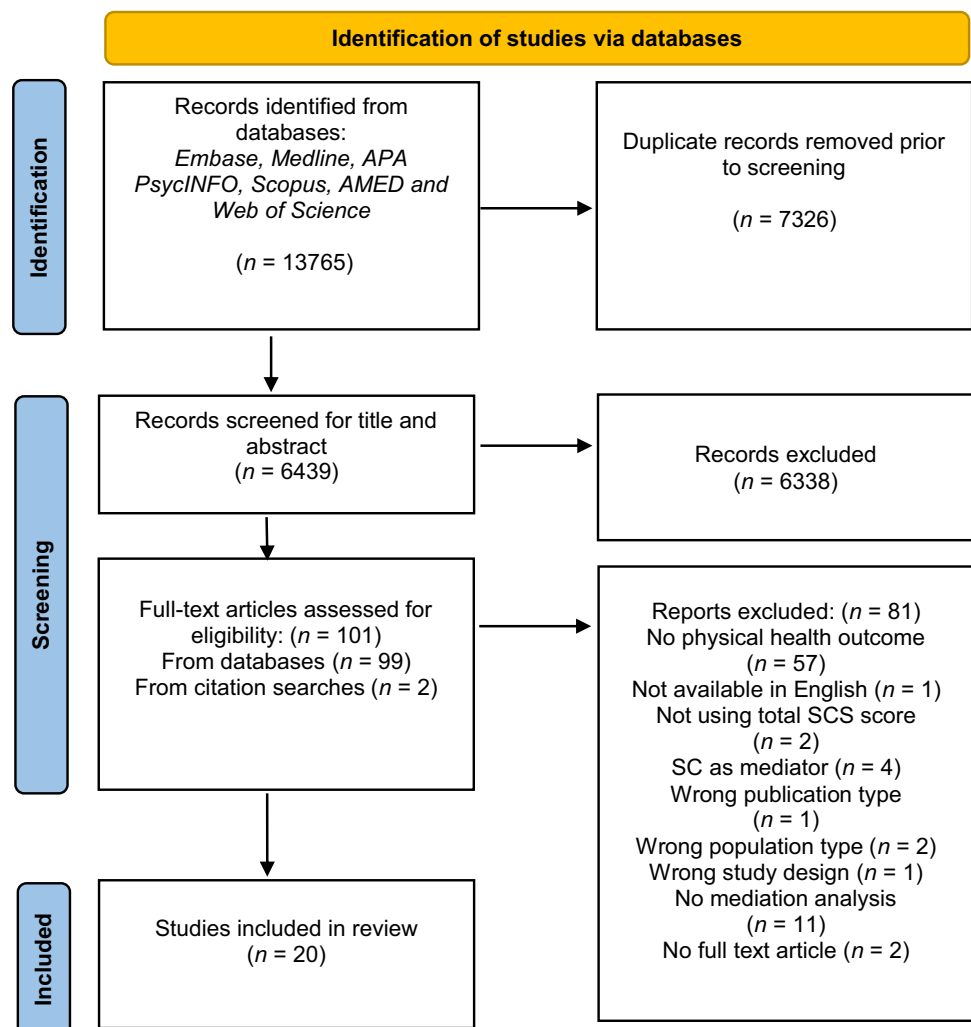
Study Selection

Initially, 19 eligible papers were identified from 6439 papers (see Fig. 1 for a schematic of the selection process) by two researchers (first author JC and reviewer AB). Of the 101 articles assessed for full-text screening, the majority (80%)

were excluded based on various reasons, but not assessing a physical health outcome was the most common exclusion criterion (70%). Two additional papers were identified by JC and AB from reference checks and forward citation searches, resulting in 21 papers, although one additional study was subsequently excluded due to including a clinical population.

Overall, 20 papers (articles with more than one mediation studies were counted as separate studies) meeting all inclusion criteria were identified, and the following information was extracted by JC and AB for summary tables: sample characteristics, study design, self-compassion measurement, mediator variables and measures, physical health outcomes and measures, quality ratings for Downs and Black (Downs & Black, 1998), test of mediation, correlations, results of mediational analyses, co-variables (if reported), and mediation checklist (Rhodes & Pfaeffli, 2010). Although we did not observe any specific patterns, the two researchers (JC and AB) were inconsistent in approximately 3% of the decisions regarding article selection. All inconsistencies were resolved by mutual consent or by consulting a senior researcher (NC).

Fig. 1 Adapted Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 Flowchart of the Literature Search and Article Selection (Page et al., 2021)



Study Methodological and Mediation Quality Rating Assessments

In line with our aim of assessing studies' risk of bias and the quality of mediational approaches, 20 identified papers were evaluated for methodological and mediation quality using the *Checklist for Measuring Quality* (Downs & Black, 1998) and an adapted version of the *Mediation study quality checklist* (Rhodes & Pfaeffli, 2010). The *Checklist for Measuring Quality* has high internal consistency, good inter-rater and test re-test reliability (Downs & Black, 1998), and can be applied across designs (Malik et al., 2015). Importantly for this review, Downs and Black's (1998) tool has been applied to both cross-sectional and longitudinal designs. Various adapted versions have been used from the original 27 items. For our review, we used the original, 27-item checklist for intervention studies and an adapted 15-item checklist (Irving et al., 2006) for non-intervention studies (e.g., cross-sectional and longitudinal). The additional 12 items asked for intervention studies were 4, 8, 9, 13, 14, 15, 17, 19, 23, 24, 26, and 27. Given the variation in the number of quality evaluation items relevant to different study types, a percentage score was used to present and compare the overall quality assessment results across intervention and non-intervention designs. Consistent with prior systematic review and meta-analysis using the Downs and Black tool (Munn et al., 2010), study quality was scored as follows: > 75% as high, 60–74% as moderate, and < 60% as low.

In addition, a mediation quality checklist tool initially developed by Lubans et al. (2008), and later adapted by Cerin et al. (2009) and Rhodes and Pfaeffli (2010), was adapted for the current review. The updated mediation checklist tool contains 11 items (three additional items from the original 8-item checklist by Lubans et al. (2008)). Items assess the quality of mediation studies in scale reliability, mediation analysis methods, and assessment of change in mediators preceding change in the outcome (for intervention studies). For the current review, all 11 items were used but some of the item wordings were adapted (e.g., from physical activity to physical health outcomes). Each item was scored in a yes (1) or no (0) format and a total score was generated by summing up all items. We used the criteria by Cerin et al. (2009) in which studies scoring 0–3 were deemed low-quality, 4–6 as medium-quality, and 7–9 as high-quality studies. Both quality checks were conducted independently by JC and AB. Similarly, while there were no specific questions or sections resulting in inconsistent ratings, there was disagreement in approximately 6% in risk of bias and mediation quality checklist assessments. All disagreements were resolved by mutual consent or by consulting the senior researcher (NC) to reach 100% agreement.

Results

Overview of Studies

Table 1 presents a summary of study characteristics included in the current review. All studies used quantitative designs and normative samples ($n=20/20$). Nine involved university student samples, others employed community ($n=4/20$) or Amazon Mechanical Turk (MTurk) samples ($n=2/20$). One study combined university and community samples and others consisted of mothers with young children, employees, educators, and psychologists. Of the studies that reported gender proportions, apart from two studies reporting only 45% female samples, most studies had over 50% women (55 to 100%). The largest number of included articles was from Canada ($n=10/20$), two studies originated from Germany and the UK, and single studies originated from the UK, the USA, Australia, and China. Three studies did not report the country where the study was conducted. Sample sizes ranged from 68 to 646 participants and the mean age of included study participants ranged from 20 to 42 years.

All studies used either the full 26-item Self-Compassion Scale (Neff, 2003) or the 12-item Self-Compassion Scale Short Form (Raes et al., 2011), as per our inclusion criteria. A range of *physical health outcomes* were assessed. Most studies used validated self-report measures to assess outcomes: sleep quality ($n=8/20$) was assessed by Insomnia Severity Index (Bastien et al., 2001), sleep quality index (Jenkins et al., 1988), and the Pittsburgh Sleep Quality Index (Buysse et al., 1989). Physical symptoms ($n=1/20$) were assessed by the Symptoms of Illness Checklist (SIC; Stowell et al., 2009), stress ($n=1/20$) by the Depression and Anxiety Scale (Lovibond & Lovibond, 1995), and physical health ($n=1/20$) by the RAND 36-Item Health Survey (Hays & Morales, 2001).

The measurement of health-promoting behaviors ($n=3/20$) was more varied. Eating behavior was measured by the three items according to the Chinese Dietary Guidelines (Wang et al., 2016). Other health-promoting behaviors, including intentions, were measured by the Wellness Behavior Inventory (Sirois, 2001). Bedtime procrastination ($n=2/20$) was measured by the Bedtime Procrastination Scale (Kroese et al., 2014). Lastly, drinking to cope with anxiety/depression, coping-motivated marijuana use, and alcohol/marijuana-related problems ($n=4/20$) were assessed. Drinking to cope with depression and anxiety was measured by the Modified Drinking Motives Questionnaire–Revised (MDM-R; Blackwell & Conrod, 2003), coping motivated marijuana use was measured by Marijuana Motives Measure questionnaire (MMM; Simons et al., 1998), alcohol-related problems were measured by the Young Adult Alcohol Consequences Questionnaire (YAACQ; Read et al., 2006), and marijuana-related problems were measured by the Brief

Table 1 Summary of study characteristics and methodological quality rating

Authors	Design	Sample	Predictor — SCS measure	Mediator/s	Mediator measure/s	Physical health outcome	Outcome measure	Downs and Black quality rating
Butz & Stahlberg, 2018; Study 1	Cross-sectional	68 university students ($M = 21.41$ years, $SD = 5.65$), 75% female	SCS-SF ($\alpha = .82$)	Rumination	4-items from Rumination Response Scale (Nolen-Hoeksema & Morrow, 1991); ($\alpha = .82$)	Sleep quality	Insomnia Severity Index (Bastien et al., 2001); ($\alpha = .80$)	60%; moderate
Butz & Stahlberg, 2018; Study 2	Randomized controlled trial (session 1 = conducted at lab, sessions 2 and 3 = home online survey)	143 university students ($M = 22.59$ years, $SD = 3.43$), 45% female, 33% lost at session 2 ($n = 143$); 9% lost at session 3 ($n = 88$)	SCS ($\alpha = .94$) (session 1)	Rumination (session 3)	10 items from revisited Rumination Response Scale (Treyner et al., 1991); ($\alpha = .82$)	Sleep quality (session 3)	Sleep Quality Index (Jenkins et al., 1988) with an added item; ($\alpha = .84$)	44%; low
Dunne et al., 2018	Cross-sectional	147 adults ($M = 32.28$ years, $SD = 9.6$), 81% female	SCS ($\alpha = 0.94$)	Health-promoting behaviors	The 10-item Wellness Behaviors Inventory (WBI; Sirosis, 2001); ($\alpha = 0.64$)	Physical symptoms	The 33-item Symptoms of Illness Checklist (Stowell et al., 2009); ($\alpha = 0.87$)	60%; moderate
Finlay-Jones et al., 2015	Cross-sectional	198 psychologists or trainees ($M = 36.25$ years, $SD = 11.79$), 86% female	SCS-SF ($\alpha = 0.90$)	Emotion regulation difficulties	The Difficulties in Emotion Regulation Scale (DERS; Gratz & Roemer, 2004) — except Awareness subscale ($\alpha =$ ranging from .75 to .91)	Stress	Depression Anxiety Stress Scales (Lovibond & Lovibond, 1995) — only the stress subscale was used; ($\alpha = .85$)	67%; moderate
Homan & Sirosis, 2017	Cross-sectional	176 Amazon's Mechanical Turk users ($M = 31.6$ years, $SD = 10.1$), 45% female	SCS-SF ($\alpha = 0.82$)	(1) Perceived stress, (2) health behaviors (general health protective practices)	(1) Perceived Stress Scale (PSS; Cohen & Williamson, 1988); ($\alpha = .92$), (2) four subscales from the Health Promoting Lifestyle Profile II (HPLPII; Walker et al., 1995); ($\alpha =$ not reported)	Physical health	RAND 36-Item Health Survey (RAND-36; Hays & Morales, 2001); only the physical component summary (PCS) was used; (α ranging from = .81 (pain) to .89 (mental health))	60%; moderate

Table 1 (continued)

Authors	Design	Sample	Predictor — SCS measure	Mediator/s	Mediator measure/s	Physical health outcome	Outcome measure	Downs and Black quality rating
Hu et al., 2018; Study 1	Cross-sectional	142 university students ($M=20.07$ years, $SD=2.36$), 55% female	SCS-SF ($\alpha=0.76$)	Perceived stress	Perceived Stress Scale (PSS; Cohen et al., 1983); ($\alpha=0.77$)	Sleep quality	The Pittsburgh Sleep Quality Index (PSQI; Buysse et al., 1989); ($\alpha=0.72$)	60%; moderate
Hwang et al., 2019	Cross-sectional	231 educators ($M=42.26$ years, $SD=11.76$), 87% female	SCS-SF ($\alpha=0.87$)	Perceived stress	Perceived Stress Scale (PSS; Cohen et al., 1983); ($\alpha=0.86$)	Sleep quality	The Pittsburgh Sleep Quality Index (PSQI; Buysse et al., 1989); ($\alpha=0.74$)	53%; low
Li et al., 2020	Longitudinal	82 employees ($M=35.18$ years, $SD=5.8$), 63% female	SCS ($\alpha=0.91$)	Perceived stress	Perceived Stress Scale (PSS-4); (Leung et al., 2010); ($\alpha=0.72$)	Health-promoting behavior — eating behavior	Eating behavior: 3-item scale according to the Chinese Dietary Guidelines (Chinese Nutrition Society, 2016); ($\alpha=.75$)	40%; low
Miller & Strachan, 2020	Cross-sectional	143 mothers ($M=34$ years, $SD=5.24$), 100% female	SCS ($\alpha=0.94$)	Mother guilt	State Shame and Guilt Scale (SSGS; Marshall et al., 1994); ($\alpha=0.91$)	Health-promoting behaviors	The Wellness Behavior Inventory (WBI; Sirois, 2001); ($\alpha=0.67$)	60%; moderate
Rakhimov et al., 2021	Cross-sectional	468 community samples ($M=39$ years, $SD=19.4$), 59% female	SCS ($\alpha=0.92$)	(1) Anxiety about sleep, (2) perceived stress, (3) poor sleep hygiene	(1) Anxiety and Preoccupation about Sleep Questionnaire (APSQ; Tang & Harvey, 2004); ($\alpha=0.95$), (2) Perceived Stress Scale (PSS; Cohen et al., 1983); ($\alpha=0.88$), (3) Sleep Hygiene Index (SHI; Mastin et al., 2006); ($\alpha=0.83$)	Sleep quality	The Pittsburgh Sleep Quality Index (PSQI; Buysse et al., 1989); ($\alpha=.76$)	73%; moderate
Semenchuk et al., 2021; Study 1	Cross-sectional	193 university students (M =not reported, SD =not reported)	SCS ($\alpha=0.88$)	Proactive health focus	Proactive Health Focus scale (PHF; Terry et al., 2013); ($\alpha=0.88$)	Sleep quality	The Pittsburgh Sleep Quality Index (PSQI; Buysse et al., 1989); ($\alpha=.75$)	60%; moderate
Semenchuk et al., 2021; Study 2	Cross-sectional	193 university students (M =not reported, SD =not reported)	SCS ($\alpha=0.88$)	Cognitive emotional regulation	The Cognitive Emotional Regulation Questionnaire (Garnefski et al., 2001); ($\alpha=0.76$)	Sleep quality	The Pittsburgh Sleep Quality Index (PSQI; Buysse et al., 1989); ($\alpha=.75$)	60%; moderate

Table 1 (continued)

Authors	Design	Sample	Predictor — SCS measure	Mediator/s	Mediator measure/s	Physical health outcome	Outcome measure	Downs and Black quality rating
Sirois, 2015	Cross-sectional	403 community samples and university students ($M = 20.37$ years, $SD = 1.87$), 84% female	SCS ($\alpha = 0.93$)	(1) Positive affect and negative affect, (2) health self-efficacy (as indicative of perceived control over health)	(1) Positive and Negative Affect Schedule (PANAS; Watson et al., 1988); ($\alpha = .88$) (2) 8-item health self-efficacy subscale from the Control Beliefs Inventory (CBI; Sirois, 2002); ($\alpha = .88$)	Health behavior intentions	The Wellness Behavior Inventory (WBI; Sirois, 2001; ($\alpha =$ not reported)	60%; moderate
Sirois et al., 2019; Study 1	Cross-sectional	134 community samples ($M = 30.22$, $SD = 13.5$), 77% female	SCS ($\alpha = 0.92$)	Negative affect	The negative affect subscales ($\alpha = 0.91$) of the Positive and Negative Affect Schedule (PANAS; Watson et al., 1988)	Bedtime procrastination	Bedtime Procrastination Scale (BPS; Kroese et al., 2014); ($\alpha = 0.89$)	47%; low
Sirois et al., 2019; Study 2	Cross-sectional	646 community samples ($M = 30.74$ years, $SD = 12.2$), 69% female	SCS-SF ($\alpha = 0.86$)	(1) Positive and negative affect, (2) cognitive reappraisal	(1) Short 10-item version of the PANAS-X (Watson et al., 1988) (α for PA = .80) (α for NA = .82); (2) cognitive reappraisal subscale of the Emotion Regulation Questionnaire (ERQ; Gross & John, 2003); ($\alpha = 0.89$)	Bedtime procrastination	Bedtime Procrastination Scale (BPS; Kroese et al., 2014); ($\alpha = 0.90$)	67%; moderate
Vaillancourt & Wasylikiw, 2019	Cross-sectional	158 nurses ($M = 33$ years, $SD = 8.64$), 58% female	SCS ($\alpha = 0.91$)	Burnout	Professional Quality of Life (ProQOL-5) scale (Stamm, 2009); ($\alpha = .79$)	Sleep	Pittsburgh Sleep Quality Index (PSQI; Buysse et al., 1989); ($\alpha = .61$)	53%; low
Wisener & Khoury, 2020; Study 1	Cross-sectional	174 university students ($M = 20.32$ years, $SD = 1.35$), 85% female	SCS ($\alpha = 0.94$)	Drinking to cope with anxiety, drinking to cope with depression	28-item Modified Drinking Motives Questionnaire—Revised (MDM-R; Blackwell & Conrod, 2003) — only the drinking to cope with anxiety ($\alpha = 0.80$) and drinking to cope with depression ($\alpha = 0.95$) subscales were used	Alcohol-related problems	48-item Young Adult Alcohol Consequences Questionnaire (YAACQ; Read et al., 2006) ($\alpha = 0.93$)	60%; moderate

Table 1 (continued)

Authors	Design	Sample	Predictor — SCS measure	Mediator/s	Mediator measure/s	Physical health outcome	Outcome measure	Downs and Black quality rating
Wisener & Khoury, 2020; Study 2	Cross-sectional	165 university students ($M=20.16$ years, $SD=1.21$), 82% female	SCS ($\alpha=0.94$)	Coping motivated marijuana use	25-item Marijuana Motives Measure (MMM; Simons et al., 1998) — only the coping subscale was used ($\alpha=0.87$)	Marijuana-related problems	21-item Brief Marijuana Consequences Questionnaire (BMCQ; Simons et al., 2012); ($\alpha=0.87$)	60%; moderate
Wisener & Khoury, 2021; Study 1	Cross-sectional	187 university students ($M=20.34$ years, $SD=1.35$), 83% female	SCS ($\alpha=0.95$)	Difficulties in emotion regulation	36-item Difficulties in Emotion Regulation Scale (DERS; Gratz & Roemer, 2004): non-acceptance of emotional responses ($\alpha=0.94$), difficulties engaging in goal-directed behavior ($\alpha=0.90$), impulse control difficulties ($\alpha=0.90$), lack of emotional awareness ($\alpha=0.86$), limited access to emotion-regulation strategies ($\alpha=0.91$), and lack of emotional clarity ($\alpha=0.89$). Total score ($\alpha=0.96$)	Drinking to cope with depression and anxiety	The 28-item Modified Drinking Motives Questionnaire—Revised (MDM-R; Blackwell & Conrod, 2003). Only the drinking to cope with depression ($\alpha=0.95$) and drinking to cope with anxiety ($\alpha=0.78$) subscales were only used	60%; moderate

Table 1 (continued)

Authors	Design	Sample	Predictor — SCS measure	Mediator/s	Mediator measure/s	Physical health outcome	Outcome measure	Downs and Black quality rating
Wisener & Khoury, 2021; Study 2	Cross-sectional	170 university students ($M = 20.17$ years, $SD = 1.19$), 82% female	SCS ($\alpha = 0.94$)	Difficulties in emotion regulation	36-item Difficulties in Emotion Regulation Scale (DERS; Gratz & Roemer, 2004): non-acceptance of emotional responses ($\alpha = 0.93$), difficulties engaging in goal-directed behavior ($\alpha = 0.89$), impulse control difficulties ($\alpha = 0.90$), lack of emotional awareness ($\alpha = 0.84$), limited access to emotion-regulation strategies ($\alpha = 0.91$), and lack of emotional clarity ($\alpha = 0.87$). Total score ($\alpha = 0.95$)	Coping motivated marijuana-use	The 25-item Marijuana Motives Measure (MMM; Simons et al., 1998) — an adaptation of the MDM-R measure used in Wisener & Khoury, 2021 — study 1 was used. Only the coping ($\alpha = 0.88$) subscale was used	53%; low

SCS, Self-Compassion Scale 26-items (Neff, 2003); SCS-SF, Self-Compassion Scale short-form 12-items (Raes et al., 2011)

Marijuana Consequences Questionnaire (BMCQ; Simons et al., 2012).

The primary purpose of the current review was to quantify and characterize the factors tested as possible mediators of the relationships between self-compassion and physical health. A range of mediators were evaluated via self-report measures. Most studies used validated scales, but some measures had lower content validity and internal consistency due to selecting specific items from the full-scale (not subscales), using measures from manuals but not journal publications, and reporting internal reliability (α -value) from another study but not from the specific sample. However, some of these limitations were captured by methodological and mediation quality check assessments (refer to Tables 1 and 2).

In addressing another aim of this review, the most frequently assessed mediators were perceived stress ($n = 5/20$) and (aspects of) emotion regulation ($n = 5/20$). Studies evaluating stress used the Perceived Stress Scale (Cohen et al., 1983), although one used the Short Form Perceived Stress Scale (PSS-4; Leung et al., 2010), and one study used the stress subscale from the Depression Anxiety Stress Scales (DASS-21; Lovibond & Lovibond, 1995). Emotion regulation (and/or emotion regulation difficulties) was typically assessed using the Difficulties in Emotion Regulation Scale (DERS; Gratz & Roemer, 2004). Two studies used all six dimensions (non-acceptance, goal direction, impulse control, awareness, strategies, clarity), whereas one study only used five dimensions, omitting the awareness dimension (Bardeen et al., 2012). One study used the cognitive reappraisal subscale of the Emotion Regulation Questionnaire (ERQ; Gross & John, 2003), and one study used the Cognitive Emotional Regulation Questionnaire (Garnefski et al., 2001).

In addition to stress and emotion regulation, positive and negative affect ($n = 3/20$) and various maladaptive coping strategies ($n = 3/20$) were also commonly evaluated mediators. Affect was typically assessed with the Positive and Negative Affect Schedule (PANAS; Watson et al., 1988), with one study using the short 10-item version of the PANAS-X (Watson & Clark, 1999). For maladaptive coping strategies, drinking to cope with anxiety and depression was measured by the 28-item MDM-R (Blackwell & Conrod, 2003) and coping motivated marijuana use was measured by MMM (Simons et al., 1998; previously used as an outcome measure by Wisener & Khoury, 2020; Study 2).

Other prospective mediators included rumination ($n = 2/20$), health-promoting behaviors ($n = 2/20$), health self-efficacy ($n = 1/20$), proactive health focus ($n = 1/20$), burnout ($n = 1/20$), mother guilt ($n = 1/20$), anxiety about sleep ($n = 1/20$), and poor sleep hygiene ($n = 1/20$). Rumination was measured by a shortened version of the Rumination Response Scale (Nolen-Hoeksema & Morrow, 1991) and a

modified version of the Ruminative Responses Scale (Trenor et al., 2003). Health-promoting behaviors were measured by the 10-item Wellness Behaviors Inventory (WBI; Sirois, 2001) and Health Promoting Lifestyle Profile II (HPLPII; Walker et al., 1995). Health self-efficacy was measured by the Control Beliefs Inventory (CBI; Sirois, 2002), and proactive health focus was measured by the Proactive Health Focus scale (PHF; Terry et al., 2013). Burnout was measured by the Professional Quality of Life (ProQOL-5) scale (Stamm, 2009), and mother guilt was measured by the State Shame and Guilt Scale (SSGS; Marschall et al., 1994). Lastly, anxiety about sleep was measured by the Anxiety and Preoccupation about Sleep Questionnaire (APSQ; Tang & Harvey, 2004) and sleep hygiene was measured by the Sleep Hygiene Index (SHI; Mastin et al., 2006).

Quality Ratings (Downs and Black Checklist and Mediation Checklist)

Recall that the current review assessed the quality of the included studies, including risk of bias and the quality of the mediational approaches. Across the 20 included studies, quality ratings for Downs and Black (1998) ranged from 40% (low-quality) to 73% (moderate quality). Six studies scored within the low rating range of 40–53% (Butz & Stahlberg, 2018; Hwang et al., 2019; Li et al., 2020; Sirois et al., 2019; Vaillancourt & Wasylkiw, 2019; Wisener & Khoury, 2021) and 14 scored within the moderate quality, 60–73%, range (Butz & Stahlberg, 2018; Dunne et al., 2018; Finlay-Jones et al., 2015; Homan & Sirois, 2017; Hu et al., 2018; Miller & Strachan, 2020; Rakhimov et al., 2022; Semenchuk et al., 2021; Sirois et al., 2015, 2019; Wisener & Khoury, 2020, 2021). More specific study ratings can be found in Table 1.

Mediation checklist ratings ranged from low to high quality with scores ranging from 2 to 8 (out of 11). One study scored 8 with high quality (Study 2; Butz & Stahlberg, 2018), 12 studies scored within the moderate quality ratings within the range of 4–5 (Butz & Stahlberg, 2018; Finlay-Jones et al., 2015; Homan & Sirois, 2017; Hwang et al., 2019; Rakhimov et al., 2022; Semenchuk et al., 2021; Sirois et al., 2015, 2019; Wisener & Khoury, 2021), and seven scored within the low quality range of 2–3 (Dunne et al., 2018; Hu et al., 2018; Li et al., 2020; Miller & Strachan, 2020; Vaillancourt & Wasylkiw, 2019; Wisener & Khoury, 2020).

Associations Between Target Variables (Self-Compassion, Mediators, and Physical Health Outcomes)

To facilitate interpretations regarding the types of mediators investigated thus far, mediators were grouped into (1) psychological and (2) behavioral factors. Given that most mediators were psychological, we further subcategorized

psychological mediators into (1a) emotional and affective, and (1b) social-cognitive processes. These groupings were made conjointly by the first author (JC) in consultation with the senior researcher (NC). Such decisions were based on whether the mediators reflected theoretically similar constructs on the basis of face validity considerations of the self-regulation theory (Baumeister & Heatherton, 1996), basic psychological theories of emotions and affect, social-cognitive processes, and broad conceptualizations of behavioral theories. The purpose of the grouping was to assist in the current review's aim of quantifying the types and frequency of mediators tested for enabling us to identify the types of constructs most in need of further evaluation.

Below, the findings from the review are presented under these groupings. First, correlations among the target variables and the mediational findings are summarized and the presence/absence of an indirect effect noted. Given that covariation between the predictor and outcome variables is no longer a requirement for testing for cause and effect (Hayes, 2013), only the correlations between (i) putative mediators and self-compassion and (ii) mediators and outcomes are discussed. Note, however, that correlations between self-compassion and outcomes can be found in Table 2.

Secondly, we report findings of indirect effects of various mediators linking self-compassion to physical health. Out of the 20 studies, nine used simple mediation models (Butz & Stahlberg, 2018; Dunne et al., 2018; Hu et al., 2018; Hwang et al., 2019; Miller & Strachan, 2020; Semenchuk et al., 2021; Sirois et al., 2019; Vaillancourt & Wasylkiw, 2019) and eight used multiple parallel mediation models (Finlay-Jones et al., 2015; Semenchuk et al., 2021; Sirois et al., 2015, 2019; Wisener & Khoury, 2020, 2021). Of the remaining three studies, one used a serial mediation model (Homan & Sirois, 2017), one used a multilevel mediation model (Li et al., 2020), and the remaining one used both multiple and sequential mediation in the same model using SEM (Rakhimov et al., 2022). However, given the current review's aim of *quantifying* and *characterizing* the mediators, we report various indirect effects under the appropriate mediator groupings. Table 2 presents a summary of results including correlations, mediation indirect effects, and quality ratings.

Self-Compassion, Behavioral Mediators, and Physical Health Outcomes Three out of 20 included studies evaluated behavioral factors (more specifically, health-promoting behaviors and poor sleep hygiene) as possible mediators of the association between self-compassion and physical health outcomes. One study did not report correlations (Dunne et al., 2018), and another study found a moderate, positive correlation between health behaviors and self-compassion ($r = 0.49, p < 0.001$) and a moderate, positive correlation

between health behaviors and physical health outcomes ($r = 0.40, p < 0.001$) (Homan & Sirois, 2017). Finally, one study showed that poor sleep hygiene had a negative, moderate correlation with self-compassion ($r = -0.33, p < 0.001$), and a positive, moderate correlation with poor sleep quality ($r = 0.41, p < 0.001$).

For mediation effects, self-compassion had an indirect effect on physical health outcomes, physical symptoms (Dunne et al., 2018), and physical health (Homan & Sirois, 2017) via health behavioral mediators. Additionally, while self-compassion did not have an indirect effect on poor sleep quality via poor sleep hygiene (in a multiple mediation model), sequential mediation showed that self-compassion did have an indirect effect on poor sleep quality via (1) perceived stress then poor sleep hygiene and via (2) anxiety about sleep, perceived stress, then poor sleep hygiene.

Self-Compassion, Psychological Mediators (Emotional and Affective Factors), and Physical Health Outcomes Five possible psychological mediators were evaluated: emotion regulation, positive affect, negative affect, perceived stress, and anxiety about sleep. Five studies evaluated (difficulties or aspects of) *emotion regulation* as a possible mediator between self-compassion and physical health outcomes. These studies showed negative correlations between difficulties in emotion regulation and self-compassion (from $r = -.29$ to $-.73, p < .01$) and between emotion regulation and outcomes (from $r = .21$ to $.60, p < .01$) including stress (Finlay-Jones et al., 2015) and maladaptive coping strategies (Wisener & Khoury, 2020, 2021). One study assessing cognitive reappraisal as a possible mediator reported a moderate, positive correlation with self-compassion ($r = .49, p < .001$) and a weak, negative correlation with bedtime procrastination ($r = -.17, p < .001$) (Study 2; Sirois et al., 2019). The other study assessing Cognitive Emotional Regulation (CERQ) (Study 2; Semenchuk et al., 2021) as a mediator found positive correlations between self-compassion and CERQ subscales except for the *acceptance* subscale (ranging from $r = .19$ to $.46, p < .001$). The correlations between CERQ subscales and poor sleep quality showed mixed findings: some were non-significant (self-blame, acceptance, putting into perspective, catastrophizing, and other blame) and others had weak, positive correlations (rumination, positive refocusing, refocus on planning, and catastrophizing; ranging from $r = .15$ to $.17, p < .01$, and $r = .19, p < .001$).

The findings for mediation analyses were also mixed. One study found that self-compassion had an indirect effect on physical health (stress) via emotion regulation difficulties (measured by five facets of DERS; Finlay-Jones et al., 2015) while another found that self-compassion had an indirect effect on physical health (bedtime

Table 2 Summary of correlations, mediation indirect effects, and mediation quality rating

Authors	Test of mediation/type of mediation model	Correlations between self-compassion and physical health outcome	Correlations between self-compassion and mediator/s	Correlations between mediator/s and physical health outcome	Findings (significant/non-significant indirect effects)	Indirect effects estimate	95% BCa CI (LLCI, ULCI)	Co-variables	Mediation quality rating
Butz & Stahlerberg, 2018; Study 1	Bootstrap, PROCESSES/ simple mediation	Sleep quality (ISI) ($r = -.31^{***}$)	Rumination (RRS) ($r = -.62^{***}$)	($r = -.47^{***}$)	SC had a significant indirect effect on sleep quality via rumination	$b = -0.33$	(0.102, 0.817)	Not included	4; moderate
Butz & Stahlerberg, 2018; Study 2	Bootstrap, PROCESSES/ simple mediation	Sleep quality (SQ) ($r = .35^{***}$)	Rumination (RRS) ($r = -.31^{**}$)	($r = -.59^{**}$)	SC had a significant indirect effect on sleep quality via rumination	$b = 0.27$	(0.033, 0.585)	Not included	8; high
Dunne et al., 2018	Bootstrap, PROCESSES/ simple mediation	Physical symptoms (SIC) ($r = \text{not reported}$)	Health-promoting behavior (WBH) ($r = \text{not reported}$)	($r = \text{not reported}$)	SC had a significant indirect effect on physical symptoms via health-promoting behaviors	$b = -3.16$	(-6.78, -0.86) ^a	Not included	3; low
Finlay-Jones et al., 2015	Sobel's test, SEM with maximum likelihood estimation	Stress (DASS) ($r = -.55^{***}$)	Emotion-regulation difficulties (DERS): Non-acceptance ($r = -.58^{***}$) Goal direction ($r = -.47^{***}$) Impulse control ($r = -.55^{***}$) Strategies ($r = -.69^{***}$) Clarity ($r = -.29^{***}$)	($r = .51^{***}$) ($r = .38^{***}$) ($r = .50^{***}$) ($r = .60^{***}$) ($r = .21^{**}$)	SC had a significant indirect effect on stress via emotion-regulation difficulties	$z = 3.83^{***}$	Not included	Age, neuroticism	4; moderate
Homan & Sirois, 2017	Bootstrap, PROCESSES/ serial mediation	Physical health (RAND-36) ($r = .46^{***}$)	Perceived stress (PSS) ($r = -.80^{***}$) Health behaviors (HPLP-II) ($r = .49^{***}$)	($r = -.60^{***}$) ($r = .40^{***}$)	SC had a significant indirect effect on physical health via (1) perceived stress and (2) health behaviors	$b_{total} = 0.54$, SE = 0.09	(0.36, 0.72)	Sex, age	4; moderate
Hu et al., 2018; Study 1	Bootstrap/ simple mediation	Daily sleep (PSQI) ($r = -.23^{***}$)	Perceived stress (PSS) ($r = -.59^{***}$)	($r = .34^{***}$)	SC had a significant indirect effect on daily sleep via perceived stress	$b = 0.07$, SE = 0.02	(-0.11, -0.03)	Gender, age	3; low
Hwang et al., 2019	Path analysis/ simple mediation	Sleep quality (PSQI) ($r = -.35^{**}$)	Perceived stress (PSS) ($r = -.67^{**}$)	($r = .43^{**}$)	SC had a significant indirect effect on poor sleep quality via perceived stress	$b = -0.25$, SE = 0.05	Not reported	Demographics, work-related variables	4; moderate
Li et al., 2020	Monte Carlo methods/ multilevel mediation	SC ^{mini} and health-promoting behavior (eating behavior; EB) ($r = .25^{\dagger}$) Between-person SC ^{daily} and EB ($r = .23^{\dagger}$) Within-person SC ^{daily} and EB ($r = .29$)	SC ^{mini} and perceived stress (PSS-4) ($r = -.61^{**}$) Between-person SC ^{daily} and perceived stress ($r = -.61^{*}$) Within-person SC ^{daily} and Perceived stress ($r = -.43^{**}$)	HPB and Perceived stress ($r = -.41^{***}$)	Between-person SC ^{mini} and SC ^{daily} (between-person effects) and SC ^{daily} (within-person effects) had significant indirect effects on health-promoting behavior (eating behavior) through perceived stress	Between-person SC ^{mini} = 0.03 Between-person SC ^{daily} = 0.18 Within-person SC ^{daily} = 0.05	95% MCCI (.01, .06) 95% MCCI (.05, .34) 95% MCCI (.01, .11)	Time	3; low

Table 2 (continued)

Authors	Test of mediation/type of mediation model	Correlations between self-compassion and physical health outcome	Correlations between self-compassion and mediator/s	Correlations between mediator/s and physical health outcome	Findings (significant/non-significant indirect effects)	Indirect effects estimate	95% BCa CI (LLCI, ULCI)	Co-variables	Mediation quality rating
Miller & Strachan, 2020	Bootstrap, PROCESSES/ simple mediation	Health-promoting behaviors (WBI) ($r = \text{not reported}$)	Mother guilt (SSGS) ($r = \text{not reported}$)	($r = \text{not reported}$)	SC had a significant indirect effect on health-promoting behaviors via mother guilt	$b = 0.05$, $SE = 0.03$	(0.0014, 0.1133) ^a	Self-esteem, trait guilt	3; low
Rakhimov et al., 2021	SEM with maximum likelihood estimation	Sleep quality (PSQI) ($r = -.31^{***}$)	Anxiety about sleep (APSO) ($r = -.28^{***}$) Perceived stress (PSS) ($r = -.53^{***}$) Poor sleep hygiene (SHI) ($r = -.33^{***}$)	($r = .55^{***}$) ($r = .48^{***}$) ($r = .41^{***}$)	SC had a significant indirect effect on poor sleep quality via anxiety about sleep but not via perceived stress nor poor sleep hygiene 2 sequential mediating pathways were significant (1) via anxiety about sleep then poor sleep hygiene, and (2) via perceived stress then poor sleep hygiene. For 3 sequential mediators, mediating pathways (3) via anxiety about sleep, perceived stress, perceived stress then poor sleep hygiene was significant	$b = -0.07$, $p < 0.001$ (1) $b = -0.06$, $p < 0.01$ (2) $b = -0.14$, $p < 0.01$ (3) $b = -0.10$, $p < 0.01$	Not included	Demographics, health, and other predisposing factors of insomnia	4; moderate
Semenchuk et al., 2021; Study 1	Bootstrap, PROCESSES/ simple mediation	Sleep quality (PSQI) ($r = -0.34^{***}$)	Proactive health focus (PHF) ($r = .30^{***}$)	($r = -.20^{***}$)	SC did not have a significant indirect effect on sleep quality via proactive health focus	$b = -.19$	(-.57, .10)	Not included	5; moderate
Semenchuk et al., 2021; Study 2	Bootstrap, PROCESSES/ multiple mediation	Sleep quality (PSQI) ($r = -0.34^{***}$)	Cognitive Emotional Regulation (CERQ): Self-blame ($r = -.45^{***}$) Acceptance ($r = -.02$) Rumination ($r = -.35^{***}$) Positive refocusing ($r = .32^{***}$) Refocus on planning ($r = .33^{***}$) Positive reappraisal ($r = .46^{***}$) Putting into perspective ($r = .32^{***}$) Catastrophizing ($r = -.35^{***}$) Other blame ($r = -.19^{***}$)	($r = .08$) ($r = .11$) ($r = .16^*$) ($r = -.19^{***}$) ($r = .15^*$) ($r = -.20$) ($r = -.10$) ($r = .17^*$) ($r = -.02$) ($r = .36^{**}$)	SC had a significant indirect effect on poor sleep quality via self-blame but not via other cognitive emotion regulation strategies	$b = 0.54$	(0.04, 1.04)	Not included	5; moderate
Sirois, 2015	Bootstrap, PROCESSES/ multiple mediation	Health behavior intentions (WBI) ($r = .26^{**}$)	Positive affect (PANAS) ($r = .43^{**}$) Negative affect (PANAS) ($r = -.46^{**}$) Health self-efficacy (CBI) ($r = .40^{**}$)	($r = -.15^{**}$) ($r = -.46^{**}$) ($r = .56^{**}$)	SC had a significant indirect effect on health behavior intentions via negative affect and self-efficacy but not via positive affect	Negative affect $b = -.10$, $SE = .05$ Health self-efficacy $b = .34$, $SE = .07$ Positive affect $b = .06$, $SE = .05$	(-.21, -.01) (.21, .49) (-.02, .16)	Current health behaviors, gender, BMI	4; moderate

Table 2 (continued)

Authors	Test of mediation/type of mediation model	Correlations between self-compassion and mediator/s and physical health outcome	Correlations between self-compassion and mediator/s and physical health outcome	Correlations between mediator/s and physical health outcome	Findings (significant/non-significant indirect effects)	Indirect effects estimate	95% BCa CI (LLCI, ULCI)	Co-variables	Mediation quality rating
Sirois et al., 2019; Study 1	Bootstrap, PROCESSES/ simple mediation	Bedtime procrastination (BFS) ($r = -.28^{**}$)	Negative affect (PANAS) ($r = -.30^{**}$)	($r = .26^{**}$)	SC had a significant indirect effect on bedtime procrastination via negative affect	$b = -.09$, SE = .04	(-.20, -.02)	Age, sex	4; moderate
Sirois et al., 2019; Study 2	Path analysis/ multiple mediation	Bedtime procrastination (BFS) ($r = -.31^{***}$)	Negative affect (PANAS-X) ($r = -.48^{**}$) Positive affect (PANAS-X) ($r = .44^{**}$) Emotion regulation: cognitive reappraisal (ERQ) ($r = .49^{**}$)	($r = .28^{**}$) ($r = -.20^{**}$) ($r = -.17^{***}$)	SC had a significant indirect effect on bedtime procrastination via (1) reappraisal and negative affect, and (2) negative affect. No significant indirect effect via positive affect	Reappraisal and negative affect: $b = -.01$ Negative affect: $b = -.06$	(-.025, -.003) ^b (-.112, -.020) ^b	Age, sex	5; moderate
Vaillancourt & Wasylkiw, 2019	Bootstrap, PROCESSES/ simple mediation	Sleep quality (PSQI) ($r = .29^{**}$)	Burnout (ProQOL-5) ($r = -.67^{**}$)	($r = -.46^{**}$)	SC had a significant indirect effect on sleep quality via burnout	$b = 1.73$, SE = .35	(1.06, 2.43) ^f	Not included	2; low
Wisener & Khoury, 2020; Study 1	Bootstrap, PROCESSES/ parallel mediation	Alcohol related problems (YAACO) ($r = -.025^{**}$)	Drinking to cope with anxiety (MDM-R) ($r = -.041^{**}$) Drinking to cope with depression (MDM-R) ($r = -.025^{**}$)	($r = 0.44^{**}$) ($r = 0.40^{**}$)	SC had a significant indirect effect on alcohol-related problems via drinking to cope with anxiety but not via drinking to cope with depression	Drinking to cope with anxiety $b = -0.98$ Drinking to cope with depression $b = -0.58$	(-1.90, -.028) ^f (-1.72, 0.42) ^f	Not included	3; low
Wisener & Khoury, 2020; Study 2	Bootstrap, PROCESSES/ parallel mediation	Marijuana-related problems (BMCQ) ($r = -.10$)	Coping-motivated marijuana use (MMM) ($r = -.30^{**}$)	($r = 0.42^{**}$)	SC had a significant indirect effect on marijuana-related problems via coping motivated marijuana use	$b = -0.65$	(-1.11, -.028) ^f	Not included	3; low
Wisener & Khoury, 2021; Study 1	Bootstrap, PROCESSES/ parallel mediation	Drinking to cope with depression (MDM-R) ($r = -.43^{**}$)	Emotion-regulation difficulties (DERS): Non-acceptance ($r = -.59^{**}$) Goals ($r = -.54^{**}$) Impulse ($r = -.58^{**}$) Awareness ($r = -.56^{**}$) Strategies ($r = -.73^{**}$) Clarity ($r = -.54^{**}$)	($r = 0.37^{**}$) ($r = 0.29^{**}$) ($r = 0.37^{**}$) ($r = 0.28^{**}$) ($r = 0.53^{**}$) ($r = 0.37^{**}$)	SC only had a significant indirect effect on drinking to cope with depression via limited access to ER strategies. The other five DERS facets indirect effects were not significant	Strategies $b = -0.41$	(-0.64, -.018) ^f	Not included	4; moderate

Table 2 (continued)

Authors	Test of mediation/type of mediation model	Correlations between self-compassion and physical health outcome	Correlations between self-compassion and mediator/s	Correlations between mediator/s and physical health outcome	Findings (significant/non-significant indirect effects)	Indirect effects estimate	95% BCa CI (LLCI, ULCI)	Co-variables	Mediation quality rating
Wisener & Khoury, 2021; Study 2	Bootstrap, PROCESSES/parallel mediation	Coping-Motivated Marijuana Use (MMM) ($r = -0.32^{**}$)	Emotion-regulation difficulties (DERS): Non-acceptance ($r = -0.50^{**}$) Goals ($r = -0.53^{**}$) Impulse ($r = -0.54^{**}$) Awareness ($r = -0.48^{**}$) Strategies ($r = -0.73^{**}$) Clarity ($r = -0.52^{**}$)	($r = 0.43^{**}$) ($r = 0.28^{**}$) ($r = 0.24^{**}$) ($r = 0.25^{**}$) ($r = 0.40^{**}$) ($r = 0.38^{**}$)	SC only had a significant indirect effect on coping-motivated marijuana use via non-acceptance of emotional responses. The other five DERS facets indirect effects were not significant	Non-acceptance $b = -0.18$	(-0.33, -0.06) ^c	Not included	4; moderate

For specific scales, refer to Table 1; $^{**}p < .001$; $^{*}p < .05$; SC, self-compassion; SEM, structural equation modelling; unless specified, 95% confidence intervals (CI) were obtained by bias-corrected and accelerated bootstrapping ($N = 5000$)

^a95% CI obtained by bias-corrected and accelerated bootstrapping ($N = 1000$)

^b95% CI obtained by bias-corrected bootstrapping ($N = 10,000$)

^c95% CI obtained by bias-corrected bootstrapping ($N = 5000$)

procrastination) via cognitive reappraisal and negative affect (Sirois et al., 2019). Two studies found that self-compassion only had an indirect effect on outcome via specific facets of the DERS. One found that self-compassion had an indirect effect on drinking to cope with depression via limited access to emotion regulation strategies (Study 1; Wisener & Khoury, 2021) and another found that self-compassion had an indirect effect on coping motivated marijuana use via non-acceptance of emotions (Study 2; Wisener & Khoury, 2021). No other DERS facets had significant indirect effects in both studies. One study found that self-compassion had an indirect effect on poor sleep quality via *self-blame* but not via other cognitive emotion regulation strategies (Study 2; Semenchuk et al., 2021).

Two studies evaluated both *negative* and *positive affect* as mediators and one additional study evaluated negative affect alone. For negative affect, studies showed moderate, negative correlations with self-compassion (ranging from $r = -0.30$ to -0.48 , $p < 0.01$) (Sirois et al., 2015) and weak, positive correlations with bedtime procrastination (Sirois et al., 2019) (ranging from $r = -0.26$ to -0.28 , $p < 0.01$). A single study with health behavior intention as the outcome (Sirois et al., 2015) showed a weak, negative correlation with negative affect ($r = -0.15$, $p < 0.01$). Studies of positive affect showed moderate, positive correlations with self-compassion (ranging from $r = 0.43$ to 0.44 , $p < 0.01$), a weak, negative correlation with bedtime procrastination ($r = -0.20$, $p < 0.001$), and a moderate, positive correlation with health behavior intentions ($r = 0.36$, $p < 0.01$) (Sirois et al., 2015, 2019). Mediation analyses showed an indirect effect for self-compassion on health outcomes via negative effect (Sirois et al., 2015). However, no significant indirect effects were observed for positive affect (Sirois et al., 2015, 2019).

Five out of 20 studies that included *perceived stress* as the mediator found strong, negative correlations with self-compassion (ranging from $r = -0.53$ to -0.80 , $p < 0.01$) and moderate to strong correlations in the expected direction with physical health outcomes. In other words, moderate, positive correlations were observed between stress and poorer physical health (ranging from $r = 0.34$ to 0.43 , $p < 0.01$) (Homan & Sirois, 2017; Hu et al., 2018; Hwang et al., 2019; Li et al., 2020; Rakhimov et al., 2022). Conversely, moderate to large negative correlations were observed between stress and indices of good physical health (ranging from $r = -0.41$ to -0.60 , $p < 0.001$). For mediation analyses, four studies showed that self-compassion had an indirect effect on physical health via perceived stress (Homan & Sirois, 2017; Hu et al., 2018; Hwang et al., 2019; Li et al., 2020). One study showed that self-compassion did *not* have an indirect effect on poor sleep quality via perceived stress (in a multiple model with anxiety about sleep and poor sleep hygiene). However, for sequential mediation, self-compassion had an indirect effect on poor sleep

quality via (1) perceived stress then poor sleep hygiene and via (2) anxiety about sleep, perceived stress, then poor sleep hygiene. The strong positive association between perceived stress and anxiety about sleep ($r=0.57$, $p<0.001$) suggests high overlap between the two variables may account for the null finding (i.e., non-significant indirect effect) for perceived stress (Rakhimov et al., 2022). Lastly, one study assessing anxiety about sleep showed a negative, weak correlation with self-compassion ($r=-0.28$, $p<0.001$), and a positive, strong correlation with poor sleep quality ($r=0.55$, $p<0.001$). Mediation analysis showed that self-compassion had an indirect effect on poor sleep quality via anxiety about sleep (Rakhimov et al., 2022).

Self-Compassion, Psychological Mediators (Social-Cognitive Processes), and Physical Health Outcomes Mediation studies have tested several social-cognitive processes: self-efficacy, guilt, burnout, rumination, maladaptive coping, and proactive health focus. *Self-efficacy* had a positive, moderate correlation with self-compassion ($r=0.40$, $p<0.01$), and a strong, positive correlation with health behavior intentions ($r=0.56$, $p<0.01$) (Sirois et al., 2015). Mediation analysis found that self-compassion had an indirect effect on health behavior intentions via self-efficacy as well as negative affect (but not positive affect) in the same multiple mediation model. *Proactive health focus* had a moderate, positive correlation with self-compassion ($r=0.30$, $p<0.001$), and a weak, negative correlation with poor sleep quality ($r=-0.00$, $p<0.001$). Mediation analysis found that self-compassion did not have an indirect effect on sleep quality via proactive health focus (Semenchuk et al., 2021).

Correlations were not reported in the study that evaluated *guilt* as a possible mediator, but the study found an indirect effect of self-compassion on health-promoting behavior via mother guilt (Miller & Strachan, 2020). One study evaluating *burnout* had a strong, negative correlation with self-compassion ($r=-0.67$, $p<0.01$) and a moderate, negative correlation with sleep quality ($r=-0.46$, $p<0.01$). Mediation analysis showed that self-compassion had an indirect effect on sleep quality via burnout (Vaillancourt & Wasyliw, 2019). However, this finding needs to be interpreted with caution as the study showed low quality ratings on the mediation checklist. Similarly, for *rumination* as the mediator, analyses showed moderate to large, negative correlations with self-compassion (ranging from $r=-0.31$ to -0.62 , $p<0.01$) and sleep quality (ranging from $r=-0.47$ to -0.59 , $p<0.01$). Mediation analyses showed that self-compassion had an indirect effect on sleep quality via rumination for both cross-sectional and intervention study designs (Study 1 and 2; Butz & Stahlberg, 2018).

Several *maladaptive coping* strategies (drinking to cope with anxiety, drinking to cope with depression, coping

motivated marijuana use) were evaluated as potential mediators between self-compassion, alcohol, and marijuana-related problems (Wisener & Khoury, 2020). Such mediators (drinking to cope with anxiety, drinking to cope with depression, and coping motivated marijuana use) had weak-to-moderate negative correlations with self-compassion (ranging from $r=-0.25$ to -0.41 , $p<0.01$). Additionally, the same set of mediators had moderate, positive correlations with various substance-related outcomes (e.g., alcohol, marijuana-related problems, drinking to cope with depression, anxiety, and coping motivated marijuana use, ranging from $r=0.40$ to 0.44 , $p<0.01$). Mediation analysis showed that self-compassion had an indirect effect on marijuana-related problems via coping motivated marijuana use (Study 2; Wisener & Khoury, 2020). Furthermore, parallel mediation analyses showed that self-compassion had an indirect effect on alcohol-related problems via drinking to cope with anxiety but not via drinking to cope with depression (Study 1; Wisener & Khoury, 2020).

In summary, while the magnitude of correlations among target variables ranged from weak to strong, most studies found significant indirect effects between self-compassion and health outcomes via the proposed psychological (affective/emotional and social-cognitive) mediators, behavioral mediators. However, positive affect ($n=2/20$), some DERS and CERQ facets ($n=3/20$), drinking to cope with depression ($n=1/20$), and proactive health focus ($n=1/20$) did not mediate the associations between self-compassion and the specific physical health outcomes measured in various studies (Semenchuk et al., 2021; Sirois, 2015; Sirois et al., 2019; Wisener & Khoury, 2020, 2021).

Discussion

The primary aim of this review was to quantify and characterize the mediators thought to link self-compassion to physical health outcomes in non-clinical adult populations. To date, mediational studies in this domain have focused on testing psychological mediators that are broadly similar to those seen in mental health research (e.g., perceived stress, negative affect, and emotion regulation). Although a few behavioral mediators were also evaluated, the extent to which mediators are theoretically relevant remains unclear. In terms of quality assessment, evaluation tended to suggest low to moderate quality for risk of bias, and predominantly low to moderate for the mediation checklist. Improvements for future mediation studies are needed both in methodology and in implementing better mediation analysis practice. Interpretatively, most included studies tended to use the self-regulation theory (Baumeister & Heatherton, 1996) as their general theoretical framework. Below, these findings are considered more fully, with specific attention given to

summarizing the evidence and considering study and mediational quality.

Additionally, the implications for which the current data may have on evaluating the pathways in which self-compassion may impact physical health outcomes will be considered. Directions for future studies are also given.

Mediator Types and Frequency in Linking Self-Compassion to Physical Health

In summarizing the frequency with which the different *types* of mediators have been assessed in evaluating links between self-compassion and physical health, the current review found an ongoing focus on psychological mediators, notably affective and social-cognitive factors ($n = 15/20$). Perceived stress ($n = 5/20$) and emotion regulation ($n = 5/20$) were the most frequently evaluated mediators. However, despite (a) physical health outcomes being distinct from mental health and (b) health being more directly impacted by behavior, only three studies examined possible behavioral mediators (Dunne et al., 2018; Homan & Sirois, 2017; Rakhimov et al., 2022).

In testing the different mediator types, preliminary evidence shows that psychological mediators predominate but mediation effects remain somewhat mixed. We observed consistent significant indirect effects for negative affect and perceived stress (in the absence of overlapping affective mediator — anxiety about sleep) (Rakhimov et al., 2022) but not for positive affect (Sirois et al., 2015, 2019). Additionally, we found mixed significant and non-significant indirect effects for emotion regulation (Finlay-Jones et al., 2015; Sirois et al., 2019; Wisener & Khoury, 2021).

Behavioral factors linking self-compassion to physical health outcomes were less commonly studied. In summary, health-promoting behaviors tend to be significant mediators but sleep-hygiene only had an indirect effect in sequential mediating pathways when the effects of anxiety about sleep and perceived stress had been accounted for. While the limited number of studies of behavioral factors makes it challenging to derive a pattern, initial evidence suggested that “negative” psychological constructs (e.g., negative affect) were more relevant to physical health outcomes than positive ones (e.g., positive affect).

Mediation Methods and Study Methodological Quality

A second aim of the current review was to assess study and mediational method quality — seeking to identify areas of relative strength and weakness in the ways research has sought to identify self-compassion’s potential mediators in physical health contexts. Broadly, the evaluation presented here suggested that in terms of both study and mediational

quality, ongoing concerns remain. For risk of bias, although most studies scored within the acceptable, moderate range, six studies scored within the low range, indicating more serious limitations. Methodologically, the most common issues regarded limitations of external validity (notably generalizability) and internal validity (regarding internal consistency, confounding and selection bias). Future studies seeking to evaluate clinical or patient populations should further consider the issue of external validity as it is likely to have greater importance in health care evaluation and change in clinical practice. Regarding internal validity, most studies did not consider confounders and some studies did not report internal consistency (α -value) for the self-reported scales. In future work, we highly recommend identifying and evaluating confounders and reporting internal consistencies for all scales representative of the specific study sample.

Likewise, for the mediation checklist, most studies showed some concerns. Most issues were found in the study designs (e.g., cross-sectional and correlational), not having conducted an appropriate power analysis for mediation analyses, not addressing and controlling for confounds and covariates, and not conducting a sensitivity analysis. Despite the importance of addressing and controlling for confounds (Valente et al., 2017) and covariates (Hayes & Rockwood, 2017) in mediational testing, only a few studies identified and controlled for potential confounders and covariates. Furthermore, while sensitivity analyses assessing the influence of unmeasured confounders are often recommended (VanderWeele, 2019), such analyses were not evident in any included studies. Hence, possible confounders and covariates together with a possible impact from unmeasured factors may be explaining alternative pathways.

Although not captured by the mediation checklist, an important factor to consider in current mediation analyses is the *types* of indirect effects used by researchers. Various methods are used to test for indirect effects, but bootstrapping confidence interval techniques are strongly recommended (Hayes, 2013; Preacher & Hayes, 2004, 2008). Previous methods such as the *causal steps approach* by Baron and Kenny (1986) have been criticized on multiple grounds, notably regarding issues with power (Fritz & MacKinnon, 2007; MacKinnon et al., 2002). Likewise, Sobel’s test (Sobel, 1982) has also been criticized for being low in power mainly due to the assumption of normality for the sampling distribution of the indirect pathway (Hayes & Rockwood, 2017). Of the studies included in this review, two used path analysis (Hwang et al., 2019; Sirois et al., 2019), one used Sobel’s test (Finlay-Jones et al., 2015), and another study used Monte Carlo methods (Li et al., 2020). The remainder used the recommended bootstrap confidence interval methods using PROCESS (Hayes, 2013). In summary, most studies used the recommended methods of indirect testing, which avoids making false assumptions about the mediators

of interest. However, future mediation studies need to identify and control for possible confounds and should conduct a power analysis suited to intended mediational analyses.

Interpretation of Findings in Relation to Existing Empirical Data

Our review showed a heavy concentration of psychological mediators linking self-compassion to health outcomes together with a few potential behavioral mechanisms being unique to physical health outcomes. This pattern raises two general points worth considering. Firstly, the mediators assessed in physical health largely overlap with those assessed in mental health (mainly psychological factors), when in fact, this “mediator set” may not be entirely suitable. Secondly, other types of mediators (behavioral, motivational, and social constructs), which may be more relevant to physical health outcomes, were notably absent in current mediation works.

Despite broad similarities and overlap in terms of the *types* of mediators examined thus far across physical and mental health areas of study (e.g., positive and negative affect, emotion regulation), the data from this review also suggest we must be careful in assuming that the same mediators will operate in all contexts. For example, a previous systematic review evaluating emotion regulation as the mechanism of change found consistent support for emotion regulation as the mediator between self-compassion and mental health outcomes (Inwood & Ferrari, 2018). However, findings were mixed in this review; some found significant (Finlay-Jones et al., 2015; Sirois et al., 2019) and others non-significant (Wisener & Khoury, 2021) indirect effects of emotion regulation linking self-compassion to physical health.

There are a number of possible reasons that emotion regulation might be a less consistent mediator in physical versus mental health contexts. For example, the mixed findings could be due to measurement issues with the Difficulties in Emotion Regulation Scale (DERS; Gratz & Roemer, 2004). In our review, some studies employed all six DERS facets (Wisener & Khoury, 2021), whereas some only employed five facets without the *Awareness* subscale (Finlay-Jones et al., 2015). A previous study has suggested problems with the *Awareness* subscale as it may not represent the same higher-order emotion regulation construct as the other five dimensions (Bardeen et al., 2012). In support of this notion, subsequent factor analytic work suggested that DERS had good internal consistency with a robust bifactor latent structure without the *Awareness* subscale (Hallion et al., 2018). Hence, it is possible that the mixed findings are reflecting issues with varied factor structures of DERS rather than differences in associations between target variables. However, it is also possible that similar measurement issues also exist in mental health contexts.

A more likely explanation for the irregularity of emotion regulation is due to the heterogeneity in physical health outcomes studied so far. The current review focused on physical health outcomes, but nonetheless included studies that evaluated emotion regulation as mediators on outcomes ranging from stress (Finlay-Jones et al., 2015) to bedtime procrastination (Sirois et al., 2019) and drinking to cope with depression/anxiety and coping motivated marijuana use (Wisener & Khoury, 2021). Given ongoing debate regarding the direction of the links between self-compassion and physical health (e.g., higher self-compassion predicting better physical health or better physical health influencing higher self-compassion levels) (Hall et al., 2013; Raque-Bogdan et al., 2011), mixed results may reflect the different types of physical health outcomes and their measurements. Nonetheless, these findings highlight the possibility that the psychological mediators thought to link self-compassion to mental health outcomes may not be suitable for investigations in other contexts, such as in physical health (which are more heterogeneous in nature).

An important final comment reflects the need for future work to assess positive affect using measures that include indices of low arousal positive emotions. The current review found that positive affect did not mediate the links between self-compassion and health outcomes (health behavior intentions, bedtime procrastination; Sirois et al., 2015; Sirois et al., 2019), suggesting that reductions in negative affect may be more important. However, studies to date have indexed positive affect via the Positive and Negative Affect Scale (PANAS; Watson et al., 1988) which does not assess low arousal states such as acceptance, calm, or equanimity that appear more consonant with self-compassion theory (Neff, 2003). Evidence from related studies in mindfulness suggests a link between meditation and greater lower arousal positive states (Jones et al., 2018) and incorporating such measures seems likely to return interesting findings.

Interpretation of Findings in Relation to Theoretical Evidence

In considering how we might expand our investigation of the types of mediators to encompass those suited to physical health, theories of self-regulation (Baumeister & Heatherton, 1996), the adaptive regulation of emotions (Gratz & Roemer, 2004), and stress and coping (Lazarus, 1966) appear the most viable theoretical bases for current mediators. Theoretically, self-compassionate individuals are more likely to respond to health-related failures with acceptance rather than self-criticism or judgment (self-kindness), view their setbacks as part of the wider human experience (common humanity), and with less rumination (mindfulness; Adams & Leary, 2007). In theory, this way of managing failures might enhance physical

health by freeing up the resources needed for more effective behavioral self-regulation (Sirois et al., 2015). This view is consistent with the *limited strength model of self-regulation* (Baumeister & Heatherton, 1996; Baumeister et al., 2007), which suggests that individuals have a limited supply of “willpower” for acts of self-control. When this general resource gets depleted, we are more likely to experience failures in self-control.

The included studies showed some support for the self-regulation resource model (SRRM) (Sirois et al., 2015) in which self-compassion enhances physical health via reductions in negative affect. Interestingly, we did not find supporting evidence for an increase in positive affect (Sirois et al., 2015, 2019). Conceptually, there are logical reasons to expect that negative affect might have a stronger effect than positive affect. For example, as self-compassion is apparent in times of *suffering* (Neff, 2003), it is possible that self-compassion may interrupt individuals’ tendency for self-critical thoughts or responses to negative or “failed” health goals (e.g., failing to exercise three times a week), thereby reducing the negative affect associated with activation of threat systems (i.e., experience less set-back). Reductions in negative affect may, in turn, require fewer regulatory resources to protect the self thus freeing up self-regulatory capacity for future health-promoting practices and behaviors.

In summary, while there is some indirect evidence suggesting that self-compassion may “free up” resources and prevent depletion (as indexed via reductions in negative affect) thus resulting in better physical health, more direct empirical examinations are warranted. Most studies treat differences in the affective or emotional aspects of self-regulation as if they indexed this process, while other aspects of self-regulation (which may be as important in physical health outcomes, notably in relation to behavioral change such as motivation, goals, and values) have not yet been evaluated. Previous work has suggested that understanding an individual’s core values and goals in relation to self-compassion may be important (McGehee et al., 2017) as do influential approaches such as the theory of planned behavior (Ajzen, 1991). Future studies offering direct tests of the hypothesized self-regulatory mediational pathways (e.g., motivational factors and goal orientation) are clearly needed.

Limitations, Implications, and Future Directions

There are a few limitations to consider in the current review. Recall that the primary aim of the current review was to quantify and characterize the mediators linking self-compassion and physical health. However, in all initial stages of mediation reviews, temporal precedence poses a challenge in determining the *true* indirect effects. While some studies tested alternative models (e.g., Wisener & Hourly, 2021) and used different types of mediation

models to test various associations (e.g., using multiple or serial mediation), few studies with homogenous mediator and outcome types limited our ability to make reliable comparisons across different findings.

Additionally, most of the studies included here were cross-sectional, correlational designs, effectively precluding clarity regarding the directionality of the relationships among self-compassion, proposed mediators, and outcomes. For example, it is possible that the onset of physical health issues may reduce individual’s self-compassion (e.g., by increasing feelings of isolation and reducing a sense of common humanity; Casati et al., 2000). Equally, previous studies suggest that the links between mechanisms and health outcomes may be reciprocal and mutually reinforcing (Sirois et al., 2019). Given such complex, dynamic associations, prospective studies will likely prove useful in understanding the temporal links between self-compassion and physical health outcomes.

The samples in most included studies were predominantly female. Of those included studies reporting ethnicity, most participants self-identified as Caucasian or White, limiting generalizability to other samples (including clinical populations). Prior work such as that by Koopmann-Holm and Tsai (2017) delineated important cultural variation in the perception, experience, and expression of compassion and other studies suggested that the concept of self-compassion varies depending on contextual (cultural) values (Montero-Marin et al., 2018). Given that individuals think and behave in ways that are consistent with their culturally shared values (Hofstede et al., 2005), more work considering how cultural characteristics may influence mediational tests is needed.

More broadly, our findings may also be influenced by publication bias. Although a few published studies have reported non-significant indirect effects, it is possible that our review overestimated the likelihood of certain mediators simply because “positive” mediational findings are more likely to be published. Equally, in the absence of pre-registration, it is possible that published studies evaluated other mediators in initial analyses but did not (or could not) publish them due to non-significant indirect effects. While the significant indirect effects for various mediators tended to be consistent across multiple studies for the most part, publication bias needs to be carefully considered when interpreting the results.

Finally, the limitations associated with measurement issues should be noted. All studies relied on self-report measures which are prone to a number of biases including issues with recall, self- and other-presentation, and aggregation (Podsakoff et al., 2012). Prior work shows that self-compassion is associated with lower hypochondriasis (Raque-Bogdan et al., 2011), meaning differences in reporting may be influential. Incorporating objective measures is one obvious solution for future studies. Perhaps more importantly, included studies all relied on a specific conceptualization of self-compassion, measuring this

construct via either the full Self-Compassion Scale (Neff, 2003) or the SCS short-form (Raes et al., 2011). While this focus enhanced homogeneity in the predictor variables, it also means that our findings may or may not generalize to studies using different measurement approaches (e.g., in which self-compassion was examined via compassionate self-responding and uncompassionate self-responding; Muris & Otgaar, 2020). While plurality in theory and measurement is critical to the development of self-compassion research, the mediational literature based on more recent approaches was insufficiently developed to permit synthesis and would have required deviation from the pre-registered criteria. However, detailed discussions of the ongoing self-compassion measurement and conceptualization debate can be found in Ferrari et al. (2022), Khoury (2019), Muris and Otgaar (2020), and Neff (2022).

Additionally, alternative conceptualizations, influenced by particular theoretical traditions and other views, such as Gilbert (2014) model based on mammalian caring systems, may be of benefit in future studies (Kirby, 2017). Thus, future studies might also benefit from measuring self-compassion from a broader range of perspectives (Gilbert, 2014) notably those emphasizing biosocial goals/motives and physiology (Kirby, 2017), and the evolved physiological systems for caring (e.g., oxytocin, the myelinated parasympathetic system, vagal tone, and heart rate; Kirby et al., 2017).

Overall, this is the first systematic review to characterize the range and summarize the mediators that have been empirically assessed in linking self-compassion and physical health. Notably, both study methodology and mediation quality need to be improved in future mediation studies. A range of mediators broadly reflective of psychological (emotional and affective, and social-cognitive processes) and behavioral factors have been tested. Among the more commonly assessed mediators, negative affect, and stress (when not concurrently modelled with overlapping affective mediators such as anxiety) consistently mediated links between self-compassion and physical health outcomes but findings regarding emotion regulation were mixed. More generally, although physical health outcomes differ from mental health outcomes in important ways, the current mediators evaluated similar prospective mediators observed in mental health research.

There is a notable absence of studies testing behavioral, motivational, and social pathways or testing measures reflective of different conceptualizations of self-compassion. Cross-sectional study designs predominate, creating key limitations; experimental, interventional, and prospective designs are needed, as are studies with pre-registered analytic plans. Despite such limitations, self-compassion remains a promising target for interventional work in physical health. Ongoing attention to mediational considerations will benefit and facilitate our theoretical understanding of the construct as well as self-compassion interventions and treatments that can optimize physical health and well-being.

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Author Contribution JC came up with the conception and structure of the review, conducted the search and study quality assessment, wrote the manuscript, and contributed to all manuscript revisions. AB collaborated in conducting the search and study quality assessment. AS, AC, and JK assisted in reviewing various parts of the manuscript. NC collaborated in conceptualizing and structuring the review, writing the manuscript, and contributed to all manuscript revisions. All authors collaborated in reviewing and editing the final manuscript and approved it for submission.

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Declarations

Conflict of Interest The authors declare no competing interests.

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