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Science Mapping Research on Body Image: A Bibliometric Review of Publications in *Body Image*, 2004 to 2020

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Abstract

Science mapping is a methodology that combines quantitative analysis, classification, and visualisation to identify the composition and inter-relationships between bibliographic objects. Here, we used bibliometric science mapping to identify the overarching structure, evolution of research themes and research fronts, and geographic spread of body image research. We examined 2,783 keywords in 1,107 articles published in *Body Image* between 2004 and 2020, selected as being representative of body image research during this period. Co-occurrence analysis of the keywords enabled us to identify five general themes in the literature: “clinical and weight-related issues”, “body image and disordered eating”, “positive body image and objectification”, “media effects”, and “ethnicity/race”. Burst analysis allowed us to identify research fronts in this research, with work on social media and positive body image in particular being identified as emergent. Finally, co-author analysis indicated that body image research networks are heavily focused on a small handful of nations, although there is evidence of a recent shift toward greater geographic spread. 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 evolution and future trajectories of body image research.

Keywords: Science mapping; Bibliometrics; Data Visualisation; Body Image; Disordered eating

1. Introduction

Although conceptualisations of body image have a very long history (e.g., Fisher, 1970; Schindler, 1935/1950; for a review, see Cash & Pruzinsky, 2002), it is only in recent decades that significant theoretical and practical progress has been made. In broad outline, this body of work has focused on a range of topics, such as the conceptualisation of the multidimensional nature of body image in different social identity groups, factors that shape the development and maintenance of body image, the elaboration of theoretical models of body image, and the creation and evaluation of intervention programmes (e.g., Cash, 2004, 2012, 2017; Cash & Pruzinsky, 2002; Cash & Smolak, 2011). This sustained interest has provided a strong foundation for body image scholars, guiding ongoing research, clinical applications, and practical policy at a societal level, as well as the proliferation of new areas of research.

Alongside these developments has come a rapid increase in the volume and range of published research on body image (Cash, 2017; Tylka et al., 2020), which can present challenges for scholars. For example, as the volume of research increases, it can become difficult for researchers to adopt a holistic perspective of the field and ascertain what others, outside of one's own immediate field, are working on (Andersen & Lund, 2020; Ball, 2018; Stone, 2004). These concerns can be exacerbated when research streams are fragmented (Aria & Cuccurullo, 2017) and researchers succumb to a silo mentality, a form of narrow-mindedness that blocks opportunities for "creagement" (i.e., effective management of creativity within and between research groups), impedes the ability to achieve common goals, and increases the likelihood of duplication of effort (Crane, 1972; Stone, 2004). The rapid proliferation of research on body image can also make it difficult to know how disparate topics of research fit together, which in turn hinders efforts to consolidate research.

Traditionally, these issues would have been – and continue to be – addressed through reviews (i.e., narrative, systematic, or meta-analytic reviews), which provide syntheses of definitions, summarise major empirical findings, and identify shortcomings of existing research. While vital for assessing the state of the field and providing opportunities to identify gaps in knowledge, such methods also tend to be limited in scope, choice of method, or theoretical formulation (Baumeister, 2013) and are susceptible to multiple forms of subjectivity and bias (e.g., resulting from researcher immersion and specialisation, citation biases in the identification of central work; Vogel & Güttel, 2013). Alternative methods deployed by body image scholars include qualitative analyses of the research priorities of body image experts (e.g., Atkinson et al., 2020) and data visualisation (see Swami, Furnham et al., 2020), but these methods suffer from some of the same limitations as reviews.

One complementary method that offers broader scope of understanding is science mapping, based on bibliometric analysis (Ball, 2018; Boyack & Klavans, 2014; Hallinger, 2014), which combines quantitative analysis, classification, and visualisation to identify intellectual structures and inter-relationships between bibliographic objects (Zupic & Čater, 2015). The main strength of bibliometric analysis is the ability to produce systematic, transparent, and reproducible reviews based on the measurement of science, scientists, or scientific activity (Broads, 1987; Diodato, 1994). More specifically, bibliometric analysis offers a powerful tool to make sense of large volumes of information, organise conceptual developments, and provide a structured view of trends over time, themes being researched, and discipline boundaries based on co-citation and co-word analyses (Li et al., 2019). In short, unlike other methods, bibliometrics has the potential to visualise the “big picture” of extant research on a given topic (Aria & Cuccurullo, 2017; Crane, 1972).

Although bibliometric analysis has been increasingly used in different fields of research (e.g., Andersen, 2021a; Andersen & Lund, 2020; Kuzhabekova et al., 2015), we are

not aware of its application to body image research. In this article, therefore, we present the results of the first bibliometric analysis of body image research based on all articles – the corpus – published in *Body Image* between 2004 and 2020. Focusing on the *Body Image* corpus is beneficial for a number of reasons. First, *Body Image* is the eminent journal in the field of body image (Cash, 2017). Indeed, as Tylka and colleagues (2020, p. iii) have recently noted, *Body Image* is “the *only* specialty journal for research relating to the construct of body image”. Focussing on the *Body Image* corpus thus allows us to provide a sense of the most relevant and important research being conducted by body image scholars since 2004.

Relatedly, this focus ensures that our analysis maps the boundaries of research being conducted by the flagship outlet for body image research, a strategy that is not uncommon in science mapping (Zupic & Čater, 2015). Finally, *Body Image* accepts for publication articles that meet both a high standard of quality and that retains a clear focus on body image and/or appearance (Cash, 2004; Tylka et al., 2020). Analysing articles from this corpus thus means we are able to represent a broad range of perspectives while ensuring that the research we are covering is of a high quality (i.e., maps a “gold standard” of body image research), which would be more challenging using a set of search terms and exclusion criteria.

More specifically, our aim in the present study was to develop a conceptual model of the “knowledge base” (Hallinger & Kovačević, 2019) of body image research. The primary dimension of this knowledge base concerns the *composition* or intellectual structure of the knowledge base (Zupic & Čater, 2015). This refers to the research traditions, disciplinary composition, influential areas of research, and thematic inter-relationships in body image research; that is, we describe the overarching structure of the *Body Image* corpus, the structure of each individual research area, and identify topics that are frequently examined or have received little attention within specific research areas. In addition, this analysis also enables us to identify the “research front” of the knowledge base (Hallinger, 2020; Hallinger

& Kovačević, 2019; Köseoglu et al., 2021; Marchiori et al., 2021), namely the topics that have received the most attention from scholars in recent years. Finally, we are also able to examine the geographic distribution of studies published in *Body Image*, which provides an insight into the distribution of scholarly capacity internationally (Castillo & Hallinger, 2019; see also Cash, 2017).

A bibliometric analysis cannot supersede traditional literature reviews (Luther et al., 2020); rather, the analyses we present here complement existing reviews of the field (e.g., Cash, 2012) but, importantly, they afford researchers opportunities to identify gaps in knowledge, potential areas of growth in body image research, and to detect connections that may be otherwise difficult to notice. That is, our work complements other efforts to provide a historical overview of body image research (Cash, 2012; Cash & Pruzinsky, 2002; Cash & Smolak, 2011), but also charts the intellectual structure of the body image knowledge base in order to advance theorising. Specifically, we addressed the following research questions: (1) What is the intellectual structure of the body image knowledge base and what research themes have attracted the most attention from researchers publishing in *Body Image*? (2) How have these research themes evolved over time and what are the current research front(s)? and (3) What is the geographic distribution of the *Body Image* literature?

2. Method

2.1. Overview of Methods and Identification of Sources

Science mapping involves extraction of bibliographic data associated with published studies in order to describe features of a knowledge base (Hallinger, 2020; Hallinger & Kovačević, 2019; Köseoglu et al., 2021; Marchiori et al., 2021; Zupic & Čater, 2015). More specifically, in the present study, we applied keyword co-occurrence, keyword burst, and co-authorship analyses (see Section 2.2.) to illuminate structural and relational features of the knowledge base of body image research, temporal aspects of the field, and the geographic

distribution of scholars publishing in *Body Image*. This involved first acquiring the appropriate collection of articles, cleaning and analysing the bibliographic data, and finally, visualising and interpreting the results (Waltman et al., 2015; Zupic & Čater, 2015).

To acquire the collection of articles, we accessed all articles published in *Body Image* between 2004 and 2020 (i.e., we used a journal-based search strategy). As explained above, this reduced ambiguity in making inclusion and/or exclusion decisions because we can assume that all articles published in *Body Image* will be relevant to the body image research area and because this provides a consistent level of quality control. Many other science mapping reviews have adopted a similar approach (see Zupic & Čater, 2015). For our purposes, bibliographic data were accessed from the Social Sciences Citation Index[®] (SSCI), available online through the Web of Science (WoS) database, and the Scopus database. The search yielded 112 articles for the period 2004 to 2006 from Scopus, and a further 995 articles for the period from 2007 to 2020 in WoS, for a total of 1107 articles.

2.2. Analytic Strategy

2.2.1. Main bibliometric analyses. Our primary analyses employed keyword co-occurrence analysis (Callon et al., 1983), which “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 (Börner et al., 2003; Zupic & Čater, 2015).

Here, we used both author and WoS KeyWords Plus keywords, where available, to create a “thesaurus file” (van Eck & Waltman, 2017). To minimise noise in the results, we removed generic terms (e.g., “method”) and terms unrelated to a concept, including the names of countries (e.g., “United Kingdom”) and research methods (e.g., “exploratory factor

analysis”). 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., “commercials” and “advertisements”), and extended abbreviations to full terms (e.g., “BDD” to “body dysmorphic disorder”) (cf. Chavalarias & Cointet, 2013). We also removed the term “body image” as it represents the search (see Perry et al., 2018); that is, including “body image” in our analyses would introduce unnecessary visual clutter and statistical artifactuality in further analyses as a result of its assignment to a given cluster.

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 interactive version of the network diagram, with all links is available on the Open Science Framework at <https://osf.io/sym6v/>.

In addition to keyword co-occurrence, we also employed co-citation analysis (McCain, 1990), which calculates the number of times that two documents have been cited together in the references lists of documents in a review database (Zupic & Čater, 2015). Because co-citation analysis is based on reference lists, its results reflect patterns of scholarly literature in the broader literature (cf. Hallinger & Kovačević, 2019; Marchiori et al., 2020). 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). We used this analysis to identify articles that composed the foundation for the research in each of the areas and used these results to inform descriptions of the keyword clusters (the co-citation network graph in presented in Supplemental Materials and the network graph files are available in the OSF repository; see above).

2.2.2. Temporal analysis of keyword usage. A secondary aim of the present study was to identify the “research front” of the body image knowledge base (Hallinger, 2020; Hallinger & Kovačević, 2019; Marchiori et al., 2020). To do so, we relied on 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 only the WoS data from 2007 to 2020, using CiteSpace v5.7.R3.7z (Chen, 2006).

2.2.3. Co-author analysis. Finally, to examine the geographic distribution of studies published in *Body Image*, we used co-author analysis to identify the network of countries where authors of articles are based by creating a link between co-authors of each article in the corpus (Acedo et al., 2006).

2.2.4. Network analysis. To identify the most representative and central keywords and articles in our bibliometric network graphs, we applied social network analysis measures.

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, 2021b). 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, 2021b) – a measure of how frequently a keyword is on the shortest path between other keywords (Kadushin, 2012) – calculated using Gephi 0.9.2 (Bastian et al., 2009).

3. Results

3.1. Size and Composition of the Corpus

The keyword co-occurrence analysis of the 1107 articles published between 2004 and 2020 shows the structure of body image topics. The results are presented both as a network diagram in Figure 1 (an interactive map is available for download at <https://osf.io/sym6v/> and the most central keywords in each cluster in Table 1. The analysis identified 2,783 keywords, of which 255 appear in five or more articles, and are included in the analysis.

3.2. Composition of Body Image Research

3.2.1. Thematic areas overview. The co-occurrence and cluster analysis of the keywords in the *Body Image* corpus indicated that there were five general themes in the literature. A graphical representation of the structure of the corpus based on the combined search is presented in Figure 1. Although examination of each individual research area shows large variations in content and structure, we were able to identify a set of five general themes that is prevalent in each of the research areas. These were: “clinical and weight-related issues” (red), “body image and disordered eating” (green), “positive body image and

objectification” (blue), “media effects” (yellow), and “ethnicity/race” (purple). A finer-grained cluster analysis identifies possible graph components that make up each cluster. In the following subsections, we first elaborate on these main themes, the central topics in each, and the inter-relatedness of topics within and across research areas. Table 1 presents key metrics for selected keywords that are examined to a varying extent in each research area (for all keywords and associated metrics, see Supplementary Materials). Note that some keywords were used to describe a general topic or broad area of research and represent bridges between other keywords and clusters. Our analysis identified three such bridging keywords, namely “body dissatisfaction”, “women”, and “eating disorders”. This reflects the fact that these constructs are widely researched within the body image literature.

3.2.2. Clinical and weight-related issues. The first research cluster, which we called “clinical and weight-related issues”, was broad in focus, covering issues related to weight status (“body weight” was the most frequent keyword in this cluster, appearing 105 times), clinical and subclinical aspects of body image, and appearance-related research. Overall, this cluster was well-connected externally with all other research clusters, as well as internally between different components. Early research in this cluster was focused understanding the phenomenology, symptom presentation, and outcomes of appearance-related concerns (Veale et al., 1996), with a strong focus on body weight. The latter is perhaps unsurprising given that body weight is often central to body social evaluations (Puhl & Brownell, 2001; Puhl & Heuer, 2009), body image concerns (Ålgars et al., 2009), and psychosocial outcomes (Cash et al., 1989). This research was also central to conceptualisations of body image as a multidimensional construct, both in terms of its assessment but also in establishing a distinction between everyday dissatisfaction and disturbance that includes concern, distress, and impairments in psychosocial functioning (Cash et al., 2004).

The cluster comprises four main graph components (see Figure 1 and Table 1), the first of which relates to clinical and subclinical aspects centred primarily around depression (the most frequent keyword in this area) and body dysmorphic disorder (BDD; the second most frequent keyword in this area). Early and ongoing work in this area is focused on understanding the psychological distress and impact on quality of life caused by body image concerns and disorders (e.g., Phillips et al., 2004). A related strand of this work is focused on establishing prevalence estimates (“prevalence” was another highly frequent keyword), symptom presentation, and the aetiology of BDD (Veale et al., 1996), which was important in leading to the inclusion of BDD in the fifth edition of the *Diagnostic and Statistical Manual of Mental Disorders (DSM-5)*; American Psychiatric Association, 2013) and the development of theoretical models of BDD (Veale, 2004). Another focus of this research is on associations between BDD symptomatology and cosmetic surgery, both in terms of consideration and outcomes (Bowyer et al., 2016; Sarwer & Crerand, 2004), while more recent work has attempted to link BDD to core theoretical perspectives in the body image literature, such as self-discrepancy theory (Veale et al., 2016), and to extend these findings to under-represented social identity groups (e.g., Rozzell et al., 2020).

A second cluster is focused on issues related to body weight, particularly attitudinal dispositions (“attitudes” was the most frequent keyword in this area). A key plank of this research area has been investigations of attitudes toward overweight and obesity (Hansson & Rasmussen, 2014), as well as perceptions of body size and weight-related physical attractiveness, particularly in different national groups (Swami & Tovée, 2005). However, inspired by work by weight-based discrimination, stigma, and bias (Puhl & Brownell, 2001; Puhl & Heuer, 2009), this research area is now more heavily focused on weight bias. Recent developments in this area have resulted in the development of theoretical models of the impact of weight bias on psychosocial outcomes (Tylka et al., 2014) and examinations of

antecedents – particularly within familial relationships – and outcomes of weight bias internalisation (Carels et al., 2020). Links have also been drawn between weight bias internalisation, self-objectification, and disordered eating (Mehak et al., 2018), which highlights the inter-connectedness of this research area with other research clusters.

A third cluster was more emergent and focused on appearance-related research, particularly in terms of visible differences and disfigurement (e.g., Bessell & Moss, 2007; Feragen & Stock, 2018). Key foci here have been on understandings of lived experiences of individuals with visible difference, psychosocial outcomes among individuals with visible differences, and the efficacy of support for such individuals (Sharratt et al., 2018; van Dalen et al., 2020). There are also links emerging between this research topic and research on positive body image (see Section 3.2.3.), although this area of work is more nascent. A final cluster was focused on issues of sampling, with research on adolescent and child populations being common (Carlson Jones, 2004). Indeed, there was a strong tradition of research in this cluster as a whole on a range of age and social identity groups, but perhaps the most striking aspect of this research area was the focus on self-esteem: after “adolescents” (153 occurrences), it was the most frequently mentioned keyword (111 occurrences) in this cluster. This likely reflects both the importance of body image in relation to the development and maintenance of self-esteem, but perhaps also an over-reliance on measures of self-esteem as an indicator of psychological well-being.

3.2.3. Body image and disordered eating. The theme “body image and disordered eating” was another dominant cluster in our analyses and was related to all other research areas. The inter-connectedness of this cluster in the map highlights its status as an anchoring construct in the knowledge base of body image research (e.g., Thompson et al., 1999). Research in this area has a long and vast history in a myriad of different research fields, with early studies focused on the relationships between negative body image, internalisation of

appearance ideals, and risk and maintenance of eating pathology (Stice, 2002; Stice & Shaw, 2002; Thompson & Stice, 2001). These, and other studies in the early 2000s, were central to establishing negative body image as a core risk factor for various forms of eating disorders, as well as the development of (now) well-established theoretical models linking negative body image and disordered eating (Thompson et al., 1999). Other central studies were focused on understanding gendered differences, such as the importance of internalisation of muscular ideals in boys/men and internalisation of thin ideals in women/girls (e.g., Arbour & Ginis, 2006; Carlson Jones, 2004).

The cluster comprises three main graph components. The first relates to the central topic of body image disturbances and eating disorders (Stice & Shaw, 2002), particularly how various forms of negative body image act as risk factors for anorexia and bulimia nervosa (e.g., Linardon et al., 2018; Moscone et al., 2017). An important aspect here is Cash and colleague's (2004) description of body image disturbance as a key facet of multidimensional body image that indexes everyday dysfunction, with impacts on both patterns of disordered eating and psychosocial well-being. Indeed, work in this area has expanded rapidly to generate links with topics more central to other research clusters, including self-objectification, cosmetic surgery, and weight bias (Jongenelis et al., 2014), which in turn has enhanced understandings of the risk factors for disordered eating. Emerging research has also focused on these issues in social identity groups that have historically not been the focus of body image researchers, such as sexual minority adults (Dahlenburg et al., 2020). There is also a well-established focus in this research area on the prevention of disordered eating (e.g., Kroon Van Diest & Perez, 2013), which often draws heavily on sociocultural models (Stice, 2002).

A second major component of this cluster is focused on male body image, particularly in terms of the idealisation of muscularity and drive for muscularity (McCreary & Sasse,

2000), with a smaller focus on muscle dysmorphia (e.g., Cunningham et al., 2020). Sociocultural theories in general, and the Tripartite Influence Model (Thompson et al., 1999) in particular, have emerged as key explanatory frameworks in understanding male body image. For example, some research has focused on the role played by internalisation of muscular ideals in mediating relationships between perceived pressure from peers, family, and mass media, on the one hand, and drive for muscularity on the other (Karazsia & Crowther, 2009; Stratton et al., 2015). A further important stream has been work demonstrating links between drive for muscularity and eating disorder symptoms and body dysmorphic symptoms (Hartmann et al., 2018). Although research on drive for muscularity is dominated by studies on men, an emerging body of work has examined these constructs in women, different ethnic groups, and different sexual orientations (Ramme et al., 2016; Tylka & Andorka, 2012), and it is more widely recognised that appearance ideals may be converging across social identity groups (Tod et al., 2012).

The third component relates to more overarching topics, such as risk factors and internalisation, which draws heavily on the Tripartite Influence Model (Schaefer et al., 2015; Thompson et al., 2004). Other topics in the component relate to issues in terms of sampling, with foci on adolescent girls and boys (e.g., Keery et al., 2004), as well as adults, and on sexual orientation (e.g., Tylka & Andorka, 2012). Emergent segments of this research areas were focused on postpartum issues (e.g., Lovering et al., 2018) and cultural factors (e.g., Swami, Frederick et al., 2010; Swami, Tran et al., 2020), although these areas of work remain relatively under-developed.

3.2.3. Positive body image and objectification. A third major cluster in our analysis related to research on positive body image and objectification. Although it may seem somewhat odd that these research areas form part of the same cluster, it should be noted that positive body image and objective represent different graph components (i.e., at a more fine-

grained analysis, they are distinct). Nevertheless, there may be a number of reasons why these research areas appear within the same research cluster. First, both research areas represent a more contemporary focus for body image scholars and share common underlying theoretical perspectives, including feminist and positivist psychology (Frederickson & Roberts, 1997; Tylka, 2012). In a similar vein, it may be that elements of positive body image and objectification show some overlap in conceptual meaning (e.g., body acceptance from others could be conceptualised as low levels of body-related objectification from others), which would facilitate cross-pollination of research efforts. Second, the relative recency of research on positive body image may mean that it has not had time to emerge as a cluster in its own right; from this perspective, research on positive body image can be seen as being closest in alignment – both theoretically and in terms of the specific research topics of interest – with that of objectification research. Of course, as both of these research areas mature, it may be that they will diverge to form relatively independent research clusters.

The cluster comprises three main graph components, with the first clearly focused on key constructs of positive body image, particularly body appreciation (95 occurrences as a keyword; Avalos et al., 2005; Tylka & Wood-Barcalow, 2015). The latter is perhaps unsurprising given that body appreciation was the earliest facet of positive body image to be conceptualised, defined, and operationalised (Avalos et al., 2005). There was also evidence in this cluster of attention on the developments of theoretical models of positive body image, such as the acceptance model of intuitive eating (Tylka & Kroon Van Diest, 2013). Another key development in this rapidly growing area has been the development of interventions designed to promote more positive body image (for a review, see Guest et al., 2019). Also notable was the focus on self-compassion, which has emerged as an important differential factor predicted to promote more positive body image (Homan & Tylka, 2015). It is also noteworthy that, while this area of research has benefitted from validation studies in a range

of social identity groups (e.g., Swami, Mohd. Khatib et al., 2019), allowing for an understanding of the construct in a wide range of populations and population segments, much of the research base remains focused on college women (74 occurrences as a keyword).

A second component in this cluster was focused on objectification research (Frederickson & Roberts, 1997). In part, this likely reflects the theorisation of positive body image as an important buffer against self-objectification tendencies (e.g., Alleva et al., 2015). However, research and theorising on objectification was also highly developed in its own right, showing inter-connections with all other research clusters. Theorising, in particular, has benefitted from strong explanatory power of the underlying theory of objectification (Frederickson & Roberts, 1997), particularly in relation to topics such as body surveillance, shame, and eating disorder symptoms (Moradi & Huang, 2008). An additional important focus of research in this area has been associations between objectification and body consciousness during sexual activity (Vandenbosch & Eggermont, 2014). Given that objectification theory was developed to understand the lived experience of women (Frederickson & Roberts, 1997), it is perhaps unsurprising that the keyword “women” was frequently mentioned in this literature; indeed, it was the most frequent keyword in this cluster).

Finally, this cluster also included a smaller component on health-related outcomes, particularly in terms of physical activity (e.g., Gilchrist et al., 2018). This work has typically been approached from the point of view of body surveillance (habitually monitoring one’s physical appearance), a key outcome of self-objectification. However, work on physical activity also demonstrates one way in which links between objectification theory and positive body image are beginning to merge in terms of research interests (e.g., Cox et al., 2017). Another key strand of this area appears to be on health promotion, particularly through embodying activities such as yoga (Alleva et al., 2020). Research on body shame (20

occurrences as a keyword), which is an important construct in objectification theory, also appears to be an important development, but overall research in this area remains underdeveloped.

3.2.4. Media effects. A fourth major cluster, which was again highly inter-connected both internally and with all other research clusters, could be broadly grouped under the theme of media effects. The core of this cluster can be described as the “traditional” focus of body image research, namely the impact of exposure to images of idealised appearance, such as thin, athletic and hyper-muscular, that are presented in various forms of media (Betz & Ramsey, 2017; Grabe et al., 2008; Groesz et al., 2002; Want, 2009; Watson et al., 2019). The dominant term in the cluster is “mass-media”, with 139 occurrences. However, the mass-media landscape has changed dramatically over the past two decades, which is reflected by the keywords in the cluster and their average year of publication. The terms: “television”, “situation comedies” have their average publication year in 2011-2012, whereas “magazines”, “media images”, “thin-ideal media”, “media exposure”, and “advertisements” have their average publication years 2013-2014. In recent years, new terms have also emerged, of which the most dominant is “social media”, the term with the strongest burst value in our analysis, starting from 2017 (see Section 3.3.). Other terms in the cluster that relate to this topic include “selfies”, “fitspiration”, “thinspiration” and “disclaimer labels”, terms with an average publication period from 2017-2019. These terms are often examined in relation to how they influence negative affect, disordered eating, and body image through social comparison processes (e.g., Holland & Tiggemann, 2016; Jarman et al., 2021; Vendemia & DeAndrea, 2018). A related topic is that of how media literacy protects against the adverse effects of negative media images on body related variables and disordered eating (e.g., McLean et al., 2016; Tamplin et al., 2018).

A second, small graph component relates to the keywords of “anxiety”, “information processing”, and “self-presentation”. Although much research on media examines constructs such as body satisfaction/dissatisfaction and body appreciation, some studies examine how exposure to various media relate to body image-related constructs, such as body-focused and social physique anxiety (e.g., Anschutz et al., 2009; Hawes et al., 2020). Much of the research in this cluster has focused on exposure to the thin ideal and shows an over-reliance on female samples (Thompson & Stice, 2001), with the impact of exposure to muscular images remaining under-represented. Within this research area, it is also possible to discern a smaller focus on exercise (e.g., Robinson et al., 2017), although this area is under-developed. Theorising in this cluster overall has been primarily driven by a focus on social comparison theory (for a review, see Myers & Crowther, 2009), as reflected in the frequency of occurrence of this keyword within this cluster.

3.2.5. Ethnicity. The final research cluster is also the smallest, and was focused on ethnicity. Keywords in this cluster relate to all other clusters, indicating that research that takes ethnicity into account is not focused on a single area of body image research. Much of the research within this cluster was focused on African American populations in the United States (e.g., Pope et al., 2014), although there was also a smaller focus on issues of acculturation and ethnic identity.

3.3. Evolution of Research Topics

Table 1 presents the average year of publication for keywords from the *Body Image* corpus, which indicates the time period when particular topic and clusters have been examined and indicates the evolution of the body image literature between 2004 and 2020 (Zupic & Čater, 2015). 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, namely 2012-2014, and those which were in vogue for a limited period of

time, we also report the burst analysis in Table 2. In broad outline, the “clinical aspects”, “body image and disordered eating”, and “media effects” clusters represent more traditional or older research foci. In the “clinical aspects” cluster, the focus on overweight, obesity, cosmetic surgery, and BDD in particular appears to have been more popular early in the literature and has received sustained interest. Notable exceptions in this cluster include an emergent focus on weight bias and visible differences. Research on young adults also appears to have emerged more recently within this cluster. The “body image and disordered eating” cluster also represents an older focus of research, although it is possible to discern emerging research fronts in terms of eating disorder prevention and on sexual orientation. The Tripartite Influence Model remains influential in terms of guiding research in this cluster. Finally, the “media effects” also represents a more traditional focus of research, with the very notable exception of research focused on social media.

In contrast, there was a clear indication that research in the “positive body image and objectification” cluster represents a research front. Within this cluster, it was research on positive body image, in particular, that was most likely to have featured in recent literature. “Hot topics” in this area include work on body appreciation (95 co-occurrences) and self-compassion (38 co-occurrences), as well as the acceptance model of intuitive eating (36 co-occurrences). Within the objectification area, on the other hand, research on mental health (32 co-occurrences) may represent an emergent front. These findings are also borne out by our keyword burst analysis, where keywords including “positive body image”, “self-compassion”, “embodiment”, and “acceptance model” have all experienced strong and recent bursts. The bursts all start in the period 2015 to 2018, and continue to the present, and have a high level of strength. Other notable research fronts identified in this analysis include a focus on social media (which had the strongest burst overall), self-objectification, and

interventions. In contrast, research on physical attractiveness, television, and body shape all had strongly, early bursts but appear to have fallen out of favour in *Body Image*.

3.4. Geographic Distribution

The co-author analysis indicated that the bulk of articles published in *Body Image* between 2004 and 2020 have come from predominantly Anglo-Saxon countries – United States, England, Australia, and Canada (see Figure 2) – which Cash (2017) had previously identified. Indeed, the networks between scholars in these four nations appears to be relatively well-established. However, the co-author analysis also identified emergent research networks in France, China, the Netherlands, and Malaysia, which were fairly well-connected to the dominant cluster. Also notable in this analysis was the breadth of nations that emerged, although many remained poorly connected in terms of scholarly networks. In particular, although research in South America, Eastern Europe, and Scandinavia is emerging in *Body Image*, these remain relatively poorly connected. It is also notable that researchers based in Africa do not feature in these networks.

4. Discussion

In the present study, we used science mapping methods to identify, visualise, and describe the composition or intellectual structure of the body image knowledge base, as indexed by publications in *Body Image* between 2004 and 2020. To our knowledge, this is the first study to use bibliometric science mapping methods to understand body image research and, as such, our work will likely be of interest to scholars who wish to understand the overarching structure of body image research as it has developed over the past two decades, as well as the structure of individual research areas. In addition, our analysis also identified topics that have traditionally been the focus of body image researchers, as well as topics that have been of especial interest more recently. Finally, we also provide an indication of the geographic distribution of scholarly knowledge and expertise on body image, which will be

important when considering the future of the field. This overview would not have been possible through more traditional review methods and allows us to draw a number of important conclusions.

4.1. Composition of Body Image Research

Based on the co-occurrence analysis of 2,783 keywords from just over 1,100 articles published in *Body Image* between 2004 and 2020, we show that the body image knowledge base consists of five major themes. Three of these themes represent more “traditional” areas of body image research that readers will likely be familiar with, namely clinical and weight-related issues, body image and disordered eating, and media effects, respectively. A fourth theme represents a traditional core of body image knowledge, namely objectification research, alongside an emergent trend of research focused on positive body image. A final theme was more general and focused on issues of ethnicity/race. An awareness of these core thematic areas may be useful for researchers, both in terms of understanding how their own research areas connects with other research themes, but also in generating ideas for new research interests.

We provide several examples to illustrate each of these implications in turn. First, it is apparent from our network visualisation in Figure 1 that few studies have examined clinical aspects of body image, such as BDD, using media exposure methodologies (for a discussion, see Leit et al., 2002). It may be that there are methodological issues that limit what can be achieved (e.g., a dearth of appropriate state measures), but bringing these “traditional” areas of body image research into closer contact may be fruitful. This is particularly the case with research on social media, which has predominantly focused on aspects of body dissatisfaction, but has infrequently made connections with issues such as body image disturbance, weight bias, and body dysmorphic disorder. In a similar vein, as research on positive body image has developed, researchers appear to have forged strong connections

with traditional foci, such as symptoms of disordered eating, eating behaviours, and media effects. While undoubtedly important, there may be value in broadening the scope of research on positive body image to include a focus on relatively less connected topics, such as weight-based discrimination.

Of course, these are merely examples, but they highlight ways in which scholars could use our analyses to develop new areas of research activity or broaden existing areas of interest. Another way in which this could be accomplished is to examine topics that have received substantial attention in some clusters and scant attention in others. Parental influence, for instance, has received relatively more coverage in the “body image and disordered eating” and “clinical and weight-related issues” clusters, but has received meagre attention in terms of the “positive body image and objectification” cluster. Another example is that “physical activity” is studied most frequently in the “positive body image” area and less so in terms of “obesity”. These, and other similarly skewed foci, may represent areas of research that could potentially be developed more fully. Understanding the ways in which positive body image and physical activity influence weight bias internalisation, for instance, may be valuable for the development of effective weight management interventions.

A final way in which our analyses could be used by researchers is by examining sample-related keywords that are dominant in particular research clusters. For instance, it is apparent that “women”, and particularly “college women”, have been a central focus of research on “positive body image and objectification”; conversely, children and adolescents are less likely to feature in this research cluster. Likewise, the relative lack of interconnectedness of the “ethnicity/race” cluster suggests that there may be value in more fully embedding issues of ethnicity/race within the broader body image research paradigm. While it was encouraging that this cluster emerged as an entity in its own right, its lack of interconnectedness with other research clusters suggests that there is scope to more fully

understand the body image experiences of ethnic minority groups and individuals, both within and across national settings.

4.2. Identifying Research Fronts

Our analyses also allowed us to identify the “research front” of the body image research base. Without doubt, the research front of this corpus is work on positive body image, which has grown substantively since about 2015 (see Daniels et al., 2018). There may be a number of factors that explain this emergence, including a shift toward understanding body image from the point-of-view of positivist psychology (see Tylka & Piran, 2019), the proliferation of measures for assessing aspects of positive body image (Webb et al., 2015), and the deployment of novel methods for conceptualising this field (e.g., Swami, Furnham et al., 2020). It is also notable that interventionist work has seen a rapid emergence since about 2018 in this research area, which may translate into clearer public policy for the promotion of healthier body image. However, as noted above, this area of research remains heavily reliant on female samples, and there is a need to more fully develop understandings of positive body image in other social identity groups. It should also be noted that, although research on positive body image represents a clear and broad research front, there have also been rapid developments in body image research *vis-à-vis* social media and self-objectification, in particular. Early-career scholars entering the body image field may find it useful to develop foci in these areas of research in particular.

4.3. Identifying the Geographic Distribution of Scholarly Effort

In his final editorial for *Body Image*, Cash (2017) reported on journal data indicating that the bulk of research published in *Body Image* up to 2015 had been conducted in the United States, the United Kingdom, Australia, and Canada. Our analyses corroborate that reporting: based on co-author analysis, there appears to be strong linkages between body image researchers in these four nations. Such findings are perhaps unsurprising given the

genesis and development of body image research in North America, Australia, and the United Kingdom, in particular. However, given the importance of body image research globally and the possibility that models of body image developed in Anglophone nations may not generalise to other cultural settings (e.g., Swami, Todd et al., 2019), our analyses also raise concerns that research networks may remain relatively under-developed in many regions of the world. A more positive reading of our analyses would highlight emergent and relatively well-embedded networks in mainland Europe, East and Southeast Asia (particularly China and Malaysia).

However, it also apparent that research networks remain relatively weak in South and Central America, South Asia, the Middle East, and Eastern Europe, and were virtually non-existent in Africa. There may be a number of obstacles in the research and publication process that explain the paucity of body image research networks in these regions. One such obstacle is that requirement of publication in English. It is possible that collaborative research efforts are impeded by difficulties in communication and that some researchers, for whom English is not a first language, are electing to publish in own-language journals (which would not have been captured in our analyses). A second obstacle may be the lack of psychometrically validated instruments for the measurement of body image in some linguistic groups, which limits the possibilities of conducting high-quality research and therefore publication in *Body Image* (e.g., because researchers in these contexts end up using novel instruments that have not been psychometrically validated or outdated measures of body image). Beyond this, it is also possible that there are structural barriers that impede researchers conducting body image research in the rest of the world (e.g., body image research may not be seen as sufficiently important, compared to other areas of cross-cultural psychology, to justify research funding). Researcher crowdsourced research (see Cuccolo et

al., 2020) may be one viable means of developing research networks across world regions more fully, as has been demonstrated recently (Swami, Tran et al., 2020).

4.4. Limitations

As noted above, this is the first time that science mapping methods have been applied to understand the structure and scope of body image research. The main strength of our work, and of science mapping in general, is the ability to combine quantitative analysis, classification, and visualisation to identify intellectual structures and inter-relationships between bibliographic objects (Zupic & Čater, 2015). That is, our analysis helps scholars to make sense of a large volume of information in the body image corpus and helps researchers to understand conceptual themes and developments, time-trends, and discipline boundaries (cf. Aria & Cuccurullo, 2017; Li et al., 2019). Nevertheless, there are a number of limitations to science mapping generally and our analyses specifically. First, science mapping does not replace review methods, such as meta-analyses and research syntheses, which would offer assessments of research quality, integration, and limitations. More broadly, the analyses we have presented here should be seen as complementing existing syntheses of the field (e.g., Cash, 2012; Cash & Pruzinsky, 2002; Cash & Smolak, 2011), while affording readers an opportunity to identify gaps in knowledge, potential areas of growth in body image research, and connections that may be otherwise difficult to notice.

Second, there are limitations that stem from the manner in which we implemented our methodology. First, our choice of using only articles from *Body Image* means that our corpus represents a sample of the field, rather than the entirety of body image research. For example, our corpus does not take into consideration body image research published in other journals, books, book chapters, conference papers, and theses. We justified our approach – not uncommon in science mapping (Zupic & Čater, 2015) – on the basis that *Body Image* remains the only specialty journal for body image research (Tylka et al., 2020), which means

that our corpus does – to some extent, at least – capture the most relevant research being conducted on body image since 2004. Moreover, relying on publications in *Body Image* ensures a degree of quality control, insofar as we can be confident that all entries are of a high standard of quality; however, we acknowledge the potential bias resulting from editorial preferences, priorities, and direction of the journal that may have played a part in the type of articles accepted for publication.

Third, and relatedly, there are limitations in our reliance on the WoS and Scopus databases: WoS only includes articles from *Body Image* from 2007 and onwards. While we supplemented our corpus with data from the Scopus database for the missing years, these data did not include the WoS Keywords Plus, meaning some terms from the early years may be underrepresented. Further, the burst analysis could only be conducted on the WoS data, meaning that bursts that began prior to 2007 were not included. Examining the results, we do not believe these weaknesses have unduly influenced our results. 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.

4.5. Conclusion

To summarise, the present study applied science mapping methods to understand the composition, development, and geographic distribution of the body image knowledge base, as indexed by publications in *Body Image* between 2004 and 2020. To our knowledge, this is the first time that science mapping methods have been applied to body image research and, the limitations above notwithstanding, we believe our results will be of interest to researchers seeking an overview of the evolution of body image research over the past two decades.

Based on our results, we suggest that there is scope to broaden research in “traditional” areas of focus, to develop new areas of sustained research, and to more fully understand trajectories of ongoing research. Similarly, we suggest that there is a need for greater geographic diversity in body image research networks, a challenge that Cash (2004) identified as important when *Body Image* was first established. More broadly, we assert the usefulness of science mapping methods to better understand body image and related research.

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Table 1

*Selected Keywords from the Bibliometric Co-occurrence Analysis of the Body Image**Literature, Clustered by Topic.*

Keyword	Occurrence	Degree	Avg. Pub. Year	PageRank
Cluster 1 (Red): Clinical and Weight-Related Issues				
Component 1a				
Depression	63	139	2014.4	0.08
Prevalence	58	125	2013.9	0.07
Body Dysmorphic Disorder	61	91	2012.3	0.05
Quality-Of-Life	43	111	2014.9	0.05
Symptoms	21	75	2013.4	0.03
Cosmetic Surgery	26	72	2012.7	0.03
Component 1b				
Attitudes	105	177	2013.8	0.12
Body Weight	84	150	2011.8	0.09
Obesity	73	121	2012.4	0.08
Overweight	56	110	2012.5	0.07
Stigma	45	109	2014.6	0.06
Body Size	36	96	2014.2	0.05
Perceptions	28	85	2013.3	0.04
Weight Bias	20	67	2015.1	0.03
Component 1c				
Appearance	75	155	2015.0	0.09
Sex Difference	68	150	2012.2	0.08
Young-Adults	28	109	2016.4	0.04
Cancer	18	61	2014.9	0.02
Visible Difference	15	44	2015.1	0.02
Disfigurement	15	30	2011.9	0.02
Component 1d				
Adolescents	153	192	2013.6	0.18
Self-Esteem	111	170	2012.8	0.13
Girl	81	142	2013.3	0.11
Children	80	140	2013.5	0.10
Parents	23	72	2014.2	0.04
Peers	20	75	2013.6	0.03
Other keywords in cluster				
Gender	98	181	2013.4	0.12

Cluster 2 (Green): Body image and disordered eating

Component 2a

Eating Disorders	299	225	2014.0	0.34
Body-Image Disturbance	81	161	2012.8	0.10
Anorexia-Nervosa	69	140	2013.9	0.07
Bulimia-Nervosa	60	121	2012.8	0.07
Prevention	48	111	2014.6	0.06
Dieting	39	100	2012.2	0.05
Body Shape	26	60	2012.4	0.03

Component 2b

Body Dissatisfaction	471	245	2013.9	0.54
Adolescent Boys	86	144	2012.0	0.11
Men	71	134	2012.6	0.07
Muscularity	62	130	2012.4	0.07
Sociocultural Influences	37	106	2013.0	0.05
Sexual Orientation	40	92	2014.2	0.04
Tripartite Influence Model	28	85	2014.9	0.04
Drive For Muscularity	33	79	2012.4	0.03
Muscle Dysmorphia	26	57	2013.0	0.03

Component 2c

Internalization	136	175	2014.3	0.17
Adolescent Girls	133	171	2013.3	0.17
Risk-Factors	118	174	2013.3	0.15
Sociocultural Attitudes	46	108	2014.2	0.06
Eating Pathology	23	84	2013.8	0.03

Other keywords in cluster

Weight	132	181	2012.5	0.16
Behaviors	98	164	2014.2	0.12

Cluster 3 (Blue): Positive body image and objectification**Component 3a**

Body Appreciation	95	131	2016.6	0.10
Positive Body Image	80	131	2016.4	0.09
College-Women	74	138	2015.0	0.09
Intervention	50	120	2015.3	0.06
Self-Compassion	38	106	2017.6	0.05
Acceptance Model	36	107	2016.8	0.05

Component 3b

Women	256	229	2014.1	0.28
Objectification	114	165	2015.3	0.14
Self-Objectification	103	152	2015.9	0.13
Mental-Health	32	107	2016.3	0.05

Eating Disorder				
Symptoms	24	93	2014.9	0.04
Consciousness	21	84	2015.0	0.03
Body Surveillance	22	74	2014.9	0.03

Component 3c

Health	51	136	2014.9	0.06
Physical Activity	39	105	2013.8	0.05
Social Physique Anxiety	25	85	2013.8	0.03
Shame	20	69	2015.5	0.03

Other keywords in cluster

Negative Affect	23	88	2013.8	0.03
Fat Talk	43	108	2015.5	0.05

Cluster 4 (Yellow): Media effects**Component 4a**

Mass-Media	139	168	2013.8	0.17
Media Exposure	85	141	2013.9	0.11
Social Comparison	76	136	2014.5	0.10
Impact	77	146	2016.4	0.09
Media Images	65	122	2013.9	0.09
Physical Attractiveness	80	127	2011.8	0.08
Thin Ideal	56	128	2014.2	0.07
Social Media	55	104	2018.3	0.07
Ideals	48	109	2014.5	0.06
Mood	44	81	2014.6	0.05
Body-Image Concerns	37	114	2016.2	0.05
Thinness	37	98	2014.5	0.05
Advertisements	31	65	2014.9	0.04

Component 4b

Anxiety	41	116	2013.6	0.05
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Other keywords in cluster

Physical Appearance	15	63	2013.8	0.02
Exercise	40	107	2015.0	0.05
Body Satisfaction	124	186	2014.4	0.16

Cluster 5 (Purple): Ethnicity/race

Ethnicity	31	89	2013.3	0.04
African-American	22	79	2014.4	0.03

Note: Occurrence (OC) refers to number of articles the keyword appears in. Degree is the number of other keywords the focal keyword connects to. Average publication year (Avg. Pub. Year) PageRank is the weighted centrality measure of local importance. Full table of all keywords are available in the supplemental materials.

Table 2

Top 36 Keywords with the Strongest Bursts.

Keywords	Strength	Begin	End	2007 - 2020
Sex Difference	4.46	2007	2009	
Physical Attractiveness	8.70	2007	2010	
Television	5.00	2007	2011	
Weight	6.72	2007	2011	
Body Shape	4.39	2007	2012	
Muscularity	4.69	2008	2009	
Drive for Muscularity	2.93	2008	2010	
Overweight	2.99	2008	2011	
Media Influence	3.16	2009	2011	
Muscularity Dysmorphia	3.32	2009	2012	
Drive for Thinness	3.01	2010	2012	
Media Exposure	3.51	2010	2012	
Risk-factors	2.95	2010	2012	
Sociocultural Influence	3.32	2011	2012	
Body Image Disturbance	3.37	2011	2014	
Dieting	4.23	2011	2014	
Internalization	3.90	2012	2016	
Prevention	3.18	2013	2014	
Positive Body Image	8.76	2015	2020	
Health	3.00	2016	2018	
Acceptance Model	2.79	2016	2020	
Disclaimer Label	3.29	2016	2020	
Self-Compassion	3.68	2016	2020	
Experience	3.49	2017	2018	
Body Functionality	3.91	2017	2020	
Body Image Concern	2.85	2017	2020	
Quality-of-Life	3.25	2017	2020	
Self-objectification	5.55	2017	2020	
Social Media	15.59	2017	2020	
Appearance Comparison	2.92	2018	2020	
Embodiment	4.21	2018	2020	
Functionality	3.01	2018	2020	
Intervention	4.48	2018	2020	
Mass Media	2.82	2018	2020	
Mental Health	2.77	2018	2020	
Stigma	2.96	2018	2020	

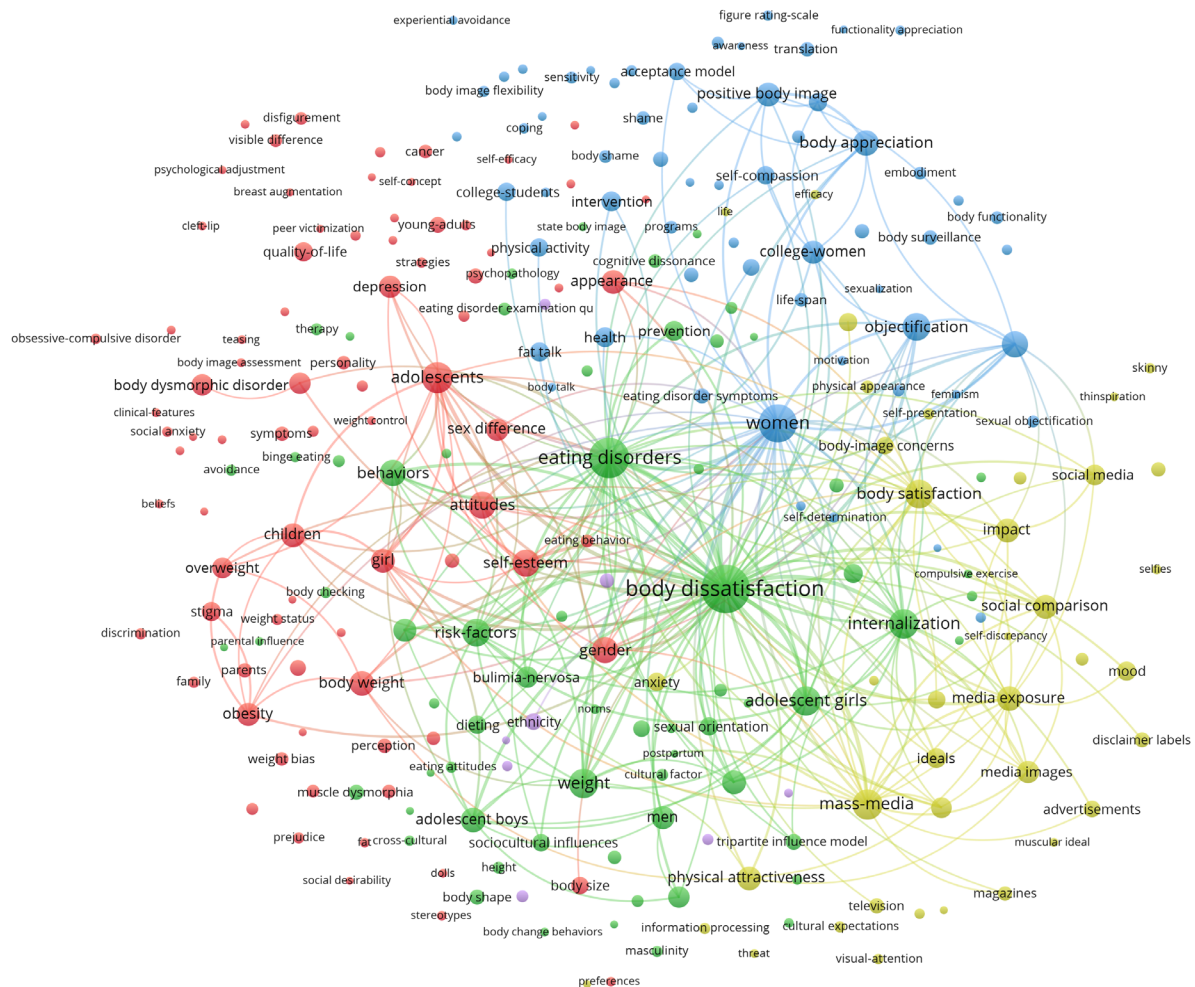


Figure 1. Network visualisation of the keyword co-occurrence analysis of literature on body image, clustered by topic. Red – cluster 1: Clinical aspects; Green – cluster 2: Body image and disordered eating; Blue – cluster 3: Positive body image and objectification, Yellow – cluster 4: Media effects; Purple – cluster 5: Ethnicity/race. 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 three or more links are shown in the figure for legibility. To view all links, please access the online interactive map at

<https://osf.io/sym6v/>.

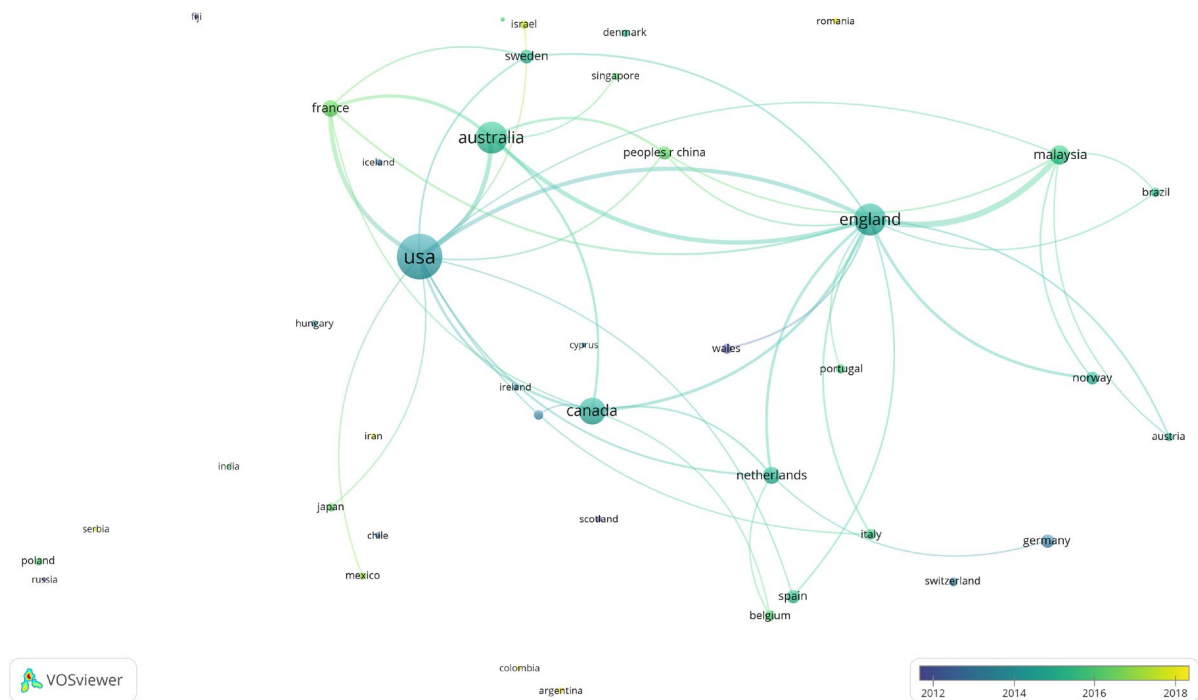


Figure 2. Co-authorship network graph of countries where authors of articles reside. Size of circle indicate number of articles originating from the country. Colour scale shows average publication year of the publications. The thickness of the ties between countries indicates the frequency of collaborations. For visual clarity, the minimum number of collaborations is set to three.