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The relationship between self-compassion and stress, and the role of self-compassion in psoriasis, stress, and treatment adherence

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Declaration

This thesis has been submitted for the award of Doctorate in Clinical Psychology at the University of Sheffield. It has not been submitted for any other qualification, or to any other institution.

Structure and word counts

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Lay summary

Self-compassion is a positive way of relating to oneself. Self-compassion involves self-kindness, recognising that difficulties are part of being human, and being present and non-judgemental regarding one's thoughts and feelings. Self-compassion is associated with reduced stress, yet there has been no study which assesses the magnitude of this relationship. In the first part of the thesis, a meta-analysis was conducted to achieve this.

The meta-analysis combined the results of 26 studies with 37 effect sizes, finding that self-compassion has a medium inverse relationship with objective stress, measured through bodily responses, and a large inverse relationship with subjective perceived stress, measured through self-report questionnaires. The meta-analysis also found that self-compassion relates to reduced stress equally in clinical and non-clinical populations, and that gender and age do not influence the magnitude of this relationship.

Whilst self-compassion is a trait that is in part developed in childhood, it can be cultivated through psychological interventions. Psychological interventions aimed at cultivating self-compassion, if successful in this, could be beneficial in reducing stress, particularly self-reported perceived stress.

Psoriasis is a skin condition that can be influenced by stress. Stress is of particular relevance in psoriasis as it is associated with inflammation and maladaptive health behaviours, including poor treatment adherence, which increase the severity of psoriasis and associated itchiness. In the second part of the thesis, a research study was conducted to investigate the relationships between self-compassion, perceived stress, treatment adherence, and psoriasis severity and itch severity in participants with psoriasis. Participants were then randomly allocated to complete either a brief online self-compassionate writing intervention, or an active control condition.

There was a large inverse relationship between self-compassion and perceived stress. There was a small relationship between self-compassion and treatment adherence. There were small inverse relationships between self-compassion and psoriasis severity, and itch severity. The relationship between self-compassion and itch severity was found to be in part explained by perceived stress. The brief online self-compassionate writing intervention had a small effect in cultivating state self-compassion, but there were no changes in self-compassion, perceived stress, treatment adherence, psoriasis severity, or itch severity at a four-week follow-up that could be attributed to the effects of the brief online self-compassionate writing intervention.

The results of the research study add to the evidence that self-compassion is associated with reduced stress and increased treatment adherence in the context of physical health. Further research is needed to investigate the potential benefits of psychological interventions aimed at cultivating self-compassion in this area.

Acknowledgements

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Section one: Literature review

The relationship between self-compassion and stress: A systematic review and meta-analysis

Abstract

Objectives

Self-compassion is known relate to reduced stress, yet there has been no synthesis of the research where the relationship between self-compassion and stress in adults is explored. This study sought to systematically search, critically appraise, and meta-analyse the findings of this literature.

Methods

A systematic review was conducted with searches of the Cumulative Index to Nursing and Allied Health Literature (CINAHL), PsychInfo, Scopus, and Web of Science. Search terms relating to self-compassion and physiological and self-reported stress, and inclusion and exclusion criteria were defined prior to the searches. Included studies were quality assessed, and a random effects meta-analysis and planned moderator analyses were conducted.

Results

A random effects meta-analysis was conducted on 37 effect sizes from 26 studies which met the criteria for inclusion. The studies were generally of high quality, and the risk of publication bias was deemed low. The meta-analysis revealed a large negative relationship between self-compassion and stress. Planned moderator analyses indicated stress measure type, but not sample type, participant gender, or participant age, to influence the magnitude of the relationship between self-compassion and stress.

Conclusions

There is a medium negative relationship between self-compassion and physiological stress in adults. This finding should be interpreted with caution as only five studies using physiological measures of stress were meta-analysed. There is a large negative relationship between self-compassion and self-reported perceived stress in adults. With this relationship well established at a cross-sectional level, more longitudinal

and experimental research into self-compassion and psychologically self-reported perceived stress is needed.

Practitioner points

- Self-compassion is a positive way of relating to oneself that promotes reduced stress, particularly self-reported perceived stress.
- Due to a paucity of studies, more research is needed to assess the relationship between self-compassion and physiological stress.

Limitations

- Only five studies using physiological measures of stress were meta-analysed, using four different measures. Consequently it may be premature to assert the magnitude of the relationship between self-compassion and physiological stress.
- Only published English language studies using adult participants were meta-analysed. Participant culture may moderate the relationship between self-compassion and stress.
- The magnitude of the relationship between self-compassion and stress may differ in children and adolescents.

Introduction

Self-compassion has been associated with increased wellbeing and reduced stress (Neff, 2003; Allen & Leary, 2010). These relationships have been consistently demonstrated in psychological research (Inwood & Ferrari, 2018; Neff & Dahm, 2015). Despite this, the magnitude of relationship between self-compassion and stress, and the factors which moderate it, remains unknown.

Defining self-compassion

Self-compassion is a trait that is in part developed through childhood experiences, but it can be cultivated as a state, and developed through therapies that pay attention to self-to-self relating (Neff & Dahm, 2015). Psychological research into self-compassion has been largely guided by Neff's (2003) three component model, which has been derived from Buddhist philosophy. Neff (2003) proposes that self-compassion can be defined by three elements: self-kindness (relating to the self with warmth and understanding, rather than frustration and criticism in times of difficulty), common humanity (recognising that suffering and inadequacy are an inevitable and shared aspect of the human condition), and mindfulness (attending to the present moment, without judgement). Consequently, self-compassion protects against self-criticism, feelings of isolation and defectiveness, and over-identification with thoughts and feelings (Allen & Leary, 2010; Neff, 2003), impacting on a person's ability to cope with stress effectively (Allen & Leary, 2010; Terry & Leary, 2011).

Self-compassion promotes an awareness of, and sensitivity to the experience of one's suffering, coupled with a motivation to alleviate that suffering (Neff & Dahm, 2015). Self-compassionate people are less likely to engage in maladaptive coping behaviours such as avoidance and escape, and are more likely to utilise adaptive coping methods that attenuate stress (Allen & Leary, 2010; Terry & Leary, 2011). Adaptive coping involves either working to reduce the demands that cause stress, or re-framing or

accepting demands so that associated stress is reduced (Sirois & Rowse, 2014). As self-compassion promotes adaptive coping, in recent years there has been much interest into the potential benefits of self-compassion in clinical populations, where stress and coping are fundamental (Sirois & Rowse, 2016; Terry & Leary, 2011).

Defining stress

Stress is an internal state that is both physiologically experienced, and psychologically perceived (Lester, Nebel, & Baum, 1994). Stress occurs in response to situations that are perceived as demanding, and functions to elicit adaptive coping (Lazarus & Folkman, 1984). Situations are perceived as demanding when they are appraised as novel, pressuring, unpredictable, or uncontrollable (Cohen, Karmarck, & Mermelstein, 1983; Lazarus & Folkman, 1984). The resulting stress influences a person's physiological homeostasis, and psychological, cognitive and behavioural processes and responses (Lester et al., 1994), which can attenuate or exacerbate stress (Lazarus & Folkman, 1984).

Acute stress causes the hypothalamic-pituitary-adrenal (HPA) axis to trigger the release of hormones that cause the activation of the sympathetic nervous system, and the "fight or flight" response (Moberg, 1999). The fight or flight response is an adaptive, evolved response which serves to mobilize an animal when it is faced with a threat to its survival (Lupien, 2007). The response can also be triggered when there is no mortal danger, in response to a perceived demand (Epel et al., 2018). There is high variability in peoples' physiological stress reactivity, influenced by a number of factors, including gender and age (Bale & Epperson, 2015). Physiological stress is associated with a range of measurable bodily responses, such as changes in hormones, proteins, and heart rate (Lupien, 2007).

People's self-reported perceptions of their stress can also be measured. Psychologically perceived stress is dependent both on a person's appraisals of the daily,

event-based, and chronic demands in their life, and their perception of their ability to cope with them (Cohen et al., 1983). Stress tends to also be perceived in response to the psychological components of the fight or flight response, such as becoming flushed, or experiencing impacted cognition (Epel et al., 2018).

When chronic, stress can result in the use of less adaptive coping methods, and cause lasting physiological and psychological disturbance (Epel et al., 2018). Distress is an example of such disturbance. Distress is a negative internal state that results when a person's methods of coping fail to re-establish physiological homeostasis, and/or reduce the psychologically perceived impact of a demand (Moberg, 1999). Stress therefore differs from distress, although the two constructs are commonly confused (Epel et al., 2018), in that it describes an internal state that is neutral (Lazarus & Folkman, 1984).

Aims

To determine the magnitude of the known relationship between self-compassion and stress, this study sought to systematically search, critically appraise, and synthesise the findings of the literature where the relationship between self-compassion and stress in adults has been assessed, using a meta-analytic approach. The study also sought to investigate the moderators of this relationship.

Hypotheses

It was hypothesised that there would be a large negative relationship between self-compassion and stress. It was hypothesised that sample type, stress measure type, participant gender, and participant age, would moderate the relationship between self-compassion and stress.

Hypothesised moderators

Several factors were hypothesised to moderate the relationship between self-compassion and stress in adults:

Sample type

It was hypothesised that sample type would moderate the relationship between self-compassion and stress, as clinical populations are likely to experience increased stress when compared to non-clinical populations (Terry & Leary, 2011).

Stress measure type

It was hypothesised that stress measure type would moderate the relationship between self-compassion and stress, as physiological and self-reported perceived stress are related, but different constructs (Epel et al., 2018).

Participant gender

It was hypothesised that participant gender would moderate the relationship between self-compassion and stress, as a previous meta-analysis has indicated that women have slightly lower levels of self-compassion than men (Yarnell et al., 2015), and there are gender differences in stress reactivity (Bale & Epperson, 2015) .

Participant Age

It was hypothesised that participant age would moderate the relationship between self-compassion and stress, as research has indicated a positive relationship between self-compassion and age (Neff & Vonk, 2009), and there are age differences in stress reactivity (Bale & Epperson, 2015).

Method

Search strategy

A literature search was conducted in January 2019. Four databases were searched: The Cumulative Index to Nursing and Allied Health Literature (CINAHL), PsychINFO, Scopus, and Web of Science. The parameters were set to search English language studies published between January 2003, when Neff's Self-compassion Scale (SCS), the first measure of self-compassion was published (Neff, 2003), and January 2019. To ensure the literature search was comprehensive, the search terms were finalized after keyword term

searches using the National Library of Medicine's thesaurus, Medical Subject Headings (National Library of Medicine, 2019). The final search terms were: self-compassion OR "self compassion" AND stress OR "autonomic nervous system" OR alpha-amylase OR "alpha amylase" OR cortisol OR galvanic OR "heart-rate variability" OR "heart rate variability" OR interleukin-6 OR "interleukin 6" OR "sympathetic nervous system". Many of these terms relate to physiological stress, and the bodily responses associated with it (Lupien, 2007). To check for additional studies, relevant reviews identified in the literature search were read, and an ancestry and citation search of included studies was conducted. No additional eligible studies were found.

Inclusion and exclusion criteria

Studies were included in the meta-analysis if they were published in a peer-reviewed journal (in press articles were included), were written in English, used adult participants, and used the SCS or the shortened Self-compassion Scale – Short From (SCS-SF; Raes, Pommier, Neff, & Van Gucht, 2011) and a validated physiological or self-report measure of perceived stress to assess the cross-sectional relationship between self-compassion and stress. Studies using a broad self-report measure of mental health were included if a stress subscale score was derived and analysed.

Studies were excluded from the meta-analysis if they measured the relationship between self-compassion and a construct differing to stress, such as distress, minority stress, and post-traumatic stress (Epel et al., 2018). Where the relationship between self-compassion and stress was assessed but not reported, supplementary details were checked and study authors were emailed to retrieve this information. Authors were given four weeks to respond to this email, after which their study was excluded from the meta-analysis due to time constraints.

Selection for inclusion

Figure 1 illustrates the systematic process by which studies were selected for inclusion via a flow diagram, as recommended in the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) statement (Moher, Liberati, Tetzlaff, & Altman, 2009).

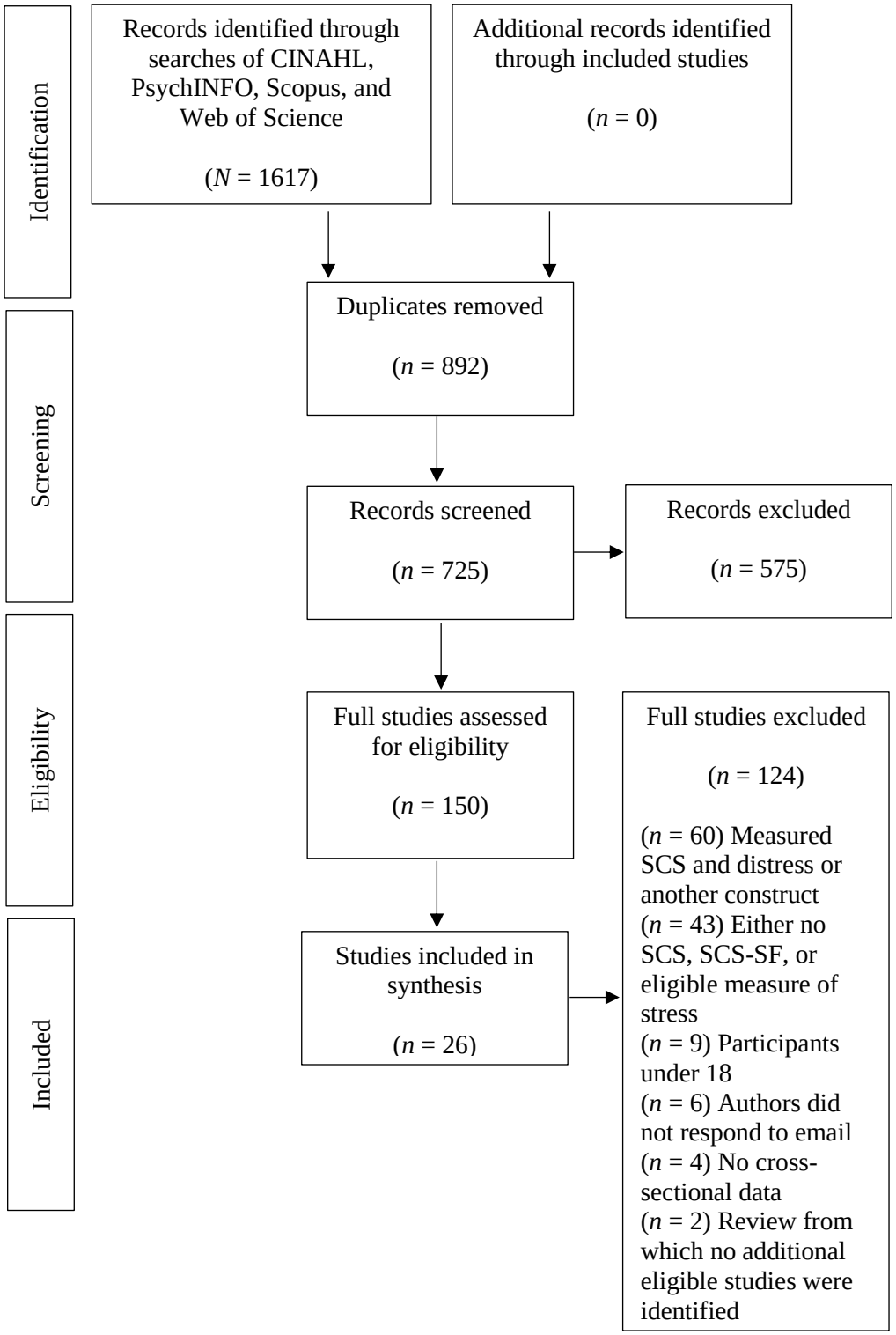

Figure 1. Flow diagram illustrating the systematic process by which studies were selected for inclusion.

Data extraction

The characteristics of studies included in the meta-analysis are summarised in Table 1. Data on samples, measures, and effect sizes were extracted from each study to enable the meta-analysis and planned moderator analyses. From the 26 studies meeting the criteria for inclusion there were five studies that reported effect sizes from multiple independent samples, yielding a total of 37 effect sizes to be meta-analysed (Gilbert, McEwan, Matos, & Rivis, 2011; Pinto-Gouveia, Duarte, Matos, & Fraguas, 2013; Sirois, 2014; Sirois & Hirsch, 2019; Sirois, Molnar, & Hirsch, 2015).

Table 1.

Characteristics of included studies

Author/s and country of conduct	Sample	Demographics	Stress measure	Effect size (*r*)	Quality score
Breines, McInnis, Kuras, & Thoma (2015) USA	Students	*N* = 33 48.00% female M_{age} = 21.12, *SD* = 3.94	SAA	-.46**	100%
Breines et al. (2013) USA	Students	*N* = 41 44.00% female M_{age} = 24.26, *SD* = 3.30	IL6	-.40*	92%
Brito-Pons, Campos, & Cebolla (2018) Chile	Community	*N* = 50 50.00% female M_{age} = 38.40, *SD* = 12.93	PSS14	-.45***	75%
Costa & Pinto-Gouveia (2011) Portugal	Patients with a chronic illness	*N* = 103 79.61% female M_{age} = 60.22, SD_{female} = 14.61, SD_{male} = 13.24	DASS42	-.59***	83%
Erikkson, Germundsjo, Astrom, & Ronnlund (2018) Sweden	Psychologists	*N* = 101 96.53% female M_{age} = 36.20, *SD* = 8.20	PSS14	-.61**	83%
Finlay-Jones, Rees, & Kane (2015) Australia	Psychologists and trainee psychologists	*N* = 198 86.36% female M_{age} = 36.25, *SD* = 11.79	DASS21	-.55***	75%
Fong & Loi (2016) Australia	Students	*N* = 306 78.10% female M_{age} = 25.17, *SD* = 8.19	PSS10	-.74***	67%

Author/s and country of conduct	Sample	Demographics	Stress measure	Effect size (*r*)	Quality score
Ghorbani, Pourhosein & Ghobadi (2018) Iran	Shop-workers	N = 114 67.54% female M_{age} = 27.00, SD = 0.60	PSS14	-.39**	42%
Gilbert et al. (2011) A UK	Students	N = 222 75.68% female M_{age} = 22.70, SD = 7.07	DASS21	-.29**	50%
Gilbert et al. (2011) B UK	Therapists	N = 59 83.05% female M_{age} = 39.52, SD = 10.99	DASS21	-.17	50%
Herriot, Wrosch, & Gouin (2018) Canada	Older adults	N = 233 60.94% female M_{age} = 75.57, SD = 7.75	Diurnal Cortisol	-.14*	92%
Homan & Sirois (2017) Online	MTurk	N = 176 44.90% female M_{age} = 31.60, SD = 10.10	PSS10	-.80***	83%
Hu, Wang, Sun, Arteta-Garcia, & Purol (2018) USA and China	Students	N = 83, 55.63% female, M_{age} = 20.07, SD = 2.36	PSS10	-.59***	75%
Kemper, Mo, & Khayat (2015) USA	Trainee clinicians	N = 213 73.00% female M_{age} = 28.30, SD = 8.90	PSS10	-.55***	83%
Ko et al. (2018) USA	Students	N = 41 65.85% female M_{age} = 19.80, SD = 1.40	PSS10	-.70***	83%
Lopez et al. (2015) Netherlands	Community	N = 1643 54.80% female M_{age} = 54.90, SD = 16.70	PSS4	-.53***	75%
Luo, Qiao, & Che (2018) China	Students	N = 34 0.00% female M_{age} = 19.68, SD_{high} = 0.59, SD_{low} = 0.82	HRV	.48**	83%
Neff et al. (2018) Online	MTurk	N = 192 63.00% female M_{age} = 37.26, SD = 12.64	DASS21	-.65**	83%
Pinto-Gouveia et al. (2013) A Portugal	Patients with cancer	N = 63 82.50% female M_{age} = 54.05, SD_{female} = 10.01, SD_{male} = 13.24	DASS42	-.58	75%
Pinto-Gouveia et al. (2013) B Portugal	Patients with a chronic illness	N = 68 75.00% female M_{age} = 51.55, SD_{female} = 10.48, SD_{male} = 14.12	DASS42	-.46**	75%
Pinto-Gouveia et al. (2013) C Portugal	Healthy adults	N = 71 73.20% female M_{age} = 50.15, SD_{female} = 17.33, SD_{male} = 13.75	DASS42	-.03**	75%
Pires et al. (2018) Brazil	Managers	N = 46 100.00% female M_{age} = 43.26, SD = 8.36	PSS10	-.63***	83%

Author/s and country of conduct	Sample	Demographics	Stress measure	Effect size (*r*)	Quality score
Przezdziecki & Sherman (2016) Australia	Breast cancer survivors	*N* = 141 100.00% female M_{age} = 51.45, *SD* = 9.44	DASS21	-.53**	100%
Robinson, Hastings, Weiss, Pagavathsing, & Lunsky (2017) UK and Canada	Parents of children with intellectual and developmental disabilities	*N* = 56 70.00% female M_{age} = 56.50, *SD* = 8.80	DASS21	-.38**	67%
Sirois (2014) A Canada	Community	*N* = 94 67.50% female M_{age} = 34.28, SD = 14.32	PSS10	-.60**	83%
Sirois (2014) B Canada	Students	*N* = 145 74.50% female M_{age} = 21.27, *SD* = 3.92	PSS10	-.63**	83%
Sirois (2014) C Canada	Students	*N* = 339, 81.70% female M_{age} = 21.68, *SD* = 4.93	PSS10	-.63**	83%
Sirois (2014) D Canada	Students	*N* = 190 74.20% female M_{age} = 22.41, *SD* = 5.89	PSS10	-.58**	83%
Sirois & Hirsch (2019) A Online	Participants with cancer	*N* = 55 62.00% female M_{age} = 61.24, *SD* = 11.24	PSS4	-.63**	83%
Sirois & Hirsch (2019) B Online	Participants with cancer in remission	*N* = 122 64.40% female M_{age} = 61.47, *SD* = 12.39	PSS4	-.67**	83%
Sirois & Hirsch (2019) C Online	Participants with chronic fatigue syndrome	*N* = 61 83.80% female M_{age} = 33.91, *SD* = 14.80	PSS10	-.63**	83%
Sirois & Hirsch (2019) D Online	Participants with fibromyalgia	*N* = 319 96.10% female M_{age} = 47.89, *SD* = 12.70	DASS21	-.58**	83%
Sirois & Hirsch (2019) E Online	Participants with fibromyalgia	*N* = 152 89.40% female M_{age} = 41.51, *SD* = 14.02	PSS10	-.60**	83%
Sirois et al. (2015) A Online	Participants with arthritis	*N* = 170 91.50% female M_{age} = 47.44, *SD* = 11.60	PSS10	-.56*	75%
Sirois et al. (2015) B Online	Participants with inflammatory bowel disease	*N* = 155 83.10% female M_{age} = 38.84, *SD* = 12.80	PSS10	-.56*	75%
Svendsen, Osnes, Binder, & Dundas (2016) Norway	Students	*N* = 53 68% female M_{age} = 23.60, *SD* = 2.52	HRV	.31*	92%
Yu et al. (2019) China	Participants with sleep difficulties	*N* = 998 76.10% female M_{age} = 52.29, *SD* = 11.39	PSS10	-.71**	92%

Note. * $p < .05$, ** $p < .01$, *** $p < .001$. DASS = Depression, Anxiety, and Stress Scale, HRV = heart rate variability, IL6 = interleukin 6, PSS = Perceived Stress Scale, SAA = saliva alpha amylase. Studies reporting multiple effect sizes from independent samples are named using alphabetical codes (A, B, C, etc).

Quality appraisal

Reporting guidelines and quality assessment tools designed for use in medical research are considered inappropriate for use in the quality assessment of psychological research (Da Costa, Cevallos, Altman, Rutjes, & Egger, 2011; Protogerou & Hagger, 2018). Reporting guidelines offer a measure of a research report's completeness, rather than assessing methodological appropriateness, and consequently, the quality of the conducted research (Da Costa et al., 2011). Quality assessment tools designed for use in medical research often contain items that are not applicable in the context of psychological research, which may render their use invalid in this context (Protogerou & Hagger, 2018).

After assessing each of the relevant quality appraisal tools reviewed in Sanderson, Tatt, and Higgins' (2007) systematic review, the Specialist Unit for Review Evidence (SURE, 2018) checklist for the critical appraisal of cross-sectional studies was selected as the most appropriate quality appraisal tool for use in the current meta-analysis (see Appendix A). The checklist has 12 items, from which a total percentage score was calculated to give a crude indication of included studies' quality. These scores can be observed in Table 1 (see Appendix B for full ratings). It was decided that scores of ≥ 75% were crudely indicative of a good quality study, and scores ≤ 50% were crudely indicative of a poor quality study. To increase the reliability of the quality assessment, 20% of the included studies were additionally quality assessed by a colleague (a fellow Trainee Clinical Psychologist), yielding similar scores. Discrepancies were discussed until a mutual decision was made.

Meta-analytic strategy

Comprehensive Meta-analysis (CMA) was used to conduct the meta-analysis (Borenstein, Hedges, Higgins, & Rothstein, 2013). A random effects meta-analysis was conducted to ensure heterogeneity observed in the pooled average effect size was both

reflective of between-study heterogeneity in true effects, and within-study sampling error (Quintana, 2015). CMA weights inputted effect sizes before meta-analysing them, and has the capacity to compare different effect size types, by transforming them into Fisher's z scores (Borenstein et al., 2013). Only one of the included studies did not report an effect size using Pearson's *r*. Breines et al. (2013) reported an r^2 value from which *r* was calculated prior to entry into CMA. Cohen's (1992) guidelines were used to assess the magnitude of effect sizes, denoting $r = .10$ to be small, $r = .30$ to be medium, and $r = .50$ to be large. Moderator analyses were planned using subgroup random effects meta-analyses and meta-regressions should there be significant variability between study effect sizes in the main meta-analysis.

Heterogeneity

To determine whether the planned moderator analyses were warranted, the variability between study effect sizes was assessed using *Q* and I^2. The *Q* statistic indicates the ratio of observed to within-study variance (Quintana, 2015). When the *p*-value for *Q* is < .05 it is indicative of there being more observed variance between study effect sizes than can be accounted for by within-study variance, indicating the need for moderator analyses (Higgins, Thompson, Deeks, & Altman, 2003). The I^2 statistic indicates the percentage of variation across included studies that is due to differences between studies (Quintana, 2015). When I^2 is ≤ 50%, there is low variance between study effect sizes. When I^2 is between 50 - 75% there is moderate variance between study effect sizes. When I^2 is ≥ 75%, there is high variance between study effect sizes, indicating the need for moderator analyses (Higgins et al., 2003).

Publication Bias

Publication bias was assessed using the funnel plot and Egger's regression to test its asymmetry, and by calculating the Fail-safe *N*. Asymmetry of a funnel plot indicates publication bias, as a symmetrical distribution of observed effect sizes should be expected

(Borenstein et al., 2013). The funnel plot was additionally visually inspected to count the number of studies falling outside of the funnel, where there is high standard error (Quintana, 2015). Fail-safe *N* determines the number of studies with a null finding that would be needed to make a pooled average effect size statistically insignificant (Borenstein et al., 2013). A high Fail-safe *N* is greater than $5k + 10$, where *k* is the number of studies included (Rosenthal, 1979).

Results

The random effects meta-analysis revealed a large negative relationship between self-compassion and stress, $N = 7140$, $r(35) = -.55$, $p < .001$, 95% CI [-.60, -.50]. *Q* was significant, $Q(36) = 285.12$, $p < .001$, and I^2 was high, $I^2 = 87.37\%$, indicating planned moderator analyses were warranted to probe the source of heterogeneity. The forest plot for the random effects meta-analysis can be seen in Figure 2.

	Correlation	Lower limit	Upper limit	Z-Value	p-Value
Breines, McInnis, Kuras, & Thoma (2015)	-0.460	-0.694	-0.139	-2.724	0.006
Breines, Thoma, Gianferante, Hanlin, Chen, & Rohleder (2013)	-0.400	-0.630	-0.105	-2.612	0.009
Brito-Pons, Campos, & Cebolla	-0.445	-0.644	-0.190	-3.280	0.001
Costa & Pinto-Gouveia (2011)	-0.588	-0.702	-0.445	-6.746	0.000
Eriksson, Germundsjo, Astrom, & Ronnlund (2018)	-0.610	-0.720	-0.471	-7.018	0.000
Finlay-Jones, Rees, & Kane (2015)	-0.550	-0.640	-0.445	-8.635	0.000
Fong & Loi (2016)	-0.740	-0.787	-0.685	-16.545	0.000
Gilbert, McEwan, Matos, & Rivis (2011) A	-0.290	-0.406	-0.165	-4.418	0.000
Gilbert, McEwan, Matos, & Rivis (2011) B	-0.170	-0.408	0.090	-1.285	0.199
Ghorbani, Pourhosein, & Ghobadi (2018).	-0.390	-0.536	-0.222	-4.339	0.000
Herriot, Wrosch, & Gouin (2018)	-0.140	-0.264	-0.012	-2.137	0.033
Homan & Sirois (2017)	-0.800	-0.848	-0.740	-14.450	0.000
Hu, Wang, Sun, Arteta-Garcia, & Purol (2018)	-0.590	-0.715	-0.429	-6.061	0.000
Kemper, Mo & Khayat (2015)	-0.550	-0.637	-0.449	-8.961	0.000
Ko, Grace, Chavez, Grimley, Dalrymple, & Olson (2018)	-0.700	-0.829	-0.500	-5.346	0.000
Lopez et al. (2015)	-0.530	-0.564	-0.494	-23.899	0.000
Luo, Qiao, & Che (2018)	-0.480	-0.704	-0.169	-2.912	0.004
Neff et al. (2018)	-0.650	-0.725	-0.560	-10.659	0.000
Pinto-Gouveia, Duarte, Matos, & Fraguas (2013) A	-0.030	-0.261	0.205	-0.247	0.805
Pinto-Gouveia, Duarte, Matos, & Fraguas (2013) B	-0.460	-0.629	-0.249	-4.009	0.000
Pinto-Gouveia, Duarte, Matos, & Fraguas (2013) C	-0.580	-0.724	-0.388	-5.131	0.000
Pires et al. (2018)	-0.625	-0.775	-0.409	-4.808	0.000
Przezdziecki & Sherman (2016)	-0.526	-0.636	-0.395	-6.867	0.000
Robinson, Hastings, Weiss, Pagavathsing, & Lunsky (2017)	-0.380	-0.585	-0.130	-2.912	0.004
Sirois & Hirsch (2019) A	-0.583	-0.651	-0.506	-11.857	0.000
Sirois & Hirsch (2019) B	-0.601	-0.694	-0.489	-8.480	0.000
Sirois & Hirsch (2019) C	-0.628	-0.760	-0.447	-5.621	0.000
Sirois & Hirsch (2019) D	-0.625	-0.764	-0.431	-5.287	0.000
Sirois & Hirsch (2019) E	-0.668	-0.756	-0.556	-8.805	0.000
Sirois (2014) A	-0.630	-0.719	-0.520	-8.835	0.000
Sirois (2014) B	-0.630	-0.690	-0.561	-13.590	0.000
Sirois (2014) C	-0.580	-0.667	-0.477	-9.059	0.000
Sirois (2014) D	-0.600	-0.716	-0.452	-6.612	0.000
Sirois, Molnar, & Hirsch (2015) A	-0.560	-0.655	-0.447	-8.178	0.000
Sirois, Molnar, & Hirsch (2015) B	-0.560	-0.659	-0.441	-7.802	0.000
Svendsen, Osnes, Binder, & Dundas (2016)	-0.310	-0.535	-0.043	-2.267	0.023
Yu et al. (2019)	-0.710	-0.739	-0.678	-27.985	0.000
	-0.547	-0.595	-0.495	-16.763	0.000

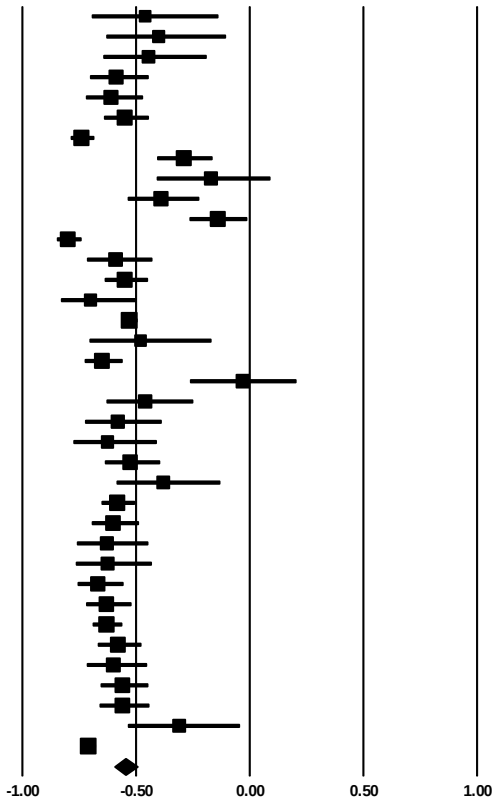

Figure 2. Forest plot illustrating the effect sizes, confidence intervals, and weightings of included studies.

Visual inspection of the funnel plot seen in Figure 3 indicated near symmetry of the distribution of study effect sizes around the pooled average effect size, as confirmed by Egger's regression, $t(35) = 1.37$, $p = 0.18$. There were 10 studies falling outside of the area of the funnel, where standard error is high. The Fail-safe *N* indicated 20,428 studies with a null finding would be needed to make the pooled average effect size statistically insignificant, far higher than the calculated threshold of 195 studies (Rosenthal, 1979). The risk of publication bias was therefore deemed low.

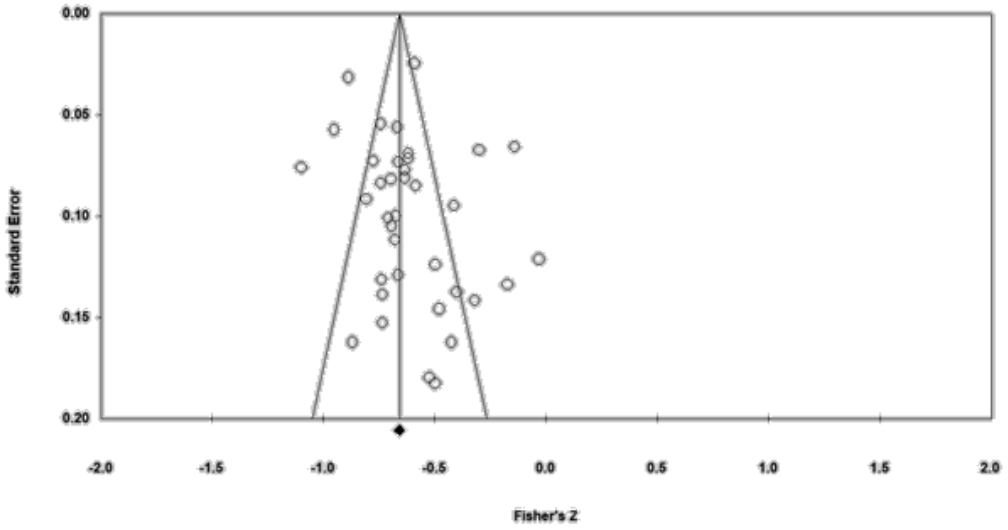

Figure 3. Funnel plot illustrating the distribution of effect sizes of included studies around the pooled average effect size.

Moderator Analyses

Subgroup random effects meta-analyses were conducted for the hypothesised moderators of stress measure type and sample type. The results of these meta-analyses are summarised in Table 2.

Table 2.

Results of subgroup random effects meta-analyses for categorical moderators

Moderator	*k*	*n*	*r*	95% CI	*Q*	I^2
Sample type	37	7140	-.56*	[-.60, -.52]	285.12*	87.37
Clinical	13	2463	-.59*	[-.64, -.53]	41.59*	71.15
Non-clinical	24	4677	-.52*	[-.59, -.45]	212.94*	89.20
Measure type	37	7140	-.54*	[-.59, -.50]	285.12*	87.37
Physiological	5	394	-.32*	[-.47, -.16]	8.27	51.66
Perceived	32	6746	-.57*	[-.62, -.52]	210.70*	85.29

Note. * $p < .001$

The pooled average effect sizes of the subgroup random effects meta-analyses showed there is no significant difference in the relationship between self-compassion and stress by sample type, $Q(1) = 2.01$, $p = .16$. A large negative relationship between self-compassion and stress was observed in both clinical and non-clinical samples.

The pooled average effect sizes of the subgroup random effects meta-analyses showed there is a significant difference in the relationship between self-compassion and stress by stress measure type, $Q(1) = 10.91$, $p = .001$. A medium negative relationship was observed between self-compassion and physiological stress, and a large negative relationship was observed between self-compassion and self-reported perceived stress.

Meta-regressions were conducted to assess the hypothesised moderating effects of the continuous variables of participant gender (% female) and participant age (M_{age}).

The meta-regression with (% female) showed that participant gender does not moderate the relationship between self-compassion and stress, $\beta = -0.00$, 95% CI [-0.01, 0.00], $p = .67$, $Q(1) = 0.16$, $p = 0.69$. Q remained significant, $Q(35) = 280.10$, $p < .001$, and I^2 remained high, 87.50%.

The meta-regression with age (M_{age}) showed that participant age does not moderate the relationship between self-compassion and stress, $\beta = 0.00$, 95% CI [-0.00, 0.01], $p = .28$. Q (1) = 1.15, $p = 0.28$. Q remained significant, $Q(35) = 273.72$, $p < .001$, and I^2 remained high, 87.21%.

Discussion

This was the first meta-analysis to examine the relationship between self-compassion and stress, and assess the impact of different moderators on this relationship. A random effects meta-analysis was conducted on 37 effects sizes from 26 studies that met the criteria for inclusion. The studies were generally of high quality, and the risk of publication bias was deemed low. The random effects meta-analysis revealed a large negative relationship between self-compassion and stress. As heterogeneity was high, planned moderator analyses were conducted, indicating stress measure type moderates the relationship between self-compassion and stress, as was hypothesised. The relationship between self-compassion and physiological stress was found to be medium and negative. The relationship between self-compassion and self-reported perceived stress was found to be large and negative. Sample type, participant gender, and participant age were found not to moderate the relationship between self-compassion and stress, as had been hypothesised. Heterogeneity remained significant and moderate to high following the planned moderator analyses, indicating factors other than stress measure type influence the magnitude of the relationship between self-compassion and stress.

The continued variability between study effect sizes observed following the subgroup random effects meta-analyses by stress measure type is likely in part explained by differences within the physiological and self-report measures used. The studies utilising physiological measures of stress used four different measures, measuring hormones and proteins in blood (interleukin 6 [IL6], urine (diurnal cortisol), and saliva (saliva alpha amylase [SAA]), and changes in heart rate (heart rate variability [HRV]). The studies utilising self-report measures of stress used five different measures, the Perceived Stress Scale (PSS; Cohen et al., 1983) and its 14-item, 10-item, and 4-item versions, and the stress subscale of the Depression, Anxiety, and Stress Scale (DASS; Lovibond & Lovibond, 1994), and its 42-item and 21-item versions. Variability between

study effect sizes was higher in studies using self-report measures of perceived stress. Further post-hoc subgroup random effects meta-analyses were not conducted to assess whether measure used was a moderator of the relationship between self-compassion and stress, as there was an insufficient number of study effect sizes within studies using physiological measures of stress, and studies using the self-report PSS4, PSS14, and DASS42, to enable this (Higgins et al., 2003).

The relationship between self-compassion and physiological stress was found to be medium and negative. The relationship between self-compassion and self-reported perceived stress was found to be large and negative. Physiological stress and self-reported perceived stress are related but different constructs (Epel et al., 2018), so the finding that stress measure type influences the magnitude of the relationship between self-compassion and stress was not unexpected. Physiological measures of stress correlate weakly with self-report measures of perceived stress as physiological and psychological reactivity to stress differ, and the two types of stress are measured in different ways (Epel et al., 2018). Physiological stress tends to be measured in response to a demand that is either currently present or experimentally-induced (Lupien, 2007), whereas self-reported perceived stress tends to be measured via a person's retrospective ratings of the daily, event-based, and chronic demands occurring in their life over a given time period (Cohen et al., 1983; Lupien, 2007). Consequently, physiological and self-reported perceived stress measurements are likely to differ, even when measured concurrently.

The psychological perception of stress balances a person's appraisal of the daily, event-based, and chronic demands in their life, with their perception of their ability to cope with them (Cohen et al., 1983). Self-compassion promotes adaptive coping, in part through its influences on these perceptions (Allen & Leary, 2010). Self-compassion likely reduces stress as it protects against self-criticism, feelings of isolation and defectiveness, and over-identification with thoughts and feelings (Neff, 2003; Neff & Dahm, 2015).

These factors are likely to increase the perceived novelty, pressure, unpredictability, and uncontrollability of demands, increase rumination and worry regarding demands, and reduce a person's perceptions that they are capable of coping with demands, and that they are not alone in their difficulties (Allen & Leary, 2010; Terry & Leary, 2010). Self-compassion may be more beneficial in reducing self-reported perceived stress than in reducing physiological stress because of this, although a person's physiological stress reactivity is also shaped by such psychological processes (Moberg, 1999).

The magnitude of the relationship between self-compassion and stress was found not to be influenced by sample type, as had been hypothesised, despite clinical populations being more likely to experience increased stress when compared to non-clinical populations (Terry & Leary, 2011). Interventions cultivating self-compassion are therefore likely to be just as effective in clinical populations, as they might be in non-clinical populations.

The magnitude of the relationship between self-compassion and stress was found not to be influenced by participant gender and age, as had been hypothesised. This was an unexpected finding considering previous research has demonstrated gender and age-related differences in both self-compassion and stress (Bale & Epperson, 2015; Neff & Vonk, 2009; Yarnell et al., 2015). The included studies assessed the relationship between self-compassion and stress in adults, and only one study recruited an older adult sample (Herriot et al., 2018). Gender and age-related differences in self-compassion and stress may be more prominent in childhood and adolescence, when self-compassion is in part developed (Neff & Dahm 2015), and physiological and psychological stress reactivity is high (Bale & Epperson, 2015).

The included studies were generally of high quality, and publication bias was deemed low, although there were 10 studies with high standard error, and two studies reporting three effect sizes which were rated as poor quality, as they scored ≤ 50% in the

quality appraisal (Ghorbani et al., 2018; Gilbert et al., 2011). Determining study quality via a total percentage score is questionable, as not all ratings regarding what a study includes and considers are of equal importance (Da Costa et al., 2011). Such scores should therefore be interpreted with caution, although quality appraisal is a crucial element of any systematic review or meta-analysis, and scores can offer a crude indication of included studies' quality (Protogerou & Hagger, 2018). The two studies deemed to be of poor quality were not excluded from the meta-analysis as the items which were missing from the studies were not fundamental to the appropriateness of the studies' methodologies, and therefore the quality of the research (Da Costa et al., 2011).

A noteworthy and unusual finding came from Pinto-Gouveia et al.'s (2013) study. The study investigated the relationship between self-compassion and stress in two clinical and one non-clinical samples, the only study to contrast sample types, and found no relationship between self-compassion and self-reported perceived stress in the non-clinical sample (Pinto-Gouveia et al., 2013). The study was of good quality, but this finding is of some concern considering the magnitude of the pooled average effect size of the relationship between self-compassion and self-reported perceived stress, and the finding that sample type does not moderate the relationship between self-compassion and stress. Another study warranting further discussion is Luo et al.'s (2018) study, in which they assessed the relationship between self-compassion and physiological stress (via HRV) only in participants scoring in the lowest and highest 27% on the SCS from their original sample, potentially biasing their findings.

Limitations

The findings of the meta-analysis must be interpreted with consideration to a number of limitations.

Only published studies were included in the meta-analysis increasing the likelihood of publication bias. Studies with non-significant results are more likely to be

left unpublished, leading to the "file-drawer problem" (Rosenthal, 1979). However, as the funnel plot was symmetrical, as confirmed by Egger's regression, and the Fail-safe *N* far exceeded the calculated threshold, the likelihood of publication bias was deemed low. Seven of the 13 effect sizes regarding the relationship between self-compassion and stress in clinical samples came from two studies with the same first author (Siriois et al., 2015; Sirois & Hirsch, 2019). This too could be concerning, as publication bias is more likely when multiple studies by the same authors are included in a meta-analysis (Borenstein et al., 2013), but this was not found. This scenario is likely reflective of the fact that research into self-compassion in a physical health context is in its relative infancy.

Only English language studies were included in the meta-analysis. It would be interesting to see whether studies not written in English have reported similar effect sizes regarding the relationship between self-compassion and stress, given the potential influence of participant culture on self-compassion (Yu et al., 2019). As self-compassion is derived from Buddhism, people from countries where Buddhism is prevalent may be more likely to develop self-compassion, either through Buddhist practice, or due to a greater familiarity with Buddhist teachings. This possibility was highlighted as a potential in several of the included studies, although Yu et al. (2019) added research into cultural differences in self-compassion has shown mixed results, with some research indicating that "Asian people tend to be more self-critical", although this may refer to people from countries where Buddhism is not a dominant religion. The significant moderate to high variability between study effect sizes indicates factors other than stress measure type influence the magnitude of the relationship between self-compassion and stress. It would have been beneficial to assess whether participant culture moderates the relationship between self-compassion and stress. There was an insufficient number of study effect sizes to warrant a further subgroup random effects meta-analysis to assess this (Higgins et

al., 2003), as only three of the included studies recruited solely Asian participants (Ghorbani et al., 2018; Luo et al., 2018; Yu et al., 2019).

As only five studies assessed the relationship between self-compassion and physiological stress, it may be premature to assert the magnitude of this relationship, particularly as the included studies used four different measures of physiological stress to assess this relationship.

Clinical implications

People who are high in trait self-compassion are likely to experience reduced levels of both physiological and psychologically perceived stress. Chronic stress is associated with a range of poor health outcomes (Epel et al., 2018), which self-compassion may protect against (Allen & Leary, 2010; Terry & Leary, 2011). As state self-compassion can be cultivated, perhaps even impacting on trait self-compassion (Neff & Dahm, 2015), this provides an exciting clinical opportunity. Interventions aimed at increasing self-compassion, if effective in this, are likely to have a beneficial effect in reducing stress, particularly self-reported perceived stress. Neff's (2003) three component model offers a framework for such interventions. By fostering self-kindness, mindfulness, and the recognition that suffering and inadequacy are an inevitable and shared aspect of the human condition, self-compassion interventions can reduce self-criticism, feelings of isolation and defectiveness, and over-identification with thoughts and feelings (Allen & Leary, 2010; Neff, 2003). Consequently, situations which are appraised as demanding are likely to be perceived as challenging but conquerable, rather than stressful and insurmountable, with self-compassionate people more likely to perceive themselves as supported and capable of coping, and less likely to ruminate and worry, which can lead to maladaptive coping and distress (Allen & Leary, 2011; Epel et al., 2018).

Compassion-based interventions have gained increased popularity in the last decade, with a 2017 review reporting the results of studies evaluating the efficacy of eight

different compassion-based interventions (Kirby, 2017). Interventions cultivating self-compassion could be of particular benefit in populations where self-compassion might be low, where stress might be high, and where adaptive coping is crucial, such as in the context of physical health (Sirois & Rowse, 2016; Terry & Leary, 2011). In certain chronic illness populations, particularly in auto-immune conditions, stress can trigger, exacerbate, and maintain conditions (Sirois & Rowse, 2016). Self-compassion interventions have the potential to not only reduce stress in this context, but to impact on conditions' course. It is not surprising that there is much research interest regarding the benefits of self-compassion, and potential role of self-compassion interventions in the context of physical health (Sirois & Rowse, 2016; Terry & Leary, 2011). The finding that sample type does not moderate the relationship between self-compassion and stress suggests that self-compassion interventions are likely to be just as effect at reducing stress in clinical populations as in non-clinical populations.

Directions for future research

More research is needed to assess the relationship between self-compassion and physiological stress, as there is currently a limited number of studies utilising physiological measures of stress to assess this relationship, and high variability in measures used. Researchers should seek to use the most reliable measures of physiological and self-reported perceived stress, with consideration to what is most appropriate to the research question (Epel et al., 2018). The consistent use of measures may be beneficial in reducing heterogeneity between study effect sizes, increasing the reliability and comparability of findings.

The majority of research investigating the relationship between self-compassion and stress is cross-sectional. With the negative relationship between self-compassion and stress, and particularly self-reported perceived stress now well established, future research should seek to investigate the efficacy of self-compassion interventions in reducing stress

in both clinical and non-clinical populations, and assess the longitudinal impact of self-compassion and self-compassion interventions.

Conclusion

This was the first meta-analysis to examine the relationship between self-compassion and stress in adults, and assess the impact of different moderators on this relationship. The meta-analysis found a large negative relationship between self-compassion and stress in adults. Planned moderator analyses showed sample type, participant gender, and participant age do not influence the magnitude of this relationship, but stress measure type does. There is a medium negative relationship between self-compassion and physiological stress in adults. This finding should be interpreted with caution as only five studies using physiological measures of stress were meta-analysed. There is a large negative relationship between self-compassion and self-reported perceived stress in adults. With this relationship well established at a cross-sectional level, more longitudinal and experimental research into self-compassion and stress is needed.

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Appendix A

Quality appraisal checklist

Removed from ethesis

Appendix B

Quality appraisal ratings

Author/s	1	2	3	4	5	6	7	8	9	10	11	12	Score
Breines, McInnis, Kuras, & Thoma (2015)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	100%
Breines et al., (2013)	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	92%
Brito, Campos, & Cebolla (2018)	N	Y	N	Y	Y	Y	N	Y	Y	Y	Y	Y	75%
Costa & Pinto-Gouveia (2011)	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	N	Y	83%
Eriksson, Germundsjo, Astrom, & Ronnlund (2018)	Y	Y	N	Y	Y	Y	N	Y	Y	Y	Y	Y	83%
Finlay-Jones, Rees, & Kane (2015)	Y	Y	N	Y	Y	Y	N	Y	N	Y	Y	Y	75%
Fong & Loi (2016)	Y	Y	N	U	Y	Y	Y	Y	N	Y	N	Y	67%
Ghorbhani, Pouhosein, & Ghobadi (2018)	N	Y	U	U	N	Y	Y	U	N	Y	N	Y	42%
Gilbert, McEwan, Matos, & Rivis (2011)	N	Y	Y	U	Y	Y	N	Y	N	Y	N	N	50%
Herriot, Wrosch, & Gouin (2018)	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	92%
Homan & Sirois (2017)	Y	Y	N	Y	Y	Y	N	Y	Y	Y	Y	Y	83%
Hu, Wang, Sun, Arteta-Garcia, & Purol (2018)	N	Y	N	Y	Y	Y	N	Y	Y	Y	Y	Y	75%
Kemper, Mo & Khayat (2015)	Y	Y	Y	Y	Y	Y	N	Y	N	Y	Y	Y	83%
Ko et al., (2018)	Y	Y	Y	Y	Y	Y	N	Y	N	Y	Y	Y	83%
Lopez et al. (2015)	N	Y	N	Y	Y	Y	N	Y	Y	Y	Y	Y	75%
Luo, Qiao, & Che (2018)	N	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	83%
Neff et al. (2018)	Y	Y	N	Y	Y	Y	N	Y	Y	Y	Y	Y	83%
Pinto-Gouveia, Duarte, Matos, & Fraguas (2013)	Y	Y	Y	Y	Y	Y	N	Y	N	Y	N	Y	75%
Pires et al. (2018)	Y	Y	N	Y	Y	Y	N	Y	Y	Y	Y	Y	83%
Przezdziecki & Sherman (2016)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	100%
Robinson, Hastings, Weiss, Pagavathsing, & Lunsky (2017)	N	Y	N	Y	Y	Y	N	Y	N	Y	Y	Y	67%
Sirois (2014)	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	N	Y	83%
Sirois & Hirsch (2019)	Y	Y	Y	Y	Y	Y	N	Y	N	Y	Y	Y	83%
Sirois, Molnar, & Hirsch (2015)	Y	Y	N	Y	Y	Y	N	Y	N	Y	Y	Y	75%
Svendsen, Osnes, Binder, & Dundas (2016)	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	92%
Yu et al. (2019)	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	92%

Section two: Research report

The role of self-compassion in psoriasis, stress, and treatment adherence

Abstract

Objectives

Self-compassion is associated with reduced stress and increased treatment adherence in the context of physical health. This study investigated how self-compassion relates to perceived stress, treatment adherence, psoriasis severity, and itch severity, in people with psoriasis, before investigating the immediate and longitudinal effects of a brief online self-compassionate writing intervention.

Design

The study used a between-subjects experimental design, with a longitudinal four-week follow-up.

Methods

Participants (N = 317, M_{age} = 38.25 years, 73.82% female) completed measures of self-compassion, perceived stress, treatment adherence, psoriasis severity, and itch severity, before being randomly allocated to an intervention or active control group. Participants in the intervention group completed a brief online self-compassionate writing intervention. Participants completed manipulation checks before and after the intervention and active control condition. Participants (N = 207, M_{age} = 37.64 years, 71.91% female) completed measures again at follow-up testing.

Results

Self-compassion negatively correlated with perceived stress, psoriasis severity, and itch severity, and positively correlated with treatment adherence. Perceived stress partially mediated the relationship between self-compassion and itch severity. A significant increase in state self-compassion could be attributed to the effects of the intervention. There was no effect of the intervention on follow-up primary measure scores

Conclusions

This study demonstrates the benefits of self-compassion in the context of psoriasis, adding to the evidence that self-compassion is associated with reduced stress and increased treatment adherence in the context of physical health. The study additionally demonstrates that a brief online self-compassionate writing intervention can cultivate state self-compassion in this context.

Practitioner points

- Self-compassion is beneficial in the context of psoriasis, relating to reduced perceived stress, and increased treatment adherence.
- Self-compassion additionally relates to reduced psoriasis severity and itch severity, which in the case of itch severity can in part be explained by its effects in reducing stress, which is known to increase itch severity.
- A brief online self-compassionate writing intervention resulted in a significant increase in state self-compassion in participants with psoriasis, although no lasting effects of this were seen at a four-week follow-up.
- Further research is needed to assess the efficacy of self-compassion interventions in reducing stress, and increasing adaptive health behaviours in the context of physical health.

Limitations

- The study used a self-selecting sample of participants, and relied on self-report measures, introducing potential biases.
- The impacts of distress and shame, both of which can be high in people with psoriasis, was not assessed in the study, and may be barriers to the efficacy of self-compassion interventions in this context.

Introduction

Psoriasis is a chronic, incurable skin condition that is associated with stress and maladaptive health behaviours (Psoriasis Association, 2017; Kouris, Platsidaki, Kouskoukis, & Christodoulou, 2017). Self-compassion relates to reduced stress (Costa & Pinto-Gouveia, 2011; Pinto-Gouveia, Duarte, Matos, & Fraguas, 2013; Sirois et al., 2015; Sirois & Hirsch, 2019), and adaptive health behaviours in the context of physical health (Sirois et al., 2015; Sirois & Hirsch, 2019), and may therefore be beneficial in the context of psoriasis.

Psoriasis and its impact

Psoriasis affects 2 – 3% of the world's population (Psoriasis Association, 2017). The condition is characterised by an abnormal immune response which causes the skin replacement process to speed up, resulting in inflammation and the build-up of reddened, 'scaly' plaques of skin (National Institute for Health and Care Excellence [NICE], 2018). Psoriasis can be mild, covering only a small percentage of the body, to severe, covering a large percentage of the body (Psoriasis Association, 2017). In addition to causing plaques, psoriasis can affect the scalp, nails, and joints, causing psoriatic arthritis, and can present with pustules. There are several sub-types of psoriasis named after these differing presentations (NICE, 2018). Psoriasis can be itchy and painful, with 70% of people with psoriasis reporting itchiness (Reich, Medrek, & Szepietowski, 2016). The condition is associated with an increased risk of cardiometabolic diseases, gastrointestinal diseases, kidney disease, malignancy, and infection (Takeshita et al., 2017).

In addition to its physical impact, psoriasis has a psychological impact (Lamb et al., 2016; Thompson, 2009). Psoriasis is associated with an increased risk of clinically significant levels of anxiety and depression, with around a third of people with the condition reporting psoriasis-related distress (Lamb et al., 2016; Takeshita et al., 2017; Thompson, 2009). People with psoriasis report high levels of stress, shame, social

inhibition, and reduced quality of life (D'Alton et al., 2019; Kouris et al., 2017). This is in part explained by the intrusive and negative reactions from others that those with the condition commonly experience, with people with psoriasis additionally reporting high levels of stigmatization and discrimination (Lamb et al., 2016; Thompson, 2009). The psychological impact of psoriasis is comparable to other chronic illnesses, including cancer and diabetes (Rapp, Feldman, Exum, Fleischer, & Reboussin, 1999), and is acknowledged in the NICE guidelines for psoriasis treatment (NICE, 2017).

Psoriasis and stress

The psychological impact of psoriasis can influence the condition's course. Psoriasis can be triggered and exacerbated by stress (NICE, 2018). Whilst the exact mechanism behind this link is unclear, psoriasis, like other auto-immune conditions, is associated with differences in the hypothalamic-pituitary-adrenal (HPA) axis, and the increased release of pro-inflammatory cytokines, such as interleukin-6, which are markers of physiological stress (Dodoo-Schittko, 2018). A recent meta-analysis has critiqued this supposed link, as research linking psoriasis and stress is primarily retrospective, and utilises self-report measures of perceived stress (Snast et al., 2018). Yet another recent systematic review concluded perceived stress is associated with the onset, severity, and recurrence of the condition (Stewart, Tong, & Whitfield, 2018). Both studies discussed the need for further research into this likely relationship (Snast et al., 2018; Stewart et al., 2018).

Maladaptive health behaviours such as poor diet, excessive alcohol consumption, and smoking, are common in people with psoriasis, and exacerbate stress and inflammation, and consequently psoriasis symptoms (Kouris et al., 2017; NICE, 2017). This vicious cycle is frequently referred to in the literature, with research demonstrating bidirectional correlations between stress and psoriasis severity (Kouris et al., 2017; Thompson, 2009), and stress and itch severity (Reich et al., 2016).

Psoriasis treatments

Another maladaptive health behaviour that is associated with stress is poor treatment adherence (Kouris et al., 2017). Utilising topical, ultraviolet (UV), systemic, and biologic medications, the treatment of psoriasis can be unpleasant, time-consuming, expensive, and cause considerable side-effects (Thompson, 2009). Topical medications for psoriasis include steroid creams, which are associated with a "rebound effect", and with prolonged use cause the skin to thin (NICE, 2018). UV treatment for psoriasis involves attendance to a dermatology clinic up to three times a week, and with repeated use is associated with an increased risk of skin cancer (NICE, 2018). Systemic and more targeted biologic treatments for psoriasis include Methotrexate, an immunosuppressant medication commonly used in chemotherapy, which like other systemic medications has side effects such as gastrointestinal problems and headaches, and when prescribed requires patients to undergo regular blood tests to monitor potentially compromised kidney and liver function (NICE, 2018). The treatment burden associated with psoriasis can result in poor treatment adherence (Augustin, Holland, Dartsch, Langenbruch, & Radtke, 2011). Poor treatment adherence can be exacerbated by stress, resulting in another vicious cycle of worsening symptoms caused by non-adherence, and consequently, increased stress and distress (Kouris et al., 2017).

Due to psoriasis' associations with increased stress and distress, researchers have investigated the potentially beneficial effects of psychological interventions for people with psoriasis, although access to psychological interventions in practice is limited (Eedy et al., 2009). A recent systematic review concluded that whilst psychological interventions have shown promise in the context of psoriasis, more research is needed to determine their efficacy, and to assess the practical and financial feasibility of implementing psychological interventions in practice (Qureshi, Awosika, Baruffi, Rengifo-Pardo, & Ehrlich, 2019).

Self-compassion and physical health

Self-compassion is a positive way of relating to oneself that can be defined by three elements: self-kindness (relating to the self with warmth and understanding, rather than frustration and criticism in times of difficulty), common humanity (recognising that suffering and inadequacy are an inevitable and shared aspect of the human condition), and mindfulness (attending to the present moment, without judgement) (Neff, 2003). Consequently, self-compassion protects against self-criticism, feelings of isolation and defectiveness, and over-identification with thoughts and feelings, reducing stress, and increasing adaptive coping (Allen & Leary, 2010; Neff, 2003).

For people who are highly self-critical self-compassion can be challenging, and even anxiety-provoking. It is thought that this can be explained by the under-development of the brain's affiliative system, which is developed through the experience of nurturing early attachments (Gilbert, 2010). For people who have experienced critical, neglectful, and/or abusive parenting, self-compassion can feel unfamiliar and undeserved (Gilbert, 2010). Self-compassion efficacy refers to a person's judgement of their ability to be self-compassionate, and is important to consider when conducting research into self-compassion.

Self-compassion has been shown to relate to reduced stress (Costa & Pinto-Gouveia, 2011; Pinto-Gouveia et al., 2013; Sirois et al., 2015; Sirois & Hirsch, 2019), and adaptive coping (Sirois et al., 2015), including treatment adherence (Sirois & Hirsch, 2019; Terry & Leary, 2011) in the context of physical health. This has been reported in a variety of chronic conditions, including those where stress and inflammation is a factor in the condition's course such as arthritis, inflammatory bowel disease, fibromyalgia, and chronic fatigue syndrome (Sirois et al., 2015; Sirois & Hirsch; 2019). Self-compassion may therefore be of benefit in the context of psoriasis.

Previous research has demonstrated self-compassion to have a positive effect on physical health through reduced perceived stress, and increased health promoting behaviours (Dunne et al., 2016; Homan & Sirois, 2017). Self-compassion has the potential to interrupt the vicious cycles associated with psoriasis, reducing stress which can trigger and exacerbate symptoms, and increase non-adherence to treatment (Kouris et al., 2017; NICE, 2018), and increasing adaptive health behaviours, including treatment adherence, which in people with psoriasis can be poor (Augustin et al., 2011).

Whilst self-compassion is a trait, it can be cultivated as a state (Neff & Dahm 2015). Previous research utilising a self-compassionate writing intervention has demonstrated the successful cultivation of state self-compassion in a physical health context, in survivors of breast cancer (Przezdziecki & Sherman, 2016). Previous research has also demonstrated the immediate and lasting benefits of online self-compassion interventions in increasing self-compassion, and reducing stress in non-clinical samples (Erikkson, Germundsjo, Astrom, & Ronnlund, 2018; Finlay-Jones, Kane, & Rees, 2017). Online psychological interventions offer a potential solution to the practical and financial concerns associated with implementing psychological interventions for psoriasis in practice (Qureshi et al., 2019). They can be accessed outside of a medical setting, can be flexibly administered, and are highly cost-effective (Finlay-Jones et al., 2017).

There is currently no research into the relationships between self-compassion, stress, treatment adherence, and psoriasis severity and itch severity. Nor is there research into the potentially beneficial effects of a brief online self-compassionate writing intervention for those with psoriasis. This study sought to address these gaps in the literature.

Aims

Firstly, the study sought to investigate how self-compassion relates to perceived stress, treatment adherence, psoriasis severity, and itch severity, and investigate whether

the relationships between self-compassion and psoriasis severity and itch severity are partially mediated by perceived stress and/or treatment adherence.

Secondly, the study sought to investigate the efficacy of a brief online self-compassionate writing intervention in increasing state self-compassion, self-compassion efficacy, and motivation to adhere to treatment, and investigate whether at a four-week follow-up, any changes in perceived stress, treatment adherence, psoriasis severity, and itch severity could be attributed to the effects of the brief online self-compassionate writing intervention.

Hypotheses

Hypothesis one

Self-compassion would be negatively associated with perceived stress, psoriasis severity, and itch severity, and positively associated with treatment adherence.

Hypothesis two

Perceived stress and treatment adherence would explain a link between self-compassion and psoriasis severity and itch severity (see Figure 1).

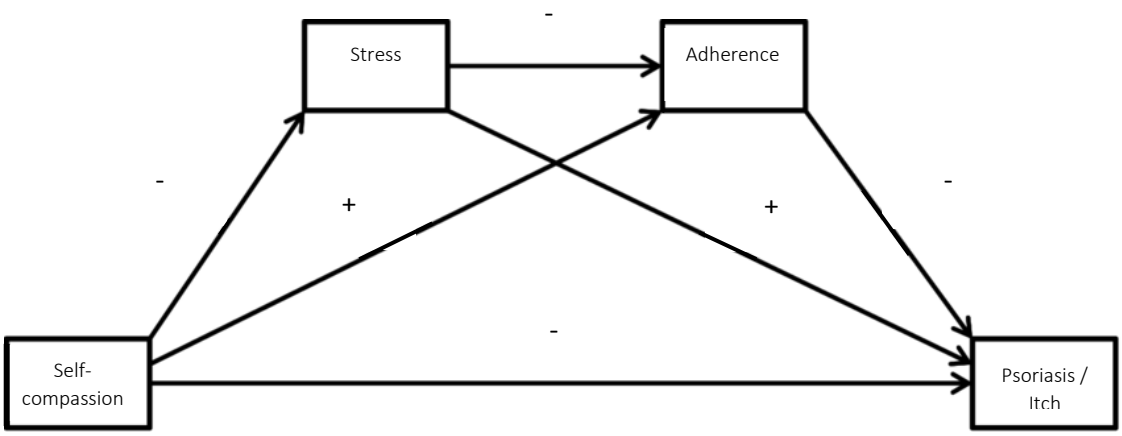

Figure 1. Conceptual diagram of proposed serial mediation models linking self-compassion and psoriasis severity and itch severity through perceived stress and treatment adherence.

Hypothesis three

The brief online self-compassionate writing intervention would cultivate state self-compassion, self-compassion efficacy, and motivation to adhere to treatment, resulting in significant between-group differences on these measures post-intervention.

Tentative hypotheses

Hypothesis four

Participants in the intervention group would report a reduction in perceived stress, psoriasis severity, and itch severity, and an increase in self-compassion and treatment adherence at follow-up testing, resulting in significant between-group differences on these measures at follow-up.

Hypothesis five

Group would moderate associations between perceived stress and treatment adherence at time one, and psoriasis severity and itch severity at follow-up testing. The association between time one perceived stress and follow-up psoriasis severity and itch severity would be weaker for those in the intervention group. The association between time one treatment adherence and follow-up psoriasis severity and itch severity would be stronger for those in the intervention group.

Method

Participants

Participants were recruited from a dermatology clinic at a hospital in the north of England, and online via social media between July 2018 and April 2019. Participants were eligible to take part in the study if they had any form of psoriasis, were aged 18 years old or older, and were proficient in reading and writing in English.

Power analysis

Cohen's (1992) table was used to calculate the sample size needed to ensure the study analyses were adequately powered. To enable mediator analyses at time one with a

medium effect size, a sample of 91 participants was needed. To enable moderator analyses at follow-up testing with a medium effect size, a sample of 168 participants (84 per group) was needed. To account for a 50% attrition rate between time one and follow-up testing, as has previously been seen by the study's supervisors, the study sought to recruit 252 participants.

Design

The study used a between-subjects experimental design, with a longitudinal four-week follow-up.

Measures

Demographics

Participants were asked to report their gender, age, ethnicity, education status, and employment status.

Primary measures

Self-Compassion Scale – Short Form (see Appendix A)

The Self-Compassion Scale – Short Form (SCS-SF; Raes, Pommier, Neff, & Van Gucht, 2011) is a 12-item scale which measures self-reported self-compassion (self-kindness vs. self-criticism, common humanity vs. isolation, and mindfulness vs. over-identification) using a 5-point Likert-type scale with response options ranging from 1 (almost never) to 5 (almost always). From this, a mean self-compassion score is derived where a higher score indicates higher self-compassion. The SCS-SF has a near perfect correlation with the original 26-item SCS ($r \geq 0.97$), and has demonstrated good reliability ($\alpha = 0.86$). In the present study $\alpha = .87$ at time one.

Perceived Stress Scale (see Appendix B)

The 10-item version of the Perceived Stress Scale (PSS10; Cohen, Kamarck, & Mermelstein, 1983) measures self-reported perceived stress (the degree to which situations in one's life are perceived as stressful due to their appraisal as demanding)

experienced in the last month, using a 5-point Likert-type scale with response options ranging from 0 (never) to 4 (always). From this, a sum perceived stress score is derived where a higher score indicates higher perceived stress. The PSS10 has demonstrated acceptable reliability (α = 0.78). In the present study α = .89 at time one.

Medical Outcomes Study – General Adherence Items (see Appendix C)

The Medical Outcomes Study – General Adherence Items (MOSGA; Sherbourne, Hays, Ordway, DiMatteo, & Kravitz, 1992) is a 5-item scale which measures self-reported treatment adherence (the tendency to adhere to medical recommendations) in the last four weeks, using a 6-point Likert-type scale with response options ranging from 1 (none of the time) to 6 (all of the time). From this, a mean treatment adherence score is derived where a higher score indicates higher treatment adherence. The MOSGA has demonstrated good reliability (α = 0.81). In the present study α = .71 at time one.

The Self-assessed Simplified Psoriasis Index (see Appendix D)

The Self-assessed Simplified Psoriasis Index (SASPI; Chularojanamontri, Griffiths, & Chalmers, 2013) is a self-reported measure of psoriasis severity and impact, and past history and interventions. The subscales of the SASPI have demonstrated acceptable reliability (all α's > .75). In the present study the psoriasis severity subscale was used, which sums average severity ratings for 10 areas of the body before multiplying this score with an overall state rating to give a psoriasis severity score. In the present study the subscale showed acceptable reliability, α = .76 at time one.

Itch severity (Itch; see Appendix E)

Stander et al. (2013) recommend itch severity is measured via a visual analogue scale measuring self-reported itch severity from 0 (no itch) to 10 (worst imaginable itch) in clinical research.

Manipulation checks

State Self-Compassion (State SC; see Appendix F)

State self-compassion was measured via a five-item 7-point Likert-type scale with response options ranging from 1 (not at all) to 7 (extremely/very much). From this, a state self-compassion score was derived where a higher score indicates higher state self-compassion. The scale was adapted from Brienes & Chen's (2012) study by one of the project's supervisors, and has been used in previous research (Sirois, Bogels, & Emerson, 2018). In the present study the scale showed good reliability, $\alpha = .83$ at time one.

Self-Compassion Efficacy (SC efficacy; see Appendix G)

Self-compassion efficacy was measured via a three-item 7-point Likert-type scale with response options ranging from 1 (not at all) to 7 (very). From this, a self-compassion efficacy score was derived where a higher score indicates higher self-compassion efficacy. The scale was designed by one of the project's supervisor's, and has been used in previous research. In the present study the scale showed unacceptable reliability, $\alpha = .43$ at time one.

Motivation to Adhere to Treatment (Motivation to adhere; see Appendix H)

Motivation to adhere to treatment was measured via a four-item 7-point Likert-type scale with response options ranging from 1 to 7. Participants were also asked whether they had adhered to their treatment in the last four weeks. From this, a motivation to adhere to treatment score was derived where a higher score indicates higher motivation to adhere. The scale was designed by one of the project's supervisors, and has been used in previous research. In the present study the scale showed good reliability, $\alpha = .89$ at time one.

Covariate measures

Ease of recall

Participants were asked to recall a time where they experienced distress relating to their psoriasis (see Procedure). Following the recall task, participants were asked to rate how easy it was to recall their distressing experience via a single-item scale from 1 (extremely difficult) to 7 (extremely easy), so that this could be controlled for.

Distress of recall

Participants were asked to rate how distressing the experience was that they recalled via a single-item scale from 1 (not at all distressing) to 10 (extremely distressing), so that this could be controlled for.

Procedure

The study was advertised as investigating individual differences in responses to psoriasis, and their relation to psoriasis-related outcomes and wellbeing. Participants accessed the study by following a hyperlink or scanning a QR code on a poster advertisement (see Appendix I). Poster advertisements were displayed in the participating dermatology clinic, and were posted online via social media platforms by the author and The Psoriasis Association, British Skin Foundation, and Psoriasis and Psoriatic Arthritis Alliance. On following the hyperlink or scanning the QR code, participants were directed to an online information sheet (see Appendix J), and if they chose to proceed to the study, a consent form (see Appendix K). Participants consenting to take part in the study were then directed to the online questionnaire platform Qualtrics (2018), where they were prompted to enter demographic details including their email addresses, to enable the pairing of their time one and follow-up questionnaire responses.

Time one

Participants completed the study's primary measures (SCS-SF, PSS10, MOSGA, SASPI, and Itch) before being randomly allocated by Qualtrics (2018) to either the

intervention or active control group. Participants were blind to this randomization until they were debriefed at the end of the study.

Participants were asked to recall a time when they felt distress relating to their psoriasis (see Appendix L). They were then asked to briefly write about this experience in an open text box. Participants allocated to the intervention group were then directed to a brief self-compassionate writing intervention, consisting of instructions on responding to themselves with self-compassion, tailored to psoriasis-related distress (see Appendix M). The instructions were developed by one of the project's supervisors, based on Breines and Chen's (2012) study, and have since been validated in a study with parent participants, where they were tailored to guilt and shame provoking parental events, with participants allocated to the intervention group reporting increased state self-compassion, and decreased guilt and shame (Sirois et al., 2018). Participants were then invited to write a self-compassionate response regarding their distressing experience in an open text box. Participants allocated to the active control group did not see these instructions, and were instead directed to an active control condition, where they were invited to write some factual details about their distressing experience in an open text box (see Appendix N).

To assess the efficacy of the brief self-compassionate writing intervention, participants completed manipulation checks (state SC, SC efficacy, motivation to adhere) immediately before and after the intervention and active control condition. The order of the manipulation checks' presentation pre- and post-intervention was randomized by Qualtrics (2018) to reduce the impact of carryover effects. Participants were also asked to rate how easy it was to recall their experience, and how distressing the experience was that they recalled, so that these variables could be controlled for.

Following the recall task, participants completed a previously validated mood neutralisation recall task, tailored to psoriasis, where they were asked to recall and write

about a time when they felt positive about their psoriasis in an open text box (Sirois et al., 2018, see Appendix O).

Follow-up

Four weeks after completing time one, participants were invited to follow-up testing via email (see Appendix P). On following the hyperlink contained in the email participants were directed to Qualtrics (2018) where they again completed the study's primary measures (SCS-SF, PSS10, MOSGA, SASPI, and Itch), and selected whether or not they would like to be entered into the study's prize draw for the chance to win a £50 shopping voucher.

Upon submission of their questionnaires participants were directed to an online debrief form (see Appendix Q). This included the instructions from the brief self-compassionate writing intervention, inviting participants who had been allocated to the active control group to complete this intervention should they wish.

Ethical review

The study received ethical approval in May 2018 following its review by the Berkshire Research Ethics Committee and the Health Research Authority (see Appendix R). A subsequent substantial ethics amendment to expand recruitment to online was approved in October 2018 (see Appendix S). The study was given the reference code: 18/SC/0238.

Data analyses

The data was analysed using SPSS10 Statistics 25 (IBM Corp, 2017), and PROCESS v3.3 (Hayes, 2019). Correlation analyses using SPSS were planned to address hypothesis one. Mediation analyses using PROCESS were planned to address hypothesis two. ANCOVA analyses using SPSS were planned to address hypotheses three and four. Moderation analyses using PROCESS were planned to address hypothesis five.

Results

The data was firstly screened. Participants were removed from the dataset where ≤ 80% of any one questionnaire was incomplete. There were 199 participants who were removed from the dataset. The majority of these participants had completed ≤ 5% of the questionnaires at time one. For the primary measures and manipulation checks no data had to be imputed, due to participants being prompted to respond by Qualtrics (2018) when data was missing. For single item measures, missing data could not be imputed. Data was missing for two participants in the active control group on the covariate measures of ease of recall and distress of recall.

There were 317 participants who completed time one of the study. Of these, 155 participants were randomly allocated to the intervention group, and 162 participants were randomly allocated to the active control group. There was a drop-out rate of 34.70% between time one and follow-up testing, less than the 50% that had been anticipated. There were 207 participants who completed follow-up testing. Of these, 104 participants had been in the intervention group, and 103 participants had been in the active control group. The demographic characteristics of the samples can be seen in Tables 1 and 2.

Table 1

Demographic characteristics of participants completing time one (N = 317)

	Time one (*N* = 317)
Gender (%)	
Female	73.82
Male	26.18
Age (Years)	
M (*SD*)	38.25 (12.38)
Range	18 – 84
Ethnicity (%)	
Non-white	7.57
White	87.70
Not reported	4.73
Education (%)	
High school or less	15.14
College/University	60.89
Postgraduate	23.97
Employment (%)	
Full-time	56.78
Part-time	15.14
Disability leave	7.57
Retired	5.36
Student	8.52
Unemployed	6.63

Within-group differences between participants completing time one ($N = 317$) and participants completing time one and follow-up testing ($N = 207$) were checked using Independent *T*-tests and Chi-Square tests. There were no significant differences in participant characteristics within the intervention and active control groups between participants completing time one and participants completing time one and follow-up testing, all p's > .37.

Table 2

Demographic characteristics of participants by group

	Time one (N = 317)		Time one and follow-up (N = 207)	
	Intervention (n = 155)	Control (n = 162)	Intervention (n = 104)	Control (n = 103)
Gender (%)				
Female	73.55	74.07	69.23	74.58
Male	26.55	25.93	30.77	25.42
Age (Years)	38.67	37.84	39.90	35.37
M (*SD*)	(12.69)	(12.11)	(12.78)	(9.97)
Range	18 – 78	18 – 84	19 – 78	18 – 84
Ethnicity (%)				
Non-white	7.10	8.02	4.81	11.86
White	88.39	87.04	91.35	83.05
Not reported	4.51	4.94	3.84	5.09
Education (%)				
High school or less	13.55	16.67	9.62	16.94
College/University	61.94	59.87	64.42	59.33
Postgraduate	24.51	23.46	25.96	23.73
Employment (%)				
Full-time	53.55	59.88	57.69	71.19
Part-time	17.42	12.96	16.35	10.17
Disability leave	7.10	8.02	8.65	3.39
Retired	7.74	3.09	6.73	1.69
Student	8.39	8.64	6.73	5.08
Unemployed	5.80	7.41	3.85	8.48

Hypothesis one: Correlation analyses

Kolmogorov-Smirnov's tests were used to assess normality, indicating non-normal distributions across the primary measures at baseline (all p's < .01). For large samples of $N \geq 100$ the assumption of normality can be falsely rejected due to normality tests being overly conservative (Field, 2009). Indeed, visual inspections of the associated histograms and Q-Q plots indicated approximately normal distributions with no obvious outliers on all baseline measures other than the SASPI, where a positive skew was observed due to few participants reporting their psoriasis to be extremely severe all over their body. As skew and kurtosis statistics were within acceptable limits, parametric correlation analyses were deemed appropriate (Field, 2009).

The results of the correlation analyses are shown in Table 3. There was a large negative correlation between self-compassion and perceived stress. There was a small positive correlation between self-compassion and treatment adherence. There were small negative correlations between self-compassion and psoriasis severity and itch severity.

Table 3

Pearson's correlations between self-compassion and other primary measures at time one (N = 317)

	PSS10	MOSGA	SASPI	Itch
SCS-SF	-.70***	.21***	-.21***	-.15***
PSS10		-.17**	.22***	.23***
MOSGA			-.12*	-.13*
SASPI				.41***

Note. *** $p < .001$, ** $p < .01$, * $p < .05$. SCS-SF = Self-compassion Scale – Short Form, PSS10 = Perceived Stress Questionnaire, MOSGA = Medical Outcomes Study – General Adherence, SASPI = Self-assessed Simplified Psoriasis Index, Itch = Itch severity.

Hypothesis two: Mediation analyses

Conceptual diagrams of the tested serial mediation models are shown in Figure's 2 and 3. Participant gender and age were included as covariates in the analyses. The significance of indirect effects was tested using 5000 bootstrap samples, as recommended by Hayes (2009), ensuring the robustness of the analyses to the observed non-normal distributions.

There was no direct effect of self-compassion on psoriasis severity, β = -1.01, $t(311) = -1.00$, $p = .32$. Indirect effect model one, linking self-compassion to psoriasis severity through perceived stress was not significant, β = -1.36, 95% BootCI's [-2.88, 0.11]. Self-compassion was a significant predictor of perceived stress, β = -5.87, $t(313) = -16.43$, $p < .001$, and perceived stress was a significant predictor of psoriasis severity, β = 0.23, $t(311) = 1.99$, $p < .05$. Indirect effect models two, linking self-compassion to psoriasis severity through treatment adherence, and three, linking self-compassion to

psoriasis severity through perceived stress and treatment adherence, were not significant (both 95% BootCI's crossing zero). Age and gender did not have a significant effect in any of the tested models, all *p*'s > .10.

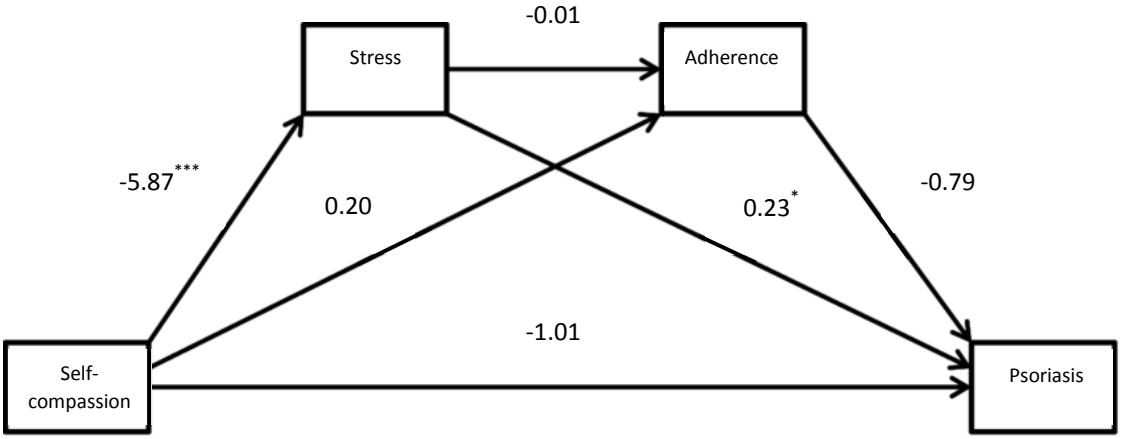

Figure 2. Conceptual diagram of tested serial mediation model with β coefficients. *Note*. $^{***}p < .001$, $^{*}p < .05$.

There was no direct effect of self-compassion on itch severity, $\beta = 0.06$, $t(311) = 0.21$, $p = .84$. Indirect effect model one, linking self-compassion to itch severity through perceived stress was significant, indicating indirect-only mediation, $\beta = -0.54$, 95% BootCI's [-0.94, -0.17]. Self-compassion was a significant predictor of perceived stress, $\beta = -5.87$, $t(313) = -16.43$, $p < .001$, and perceived stress was a significant predictor of itch severity, $\beta = 0.09$, $t(311) = 2.90$, $p < .01$. Indirect models two, linking self-compassion to itch severity through treatment adherence, and three, linking self-compassion to itch severity through perceived stress and treatment adherence, were not significant (both 95% BootCI's crossing zero). Age and gender did not have a significant effect in any of the tested models, all *p*'s > .10.

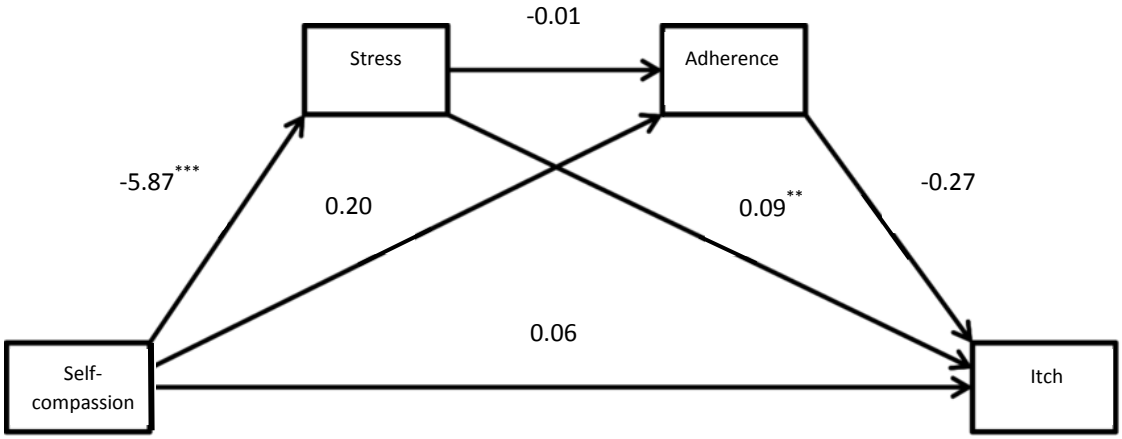

Figure 3. Conceptual diagram of tested serial mediation model with β coefficients. Note. $^{**}p < .01$, $^{*}p < .05$.

Hypothesis three: ANCOVA analyses

Kolmogorov Smirnov's tests indicated non-normal distributions across manipulation checks, both pre- and post-intervention, for both groups (all *p*'s < .001). Visual inspections of the associated histograms and QQ-plots indicated approximately normal distributions with no obvious outliers for State SC both pre- and post-intervention, for both groups. For SC efficacy, an approximately normal distribution with no obvious outliers for was apparent pre-intervention for the intervention group, but skews were observed post-intervention, and pre- and post-intervention for the active control group. Negative skews were apparent both pre- and post-intervention, for both groups, for motivation to adhere, due to few participants reporting their motivation to adhere to treatment to be extremely low. Skew and kurtosis statistics were within acceptable limits except for on the SC efficacy measure at follow-up testing (Field, 2000). Bootstrapping using 1000 samples was used to ensure robustness of the parametric analyses to the observed non-normal distributions (Field, 2009).

Levene's tests were used to assess homogeneity, indicating equality of variances between groups, all *p*'s > .05.

Participant gender and age, ease of recall, and distress of recall scores, and manipulation check scores pre-intervention were included in the analyses as covariates. Table 4 shows participants' scores on the manipulation checks pre- and post-intervention.

There was a significant small effect of group on post state SC scores after adjusting for covariates, $F(1, 308) = 14.33$, $p < .001$, $\eta_p^2 = .04$. Comparing the estimated marginal means showed participants in the intervention to have significantly higher state SC scores post-intervention ($M = 4.23$), compared to participants in the active control group ($M = 3.94$), after adjusting for covariates. Ease of recall and distress of recall (both p's $< .05$), but not age and gender (both p's $> .12$), had significant effects in the model.

There was no significant effect of group on post SC efficacy scores after adjusting for covariates, $F(1, 308) = 1.97$, $p = .16$, $\eta_p^2 = .01$. The covariates did not have a significant effect in the model, all p's $> .13$. As the SC efficacy measure showed unacceptable reliability the results of the ANCOVA should be interpreted with caution.

There was no significant effect of group on post motivation to adhere scores after adjusting for covariates, $F(1, 308) = 1.50$, $p = .22$, $\eta_p^2 = .01$. The covariates did not have a significant effect in the model, all p's $> .07$.

Table 4

Manipulation check scores

	Pre		Post	
	Intervention (n = 155)	Control (n = 162)	Intervention (n = 155)	Control (n = 162)
State SC	3.72 (1.24)	4.03 (1.00)	4.09 (1.24)	4.07 (1.01)
SC efficacy	3.77 (1.20)	4.00 (1.01)	4.02 (1.28)	4.01 (0.89)
motivation to adhere	5.54 (1.29)	5.50 (1.26)	5.65 (1.32)	5.54 (1.29)

Hypothesis four: ANCOVA analyses

Kolmogorov Smirnov's tests indicated non-normal distributions in follow-up SCS-SF, MOSGA, SASPI, and Itch scores for participants in the intervention group, all

p's < .05, and in follow-up MOSGA, SASPI, and Itch score for participants in the active control group, all *p*'s < .05. Visual inspections of the associated histograms and QQ-plots indicated approximately normal distributions with no obvious outliers for all measures other than the SASPI, where positive skews were observed due to few participants reporting their psoriasis to be extremely severe all over their body. This was the same for baseline SASPI scores. Skew and kurtosis statistics were within acceptable limits except for the on SASPI at follow-up testing (Field, 2000). Bootstrapping using 1000 samples was used to ensure robustness of the parametric analyses to the observed non-normal distributions (Field, 2009).

Levene's tests were used to assess homogeneity, indicating equality of variances between groups, all *p*'s > .14.

Participant gender and age, and baseline primary measure scores were included in the analyses as covariates. Table 5 shows completer participants' scores on the measures at time one and follow-up testing.

There was no significant effect of group on follow-up self-compassion, perceived stress, treatment adherence, psoriasis severity, and itch severity scores, after adjusting for covariates, all *p*'s > .07.

Table 5

Measure scores for completers at time one and follow-up testing

	Time one		Follow-up	
	Intervention (*n* = 104)	Control (*n* = 103)	Intervention (*n* = 104)	Control (*n* = 103)
SCS-SF	2.70 (0.91)	2.80 (0.77)	2.74 (0.89)	2.81 (0.75)
PSS10	22.29 (7.34)	22.09 (6.69)	22.57 (7.29)	22.01 (7.18)
MOSGA	4.22 (1.11)	4.11 (0.99)	4.31 (1.17)	4.00 (1.12)
SASPI	12.30 (10.75)	11.62 (10.14)	10.08 (8.70)	10.84 (9.74)
Itch	5.43 (2.84)	5.40 (2.86)	5.48 (2.46)	5.43 (2.65)

Note. SCS-SF = Self-compassion Scale – Short Form, PSS10 = Perceived Stress Questionnaire, MOSGA = Medical Outcomes Study – General Adherence, SASPI = Self-assessed Simplified Psoriasis Index, Itch = Itch severity

Hypothesis five

Hypothesis five was not tested as there was no effect of group on follow-up primary measure scores, and so the hypothesis was not supported.

Discussion

This was the first study to investigate the relationships between self-compassion, perceived stress, treatment adherence, and psoriasis severity and itch severity. This was also the first study to assess the effects of a brief online self-compassionate writing intervention tailored to psoriasis-related distress on state self-compassion, self-compassion efficacy, and motivation to adhere to treatment, and investigate its longitudinal effects on self-compassion, perceived stress, treatment adherence, and psoriasis severity and itch severity.

Hypothesis one was supported. Self-compassion was found to negatively relate to perceived stress, psoriasis severity, and itch severity, and positively relate to treatment adherence. All relationships were small except for between self-compassion and perceived stress where a large negative relationship was found, in line with the results of the meta-analysis conducted in part one of the thesis, and previous research assessing this relationship in a physical health context (Costa & Pinto-Gouveia, 2011; Pinto-Gouveia et al., 2013; Przezdziecki & Sherman, 2016; Sirois et al., 2015; Sirois & Hirsch, 2019). Equally, previous research has found small to medium relationships between self-compassion and treatment adherence in people with diagnoses of cancer, chronic fatigue syndrome, and fibromyalgia (Sirois & Hirsch, 2019).

Hypothesis two was partially supported. It was hypothesised that the relationships between self-compassion and psoriasis severity, and self-compassion and itch severity would be explained both by reduced perceived stress, and increased treatment adherence. This was not found, but the relationship between self-compassion and reduced itch severity was found to be in part explained by reduced perceived stress. Previous research

has linked self-compassion to physical health through both reduced perceived stress and increased health promoting behaviours (Dunne et al., 2016; Homan & Sirois, 2017), but not specifically treatment adherence, in a physical health context.

Hypothesis three was partially supported. A significant increase in state self-compassion could be attributed to the effects of the brief online self-compassionate writing intervention. This effect was small. There was no effect of the intervention on self-compassion efficacy and motivation to adhere to treatment, as had been hypothesised. The results are in line with previous research which has found a similar brief online self-compassionate writing intervention to have a small effect in increasing state self-compassion in a non-clinical sample of parents (Sirois et al., 2018). This study did not assess the effects of the intervention on self-compassion efficacy and motivation to adhere to treatment.

Hypothesis four was not supported. There was no effect of group on follow-up primary measure scores, indicating that the brief online self-compassionate writing intervention, despite its effect in increasing state self-compassion, had no lasting effects in increasing self-compassion, reducing perceived stress, increasing treatment adherence, and reducing psoriasis severity and itch severity, as had been tentatively hypothesised. Research into the longitudinal effects of self-compassion interventions in the context of physical health is in its infancy, and so this finding was not unexpected, especially given the brief online nature of the self-compassion intervention, which may be less efficacious than a longer intervention delivered in person. This potential is discussed further in the clinical implications section.

Hypothesis five was not tested. As the brief self-compassionate writing intervention had no lasting effects, group was not expected to influence relationships between time one stress and treatment adherence, and follow-up psoriasis severity and itch severity, as had been tentatively hypothesised.

Limitations

The results of the study should be interpreted with consideration to several limitations.

The study used a self-selecting sample of participants recruited from a hospital and online via social media. Only a small number of participants were recruited from the hospital, necessitating a substantial ethics amendment to expand recruitment to online. Clinicians at the hospital cited the study's online nature as a reason for poor recruitment. Although not ethically permissible, it would have been beneficial to explore patients' reasons for not participating in the study, as there may be important differences between people who opt in or out of research participation. For example, people who volunteer to participate in research are likely to have a higher socio-economic status than people who opt out of research participation, potentially reducing the external validity of research findings (Rosenthal & Rosnow, 1976). The sample in the current study were predominantly educated to a college/university level, and working full-time. There may also be differences in participants who were recruited from the hospital and participants recruited online, such as differences in psoriasis severity, however, these differences could not be probed due to the very small size of the subsample of participants recruited from the hospital (n = 6).

The study relied on self-report measures, some of which were retrospective (SCS-SF, PSS10, and MOSGA) and thus prone to recall bias. Much research into psoriasis utilises scales of clinician-rated psoriasis severity. It may have been beneficial to use such a measure, although the SASPI and other self-reported measures of psoriasis severity correlate strongly with clinician-rated measures (Chularojanamontri et al., 2013). The itch severity measure used in the study consisted of only one item. Whilst the use of a visual analogue scale is recommended in the rating of itch severity (Stander et al., 2013), the reliability of a single-item measure is perhaps questionable. The manipulation check

measuring self-compassion efficacy showed unacceptable reliability, and so the results of the ANCOVA assessing the impact of group on self-compassion efficacy should be interpreted with caution.

The study did not include a measure of distress. Psoriasis is associated with an increased risk of anxiety and depression (Lamb et al., 2016). Such distress is a likely barrier to the cultivation of state self-compassion, self-compassion efficacy, and motivation to adhere to treatment. Another measure which it may have been pertinent to include is a measure of shame. Psoriasis is associated with high levels of shame (D'Alton et al., 2019; Kouris et al., 2017), which is in part explained by the stigmatization and discrimination experienced by those with the condition (Lamb et al., 2016; Thompson, 2009). Shame is a likely barrier to the cultivation of state self-compassion and self-compassion efficacy as it involves self-criticism and feelings of defectiveness (Thompson, 2009), whereas self-compassion involves self-kindness, an acknowledgement that difficulties are part of being human, and being present and non-judgemental regarding one's thoughts and feelings (Neff, 2003). Whilst the results of the ANCOVA assessing the impact of group on self-compassion efficacy should be interpreted with caution, it is interesting that the brief online self-compassionate intervention had no effect on self-compassion efficacy, indicating participants did not feel better able to respond to themselves self-compassionately following the intervention. This could potentially be explained by participant distress and/or shame. The present study did not seek to analyse the qualitative data resulting from the recall task and brief self-compassionate writing exercise. This will be of interest to see if the themes of distress and shame are prevalent in participants' responses.

Participants were not asked to report their current psoriasis treatment. The SASPI includes a subscale to assess previous treatments (Chularojanamontri et al., 2013). It may have been beneficial to control for current treatment in the mediation and ANCOVA

analyses assessing the longitudinal effects of the brief online self-compassionate writing intervention, as there is heterogeneity in treatment preference and treatment adherence among people with psoriasis (Augustin et al., 2011).

The study benefited from a large sample size, increasing the power of its findings, but increasing the likelihood of assumptions such as normality being violated, which was observed. However, bootstrapping was used to ensure the robustness of parametric analyses, as recommended by Hayes (2009).

Clinical implications

The findings of the study demonstrate that self-compassion is of benefit in the context of psoriasis, relating to reduced perceived stress, which can trigger and exacerbate the condition and associated itchiness (Kouris et al., 2017; NICE, 2017), and increased treatment adherence, which in people with psoriasis can be poor (Augustin et al., 2011). Self-compassion additionally relates to reduced psoriasis severity and itch severity, which in the case of itch severity can be in part explained by its effects in reducing stress, which is known to have a bidirectional relationship with itch severity (Kouris et al., 2017). The findings of the study replicate some of the findings of previous studies that have shown self-compassion to relate to reduced stress and increased treatment adherence in people with diagnoses of cancer, chronic fatigue syndrome, and fibromyalgia (Sirois & Hirsch, 2019), and demonstrate the potential value of self-compassion interventions in dermatological practice.

The brief online self-compassionate writing intervention had a small effect in cultivating state self-compassion. This finding is promising considering the observed beneficial effects of self-compassion in the context of psoriasis, although no lasting effects of the intervention were observed at follow-up testing. There are a number of factors which may explain this, such as the brief online nature of the intervention, and the distress and shame experienced by people with psoriasis acting as a barrier to the

cultivation and maintenance of self-compassion. Longer interventions delivered in person may better foster lasting self-compassion, facilitating the development of the brain's affiliative system through the repeated practice of self-compassion exercises, and the experience of a compassionate other (Gilbert, 2010). One example of a longer compassion-based intervention is Gilbert's (2014) Compassion-Focussed Therapy (CFT), which has shown efficacy in the treatment of mood disorders. CFT can be delivered both individually, with an open-ended time frame, or to groups, with a format of 8-12 weekly 2-hour sessions (Gilbert, 2014). Yet with access to psychological interventions in dermatological practice limited (Eedy et al., 2009), and their practical and financial feasibility a concern (Qureshi et al., 2019), online interventions are likely to be more appealing to commissioners than costly face-to-face therapy. Indeed, Kirby (2017) highlighted the need for non-therapy alternatives compassion-based interventions in a recent review. Previous research assessing the efficacy of a 6-week online self-compassion intervention in trainee psychologists has demonstrated lasting effects at a 3-month follow-up (Finlay et al., 2017). This provides some evidence for a dose-response, indicating that longer online interventions may offer an efficacious practical and financial compromise between traditional therapy and the brief online intervention tested in the current study.

Directions for future research

The qualitative data regarding participants' descriptions of a time when they felt distress relating to their psoriasis and their self-compassionate responses to this experience should be analysed to gain further insights on psoriasis-related distress, and whether variables such as distress and shame are barriers to the efficacy of self-compassion interventions in the context of psoriasis

With the beneficial effects of self-compassion in the context of physical health well researched at a cross-sectional level, future research should seek to investigate

the potentially beneficial effects of self-compassion interventions in the context of physical health, and the longitudinal effects of both trait and cultivated state self-compassion. Further research is needed to assess the efficacy of self-compassion interventions in reducing stress, and promoting adaptive health behaviours in the context of physical health.

Future research should investigate the relationships between self-compassion, stress, and other specific health behaviours. In addition to poor treatment adherence, stress is associated with a range of maladaptive health behaviours including poor diet, excessive alcohol consumption, and smoking (Kouris et al., 2017; NICE, 2017), which may be influenced by self-compassion (Homan & Sirois, 2017; Terry & Leary, 2011). These behaviours are particularly relevant in auto-immune conditions such as psoriasis, as they increase systemic inflammation, exacerbating symptoms (NICE, 2017).

Conclusion

This was the first study to investigate the role of self-compassion in the context of psoriasis. Self-compassion relates to reduced perceived stress, and increased treatment adherence in people with psoriasis, as well as relating to reduced psoriasis severity and itch severity. The link between self-compassion and itch severity can be in part explained by reduced perceived stress, adding to the evidence that self-compassion can be linked to improved physical health through reduced perceived stress. The study was also the first study to investigate the effects of a brief online self-compassionate writing intervention in the context of psoriasis, demonstrating its efficacy in increasing state self-compassion. This finding is promising, adding to the evidence that self-compassion can be cultivated, even via a brief online intervention, although no lasting effects of the intervention were observed at follow-up testing.

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Appendix A

Self-Compassion Scale – Short Form

How I typically act towards myself in difficult times.

Please read each statement carefully before answering. To the left of each item, indicate how often you behave in the stated manner, using the following scale:

Almost never 1 2 3 4 5 Almost always

1. When I fail at something important to me I become consumed by feelings of inadequacy. (Reversed)
2. I try to be understanding and patient towards those aspects of my personality I don't like.
3. When something painful happens I try to take a balanced view of the situation.
4. When I'm feeling down, I tend to feel like most other people are probably happier than I am. (Reversed)
5. I try to see my failings as part of the human condition.
6. When I'm going through a very hard time, I give myself the caring and tenderness I need.
7. When something upsets me I try to keep my emotions in balance.
8. When I fail at something that's important to me, I tend to feel alone in my failure. (Reversed)
9. When I'm feeling down I tend to obsess and fixate on everything that's wrong. (Reversed)
10. When I feel inadequate in some way, I try to remind myself that feelings of inadequacy are shared by most people.
11. I'm disapproving and judgmental about my own flaws and inadequacies. (Reversed)
12. I'm intolerant and impatient towards those aspects of my personality I don't like. (Reversed)

Appendix B

Perceived Stress Scale

Removed from ethesis

Appendix C

Medical Outcomes Study – General Adherence Items

Removed from ethesis

Appendix D

Self-Assessed Simplified Psoriasis Severity Index

Removed from ethesis

Appendix E

Itch Severity

Draw a line on the scale that best represents the severity of your itching:

0 1 2 3 4 5 6 7 8 9 10

Guide:

0 = No itch

10 = Worst imaginable itch

Appendix F

Manipulation check: State Self-Compassion

1.Right now, how kind do you feel towards yourself?
Not at all kind 1 2 3 4 5 6 7 Extremely kind

2.Right now, how accepting do you feel towards yourself?
Not at all accepting 1 2 3 4 5 6 7 Extremely accepting

3.Right now, how critical do you feel towards yourself? (Reversed)
Not at all critical 1 2 3 4 5 6 7 Extremely critical

4.Right now, how much do you see your weaknesses as part of being human?
Not at all 1 2 3 4 5 6 7 Very much

5.Right now, how much are you trying to take a balanced view of the situation?
Not at all 1 2 3 4 5 6 7 Very much

Appendix G

Manipulation check: Self-Compassion Efficacy

When thinking about distress associated with your psoriasis:

Not at all 1 2 3 4 5 6 7 Very

1.How easy is it for you to be kind, accepting, and non-judgmental towards yourself?

2.How successful are you at keeping your emotions in balance?

3.How difficult is it for you to see your weaknesses as part of being human? (Reversed)

Appendix H

Manipulation check: Motivation to Adhere to Treatment

1.How strong are your intentions to adhere to your psoriasis treatment?
No intentions 1 2 3 4 5 6 7 Very strong intentions

2.How motivated are you to adhere to your psoriasis treatment?
Not at all motivated 1 2 3 4 5 6 7 Very motivated

3.How capable do you feel of adhering to your psoriasis treatment?
Not at all capable 1 2 3 4 5 6 7 Very capable

4.How likely is it that you will adhere to your treatment as recommended by the Dr in future?
Not at all likely 1 2 3 4 5 6 7 Very likely

Appendix I

Poster advertisement

IRAS ID – 242056 V1 – 27.03.2018

Do You Have Psoriasis?

The University Of Sheffield.

If so we invite you to take part in an online research study aimed at understanding how differences in responses to psoriasis are related to psoriasis related outcomes and wellbeing. This will take around 25 minutes.

If you choose to participate you can enter into a prize draw for the chance to win a £50 Amazon voucher.

To take part, or find out more about the study, please either scan the QR code or visit the website below:

https://sheffieldpsychology.eu.qualtrics.com /jfe/form/SV_2aWFPp0wJIEUfkN

Appendix J

Information sheet

Please ensure you submit your responses at the end of the survey. Partial responses will not be recorded. Please click the arrow below to continue...

Do you have psoriasis?

If so, we invite you to take part in this online research study aimed at understanding how individual differences in responses to psoriasis are related to psoriasis-related outcomes and wellbeing. Please read the following information before deciding whether you would like to take part in the study. Please screen shot this information sheet and keep it for your records. To participate we ask that you are aged 18 years or older and are a proficient English speaker.

What will the study involve?

If you decide to participate you will be asked to complete online questionnaires regarding your psoriasis and wellbeing. You will also be asked to recall and write about a time when your psoriasis caused you distress, before being randomly assigned to a brief instructional intervention. This part of the study should take around 20 minutes. Four weeks later, you will be asked to complete some further online questionnaires. This should take around 5 minutes.

Where will I complete the study?

As the study is online you can take part whenever and wherever you choose. As you will be asked to recall and write about a time when your psoriasis caused you distress you may prefer to complete the study somewhere private.

Confidentiality

You will be assigned a code upon entry to the study meaning your questionnaire responses and recollections are anonymous. The data we collect will be kept securely to ensure confidentiality. The study complies with data protection laws. Anonymised data may be kept and used in future research into psoriasis.

Advantages and disadvantages of taking part

It is up to you to decide whether or not to take part in the study. If you decide to take part you can enter into a draw for the chance to win a £50 Amazon voucher, and will have access to a brief instructional intervention. You can withdraw from the study at any time. Not taking part will not affect the standard of care which you receive.

Ethical approval and data protection

This research has received ethical approval following a review by the Berkshire REC. The University of Sheffield is the sponsor for the study based in the United Kingdom. The researchers will use the data you provide in order to undertake this study and will act as the data controller. This means that we are responsible for looking after your information and using it properly, ensuring data protection and confidentiality. Collected data will be anonymised by removing your email address once the study is complete (after follow-up testing). Anonymised data will be kept for 10 years and may be used in other research by the project supervisors.

Contacts

This research is being conducted by Laura Perry (Trainee Clinical Psychologist), under the supervision of Dr. Fuschia Sirois and Dr. Andrew Thompson (University of Sheffield). The research will be written up as a doctoral thesis as part of the doctorate in clinical psychology. If you have any questions regarding this study, its purpose, or procedures, please contact Laura Perry (lperry1@sheffield.ac.uk), who will be happy to answer your questions. Should you have any complaints about the study, please contact the department of psychology at the University of Sheffield.

Appendix K

Consent form

I agree to participate in this online research study regarding individual differences in responses to psoriasis, and their relation to psoriasis-related outcomes and wellbeing, and I have made this decision based on the information I have read.

Please click the "I agree" box below to indicate that you:

- Have read the information sheet and understand the nature of the study.
- Understand that taking part is entirely your choice and not taking part will not affect the standard of care you receive.
- Understand that your data may be used in other research projects and will be used for the purposes of a doctoral thesis and its presentation and publication.
- Understand that you can cease your participation at any time during the research, but only up until the time that you click the "submit the survey" button at the end of the research as submitted data is not identifiable for removal due to the use of participant codes.
- Are aged 18 years or older and a proficient English speaker/reader/writer.
- Fully consent to participate.

To acknowledge that you have read and understood this information and would like to continue with the research study, please click "I agree". This research has received ethical approval following a review by the Berkshire REC. Please screen shot this consent form and keep it for your records. Should you have any complaints about the study, please contact the department of psychology at the University of Sheffield.

Appendix L

Recall instructions (all participants)

We would like you to recall a time when you felt distressed about your psoriasis. You should choose a situation that you can recall fairly easily, and one which you still feel a bit troubled about. Recall what happened and how you were feeling in this situation as clearly as you can, and try to vividly imagine yourself back in this situation and what it felt like.

In the space below, please briefly describe this situation and how you felt. We ask that you do not rush through this task:

Appendix M

Self-compassionate writing intervention instructions

After re-reading the situation you just recalled and wrote about, we would now like you to consider that it is common for people with psoriasis to feel distressed by it. Sometimes this is made worse by other people responding negatively to it. Psoriasis is a common skin condition and affects around 2% of the U.K. population. You are not alone. Being hard on yourself about your psoriasis won't change things, and may make things worse. Try instead to take a balanced perspective on this situation you wrote about, and how you felt. Be kind, accepting and compassionate towards yourself about what happened.

We would now like you to write a couple of sentences expressing kindness, understanding, and acceptance of your psoriasis. Write in the same way that you might if you were supporting a friend who had psoriasis and had gone through something similar:

Appendix N

Control intervention instructions

After re-reading the situation you just recalled and wrote about, we would now like you to write a couple of sentences giving some facts about the situation, such as what day of the week it was, what the weather was like, and who else was there:

Appendix O

Mood neutralisation recall instructions

We would now like you to recall a time when you felt positive about your psoriasis. You should choose a situation that you can recall fairly easily. Recall what happened and how you were feeling in this situation as clearly as you can, and try to vividly imagine yourself back in this situation and what it felt like.

In the space below, please briefly describe this situation. We ask that you do not rush through this task:

Appendix P

Invitation to follow-up testing

Hi there,

Thank you for taking part in the study looking at differences in responses to psoriasis and psoriasis-related outcomes and wellbeing. It is now time for the second part of the study. This should only 5 – 10 minutes to complete, and will allow you to enter into the draw for your chance to win a £50 Amazon voucher. Please follow the link below to participate. Your time is greatly appreciated.

Thanks again,

Appendix Q

Debrief form

Thank you for taking part in the study. Your time and thoughtful responses are greatly appreciated. Please read the debriefing below:

A growing body of evidence suggests that self-compassion, relating to oneself with kindness, understanding, and acceptance, can be of benefit in the context of physical health. The aim of this study was to investigate the influence of self-compassion on stress, psoriasis severity, and treatment adherence, and to investigate the potential benefits of a brief online self-compassion intervention for people with psoriasis.

We asked you to recall a time where you experienced distress relating to your psoriasis. Those randomly allocated to the self-compassion intervention were then provided with some instructions. In case you were not allocated to complete the self-compassion intervention, here it is:

"Thinking about the situation you just recalled and wrote about, we would now like you to consider that it is common for people with psoriasis to feel distressed by it. Sometimes this is made worse by other people responding negatively to it. Psoriasis affects around 2% of the U.K. population, so you are not alone. Being hard on yourself about your psoriasis won't change things, and may make things worse. Try instead to take a balanced perspective on this situation you wrote about, and how you felt. Be kind, accepting, and compassionate towards yourself about what happened.

Considering the situation you just recalled and wrote about, we would now like you to write a couple of sentences expressing kindness, understanding, and acceptance of your psoriasis. Write in the same way that you might if you were supporting a friend who had gone through something similar:"

You may wish to complete this now. If you would like more information about self-compassion, and self-compassion exercises, please visit: www.self-compassion.org.

Thank you again for taking part in the study.

Appendix R

Ethical approval

NHS
Health Research Authority

South Central - Berkshire Research Ethics Committee
Bristol REC Centre
Whitefriars
Level 3, Block B
Lewins Mead
Bristol
BS1 2NT

Telephone: (020) 71048057

Please note: This is the favourable opinion of the REC only and does not allow you to start your study at NHS sites in England until you receive HRA Approval

27 April 2018

Miss Laura Perry
Trainee Clinical Psychologist
Sheffield Health and Social Care
Department of Psychology
Cathedral Court
University of Sheffield
Sheffield S1 2LT

Dear Miss Perry

Study title:	**The role of self-compassion in psoriasis related adjustment and wellbeing**
REC reference:	**18/SC/0238**
IRAS project ID:	**242056**

The Proportionate Review Sub-committee of the South Central - Berkshire Research Ethics Committee reviewed the above application on 26 April 2018.

We plan to publish your research summary wording for the above study on the HRA website, together with your contact details. Publication will be no earlier than three months from the date of this favourable opinion letter. The expectation is that this information will be published for all studies that receive an ethical opinion but should you wish to provide a substitute contact point, wish to make a request to defer, or require further information, please contact hra.studyregistration@nhs.net outlining the reasons for your request. Under very limited circumstances (e.g. for student research which has received an unfavourable opinion), it may be possible to grant an exemption to the publication of the study.

Ethical opinion

On behalf of the Committee, the sub-committee gave a favourable ethical opinion of the above research on the basis described in the application form, protocol and supporting documentation, subject to the conditions specified below.

Conditions of the favourable opinion

The REC favourable opinion is subject to the following conditions being met prior to the start of the study.

1. Please clarify the number of participants required for this study.

2. Please add contact details to the Patient Liaison Service (PALS) and note that the research has received Favourable Ethical Opinion by the Berkshire REC on all Participant Information Sheets/Informed Consent Forms (PIS/ICF) whether this would be hardcopy or online survey. There must also be a facility for participants to retain a digital copy of the PIS/ICF.

You should notify the REC once all conditions have been met (except for site approvals from host organisations) and provide copies of any revised documentation with updated version numbers. Revised documents should be submitted to the REC electronically from IRAS. The REC will acknowledge receipt and provide a final list of the approved documentation for the study, which you can make available to host organisations to facilitate their permission for the study. Failure to provide the final versions to the REC may cause delay in obtaining permissions.

Management permission must be obtained from each host organisation prior to the start of the study at the site concerned.

Management permission should be sought from all NHS organisations involved in the study in accordance with NHS research governance arrangements. Each NHS organisation must confirm through the signing of agreements and/or other documents that it has given permission for the research to proceed (except where explicitly specified otherwise).

Guidance on applying for HRA and HCRW Approval (England and Wales)/ NHS permission for research is available in the Integrated Research Application System, www.hra.nhs.uk or at http://www.rdforum.nhs.uk.

Where a NHS organisation's role in the study is limited to identifying and referring potential participants to research sites ("participant identification centre"), guidance should be sought from the R&D office on the information it requires to give permission for this activity.

For non-NHS sites, site management permission should be obtained in accordance with the procedures of the relevant host organisation.

Sponsors are not required to notify the Committee of management permissions from host organisations.

NHS
Health Research Authority
South Central - Berkshire Research Ethics Committee
Bristol REC Centre
Whitefriars
Level 3, Block B
Lewins Mead
Bristol
BS1 2NT

Telephone: 020 7104 8057

Please note: This is an acknowledgement letter from the REC only and does not allow you to start your study at NHS sites in England until you receive HRA Approval

24 May 2018

Miss Laura Perry
Clinical Psychology Unit
Cathedral Court
University of Sheffield
S1 2LT

Dear Miss Perry

Study title:	**The role of self-compassion in psoriasis related adjustment and wellbeing**
REC reference:	**18/SC/0238**
IRAS project ID:	**242056**

Thank you for your letter of 24 May 2018. I can confirm the REC has received the documents listed below and that these comply with the approval conditions detailed in our letter dated 27 April 2018

Documents received

The documents received were as follows:

Document	*Version*	*Date*
Evidence of Sponsor insurance or indemnity (non NHS Sponsors only)		
IRAS Application Form [IRAS_Form_23052018]		23 May 2018
Letter from statistician		01 February 2018

Participant consent form [Consent+Form+V4+24.05.18]	4	24 May 2018
Participant information sheet (PIS) [Information+Sheet+V4+24.05.18]	4	24 May 2018
Research protocol or project proposal [V2 03.18]	2	27 March 2018
Summary CV for Chief Investigator (CI) [Updated CV]		09 May 2018
Summary CV for student		09 May 2018

Approved documents

The final list of approved documentation for the study is therefore as follows:

Document	*Version*	*Date*
Copies of advertisement materials for research participants [Study Poster Advertisement]	1	27 March 2018
Evidence of Sponsor insurance or indemnity (non NHS Sponsors only)		
IRAS Application Form [IRAS_Form_23052018]		23 May 2018
IRAS Checklist XML [Checklist_23052018]		23 May 2018
Letter from statistician		02 February 2018
Letter from statistician		01 February 2018
Participant consent form [Consent+Form+V4+24.05.18]	4	24 May 2018
Participant information sheet (PIS) [Information+Sheet+V4+24.05.18]	4	24 May 2018
Referee's report or other scientific critique report [L Perry_scientific_approval letter]		01 February 2018
Research protocol or project proposal [Research Proposal - 03.18 - 242056]	2	27 March 2018
Research protocol or project proposal [V2 03.18]	2	27 March 2018
Summary CV for Chief Investigator (CI) [Updated CV]		09 May 2018
Summary CV for student [Laura Perry CV]		26 March 2018
Summary CV for student		09 May 2018
Summary CV for supervisor (student research) [FMSirois_CV_March 26_brief]		26 March 2018
Summary CV for supervisor (student research) [Thompson brief CV IRAS 2018]		01 January 2018

You should ensure that the sponsor has a copy of the final documentation for the study. It is the sponsor's responsibility to ensure that the documentation is made available to R&D offices at all participating sites.

18/SC/0238 **Please quote this number on all correspondence**

Yours sincerely

Ymchwil Iechyd a Gofal Cymru
Health and Care Research Wales

NHS
Health Research Authority

Miss Laura Perry
Clinical Psychology Unit
Cathedral Court
University of Sheffield
S1 2LT

Email: hra.approval@nhs.net
Research-permissions@wales.nhs.uk

30 May 2018

Dear Miss Perry

HRA and Health and Care Research Wales (HCRW) Approval Letter

Study title:	**The role of self-compassion in psoriasis related adjustment and wellbeing**
IRAS project ID:	**242056**
REC reference:	**18/SC/0238**
Sponsor	**University of Sheffield**

I am pleased to confirm that HRA and Health and Care Research Wales (HCRW) Approval has been given for the above referenced study, on the basis described in the application form, protocol, supporting documentation and any clarifications received. You should not expect to receive anything further relating to this application.

How should I continue to work with participating NHS organisations in England and Wales?
You should now provide a copy of this letter to all participating NHS organisations in England and Wales*, as well as any documentation that has been updated as a result of the assessment.

*'In flight studies' which have already started an SSI (Site Specific Information) application for NHS organisations in Wales will continue to use this route. Until 10 June 2018, applications on either documentation will be accepted in Wales, but after this date all local information packs should be shared with NHS organisations in Wales using the Statement of Activities/Schedule of Events for non-commercial studies and template agreement/ Industry costing template for commercial studies.

This is a single centre study completed as part of an educational project. The sponsor R&D office will confirm to you when the study can start following issue of HRA and HCRW Approval.

It is important that you involve both the research management function (e.g. R&D office) supporting each organisation and the local research team (where there is one) in setting up your study. Contact details of the research management function for each organisation can be accessed here.

IRAS project ID	242056

How should I work with participating NHS/HSC organisations in Northern Ireland and Scotland?
HRA and HCRW Approval does not apply to NHS/HSC organisations within the devolved administrations of Northern Ireland and Scotland.

If you indicated in your IRAS form that you do have participating organisations in either of these devolved administrations, the final document set and the study wide governance report (including this letter) has been sent to the coordinating centre of each participating nation. You should work with the relevant national coordinating functions to ensure any nation specific checks are complete, and with each site so that they are able to give management permission for the study to begin.

Please see IRAS Help for information on working with NHS/HSC organisations in Northern Ireland and Scotland.

How should I work with participating non-NHS organisations?
HRA and HCRW Approval does not apply to non-NHS organisations. You should work with your non-NHS organisations to obtain local agreement in accordance with their procedures.

What are my notification responsibilities during the study?
The document "*After Ethical Review – guidance for sponsors and investigators*", issued with your REC favourable opinion, gives detailed guidance on reporting expectations for studies, including:

- Registration of research
- Notifying amendments
- Notifying the end of the study

The HRA website also provides guidance on these topics, and is updated in the light of changes in reporting expectations or procedures.

I am a participating NHS organisation in England or Wales. What should I do once I receive this letter?
You should work with the applicant and sponsor to complete any outstanding arrangements so you are able to confirm capacity and capability in line with the information provided in this letter.

The sponsor contact for this application is as follows:

Name: Dr Fuschia Sirois
Tel: 0114 2226552
Email: f.sirois@sheffield.ac.uk

Who should I contact for further information?
Please do not hesitate to contact me for assistance with this application. My contact details are below.

Your IRAS project ID is **242056**. Please quote this on all correspondence.

Yours sincerely

Joanna Ho

Appendix S

Ethics amendment approval

NHS
Health Research Authority

South Central - Berkshire Research Ethics Committee

Bristol REC Centre
Whitefriars
Level 3, Block B
Lewins Mead
Bristol
BS1 2NT

Tel: (020) 71048043

Please note: This is the favourable opinion of the REC only and does not allow the amendment to be implemented at NHS sites in England until the outcome of the HRA assessment has been confirmed.

15 October 2018

Miss Laura Perry
Clinical Psychology Unit
Cathedral Court
University of Sheffield
S1 2LT

Dear Miss Perry

Study title:	**The role of self-compassion in psoriasis related adjustment and wellbeing**
REC reference:	**18/SC/0238**
Amendment number:	**Substantial amendment 1**
Amendment date:	**10 September 2018**
IRAS project ID:	**242056**

The above amendment was reviewed by the Sub-Committee in correspondence.

Ethical opinion

The members of the Committee taking part in the review gave a favourable ethical opinion of the amendment on the basis described in the notice of amendment form and supporting documentation.

Approved documents

The documents reviewed and approved at the meeting were:

Document	*Version*	*Date*
Notice of Substantial Amendment (non-CTIMP) [AmendmentForm_ReadyForSubmission.pdf]	Substantial amendment 1	10 September 2018
Research protocol or project proposal [Research Proposal - V3 - 10.09.2018 - 242056.doc]	3	10 September 2018

Membership of the Committee

The members of the Committee who took part in the review are listed on the attached sheet.

Working with NHS Care Organisations

Sponsors should ensure that they notify the R&D office for the relevant NHS care organisation of this amendment in line with the terms detailed in the categorisation email issued by the lead nation for the study.

Statement of compliance

The Committee is constituted in accordance with the Governance Arrangements for Research Ethics Committees and complies fully with the Standard Operating Procedures for Research Ethics Committees in the UK.

We are pleased to welcome researchers and R & D staff at our Research Ethics Committee members' training days – see details at http://www.hra.nhs.uk/hra-training/

18/SC/0238: Please quote this number on all correspondence

Yours sincerely

PP - Mr David Carpenter
Chair

E-mail: nrescommittee.southcentral-berkshire@nhs.net

Enclosures: *List of names and professions of members who took part in the review*

Copy to: *Ms Ferzanah Salim, Rotherham General Hospital*
Miss Laura Perry

Dear Miss Perry,

IRAS Project ID:	242056
Short Study Title:	Self-compassion in psoriasis related adjustment and wellbeing
Amendment No./Sponsor Ref:	Substantial amendment 1
Amendment Date:	10 September 2018
Amendment Type:	Substantial Non-CTIMP

I am pleased to confirm **HRA and HCRW Approval** for the above referenced amendment.

You should implement this amendment at NHS organisations in England and Wales, in line with the conditions outlined in your categorisation email.

User Feedback

The Health Research Authority is continually striving to provide a high quality service to all applicants and sponsors. You are invited to give your view of the service you have received and the procedure. If you wish to make your views known please use the feedback form available on the HRA website: http://www.hra.nhs.uk/about-the-hra/governance/quality-assurance/.

Please contact hra.amendments@nhs.net for any queries relating to the assessment of this amendment.

Kind regards

Alka Bhayani
Amendments Coordinator
Health Research Authority
Ground Floor | Skipton House | 80 London Road | London | SE1 6LH
E.hra.amendments@nhs.net