DIGITAL HEALTH

Fat stigma and body objectification: A text analysis approach using social media content

Vajisha U Wanniarachchi[1] (iD), Chris Scogings[1], Teo Susnjak[1] (iD) and Anuradha Mathrani[1] (iD)

Abstract

This study investigates how female and male genders are positioned in fat stigmatising discourses that are being conducted over social media. Weight-based linguistic data corpus, extracted from three popular social media (SM) outlets, Twitter, YouTube and Reddit, was examined for fat stigmatising content. A mixed-method analysis comprising sentiment analysis, word co-occurrences and qualitative analysis, assisted our investigation of the corpus for body objectification themes and gender-based differences. Objectification theory provided the underlying framework to examine the experiential consequences of being fat across both genders. Five objectifying themes, namely, attractiveness, physical appearance, lifestyle choices, health and psychological well-being, emerged from the analysis. A deeper investigation into more facets of the social interaction data revealed overall positive and negative attitudes towards obesity, which informed on existing notions of gendered body objectification and weight/fat stigmatisation. Our findings have provided a holistic outlook on weight/fat stigmatising content that is posted online which can further inform policymakers in planning suitable props to facilitate more inclusive SM spaces. This study showcases how lexical analytics can be conducted by combining a variety of data mining methods to draw out insightful subject-related themes that add to the existing knowledge base; therefore, has both practical and theoretical implications.

Introduction

In recent years, the worldwide trend in regard to social media (SM) use in everyday life has shown manifold growth. Many SM outlets (e.g. Twitter, YouTube, Facebook and Reddit) have pervaded our day-to-day lives and transformed how we interact and exchange views. 'It is estimated that 3.5 billion people worldwide use some type of social media'.[1(p.3)] Some scholars attribute the excessive use of SM to be a consequence of the 'fear of missing out',[2] as users often feel much pressure in maintaining online connectivity through regular social interactions. In fact, online SM discourses have been likened to the notion of 'para-social interactions'[3] where technology takes the role of a non-human actant[4] that facilitates conversations for shaping out a shared social reality.[5–7] Online actions reflect our social identities, namely our cognitive (self-awareness), evaluative (self-worth) and affective (self-identification),[8] when we engage in discussions on emergent topics (pertaining to health, education, politics or other societal issues). Online user conversations occur as and when users comment on each other's posts where they state their own stance on the topic under discussion which may express similar or diverging opinions.

The 'startling' increase in worldwide obesity rates with no significant decline in any country[9] has caught the attention of online communities too, and this has steered SM

[1]School of Mathematical and Computational Sciences, Massey University, Auckland, New Zealand

Corresponding author:
Anuradha (Anu) Mathrani, School of Mathematical and Computational Sciences, Massey University, Private Bag 102904, North Shore Mail Centre, Auckland 0745, New Zealand.
Email: a.s.mathrani@massey.ac.nz

discourses towards topics related to excessive body fat. Public opinions around 'what is unacceptable body weight?' have gathered momentum. And, since the internet has not been designed to safeguard users from online abuse, therefore, verbal cyber-attacks when voicing opinions cannot be avoided.[10] Messages displaying verbal aggression can lead to internet trolls that can spread prejudice, hatred, discrimination and stereotyping of fat people. Moreover, with the anonymity associated with online exchanges, users often feel a sense of liberation that allows them to express their 'true' beliefs and attitudes without fear of being judged by others. Consequently, under the guise of freedom of expression, users often write aggressive posts that cause further 'deindividuation and disinhibition'.[11(p.74)] Aggressive posts can lead to many forms of stigmatisation, such as, weight, religion and colour amongst others. The impact of stigmatisation, specifically negative weight-based characterisation, on those individuals who are struggling with excess weight[12,13] can be hugely detrimental. This social devaluation and denigration of individuals considered to have excessive weight is referred to as weight or fat stigma.[14] Weight-based discrimination can be in the form of name calling or, of being treated with less respect and courtesy, all of which can lead to internalisation of weight stigma, or self-stereotyping based on one's weight.[15–18] Research on fat stigma commonly report fat stigma to be perceived mainly as a feminine issue with more aesthetic ideals being set for women, although men too have faced discrimination, such as being considered less masculine.[19–21] With the onslaught of mass media images continuing to propagate 'thinness' or 'muscularity' as a form of body ideal, a build-up of body image expectations related to body size, shape, composition and appearance has been formed as a measure of overall attractiveness.[22] Studies show that fat women experience intense scrutiny on their physical appearance; they are judged to have more negative personal qualities (such as lack of self-discipline or as unromantic partners) and are often subjected to unsolicited advice on losing weight.[19] Fat men too face much social disapproval; they are perceived as less masculine and less desirable which undermines their status, pride and identity, resulting in 'spoiling their social competence'.[23] Therefore, irrespective of gender, those who do not fit within some specific ideal classifications[24–26] experience some form of weight-based discrimination that has a negative impact on their self-esteem.

In this study, we have examined fat stigmatising discourses that were conducted over three popular SM outlets, Twitter, YouTube and Reddit, to probe the experiential consequences of being overweight. We live in a culture where individuals (mainly women) are treated as objects to be looked at and evaluated.[27,28] Objectification theory (OT) proposed by Fredrick and Roberts has aided our investigation of online conversations on fat-based topics being conducted among SM user communities, to gain deeper insight of how fat individuals are viewed as objects or as targets of attention based on their weight gain.

Research questions

This study has explored SM users' attitudes around the context of fatness from their online exchanges using OT as the underlying framework to answer the following two research questions.

RQ1: What user sentiments have been expressed in weight-based discussions and how are gender-differences manifested in fat stigmatising content?
RQ2: What latent themes emerge within text from these social media exchanges which contain gender-based objectification around fatness?

These research questions were applied to online data retrieved from three SM outlets, namely Twitter, YouTube and Reddit. The selected SM outlets have each made a dramatic growth in popularity, where Twitter is considered relatively more transparent compared to other outlets.[29] YouTube is reported to have over 1 billion user visits every month,[30] while Reddit has been steadily gaining popularity in social science studies.[31]

Prior literature work

SM outlets create a platform for users to express themselves over a variety of topics, including that of weight or fat stigma. A recent review of SM studies conducted over the past decade revealed sociological, biological and psychological consequences of weight stigma discourses.[32] The review predominantly finds psychological themes related to body dissatisfaction, psychological well-being and body stereotyping.[33,34] Fat people have often been accused of being irresponsible in their lack of ability to control their weight gain.[11,35,36] Therefore, social network characteristics that judge an overweight person as lazy or having no self-control, can amplify or mitigate broader structural messages to potentially damage the person with the stigmatised condition.[37] Online media further promotes unrealistic body-stereotyping imagery that makes heavier individuals feel marginalised and demoralised.[11,36] Studies find the use of digital image-manipulation techniques (such as photo-editing tools) or the support of props (such as, display of expensive food-related brands or wearing sunglasses) as presentation strategies for concealing weight to protect the plus-sized users from unwanted SM attention.[38,39] Self-derogation too is a consequence of weight stigmatisation.[36] Yet other studies have revealed that derogatory humour garners much interest in SM and can promote stigma.[40,41]

The association of fat stigma content with its target's gender in SM is widely studied, with studies identifying females to have experienced more weight/fat stigmatisation.[34,36,38,42] The stigmatisation can lead women to damaged self-assessment and impact their everyday relationships.[43] Weight stigma can affect the psychological well-being of females across various cultures (e.g. Korean, Japanese and American).[33,39] Studies on teasing experiences among adolescent populations find that overweight girls are generally more upset when teased.[44] Falkner, French[45] found from a series of focus groups, that, women were significantly more likely to perceive mistreatment due to remarks made about their weight by strangers. Likewise, in a series of focus groups, Cossrow, Jeffery[46] found that women participants reported a greater number and variety of negative experiences related to excess weight, compared to men. Negative experiences comprised teasing, slurs, insults, harassment, negative judgments/assumptions and perceived discrimination related to weight. A cross-culture study involved North American and Finnish women detected the phenomenon of hyper(in)visibility and belief of fatness as a temporary or liminal state as two contradictions which lead women to internalise fat hatred.[47] Women are expected to be physically attractive in most cultures; therefore, fat women are more impacted by such stigmas compared to fat men.[48] van Amsterdam and van Eck[49] noted that women feel more compelled to frame their identities to fit within acceptable size norms when attempting to highlight their work performance. One YouTube study observed that overweight/obese women were attacked for their capacities (e.g. laziness, maturity) while men for their heterosocial skills (e.g. rudeness, annoyance).[42] Thus, verbal aggression against overweight individuals takes various forms of social, body and gendered objectification.

Objectification theory

The OT proposed by Fredrickson and Roberts[27] offers a framework for exploring how living in a culture that sexually objectifies females encourages them to self-objectify and evaluate their bodies. OT primarily has its roots on how 'women's bodies are looked at, evaluated, and always potentially objectified'[27(p.175)] that lead to self-surveillance behaviours where women internalise the observer's gaze to judge their physical appearance and consequently may experience anxiety, low self-esteem or body shame. Recently, OT has been applied to explain internalisation of body surveillance, self-objectification, muscular dissatisfaction among men.[50] The twenty-first century female and male therefore, both face social pressure in relation to their appearance, that is, while females aspire for a slender and toned body, the males too may aspire for athletic figures, as they both engage in various body pursuits

to enhance their body image.[51] The ongoing sociocultural pressures for having an ideal body shapes can result in equating one's self-worth with physical appearance[28] to impact society's judgement wherein appearance dominates accomplishment[52] that in turn forms gender stereotyping attitudes.

Theorists assert that those women who fail to live up to their idealised body shapes may develop mental health issues and suffer from depression or eating disorders such as bulimia and anorexia. Exposure to thin body images over SM can lead to self-objectification, as the battle between 'fashion versus fitness' takes shape.[53] With different forms of inspirational fitness images ('fitspiration') surfacing on SM, Prichard *et al.*[53] observed negative moods and body shame among Australian women when they were exposed to fitspiration images. A study on self-objectification based on selfie-posting on SM sites found that Chinese women engaged in restrained eating to get favourable comments regarding their appearance.[54] Appearance-related online commentary and interactions including up/down (or like/dislike) votes can reinforce further body surveillance behaviours'. For example, women may develop selfie-related behaviour where they may retake many selfies or edit selfies before sharing them on SM.[55] Over time, selfie-posting could lower one's self-worth, such as lead to facial dissatisfaction alongside body dissatisfaction.[56]

Similarly, conforming to a given masculine norm which is regularly endorsed by male models in mainstream media, can lead to internalisation of athletic ideals among men.[51] However, studies concerning men's body image have reported mixed results in connection to OT. A study by Wiseman and Moradi[57] reported self-objectification experiences of sexual minority men that indicated internalisation of attractiveness levels, body surveillance behaviours, some sense of body shame and symptoms related to eating disorders. Similar observations are presented by Heath, Tod,[50] indicating internalisation of mesomorphic (or muscular) ideal arbitrated through self-objectification, although this study had recruited participants from gyms and bodybuilding groups. However, the investigation by Davids, Watson[58] into body-related experiences of heterosexual men observed that they infrequently experienced self-objectification and body surveillance behaviour. A similar result has been reflected by Daniel and Bridges[59] as their study reported no relationship of OT with the drive for muscularity.

Figure 1 consolidates the objectification constructs namely, body shame, anxiety, low self-esteem and overall negativity (e.g. low motivation, body surveillance behaviours) that result as a consequence of internalisation of the objectifying gaze and lead to depression, disordered eating and overall body dissatisfaction.[60] Moreover, with 24/7 access to SM, the internalisation as a consequence of objectifying experiences is continually reinforced.
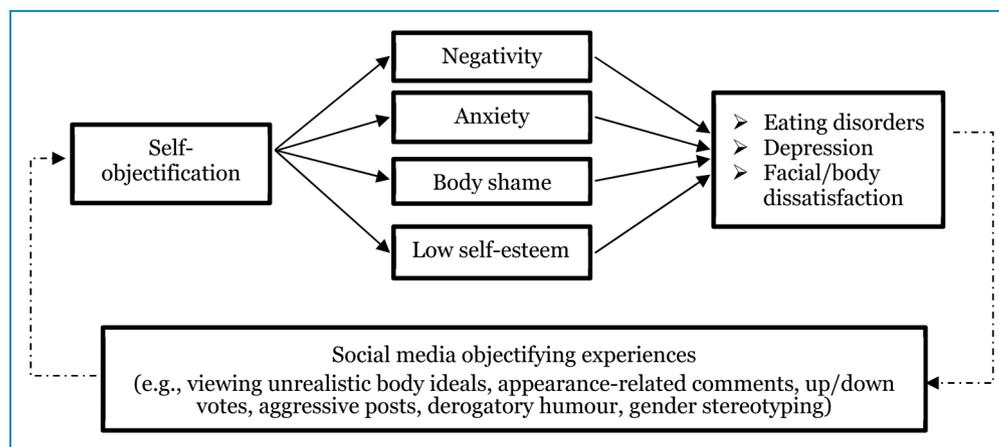
Figure 1. Consequences of social media objectifying experiences.

Data scraping methods

SM posts capture a real-world perspective, as the user-generated data exposes user sentiments, beliefs and biases. Many weight stigmatising studies have been informed by SM[36,40] by leveraging text mining and natural language processing techniques to enable interpretation of the vast textual content. That is, researchers can extract SM texts and combine them into a corpus (a text-based dataset) using unintrusive data scraping methods that can then be analysed to gain insights on linguistic approaches that are representative of how online exchanges are taking place. Further, the data corpus can be harvested frequently in changing contextual conditions such as coverage at a single point of time or over different times[61] enabling social scientists make meaningful interpretations of the real-world phenomena that is unfolding before them. This study too adopts a computational social science perspective by bridging social constructivist studies with data mining techniques on weight stigmatisation content to give a gendered objectification perspective. Online text mined from three popular outlets – Twitter, YouTube and Reddit – has provided a first-hand view of users' disposition towards people considered overweight.

Predetermined keywords that objectified individuals based on them having excessive weight (e.g. 'obese', 'overweight' and 'fat') were used for text mining. We used appropriate web crawling methods to browse user content on selected SM outlets, and publicly available APIs (Application Programming Interfaces) to scrape data.[62–64] Three popular SM platforms, Twitter, YouTube and Reddit platforms, which are rich in textual content, and whose text data can be scraped by the publicly available APIs were selected for this study. Next, the extracted data excerpts were computationally analysed for embedded user sentiments. Computational modelling can help social scientists leverage research methodologies to achieve 'control and precision in measurement, while maintaining

realism in application and generality in theory development'.[61(p.68)] We followed ethical guidelines described by Townsend and Wallace[65] in our selection of quotes and their reporting. Anonymity of online users has been preserved in our presentation of excerpts and phrases (e.g. users' Twitter handles are replaced with '@USERNAME'). Only those data excerpts not considered very derogatory have been quoted verbatim, and with expletives (if any) replaced by asterisks. Derogatory words have been blurred in word co-occurrence maps and in subsequent qualitative reporting, although all typographical errors, misspellings and slangs have been retained to illustrate authentic exchanges. The following subsections elaborate on data scraping methods and techniques that were applied for pre-processing data before conducting analyses across the three SM outlets.

Data scraping on Twitter

The corpus extracted from Twitter included 'girl' and 'boy' keywords along with other predetermined keywords. Data were mined on 18th July 2019 by requesting the latest 5000 tweets containing different combinations of the keywords, for example, 'fat + girl'. Web crawling is an automated software technique, so the next step involved data cleaning which was conducted manually. In this step, irrelevant tweets, such as those texts which referenced topics other than human body weight were removed (e.g. excluding the tweets that contained the requested keywords in the screen name).

Data scraping on YouTube

Two popular videos – 'Fat Girl Tinder Date' and 'Fat Guy Tinder Date' – were chosen from YouTube. These videos were a part of an online social experiment (as mentioned in each video's title) which comprised male and female

actors who deliberately made themselves fat targets for online posts. Text-based comments that were posted for each video were scraped on 5 June 2019 and resulted in two datasets. The comment datasets thus produced from YouTube were different to that of Reddit and Twitter since these comments were contextualised to the corresponding video content. Moreover, both the YouTube videos were social experiments having the same gendered plot; therefore, they provided a similar context for conducting subsequent analyses on how obese male and female genders were being perceived by online communities. Next, predetermined keywords were run on each comment dataset to categorise user perceptions for this gendered plot setting.

Data scraping on Reddit

Discourses displaying fat stigma were extracted from Reddit using similar methods that were followed for Twitter. The data was mined on 16 January 2020 by scraping the 1000 most recently posted Reddit posts along with their comments using different keyword combinations. The data cleaning process was conducted manually by considering the topic discussed in the main posts.

Data analysis

A mixed-method data analysis was conducted next to explore the social meanings in the stigmatising content. Existing large-scale analysis methods can assist in revealing many psychological characteristics of internet users;[66] therefore, several analysis methods were used to investigate fat discussions. The data was pre-processed to eliminate prepositions (of, to, for) and conjunctions (and, or, also). In the initial exploration, the relative distribution of keywords was examined visually. Subsequently, the R library 'syuzhet'[67] helped capture more in-depth sentiments associated with the linguistic corpus and quantify the intensity of emotions expressed in the lexicons.[68] The sentiment analysis tool helped quantify the mix of emotions underlying the human-produced texts. Human emotional states are informed by 'a complex chain of loosely collected events that begins with a stimulus and includes feelings' to act in a certain way.[69(p.345)] The Plutchik Wheel identifies eight emotions – anger, anticipation, disgust, fear, joy, sadness, surprise and trust – as an expression of one's inner state. The tools assisted in detecting the intensity of the eight emotions across the large data corpus.

Textometrica, an automated tool that explores colocations of words based on their frequency of occurrence in a body of text,[70] allows filtering of the original dataset around selected words. This tool assisted in generating co-occurrence maps and provided an inductive approach for framing themes around gender-related stigmatising words contained within the large textual data. Word co-occurrence maps (for each SM outlet) helped illustrate the occurrence of objectifying words alongside specified gender groups with different keyword combinations. The maps connected words that had some semantic correlation when users expressed their views on a particular topic, since these words tended to be near each other. Conversations around groups of connected keywords assisted in framing themes. Based on the common words observed in the generated word co-occurrence maps and their metadata, five underlying themes associated with fatness were drawn. Further, a series of map visualisations assisted in a deeper qualitative inquiry, that involved reading linked commenters' opinions to understand word associations with male/female body objectification themes.

Findings

The investigation revealed weight/fat stigma sentiments that framed the raw rhetoric expressed over the selected three SM outlets in a gendered context. The findings are presented next.

Keyword distribution

SM APIs were used to collect data having different parameters. The Twitter API request was set to capture at most 5000 tweets for each keyword combination against a sampling of recent tweets published in the past 7 days. A total number of 5000 tweets were attained for the keyword combinations, 'fat + girl' and 'fat + boy', while other keyword combinations yielded fewer tweets. The Reddit API extracted the latest 1000 posts and the comments for each keyword combinations. It displayed a similar pattern of keyword distribution as on Twitter. The YouTube API extracted a total of 14,613 comments from the video 'Fat Girl Tinder Date (Social Experiment)' and 10,312 from 'Fat Guy Tinder Date (Social Experiment)'. These comments have been aligned with three keywords – fat, overweight and obese – and again show more associations with the word 'fat'.

A detailed breakdown of comments with associated keywords is shown in Table 1. The most common keyword associated with human body weight that appeared in all SM outlets was 'fat' compared to 'overweight' and 'obese'. Except in the case of Reddit, more posts for females ('girl') compared to males ('boy').

Sentiment visualisation

The extent of positive and negative sentiments expressed alongside eight emotion labels (i.e. anger, anticipation, disgust, fear, joy, sadness, surprise and trust)[69] are presented next. Sentiment analysis tools like the Plutchik Wheel utilise complex algorithms that draw from the fields of psychology, digital humanities, linguistics,

Table 1. Keyword distributions in Twitter, YouTube and Reddit.

Twitter and Reddit			YouTube		
Keyword combination	Number of Tweets retrieved	Number of Reddit posts and comments retrieved	Video title	Keyword	Number of comments
'fat' + 'girl'	5000	11,708	Fat Girl Tinder Date	fat	2944
'overweight' + 'girl'	515	11,341		overweight	122
'obese' + 'girl'	129	8512		obese	156
'fat' + 'boy'	5000	15,429	Fat Boy Tinder Date	fat	1649
'overweight' + 'boy'	321	11,070		overweight	47
'obese' + 'boy'	129	10,595		obese	32
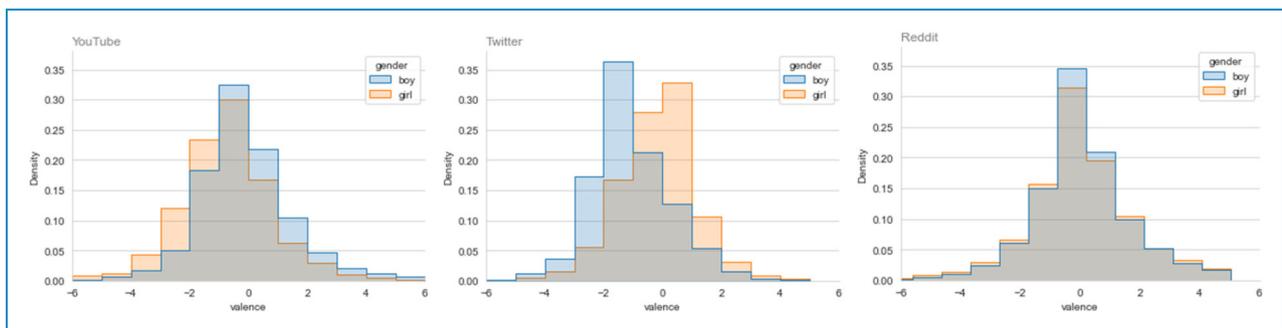
Figure 2. Histograms of sentiment values across the three corpora.

annotations and visualisations to uncover the levels of the eight emotions expressed in a corpus (e.g. collection of tweets).[71]

Figure 2 first displays the distribution of overall sentiment (valence) scores of the three corpora associated with male and female genders for the three SM platforms, with values less than zero indicating negative sentiment. Statistical tests[1] indicated that the distributions of valance values between comments directed towards male and female genders were significant. For YouTube, 75% of the comments targeting females were negative as opposed to 60% for males. The reverse was true for Twitter, with 80% for males and 55% for females. For Reddit, both genders received a similar percent of negative comments of around 80%.

Among the eight emotions, high values in anticipation, joy, surprise and trust indicate empathy towards persons at the receiving end of the SM post. On the other hand, high values for anger, disgust, fear and sadness exhibit a resentful attitude. Except for 'disgust', 'sadness' and

'trust', all SM outlets indicated significantly lower emotion values for males. More intense and varied emotions were observed towards females compared to males. Twitter displayed drastically higher 'disgust' emotions for males compared to other two outlets. Figure 3 gives an overview of the eight emotions[69] found to be associated with these discourses across the three corpora. The emotions are illustrated as percentages of emotion word count for further comparisons.

Word co-occurrence maps

Word co-occurrence maps were generated next to identify words strongly associated with gender and human body weight. These maps were produced by selecting the strongest links by normalised co-occurrence frequency (i.e. the normalised value of the frequency occurrence of two-terms in a text corpus). Concepts were created in Textometrica by grouping words representing gender and body weight. Word co-occurrence maps for the keyword combinations
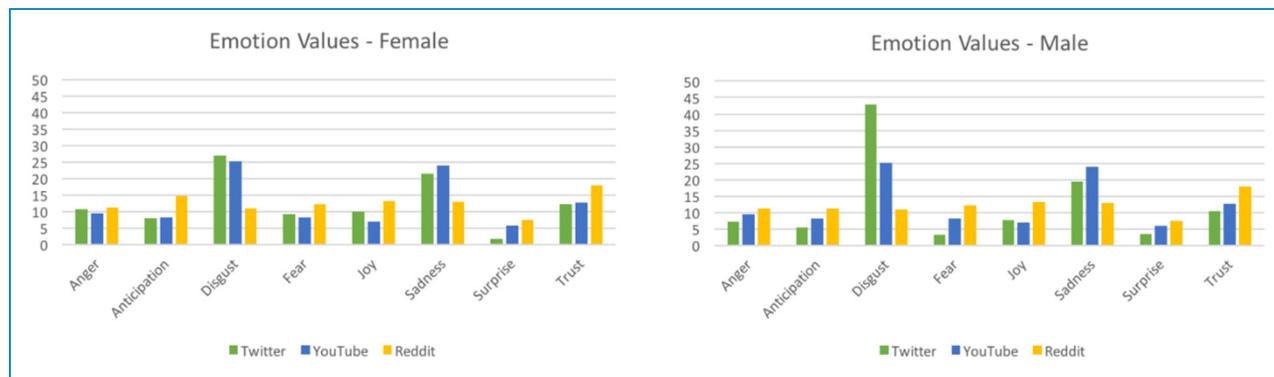
Figure 3. Emotion values as percentage of emotion word count.

'fat + girl' and 'fat + boy' are displayed in Table 2. The maps reveal that tweets containing 'fat + girl' have more derogatory content than 'fat + boy'. Maps for YouTube and Twitter data demonstrate more objectifying words on female body than for Reddit. However, compared to Twitter, YouTube comments demonstrate less derogatory discourses towards males and females; although gender was more conspicuous in comments posted for 'fat guy tinder date' video.

Underlying discussion themes

Since the initial data corpus used to identify user sentiments and investigate word co-occurrences is considerably large, an exemplar has been purposefully selected to discuss underlying discussion themes. Equal volumes of data excerpts were selected for each keyword combination from the data corpora extracted from Twitter, YouTube and Reddit. The data excerpts were analysed manually by examining word co-occurrence maps and their metadata to identify associated themes. The process involved investigator triangulation to mitigate researcher bias.[72] Biological, psychological and sociological correlates of fat stigma in SM identified by Wanniarachchi, Mathrani[32] informed our analysis. Five themes, namely, attractiveness, physical appearance, lifestyle choices, health and psychological well-being, were detected. Tweets, YouTube comments and Reddit posts that described fatness as an attraction barrier or discussed the link between fatness and attractiveness are categorised into the 'attractiveness' theme. Under 'physical appearance', SM posts using 'fat', 'overweight' and 'obese' keywords to describe a person's physical semblance are considered. Relatively higher number of excerpts discussed fatness as a lifestyle choice, where commenters emphasised changing diet or setting up exercise routines. Such content is categorised into 'lifestyle choices'. Further health issues associated with fatness were also observed, while some users specifically expressed views on the association of psychological distress among fat people. These have been categorised into 'health' and 'psychological well-being' themes. A total of 570 data

excerpts were categorised, and data distributions within each theme are presented in Figure 4.

Our data reveals that Twitter and YouTube users mainly discussed fatness with physical attraction for both genders, while Reddit users mostly discussed health in context of fat men and lifestyle choices for fat women. Compared to males, females overall had more varied discussions within the five identified themes. All the five themes exhibit levels of social, body and gender objectification that is based on an evaluation of the individual's weight.

Qualitative data analysis on sentiments

The data corpus was analysed for key sentiment expressions in weight discussions. Particular excerpts considered less derogatory have been selected from the discourse to report these sentiments (in Table 3). Data excerpts were selected through a consensus process by the study team. The most common sentiment distributed across the corpus as confirmed by the sentiment diagrams is negative (refer Figure 2).
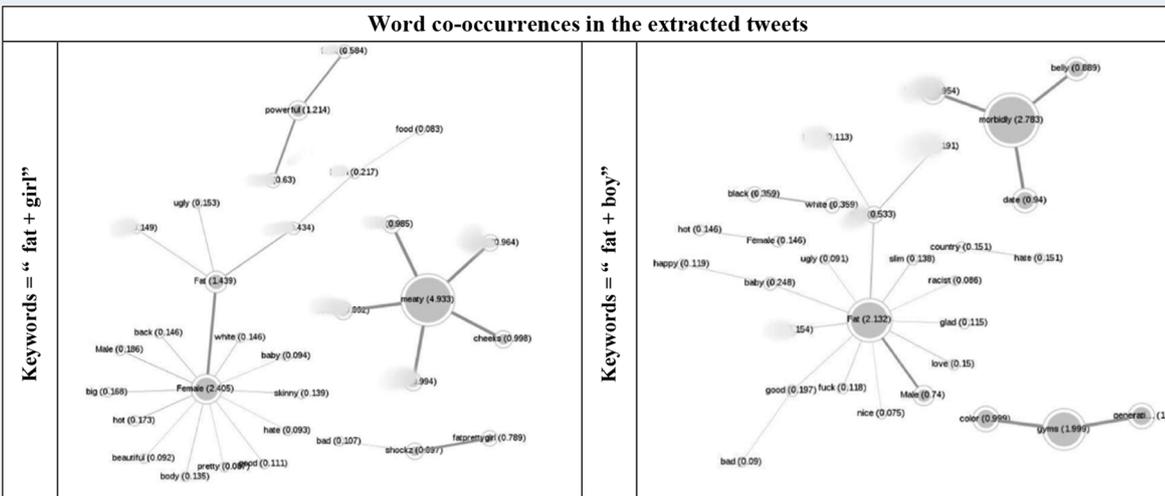
Apart from some mean-spirited attacks, the selected tweets show how a part of society recognises overweight/obese individuals as out-grouped. However, female-centric tweets mostly targeted body-shaming for overweight girls, while male-centric tweets targeted physical abilities of the overweight boys.

The negative sentiments displayed different types of negativity. According to some users, losing weight is a self-responsibility (*'Omg I've been eating like a fat girl'*). Most comments/posts showed negativity towards fatness by connecting it with attractiveness. Some comments also related fatness with self-esteem (*'the self-esteem impact from the excess skin will be something she regrets forever'*). Such negativity was observed in both female and male centric data excerpts.

Anticipation has been recognised mostly in tweets that targeted females. Though it was least presented within the captured data corpus, it is a sentiment that spreads positivism. By directing messages (as in the selected tweet) which though is not motivational, it conveys that overweight/obese females are not a separate group of the society (*'I've come up with a plan that allows …'*).

Table 2. Word co-occurrence maps.

Word co-occurrences in the extracted tweets
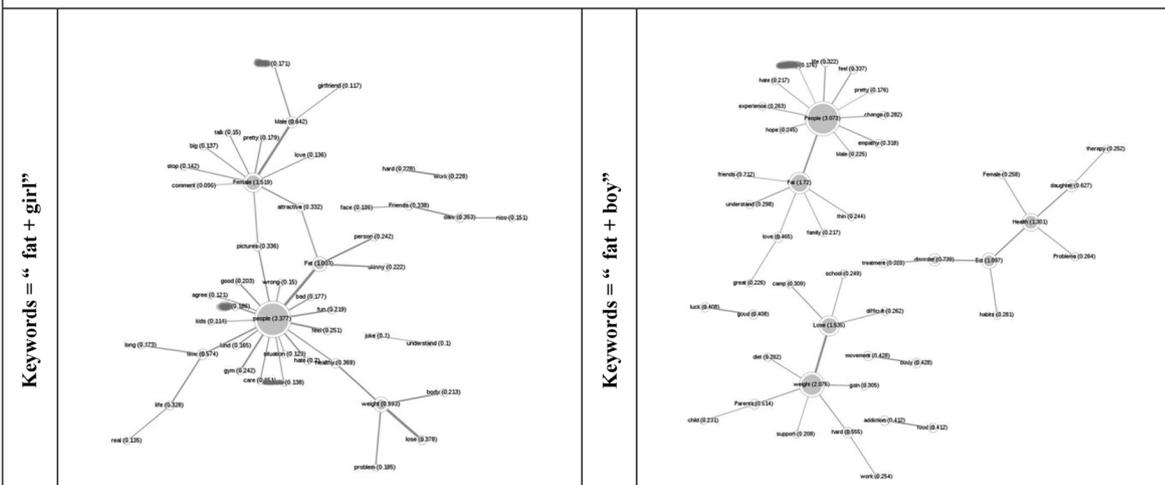
Anger and disgust were highly observed emotions, although the levels did not seem to be gender specific. However, fat women commonly experience direct anger and disgust ('…*She looks expressionless, bloated, and overweight*') compared to males. Sadness and fear were also witnessed regardless of gender and mostly these emotions were associated with finding a partner from the opposite sex ('…*and i feel i will never get a girl like you*' or '…*the boy i really liked rejected me*') and physical appearance ('…*I looked in the mirror one day and was like I can't do this anymore*'). Though negative sentiments surpassed the positives in the retrieved corpus, there were considerable posts spreading motivation and positivism.

Discussion

The first research question seeks to understand how weight/fat stigmatisation content is formed around gender in weight-based discussions over SM. Text mining methods helped unravel the user sentiments to expose how gendered body objectification and weight stigmatisation is manifested. A mixed-method analysis (comprising word co-occurrence and qualitative analysis) aided in investigating distributions of keywords and their correlations with male and female objectification. Our findings reveal that 'fat' was commonly used among the keyword distribution for excess body weight, while 'overweight' and 'obese' were mainly related to body mass index. That is, content around words 'overweight' and 'obese' hinged on a clinical note while 'fat' hinged as a social descriptor. Therefore, SM discussions about weight are mostly established around the word 'fat'.

Sentiment analysis further revealed how emotions related to gender-based fatness are scattered. Most common sentiments that emerged from the selected corpus exhibited much negativity and resentment. Further, the analysis exposed higher intensity in emotions when discussing females in comparison to males. However, it is unclear as to whose emotions were being represented since the posts could be either from the victims of weight stigma or from the stigmatisers. Overall, we found emotions

voiced in YouTube comments to be higher for females than for males, while Twitter posts demonstrated mixed results and indicated higher disgust for males compared to females.

Next, the word co-occurrence maps revealed words associated with concepts 'female', 'male' and 'fat'. Our maps visualisations indicated more derogatory words to be associated with these concepts in Twitter compared to YouTube and Reddit. The videos selected from YouTube were part of a social experiment comprising male and female actors who purposely portrayed themselves to be fat; therefore, the individuals involved in the experiment may not apparently be considered overweight or obese by commenters. This may have led commenters to discuss more on the overall video scenario rather than voice hateful comments targeting particular individuals. Also, YouTube and Reddit do not specify a text limit in their comment section, which allows users to be more expressive with their views. Although Twitter has doubled the character limit of a tweet from 140 characters to 280 characters, only 5% of tweets are longer than 190 characters.[73] With a fewer number of words for commenting, the users may be using more terse words. This could also explain the use of more derogatory words on weight in Twitter discussions. While evidence regarding the moderation of user content (via tweets) in Twitter is not explicitly stated,[74] the video content and associated comments in YouTube can be filtered (i.e. removed or reported as spam) by the content creators thereby allowing users to decide whether any of the comments pose harm.[75] Conversely, Reddit's AutoModerator[76] arbitrates the content posted on their subreddits to keep it free of hate speech and derogatory content. Our word co-occurrence maps too indicated fewer negative and more positive sentiments on Reddit compared to other SM outlets.

The metadata connected to each word and their links in the word co-occurrence maps were examined. In response to the second research question, five underlying themes were detected. These are, attractiveness, physical appearance, lifestyle choices, health, and psychological well-being. YouTube discussions were mostly scattered around the theme 'attractiveness' while Twitter centred around the theme 'lifestyle
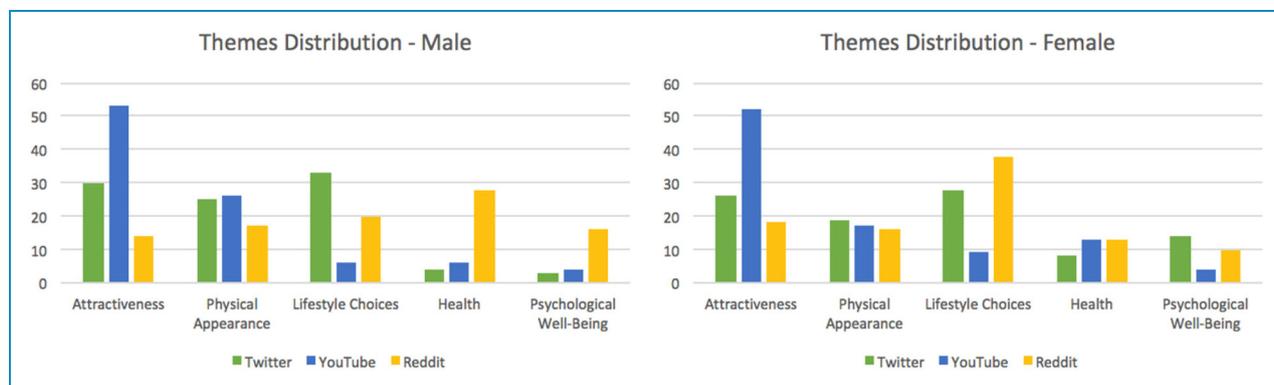

Figure 4. Distribution of data excerpts among the identified themes.

choices', regardless of the gender. However, Reddit showed more focus on 'health' when discussing fat men and on 'lifestyle choices' when discussing fat women. The social experimental nature of YouTube videos for showcasing experiences of fat men and women on Tinder dates, could also explain its focus on attractiveness. The Twitter discussions mostly accused fat people for not taking control of their weight. Comments laced with sarcasm, stated fatness to be a consequence of lack of exercises or 'unhealthy' diet (i.e.: *'You fight getting up for your doughnuts?'*). Reddit's discussion towards fatness based on gender showed that users were more concerned about health of fat men (i.e.: *'This was all a result of my brother being an emotional eater, so he developed heart disease (a family issue), cholestrol, HBP & diabetes'*) and commented more on lifestyle choices of fat women (i.e.: *'Most of it is just bad eating culture and fast food'*). Although, these health-related comments on fat men were about someone else, the comments regarding lifestyle choices of fat women mostly came from commenters' own experience (i.e.: *'I'm a bigger girl… I don't smoke/do drugs and don't eat a lot. I don't exercise as much as I should, but I do on the days I am able to'*).

More female body objectifying words were observed in Twitter discussions. Though most of these objectifying words were not directly co-occurring with the female concept, these words were discovered with the search terms 'fat' and 'girl'.

Figure 5 provides a gendered overview of sentiments expressed, word expositions used and related objectification themes that emerged from the fat stigmatising content. Such objectification can cause an overweight/obese individual psychological distress, which eventually leads to eating disorders.[36] These impacts were evident throughout the study, specifically when users claimed to have health issues such as bulimia. When any form of objectification occurs in SM, it can impact both the targeted user as well as readers. The existence of objectification should not be taken lightly as it directs the individual into internalising the observers' perspectives to evaluate their own physical self, which could lead to mental health risks.[27] The psychological distress of being targeted for fatness was also observed in Reddit. As Reddit is a discussion website, many conversations were on fatness and body objectification. Some comments emphasised different aspects of fat stigma and its relationship with female body objectification. Following examples illustrate this:

Went on a date yesterday, we had a great time but towards end of the date he said I need to lose some weight. I know I m fat but it was hurtful. This video made me realize even though men say they want a girl with great personality they care more about the physique. Trying my best to lose weight…U know what I wish I found love but at same time i am ok being single for now until I find someone who loves me for how I look and who I am

YouTube comment

Table 3. Selected excerpts representing different sentiments.

Sentiment	Gender	Comment
Negative	Girl	*Honestly can't believe a random boy just added me to tell me he isn't into me because he isn't into 'fat chicks' Omg I've been eating like a fat girl … the self-esteem impact from the excess skin will be something she regrets forever…*
	Boy	*@USERNAME Nobody wants fat boy*
Anticipation	Girl	*@USERNAME Girl yes!!!! I've come up with a plan that allows me to still eat like a fat girl ! Just move and eat at the same time*
Anger/ Disgust	Girl	*The girl must exercise. She looks expressionless, bloated, and overweight.*
	Boy	*@USERNAME Boy you stooopid lmaooo better work them 8 hrs a day and get a fat check*
Sadness/ Fear	Girl	*also the boy i really liked rejected me because im still fat and im crying even more … I looked in the mirror one day and was like I can't do this anymore….*
	Boy	*@USERNAME I don't look good. I'm so overweight and i feel i will never get a girl like you or anyone else*
Positive/ Trust	Girl	*there is nothing more powerful then a fat girl who doesn't give a ****"*
	Boy	*Fat men are sexy in my opinion (don';t judge me) …I absolutely do agree with letting obese people live, be accepted, feel attractive, and have equitable access to healthcare without condemnation…*

This this this. My mother has spent her whole life hating herself, putting herself down, and being hated and put down by others. She has tried to lose weight, and tried, and tried. At this point, her body might be too wrecked to really ever lose the weight. She is relatively healthy. I can't help but imagine how different her life could have been if she hadn't spent it under the terror of all that hatred.

Reddit comment

The sentiment analysis revealed many forms of objectifying themes. These themes project an overweight/obese person as an unattractive and irresponsible individual. Particularly, obesity can also be associated with some existing medical conditions, such that their weight gain is outside the control of the concerned individual (e.g. genetic factors, diabetes and hypertension).[51] Therefore, in such situations, the social pressure of objectification (that is often internalised) alongside some pre-existing medical conditions could make these individuals vulnerable to depression.[50] While medical reasons for weight gain are outside the scope of this study, this aspect needs to be recognised and studied in future weight/fat stigmatisation research.

This section has highlighted aspects of the five themes that were discovered from the objectifying experiences across three SM platforms. These five themes can be directly linked to the OT constructs (i.e. negativity, anxiety, body shame and low self-esteem) shown in Figure 1. Based on the nature of unflattering and derogatory comments being posted by the commenters, the targeted (fat) person may encounter increased body dissatisfaction, eating disorders and depression. And with the ongoing addition of new comments that depict objectifying content across the identified themes, or, with the up/down voting of some of the negatively-laced comments by other members of the SM community, the person at the receiving end will likely experience further weight/fat stigma. This can therefore eventuate in a cycle of fat stigmatising expressions, that reinforce the internalisation of the objectification gaze to result in more negativity, anxiety, body shame and low self-esteem for the stigmatised person.

Conclusions, study limitations and future directions

The study has revealed aspects of how gender-bias is manifested in weight stigmatising content over SM platforms. Mixed-method analysis helped detect five underlying themes (namely, attractiveness, physical appearance, lifestyle choices, health, and psychological well-being) related to male and female body objectification. Our analysis confirms the existence of stigmatising and objectifying discussions targeting overweight/obese individuals, particularly females. We shared a range of positive and negative sentiments that targeted overweight/obese individuals that also showed that gender differentiation and body objectification are not uncommon. Gender-specific fat
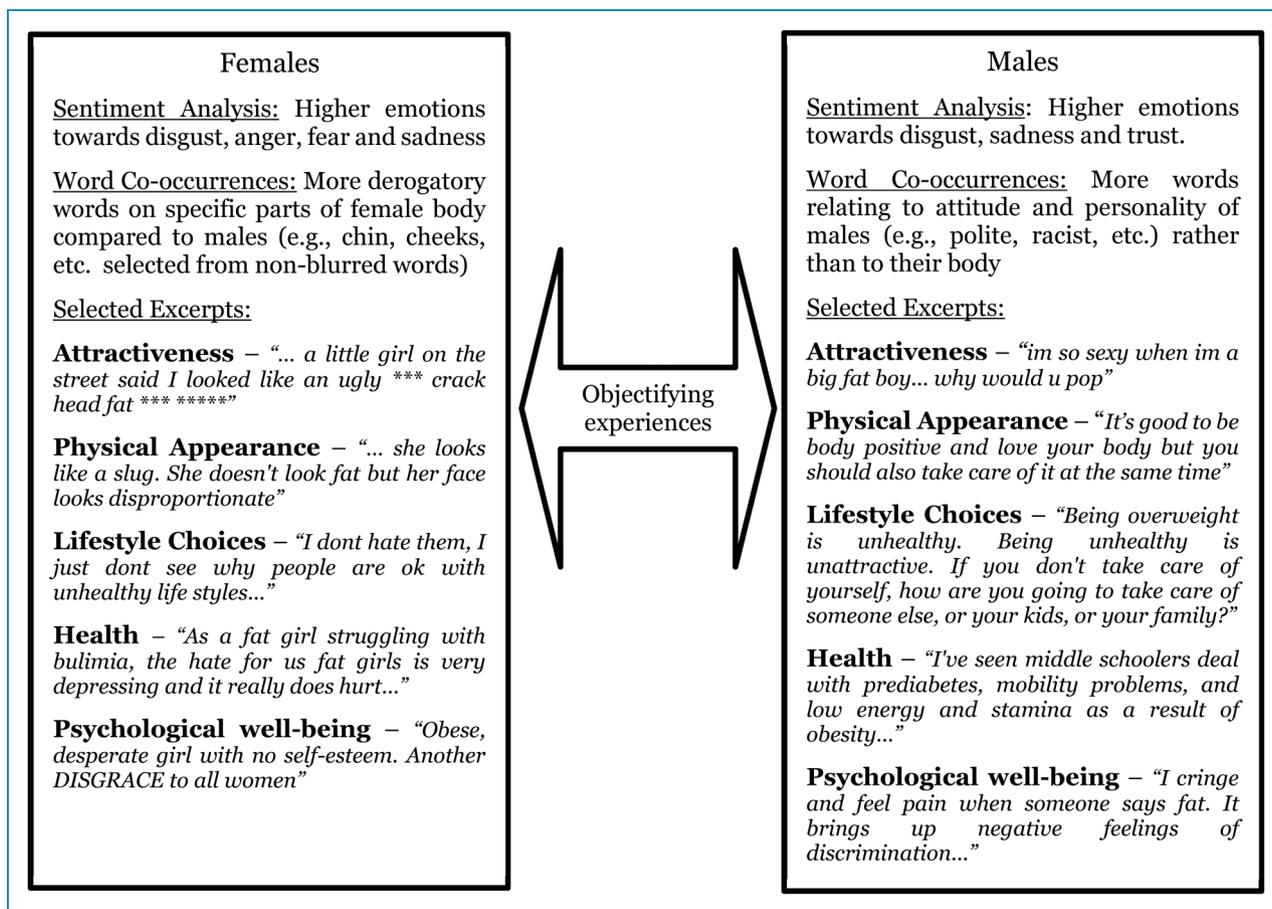

Females

Sentiment Analysis: Higher emotions towards disgust, anger, fear and sadness

Word Co-occurrences: More derogatory words on specific parts of female body compared to males (e.g., chin, cheeks, etc. selected from non-blurred words)

Selected Excerpts:

Attractiveness – *"… a little girl on the street said I looked like an ugly *** crack head fat *** *****"*

Physical Appearance – *"… she looks like a slug. She doesn't look fat but her face looks disproportionate"*

Lifestyle Choices – *"I dont hate them, I just dont see why people are ok with unhealthy life styles…"*

Health – *"As a fat girl struggling with bulimia, the hate for us fat girls is very depressing and it really does hurt…"*

Psychological well-being – *"Obese, desperate girl with no self-esteem. Another DISGRACE to all women"*

Objectifying experiences

Males

Sentiment Analysis: Higher emotions towards disgust, sadness and trust.

Word Co-occurrences: More words relating to attitude and personality of males (e.g., polite, racist, etc.) rather than to their body

Selected Excerpts:

Attractiveness – *"im so sexy when im a big fat boy… why would u pop"*

Physical Appearance – *"It's good to be body positive and love your body but you should also take care of it at the same time"*

Lifestyle Choices – *"Being overweight is unhealthy. Being unhealthy is unattractive. If you don't take care of yourself, how are you going to take care of someone else, or your kids, or your family?"*

Health – *"I've seen middle schoolers deal with prediabetes, mobility problems, and low energy and stamina as a result of obesity…"*

Psychological well-being – *"I cringe and feel pain when someone says fat. It brings up negative feelings of discrimination…"*

Figure 5. Social media objectifying experiences observed across males and females.

stigmatising content have been examined with sentiment analysis tools to show emotion values and also with objectifying word co-occurrence maps. While some evidence of positive and motivating discussions around obesity have been presented, majority of extracted content displayed more negativity than positivity. Regarding the association of gender and weight stigma, our study points at the presence of female body objectification. The underlying OT accounts for the mental state of women when their body is being objectified.[27] Therefore, more studies are needed on reducing stigmatising content by educating the public on ramifications of their posts to the person who has been affected.

While the linguistic corpus was limited to only three SM outlets, we have provided new perspectives on fat stigma and body objectification by mining direct tweets, posts and comments using predetermined keywords. However, since interactivity is the hallmark in SM, we propose future studies capture more facets of social interaction data to give a more holistic outlook on how certain stigmatising themes emerge. Further, researchers must ensure that the data scraped from SM platforms for conducting subsequent analyses are relevant, unbiased and objective. This study used textual data extracts, namely, tweets, Reddit comments and user comments, that were posted in response to two YouTube videos to provide a gendered and context-based perspective to body objectification. We advise future studies to consider more text, video and image analysis. We acknowledge that the keyword combinations used in this study may not represent the whole weight/fat stigma data corpus available on SM platforms and suggest more studies be carried out in future on terminologies that can equitably represent weight/fat stigma. While user-specific analysis can assist in revealing the effect of fat stigma discussion on particular individuals, this was outside the scope of our study. Future studies that can provide reasoning on some selective user experiences will enable a deeper understanding of weight/fat stigma and its affects.

This study bridges data mining and social construction studies with embedded analytics to extend our understanding on male and female objectification. Our study calls on policy makers to plan props for reconfiguring the online space as a place where societies 'can function without fear of being threatened, abused, sexually exploited or silenced'.[77(p.523)] While this study is limited to discussions conducted in English, future studies can target other languages and commentary-based media outlets to understand weight-based sentiments in different cultural contexts.

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ORCID iDs: Vajisha U Wanniarachchi [iD] https://orcid.org/0000-0003-2928-9832
Teo Susnjak [iD] https://orcid.org/0000-0001-9416-1435
Anuradha Mathrani [iD] https://orcid.org/0000-0002-9124-2536

Note

1. The two-sample Kolmogorov–Smirnov test was used. All the results were significant at the 0.01 level with p-value$=2.22\times10^{-16}$ for YouTube, p-value$=1.34\times10^{-150}$ for Twitter and p-value$=6.43\times10^{-8}$ for Reddit.

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