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A Bibliometric Review of Self-Compassion Research: Science Mapping the Literature, 1999 to 2020

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Abstract

Objectives: Science mapping is a methodology that combines quantitative analysis, classification, and visualisation to identify the composition and inter-relationships between bibliographic objects. Although science mapping has proven useful in diverse fields, we are not aware of its application to self-compassion research, which we sought to rectify here. Specifically, we used bibliometric science mapping to identify the overarching structure of self-compassion research between 1999 and 2020.

Methods: We collected all articles using the search terms “self-compassion” and “self compassion” in the Web of Science database ($N = 2,185$ articles). Keyword co-occurrence analysis, co-citation analysis, and network centrality analysis were used to describe the knowledge base and volume of self-compassion research.

Results: Our analyses identified four general themes in the self-compassion literature: “mental health and well-being”, “clinical outcomes”, “self-perceptions”, and “physical health and family issues”. The first three themes are relatively well-consolidated and represent core areas of research on self-compassion, whereas the fourth theme is relatively less well-connected and more emergent within the broader corpus.

Conclusions: Our results, and the provision of interactive maps and extensive tables, should allow readers to examine connections between research clusters and areas, generate novel research ideas, and more fully understand the knowledge base of self-compassion research.

Keywords: Self-compassion; Science mapping; Bibliometrics; Mindfulness; Mental health

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Fuelled by an interest in integrating Buddhist philosophies with Western approaches to psychology, scholars have developed a sustained interest in the construct of self-compassion (Bluth & Neff, 2018). In broad outline, *self-compassion* refers to “the ability to be kind and helpful to one’s self at times of error or despair” (Ferrari et al., 2019, p. 1455). One commonly used model of self-compassion is that of Neff (2003a, 2003b), who describe a multidimensional construct with three inter-related components that are exhibited primarily during times of pain, failure, or distress. The three components are: (a) self-kindness (vs. self-judgement), which refers to a forgiving, empathetic, sensitive, and patience approach to one’s self, rather than being self-critical; (b) mindfulness (vs. over-identification), which involves awareness of, attention to, and acceptance of the present moment, rather than over-identifying with or avoid painful thoughts and feelings, and; (c) common humanity (vs. isolation), which involves recognising one’s fallibilities as part of the larger human condition, rather than as isolating.

A different model of (self) compassion was proposed by Gilbert (2009), wherein compassion is viewed as the result of adaptive capacities shaped by evolution. In addition, Gilbert’s (2009) model emphasises physiological and neurological correlates of compassion. More specifically, Gilbert (2014) suggests that the “compassion system” should be considered distinct from and separate to the “critical system”. This can be contrasted with Neff’s (2003b) dimensional model, where each of the components has two parts, one denoting the component itself and the other a negation of the component. Nevertheless, both the Neff (2003b) and Gilbert (2009) models propose that self-compassion is characterised by kindness and empathy toward one’s self. Indeed, many scholars now view both models as

complementary explanatory frameworks for understanding the phenomenology and manifestation of self-compassion (Macbeth & Gumley, 2012).

Spurred by the recognition of robust links between self-compassion and a wide range of positive outcomes, research on self-compassion has grown dramatically in the past decade (Barnard & Curry, 2011; Bluth & Neff, 2018). Indeed, 81% of articles on self-compassion in the Web of Science database have been published in the past 5 years. Broadly speaking, this body of research has focused on a diverse range of topics, including associations with well-being and self-esteem, health- and body image-related outcomes, social relationships, developmental trajectories, and applications in clinical and interventionist contexts (see Neff, 2011). The research base has also diversified beyond adults from predominantly Western nations to include a wide variety of social identity groups, including children and adolescents, different national and linguistic groups, and sexual minority individuals (see Bluth & Neff, 2018). Indeed, specific elements of this research base have been the subject of a large number of systematic reviews and meta-analyses (e.g., Braun et al., 2016; Conversano et al., 2020; Ferrari et al., 2019; Lefebvre et al., 2020; Wilson et al., 2019).

While systematic reviews and meta-analyses are valuable and important, especially in terms of providing syntheses of conceptualisations of self-compassion, summarising specific elements of the research base, and identifying shortcomings of the research, such methods are also limited in a number of ways (Baumeister, 2013). For instance, systematic reviews and meta-analyses on self-compassion tend to be limited in scope, choice of method, or conceptual framework (i.e., they tend to be focused on specific research questions). Moreover, as Kirby and Gilbert (2019) have recently argued, meta-analyses on self-compassion can be limited because of the lack of clarity over key definitions and the diversity of instruments measuring self-compassion. On the other hand, non-systematic reviews and expert summaries of the field (e.g., Barnard & Curry, 2011; Neff, 2003a, 2004, 2008, 2011)

can be useful means of supplementing knowledge and providing a historical overview of the field, but are also prone to multiple forms of subjectivity and bias stemming from research immersion and specialisation, as well as citation biases in identifying central works (Vogel & Güttel, 2013). These issues are particularly important in terms of self-compassion research, where there is evidence of a proliferation of reviews on increasingly niche topics.

These concerns are often amplified when areas of research are developing rapidly, as consolidation of knowledge becomes a real challenge for researchers (Baumeister, 2013). For instance, with increasing volume and diversity of research, scholars may sometimes find it difficult maintain a comprehensive perspective of the field or understand how seemingly disparate topics are inter-connected (Ball, 2018; Stone, 2004). That is, self-compassion researchers may face difficulties placing their research in a broader context, particularly as new areas of scholarly interest emerge and old topics fade away. This is compounded when researchers are immersed in specialised topics or succumb to “silo mentality”, a form of scholarly narrow-mindedness that limits opportunities for creative and holistic consolidation of research activities (Aria & Cuccurullo, 2017; Crane, 1972). Furthermore, opportunities for a holistic understanding of a field of research can be limited when research streams are rapidly diversifying but also increasingly fragmented, impeding opportunities to work toward common goals and increasing the risk of duplication of effort (Andersen & Lund, 2020).

Science mapping can complement systematic and meta-analytic reviews, as it offers broader scope to place the development and state of self-compassion research in context (Ball, 2018; Boyack & Klavans, 2014; Hallinger, 2014). Based on bibliometric analysis, science mapping is different to traditional review methods in that it combines quantitative analysis, classification, and data visualisation to identify the intellectual structure of a knowledge base, as well as inter-relationships between specific segments of that research base (Zupic & Čater, 2015). As such, science mapping offers scholars an opportunity to make

sense of large volumes of information, organise conceptual developments, and provide a structured view of themes being researched and discipline boundaries (Hallinger, 2020; Köseoglu et al., 2021; Marchiori et al., 2021; Zupic & Čater, 2015). In the context of self-compassion research, science mapping offers the possibility of comprehensively understanding and visualising the “knowledge base” that has accumulated to date (Hallinger & Kovačević, 2019). More broadly, it allows self-compassion researchers to better understand how disparate areas of historical, emerging, or nascent research fit together, how they have evolved over time, and what trajectories have been the focus of most recent research.

Given its scope, it is not surprising that science mapping has been increasingly used in diverse fields of research (e.g., Andersen, 2020; Andersen & Lund, 2020). In this study, we describe the “knowledge base” (Zupic & Čater, 2015) of self-compassion research, which we operationalised primarily in terms of composition. *Composition* refers to the research traditions, disciplinary themes, influential areas of research, and thematic inter-relationships in research. This is useful because it provides an overview of the structure of the self-compassion corpus, the structure of each individual research area, and helps identify topics that are frequently examined or have received little attention within specific research areas. A secondary objective was to assess the *size* of the knowledge base, measured in terms of the annual volume of published studies and areas of research. This offers an indication of whether a critical mass of scholarship on self-compassion has been attained. Finally, we also identified “research fronts” of the knowledge base (Hallinger, 2020), which refers to the topics that have received the most attentions from scholars in recent years. Specifically, the following research questions are addressed: (i) What are the main research themes that have attracted the most attention from self-compassion scholars between 1999 and 2020? (ii) What

is the intellectual structure of the self-compassion knowledge base? (iii) What are the current research fronts of self-compassion research?

Method

Search and Inclusion Criteria

In this study, we applied keyword co-occurrence, co-citation analyses, and network analyses, supplemented by descriptive statistics of self-compassion research. The corpus of articles we analysed were collected using the search terms “self-compassion” and “self compassion” in the Web of Science (WoS) database, as they appear in the title, abstract, or keywords, in documents classified as journal articles or review studies. WoS was selected as our database as it offers the most relevant and comprehensive databases in the field of social sciences (Carmona-Serrano et al., 2020). The search was conducted on January 22, 2021 and included articles published in both English and non-English language journals. This search yielded 2,185 articles, published between 1999 and 2020. Although journals differ in the required quality and rigour of research required for publication, we included all the articles in the corpus in the study for the sake of comprehensiveness. Consequently, our study reflects the full range of researched topics, as well as common contexts, and are unconstrained by the varying quality of the studies.

Data Analyses

Keyword co-occurrence analysis “calculates the number of publications in which two keywords occur together (i.e., co-occur) in the titles, abstract, and author keyword lists of documents in the review database” (van Eck & Waltman, 2014, p. 287). When keywords co-occur, it indicates that they are thematically related and reflect underlying concepts in the documents and network structure of the corpus (Zupic & Čater, 2015). To achieve this, we used author and indexed keywords to first create a “thesaurus file” (van Eck & Waltman,

2017), which was then “cleaned” based on established principles (Zupic & Čater, 2015) to minimise noise in the results. Specifically, we removed generic terms (e.g., “perspectives”) and terms unrelated to a concept, including the names of countries (e.g., “United Kingdom”) and research methods (e.g., “grounded theory”). In addition, we combined plural and singular forms of words (e.g., “adolescent” and “adolescents”), British and American spelling variations (e.g., “stigmatisation” and “stigmatization”), synonyms (e.g., “postpartum depression” and “postnatal depression”), and extended abbreviations to full terms (e.g., “CBT” to “cognitive behavioural therapy”). We also removed the term “self-compassion” as it represents the search (Perry et al., 2018); that is, including “self-compassion” in our analyses would introduce unnecessary visual clutter and statistical artifactuality in further analyses as a result of its assignment to a given cluster. One author constructed and cleaned the thesaurus, which was subsequently verified by a second author.

Based on the resulting network of keywords, we constructed a 2-dimensional term-map using VOSviewer v.1.6.16 (Waltman et al., 2010), where a unified framework determined the layout for clustering and mapping. Keywords were mapped so that the distance between them showed relatedness (i.e., shorter distances indicate greater relatedness) and with the thickness of the line connecting two terms indicating how many articles contain both keywords. The clustering technique used to group keywords is closely related to modularity-based clustering (Waltman et al., 2010), where frequently co-occurring terms are assigned to the same cluster. We used a standard resolution of 1 in our primary cluster analysis and increased it to 1.5 to explore finer-grained cluster analysis and identify graph components (Waltman et al., 2010). An [anonymised for review] interactive version of the network diagram, with all links available for exploration, is available on the Open Science Framework (OSF) at https://osf.io/ku9rv/?view_only=99dfaf7468f349da9f9d2eb121b06aaa.

Co-citation analysis was used to calculate the number of times that two documents have been cited together in the references lists of documents in the review database (Zupic & Čater, 2015). Co-citation analysis is based on reference lists and, therefore, provides a reflection of scholarly literature in the broader literature (Hallinger & Kovačević, 2019; Marchiori et al., 2021). That is, when two documents are cited together, it can be assumed that they share a similarity in theoretical perspective (White & McCain, 1998), which in turns allows for a mapping of intellectual structure of a corpus. The more often two documents are cited in an article, the more likely it is that the content of the cited articles are related and, the more frequently a source is cited in the corpus, the more central it is to the field (Pasadeos et al., 1998). Here, co-citation analysis was used to identify articles that composed the foundation for the research in each of the clusters and to inform descriptions of the keyword clusters (the network graph files are available in the OSF repository; see above).

Network centrality analysis was used to identify the most representative and central keywords and articles in our bibliometric network graphs. Degree centrality (the absolute number of other keywords a given keyword connects to; Freeman, 1978) indicates the extent to which a term is examined in a narrow or broad context. We used PageRank centrality (Page et al., 1999), which estimates the importance of a keyword as a function of the importance of the connected keywords, adjusted for strength of connections, to identify the most important nodes in each cluster (Andersen, 2021). Several keywords are central to the whole graph and tend to connect the whole or parts of the network. We term these “bridging keywords” and identified them by their high betweenness centrality (Andersen, 2021) – a measure of how frequently a keyword is on the shortest path between other keywords – calculated using Gephi 0.9.2 (Bastian et al., 2009).

Finally, to identify the “research front(s)” of self-compassion research (Hallinger, 2020), we relied on the average year of publication for keywords, supplemented by keyword

burst detection analysis, based on Kleinberg's (2003) algorithm, to identify topics that have shown larger change of research interest. This analysis allows us to show both topics that have received attention over a short period but then lost favour, as well as current research fronts, in that the burst period includes the present. Further, clusters with multiple burst terms either indicates a stagnant cluster (if the burst periods are closed) or a research front and emerging trend. We conducted this analysis using CiteSpace v5.7.R3.7z (Chen, 2006).

Results

Composition of Self-Compassion Research

Keyword co-occurrence analysis of the 2,185 articles on self-compassion identified 5,376 keywords, of which 441 appear in five or more articles and are included in the analysis. The results are presented both as a network diagram in Figure 1 and the most central keywords in each cluster in Table 1 (for all keywords and associated metrics, see Supplementary Materials). Based on co-occurrence and cluster analysis of the keywords, we identified four general themes in the self-compassion literature. Based on consensus between authors, we named these: "Mental health and well-being" (red), "Clinical outcomes" (green), "Self-perceptions" (blue), and "Physical health and family issues" (yellow). Below, we elaborate on these main themes (i.e., clusters), the central topics in each (i.e., graph components), and the inter-relatedness of topics within and across research clusters. Our analysis also identified two bridging keywords, namely "mindfulness" and "depression", which indicates that these constructs are widely researched with all other topics within the self-compassion literature.

Mental health and well-being. The "Mental health and well-being" cluster (red) was broad in focus, consisting of three graph components, and well-connected externally with all other clusters, as well as internally between different within-cluster components. The first

graph component was centred around the bridging term “mindfulness” (i.e., bringing one’s complete attention to the present moment in a non-judgemental way; Kabat-Zinn, 1990, 2003), which likely reflects the fact that both self-compassion and mindfulness have deep spiritual roots and confer important health and well-being benefits (Brown & Ryan, 2003; Neff, 2003a). Although there is some overlap between the constructs of self-compassion and mindfulness (Neff, 2011), most studies on their correlates and outcomes have treated the two traits as independent but related (e.g., Bluth & Eisenlohr-Moul, 2017). For instance, some studies have considered the independent effects of mindfulness and self-compassion on health and well-being outcomes (for a review, see Raab, 2014), whereas others have treated self-compassion as a mediator of the relationship between mindfulness and well-being (e.g., Hollis-Walker & Colosimo, 2011). Other notable keywords in this graph component include “intervention”, “cognitive therapy”, and “meditation”, which indicates a focus on the effectiveness of mindfulness-based interventions at improving mindfulness, self-compassion, quality of life, and well-being (e.g., for meta-analyses, see Gu et al., 2015; Querstret et al., 2020).

The second graph component in the “Mental health and well-being” cluster focused on “stress”, “fatigue”, and “burnout”, indicating a sustained focus on workplace and educational settings, where self-compassion is presented as part of broader interventionist framework at promoting positive outcomes (for a review, see Lefebvre et al., 2020). Much of this research has focused on the efficacy of mindfulness-based stress reduction (MBSR; Kabat-Zinn, 1990) in alleviating stress and promoting coping efficacy, with self-compassion frequently treated as a mediator of MBSR’s effects on outcomes (e.g., Keng et al., 2012). One group that has been of especial interest recently in this research is health care professionals (Shapiro et al., 2005, 2007), particularly nurses (Cohen-Katz et al., 2004, 2005). An important focus of research here has been on the role of self-compassion in

protecting against indices of professional quality of life (e.g., occupational burnout; for reviews, see Conversano et al., 2020; Cooper et al., 2020; Raab, 2014), as well as patient-focused outcomes (e.g., communication; for a review, see Amutio-Kareaga et al., 2017). A smaller body of work has focused on the effectiveness of mindfulness-based therapies on mental health among higher education students (e.g., Neff et al., 2005), although evidence of efficacy in terms of self-compassion is equivocal (for a review, see Dawson et al., 2020). The final graph component in the “Mental health and well-being” cluster was broader in scope, with a general focus on indices of subjective well-being, such as happiness and life satisfaction. This body of work has established that there are robust relationships between self-compassion and subjective well-being (Neff, 2004), with a subset of studies point to causal effects (for a meta-analysis, see Zessin et al., 2015). An important segment of this work has also focused on the potential of loving-kindness meditation on promoting improved subjective well-being and positive affect (e.g., Fredrickson et al., 2008).

Clinical outcomes. The cluster we have named “Clinical outcomes” (green) was another dominant cluster in the network graph and, like the previous cluster, includes a broad range of topics. The bridging keyword “depression” dominates the cluster and connects with all other parts of the map, indicating it is a central topic in the field. Indeed, there were 282 articles in our corpus that included both the terms “depression” and “mindfulness”, the strongest link in the graph (see Figure 2). This cluster consisted of four graph components, the first of which related various forms of trauma, with keywords such as “posttraumatic stress disorder”, “abuse”, “sexual assault”, and “domestic violence” being prominent. In this research, self-compassion is conceptualised as a healthy, alternative response to trauma (e.g., Thompson and Waltz 2008), with emergent evidence showing that self-compassion interventions are effective at reducing trauma-related symptomatology (for a review, see Winders et al., 2020). An emergent area of work has been on relatively neglected segments of

the population, such as people with intellectual disabilities who have experienced trauma (for a review, see Cowles et al., 2020). Also notable within this area of research was an emerging focus on childhood issues (e.g., Tanaka et al., 2011), such as the efficacy of compassion-based interventions at reducing distress among survivors of childhood abuse (for a review, Westerman et al., 2020).

A second graph component in this cluster was more directly focused on mental health disorders, with keywords such as “borderline personality disorder”, “schizophrenia”, “personality disorder”, and “psychosis” being particularly prominent. In broad outline, this body of research has documented reliable associations between greater self-compassion and lower indices of psychopathology (Macbeth & Gumley, 2012). However, emergent research has also indicated that negative indicators of self-compassion – self-judgement, isolation, and over-identification in Neff’s (2003a, 2003b) multidimensional model of self-compassion – are positively associated with indices of psychopathology, suggesting that these constructs reflect vulnerability to mental health disorders (for a review, see Muris & Petrocchi, 2017). In addition, there is some evidence that compassion-based therapies may be particularly useful for reducing elements of self-criticism that are common in mood disorders (for a review, see Leaviss & Uttley, 2015). Also notable in this work was a focus on fear of self-compassion and fear of compassion for/from others, with available evidence indicating particularly strong links with depressive symptomatology, shame, and self-criticism (for a review, see Kirby et al., 2019). Most of the research in this area has focused on adult populations, although research on children and adolescents is emerging (for a review, see Marsh et al., 2018).

The third graph component was dominated by the link between “depression” and “anxiety”, with 241 articles in the corpus including both keywords (see Figure 2). A key focus here has been on documenting the protective efficacy of self-compassion on depression and anxiety through both cross-sectional and interventionist studies (for a review, see

Querstret et al., 2020). This is a fairly well-established area of research, with the evidence base being robust and utilising multiple methods (e.g., Krieger et al., 2016; Raes, 2011), although emergent research has begun to focus on specific segments of the population including those with medical conditions (for a review, see Misurya et al., 2020). A much smaller body of work has focused on the protective role of self-compassion in relation to postnatal depression (e.g., Monteiro et al., 2019). A final graph component was smaller and more discrete, with a focus on emotional regulation and psychological flexibility, respectively, as mediators of the relationship between self-compassion and mental health outcomes (for a review, see Inwood & Ferrari, 2018). There was also a notable focus on acceptance and commitment therapy (Hayes et al., 2006), although this work lacked full integration in terms of conceptualisation.

Self-perceptions. Research in the broad cluster of “Self-perceptions” (blue) was generally well-connected externally with all other clusters, as well as within the cluster itself. Overall, the research in this cluster could be broadly categorised as relating to the myriad of ways in which individuals perceive and relate to the self, and the role that self-compassion plays in this regard. Several keywords in this cluster – such as “college students”, “adolescents”, and “young adults” – relate to populations that are studied and, together with the keyword “sex differences”, indicates the demographic focus of this cluster. The first, and dominant, graph component in this cluster was related to research and body image and disordered eating. Within this body of research, self-compassion has been shown to protect against multiple forms of eating pathology (e.g., bulimic symptoms) and negative body image (e.g., body dissatisfaction) either directly or indirectly by interacting with risk factors, such as thin-ideal internalisation (for review, see Braun et al., 2016). Most studies in this area have been cross-sectional in nature (e.g., Wasyliw et al., 2012), but a growing number of studies have also examined the impact of self-compassion interventions on body image and

disordered eating outcomes (e.g., Albertson et al., 2015; Kelly & Carter, 2015). However, concerns have been raised about the quality of interventionist studies, particularly in relation weight loss and nutrition behaviours (for a review, see Rahimi-Arabili et al., 2018).

The second graph component in the “Self-perceptions” cluster was generally focused on the relationships between self-compassion and aggression. This body of work has generally reported that self-compassion is negatively associated with anger and aggression (e.g., Fresnics & Borders, 2017). An important aspect of this work has been in contrasting the effects of self-compassion and self-esteem on aggression (e.g., Neff & Vonk, 2009), which helps to accounts for the high frequency of “self-esteem” as a keyword in this area. A third graph component was focused on the mediating role of self-compassion in relationships between victimisation and negative consequences, such as psychological maladjustment and suicidal ideation (e.g., Játiva & Cerezo, 2014). Notably, much of this research has been conducted with younger age groups and remains under-researched within the broader context of self-compassion research. A final graph component included keywords such as “efficacy”, “motivation”, and “achievement”, and was generally focused on the utility of self-compassion on promoting positive outcomes in terms of self-improvement (e.g., Breines & Chen, 2012). Importantly, much of this work has been conducted in the context of sport and physical activity (e.g., Mosewich et al., 2011), where self-compassion is described as playing an important role in promoting positive experiences (Reis et al., 2015).

Physical health and family issues. The cluster that we called “Physical health and family issues” was the smallest cluster in the network graph and was relatively less well-connected to other clusters. This cluster consisted of two graph components, the first of which related to physical (ill-)health, with keywords such as “cancer”, “HIV”, “arthritis”, and “chronic illness” being prominent. Research in this area has focused on the efficacy of compassion-based therapies at reducing distress and promoting psychological adjustment

(e.g., improved emotion regulation, acceptance of the condition, coping skills) in people living with condition of physical ill-health (for a review, see Austin et al., 2021), with cancer patients being a particular focus of research (e.g., Batista et al., 2015). The second graph component was related to issues that affected the family unit, with keywords such as “parents”, “family”, “caregiver”, and “father” being prominent. An important focus in this area has been on the efficacy of interventions that include self-compassion components on promoting parental self-compassion and, in turn, reducing parental anxiety and stress (for a review, see Jefferson et al., 2020). A smaller body of work has focused on the impact of parental self-compassion on child outcomes but results here have been mixed and studies have been of low methodological quality (Jefferson et al., 2020). Also emergent was a focus on self-compassion as a buffer against adverse parental outcomes (e.g., stigma) among parents of children with neurodiversity (e.g., Wong et al., 2016). This cluster also included keywords relating to “gratitude”, “optimism” and “protective factors”, which was closely linked to the keyword “children” within this cluster, as well as externally with the “Clinical outcomes” cluster.

Research Fronts

Research interest on self-compassion has increased exponentially in the last several years, with over 60% of all studies in our corpus published since 2018 and 80% since 2016 (see Supplementary Figure 3). As such, it is difficult to distinguish trends given the short timespans. However, to indicate terms that have been examined early in the literature from topics that have come under scrutiny more recently, we report average years of publication in Table 1 and provide a visualisation of the evolution of research interest on self-compassion in Supplementary Figure 2. To distinguish between topics that have seen sustained research interest, indicated by high occurrence and an average publication year value in the middle of

the study period and those which were in vogue for a limited period of time, we also report the results of burst analysis in Supplementary Table 3.

In broad outline, research on “mental health and well-being”, “clinical outcomes”, and “self-perceptions” have all received sustained interest, whereas the “physical health and family issues” cluster represents a more emergent focus of research. In terms of the former, a number of specific areas of research have received sustained interest, including “positive psychology” and “attentional bias” in the first cluster, “personality”, “self-criticism”, and “borderline personality disorder” in the second cluster, and “self-esteem” and “self-efficacy” in the third cluster. With the caveat that research on self-compassion has grown substantively since about 2016, these areas of research could be seen as representing more traditional or older research foci that nevertheless remain sustainable at present. In contrast, research on topics such as “fatigue”, “healthcare”, and “sleep” in the first cluster, “abuse” and “psychological flexibility” in the second cluster, and “self-kindness” in the third cluster represent more recent research fronts. Of note, research on “gratitude”, “suicide”, “post-traumatic growth”, and “autism” from the fourth cluster all represent more recent research fronts.

Discussion

In the present work, we applied science mapping methods to identify, visualise, and describe the knowledge base of self-compassion research. Although systematic reviews and meta-analyses of self-compassion research have mushroomed in the past decade (e.g., Braun et al., 2016; Conversano et al., 2020; Ferrari et al., 2019; Lefebvre et al., 2020; Wilson et al., 2019), such methods suffer from a number of limitations and are unable to provide a broad overview of the state of knowledge of self-compassion research as a whole (Kirby & Gilbert, 2019). Conversely, science mapping offers better scope to place the development of self-

compassion research within a historical and scientific context. Based on our co-occurrence analyses of 5,376 keywords from 2,185 articles published between 1999 and 2020, we suggest that the corpus of research on self-compassion is well-established and coalesces around four broad topics, namely mental health and well-being, clinical outcomes, self-perceptions, and physical health and family issues. However, there is also scope to broaden, extend, and deepen existing knowledge, which can be done in tandem with an identification of research fronts in the self-compassion corpus.

In broad outline, these research clusters identified in the present study represent core areas where research on self-compassion has been consolidated; that is, they provide an overview of the knowledge base of self-compassion research. Although some of these broad themes have been identified in non-systematic reviews of the literature (e.g., Neff, 2011), the power and utility of science mapping lies in its ability to produce a reproducible, metrics-based review of self-compassion research; that is, we were not hindered by researcher bias or lack of awareness of potential “blind spots” in the corpus. More practically, an awareness of the core thematic areas we have identified in our analyses will likely be useful for researchers in terms of understanding how their own research areas connects with other research themes and also in generating ideas for new research ideas that have the potential to drive the field forward. Below, we provide several examples to illustrate how this might be achieved. We acknowledge that there is an element of subjectivity in crafting these examples and encourage interested readers to use our network visualisation to develop more idiosyncratic illustrations.

First, it is apparent from our network visualisation (see Figures 1 and 2) that much of the self-compassion knowledge base has focused on mental health correlates and outcomes. Although this is in keeping with the view that self-compassion builds resilience against mental health disorders (Neff, 2003a), while increasing eudaimonic and hedonic well-being, there may be some value in deepening these research foci. For instance, research on self-

compassion and mental health disorders beyond depression and anxiety remain under-researched and a stronger focus on a broader range of mental health disorders (e.g., schizophrenia; Eicher et al., 2013) may prove useful in terms of practical application in clinical practice. This may be particularly important to demonstrate the broad utility of interventions based on self-compassion or to identify their added value, but also to better understand the boundaries of effectiveness of different forms of intervention. Interestingly, our burst analysis shows some indication that this is now beginning to occur, with a focus on topics such as borderline personality disorder being emergent (Feliu-Soler et al., 2017). Likewise, while research on mental health correlates and outcomes appears to be well-consolidated, self-compassion research that focused on physical health outcomes remains relatively emergent and in need for higher-quality work (Kılıç et al., 2021; Phillips & Hine, 2021). Deepening and extending the links between physical (ill-)health, mental health, and self-compassion would seem to be a useful direction for future research.

Second, it is also apparent from our network visualisation that much of the corpus – but particularly research on mental health and clinical outcomes – is dominated by co-consideration of self-compassion and mindfulness. While this is consistent with the view that there are important distinctions between these constructs, the most notable of which is that the mindfulness component of self-compassion emphasises balanced awareness of distress, whereas trait mindfulness refers to present-moment awareness of any experience (Neff & Dahm, 2015), it may be useful to more fully understand boundary and interactional effects in relation to outcomes; that is, it may be of value to consider conditions in which self-compassion and mindfulness in combination have stronger effects than when in isolation. Doing so may also help to clarify the similarities and differences between the two dominant approaches to the conceptualisation of self-compassion (Gilbert, 2009; Neff, 2003b), as discussed above. Conversely, it also seems to be the case that much of the research on self-

perceptions has focused on self-compassion in isolation of mindfulness, and here there may value in examining the extent to which self-compassion mediates relationships between mindfulness and outcomes, such as eating behaviours and body image.

A third way in which scholars could use our analyses to develop new areas of research activity is to focus on topics that have received less attention within clusters. Research on parental self-compassion, for instance, has been characterised as being of low methodological quality (Jefferson et al., 2020) and our visual network suggests that research that work on family and child outcomes has generally not been fully integrated into broader self-compassion research. Further research in these areas may be especially useful for family-focused practitioners working to improve parental well-being following challenging parenting, for instance. Likewise, research on the protective role of self-compassion in antenatal outcomes remains under-researched, particularly in men. Another example is that research efforts have not fully considered the relationships between self-compassion and outcomes in specific population segments, such as ethnic/racial minority groups. Indeed, the little research with these populations has been characterised as methodologically weak, with small sample sizes and limited cultural sensitivity (e.g., Cotter & Jones, 2020). These, and other similarly under-represented research areas in our visual network, may represent areas of research that could be developed more fully.

Limitations

Although science mapping cannot supersede traditional review methods (Luther et al. 2020), the strength of our methodology lies in our ability to combine quantitative analysis, classification, and visualisation to identify intellectual structures and inter-relationships between bibliographic objects in the self-compassion corpus. In this sense, our analysis offers scholars an opportunity to make sense of a large volume of information and to interactive engage with our outputs to more fully understand conceptual themes and to identify

potentially fruitful areas for future research. Still, there are a number of limitations to the work reported here. First, because research on self-compassion is relatively young, with consolidation occurring only recently, it is difficult to identify “research fronts” in this corpus or topics that have received the most attention from scholars in recent years. Nevertheless, repeating our science mapping efforts in the future – when the corpus has grown substantially – may be useful in helping to identify potential research fronts.

Second, our decision to only include articles in the WoS database means that our corpus does not include books, book chapters, conference papers, articles not indexed by WoS and theses (e.g., Neff, 2011). As such, our corpus represents a sample of all literature, though we estimate the sample to be above 85% of all literature with no systematic omissions (Martín-Martín et al., 2021; Visser et al., 2021), which is sufficient for the valid analyses (Burt, 1981). Likewise, because the aim of science mapping is to understand the knowledge structure of a corpus, we are unable to assess the quality of articles included in our analysis – as is common with meta-analyses. Finally, there is an element of subjectivity in creating a “thesaurus file” (van Eck & Waltman, 2017): in cleaning the keywords, we may have unintentionally introduced a degree of bias to the results. To mitigate this problem, all authors discussed all instances where there was disagreement. We have also included our list, with explanations, in the Supplemental Materials, which should facilitate future replication efforts.

Ethical Compliance

This study involved bibliometric data and was therefore exempt from ethics approval. No human participants were involved, so no informed consent was gathered. The authors report no conflicts of interest.

Author Contributions

VS designed the study, assisted with the data analyses, and wrote the paper. NA designed the study, analysed the data, wrote part of the results. AF collaborated in the editing of the final manuscript.

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Table 1

Selected Keywords from the Bibliometric Co-occurrence Analysis of the Self-Compassion

Literature, Clustered by Topic and Graph Component.

Keyword	Occurrence	Degree	PageRank	Avg. Pub. Year
Cluster 1 (Red): Mental Health and Well-Being				
Component 1a				
Stress	435	363	0.44	2017.52
Health	241	298	0.24	2017.72
Resilience	126	212	0.10	2018.12
Burnout	163	184	0.06	2017.92
Satisfaction	92	179	0.06	2017.46
Empathy	112	164	0.06	2017.59
Component 1b				
Well-Being	186	253	0.15	2017.07
Happiness	50	130	0.03	2016.76
Positive Psychology	51	131	0.03	2016.57
Life Satisfaction	33	106	0.01	2018.06
Forgiveness	22	75	0.01	2017.10
Lifespan	20	77	0.01	2017.53
Component 1c				
Mindfulness	822	406	0.62	2017.48
Intervention	328	323	0.30	2017.93
Stress Reduction	234	277	0.19	2017.15
Meditation	251	259	0.17	2017.17
Cognitive Therapy	109	186	0.06	2017.48
Loving-Kindness Meditation	64	154	0.04	2016.22
Other Central Keywords				
Quality-Of-Life	197	270	0.18	2017.76
Mental-Health	277	309	0.27	2017.76
Cluster 2 (Green): Clinical Outcomes				
Component 2a				
Posttraumatic-Stress- Disorder	93	161	0.04	2017.37
Trauma	59	138	0.03	2017.63
Childhood Maltreatment	30	100	0.01	2017.21

Substance Use	25	90	0.01	2017.96
Abuse	21	76	0.01	2018.56
Severity	20	76	0.01	2017.16

Component 2b

Shame	192	250	0.16	2017.23
Therapy	132	225	0.12	2016.83
Attachment	93	203	0.10	2017.20
Emotion	82	195	0.08	2016.90
Criticism	115	198	0.08	2016.67
Self-Criticism	82	152	0.04	2016.62

Component 2c

Depression	735	409	0.65	2017.26
Anxiety	314	326	0.31	2017.26
Symptoms	156	250	0.14	2017.43
Rumination	124	218	0.10	2017.11
Perfectionism	49	110	0.02	2017.90
Anxiety Disorders	45	113	0.02	2018.00

Component 2d

Emotion Regulation	195	270	0.17	2017.84
Acceptance Model	131	216	0.09	2017.41
Commitment Therapy	74	165	0.04	2017.96
Cognitive-Behavioral Therapy	62	138	0.03	2017.90
Social Anxiety	48	117	0.02	2017.48
Experiential Avoidance	45	122	0.02	2017.05

Cluster 3 (Blue): Self-Perceptions**Component 3a**

Behaviors	101	223	0.12	2017.65
Eating Disorders	157	226	0.11	2017.51
Women	109	194	0.07	2017.13
Negative Affect	78	184	0.07	2017.49
Body Image	106	174	0.06	2017.87
Attitudes	44	138	0.04	2017.41

Component 3b

Self-Esteem	77	183	0.09	2016.34
College-Students	92	186	0.07	2017.67
Aggression	25	98	0.02	2016.70
Self-Kindness	18	82	0.01	2018.33
Self-Determination	13	57	0.00	2016.73
Social Connectedness	12	48	0.00	2015.09

Component 3c

Adolescents	198	275	0.21	2017.75
Prevalence	81	192	0.07	2017.96
Sex Difference	83	179	0.07	2018.11
Risk-Factors	79	179	0.06	2017.75
Suicidal Ideation	16	64	0.00	2018.00
Victimization	12	51	0.00	2018.30

Component 3 D

Efficacy	72	160	0.04	2017.97
Motivation	42	116	0.03	2016.56
Physical Activity	33	95	0.01	2018.19
Exercise	29	90	0.01	2018.19
Sport	29	80	0.01	2017.85
Achievement	20	66	0.00	2017.42

Other Central Keywords

Prevention	55	135	0.03	2017.73
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Cluster 4 (Yellow) Physical Health and Family Issues**Component 4 A**

Gratitude	28	84	0.01	2018.76
Optimism	15	70	0.00	2017.07
Children	116	209	0.10	2017.91
Suicide	17	81	0.01	2018.64
Spirituality	18	67	0.01	2017.24
Protective Factors	14	69	0.00	2017.20

Component 4 B

Distress	139	240	0.14	2017.79
Cancer	76	152	0.04	2017.09
Adjustment	52	141	0.03	2017.23
Coping	43	136	0.02	2017.39
Adherence	23	72	0.01	2017.20
Survivors	21	74	0.01	2017.80

Component 4 C

Social Support	91	200	0.07	2017.79
Stigma	49	142	0.03	2018.02
Parents	63	138	0.03	2018.26
Identity	25	86	0.01	2017.25
Family	23	87	0.01	2018.10
Caregiver	34	94	0.01	2017.76

Note. Occurrence = the number of articles the keyword appears in; Degree = the number of other keywords the focal keyword connects to; PageRank = the importance of a keyword as a

function of the importance of the connected keywords, adjusted for strength of connections;
Avg. Pub. Year = the average year for articles that include the keyword.

Figures

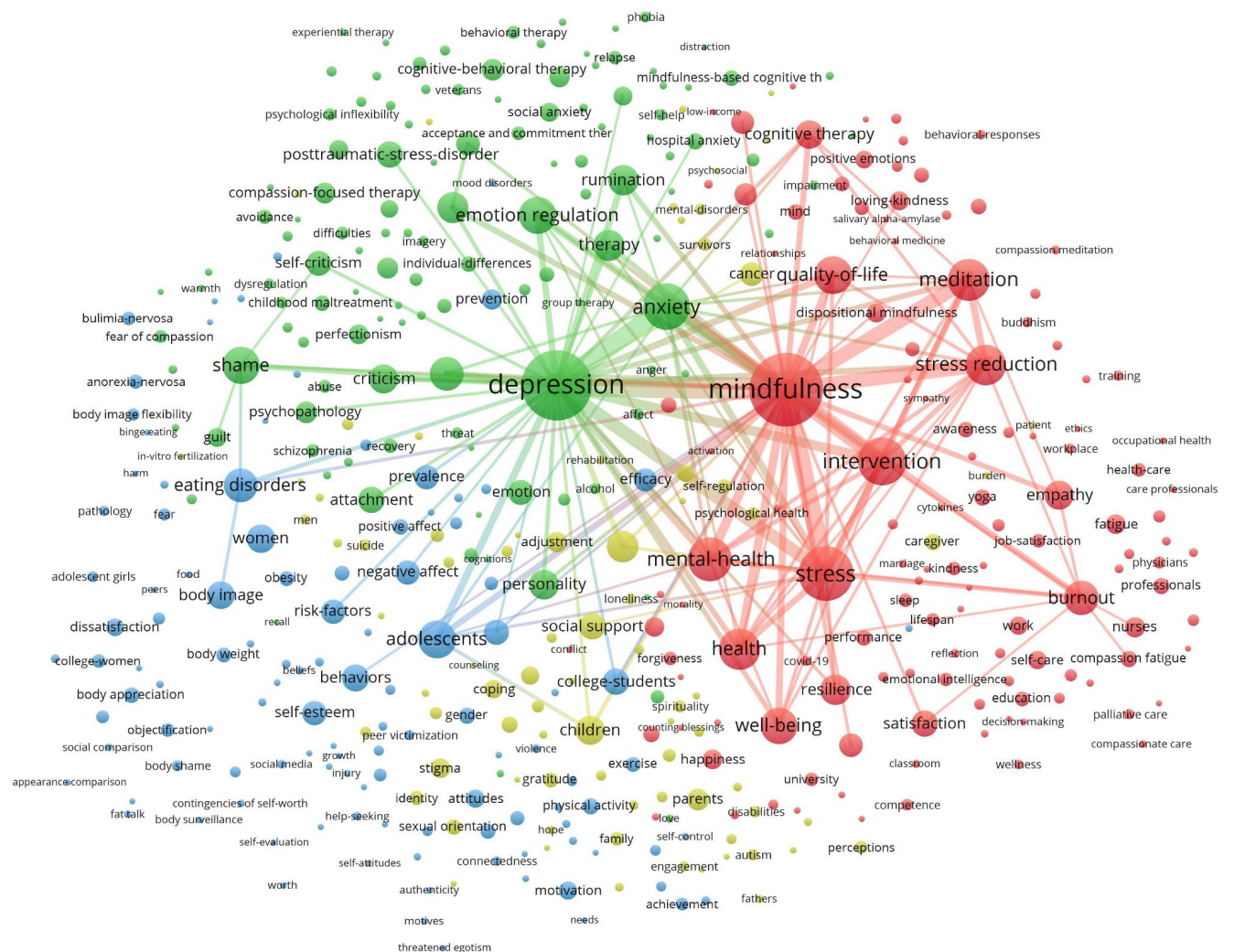


Figure 1. Network visualisation of the keyword co-occurrence analysis of literature on self-compassion, clustered by topic. Red – cluster 1: “Mental health and well-being”; Green – cluster 2: “Clinical outcomes”; Blue – cluster 3: “Self-perceptions”; Yellow – cluster 4: “Physical health and family issues”. The size of the circle shows the relative number of occurrences of a keyword, and the weight of line indicates the frequency two keywords are linked. Note only connections with 30 or more links are shown in the figure for legibility. To view all links, please access the online interactive map at

https://osf.io/ku9rv/?view_only=99dfaf7468f349da9f9d2eb121b06aaa.

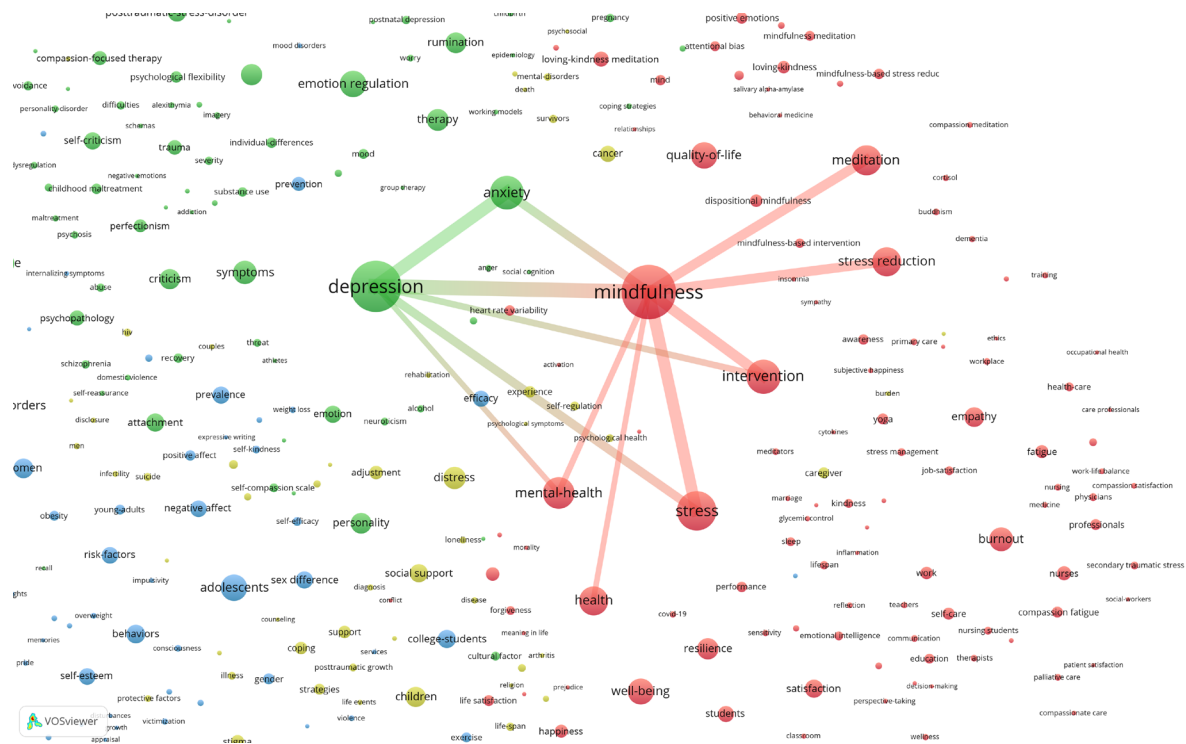


Figure 2. Co-occurrence analysis, where only links with a strength greater than 100 (i.e., more than 100 articles include the linked keywords) are drawn.