


Emotional Expression of #body on Instagram

Clelia Malighetti¹ , Simona Sciara^{1,2}, Alice Chirico¹, and Giuseppe Riva^{1,3}

Social Media + Society
April-June 2020: 1–9
© The Author(s) 2020
Article reuse guidelines:
sagepub.com/journals-permissions
DOI: 10.1177/2056305120924771
journals.sagepub.com/home/sms


Abstract

Our aim was to explore emotions in Instagram images marked with hashtags referring to body image–related components using an artificial intelligence–based discrete emotional analysis. A total of 500 Instagram photos marked by specific hashtags related to body image components were analyzed and specific discrete emotions expressed in each picture were detected using the Emotion application program interface API from Microsoft Azure Cognitive Service. Results showed that happiness and neutrality were the most intense and recognizable emotions expressed in all images. Happiness intensity was significantly higher in images with #bodyimage and #bodyconfidence and higher levels of neutral emotion were found in images tagged with #body, #bodyfitness, and #thininspirational. This study integrated a discrete emotional model with the conventional dimensional one, and offered a higher degree of granularity in the analysis of emotions–body link on Instagram through an artificial intelligence technology. Future research should deepen the use of discrete emotions on Instagram and the role of neutrality in body image representation.

Keywords

Instagram, emotions, body, hashtags, body image, Microsoft Azure Emotion API

Introduction

Instagram is an image-based social media platform that promotes a new form of communication and self-expression. On this platform, it is possible to upload, edit, and share pictures and video with others users (Alhabash & Ma, 2017; Fardouly et al., 2018).

Specifically, Instagram works on two main communication levels. The first concerns images. The second concerns text. That is, users can choose to “post” (i.e., write a text as a comment or as a first prompt to an online material) and to associate hashtag “#” to each media posted online to make it recognizable and easy to be found by other users. The integration of images and related tags expands the communicative potential of Instagram to even complex concepts, such as emotions. It is possible to give an “emotional mark” on materials posted on Instagram, that is, to associate even specific and complex emotions to likewise specific ideas or concepts, which can be easily shared online with other users. This is the case of body image. An increasing number of people post images of body conveying more than the image per se. By posting these images on Instagram, people can communicate and share the complexity of their inner emotional words to a wider audience in a genuine and intuitive

way. However, research has only partially explored this aspect, as explained in the next paragraph.

Instagram and Emotions

Research concerning emotions on Instagram has focused mainly on the emotional valence of individual posts (Yin et al., 2014) by adopting a dimensional approach based on affect (Russell, 2003). In other words, it would be more correct to label this research line as affect on Instagram. With this regard, it emerged an online bias toward positive affect called “positivity bias,” that is, a major tendency to post materials conveying positive instead of negative affect (Lin et al., 2014; Reinecke & Trepte, 2014). According to Reinecke and Trepte (2014), positive forms of authenticity are shown more frequently on social networks sites (SNSs)

¹Università Cattolica del Sacro Cuore, Italy

²Vita-Salute San Raffaele University, Italy

³IRCCS Istituto Auxologico Italiano, Italy

Corresponding Author:

Clelia Malighetti, Department of Psychology, Università Cattolica del Sacro Cuore, Largo Gemelli, 1, 20123 Milan, Italy.
Email: clelia.malighetti@unicatt.it



and are more likely to receive reinforcement in the SNS context than the negative ones. Consistently, Qiu et al. (2012) in their study showed that participants revealed a significantly higher willingness to express positive rather than negative emotions and disclosed more positive emotions on social networks than in their offline interactions. The expression of positive affect is perceived considerably more appropriate than negative one especially for Instagram and Facebook compared with Twitter (Chaikin & Derlega, 1974; Howell & Conway, 1990; Waterloo et al., 2018). Affect is a general term defined as a feeling state (Barrett & Bliss-Moreau, 2009; Schimmack & Crites, 2005) that characterizes at least by two qualities, valence and arousal (Barrett & Bliss-Moreau, 2009; Clore & Schnall, 2005).

It might be defined as an indicator of people's own evaluative reactions to the world. For example, positive or negative affect might be experienced as positive or negative evaluations about something, as an object or a person (Clore & Schnall, 2005). Positive affect indicates the positive way of interacting with life-changes and interactions (Cohn & Fredrickson, 2009), while negative affect relates to the feeling of unhappiness and negativity in relationships and surroundings.

The positivity bias emerged online may be due to prevailing positivity norms that social media encourage (Reinecke & Trepte, 2014). Disclosures of negative affect might seem as more intimate and therefore perceived as maladjusted behavior when directed at strangers or acquaintances (Chaikin & Derlega, 1974; Howell & Conway, 1990). These findings corroborate the existing literature showing the tendency of a positive self-promotional use of Instagram due to its visual properties (Sheldon & Bryant, 2016) and the popularity of negative valences content on Twitter (Naveed et al., 2011). Furthermore, there is evidence that the control required from the online settings of how people present themselves on Instagram lead to a more desirable way of self-presentation (Walther, 2007). While positive and negative affect have received substantial attention from researchers, neutral affect has been very little investigated. Neutral affect might be defined as feeling indifferent, nothing in particular or a lack of preference one way or the other. According to Gaspar and colleagues (2019), neutral affect is not the absence of feeling, but rather the feeling of nothing in particular. Even if people often use neutral expression both in online and offline communication, through their facial expressions or face emojis, however, this affective state has not been deepened in research field of affection and emotions.

Self-expression and positive/negative bias on Instagram showed a differential pattern according to users' gender. A rich series of studies showed significant gender differences in computer-mediated communication, such as communication expression and technology usage (Chou & Tsai, 2007). Women seem to be more inclined to share emotions with people and in wider social context compared with men

(Derks et al., 2008). Men are more task-oriented, likely to discuss rational information or social facts using reasonable language (Savicki & Kelley, 2000).

Men primarily consider social network as a pragmatic communication medium but not a relevant platform for self-portrayal, whereas women seem to be driven by a more hedonistic motive of self-presentation, which makes them more concerned about how they are perceived by others (Haferkamp et al., 2012). Furthermore, Zhang (2018) investigated gender difference in hashtag use on Instagram, classifying the hashtags into informative and emotional, positive and negative. They showed that female users tend to use more emotional and positive expression on Instagram compared with males. Although gender roles are important in technology communications, studies have overlooked gender preferences in hashtag usage and emotional expression on social networks. Most existing gender emotional studies have focused on the face-to-face communication medium, yet few are based on social media and Instagram in particular.

Despite the enormous possibilities provided by Instagram to communicate even fine and complex emotions have been extensively exploited by its users (Sonne & Erickson, 2018), research tended to diverge. First, research has mainly studied emotions starting from textual materials (hashtags or post; Lee et al., 2014; Pilař et al., 2016) instead of adopting an integrated analysis of both images and text. Then, evidence on emotions on Instagram relied mainly on a dimensional analysis of affect instead of specific discrete emotions (e.g., Hyvärinen & Beck, 2018), despite preliminary evidence supporting the usefulness of adopting a discrete emotional approach (Hyvärinen & Beck, 2018). The focus on discrete emotions could offer greater precision in determining how differently self-expressions vary in their perceived appropriateness (Waterloo et al., 2018). Furthermore, the adoption of a discrete emotion model might specify what type of negative or positive emotions cause certain types of behavior online or are associated with a type of widespread online phenomenon. Focusing on discrete emotions can be more informative and avoid oversimplifying self-expressions across Instagram. Therefore, despite the increasing number of studies focusing on affect on Instagram (de Vries et al., 2018; Reinecke & Trepte, 2014; Sonne & Erickson, 2018; Yin et al., 2014), we still know little regarding specific emotions users tend to express and even less regarding the image-based expressions of them. This can be due to the difficulty to implement emotion detection on image-based materials, which would require more sophisticated tools. To address these issues, we detected emotions on Instagram on the base of images by means of Azure Cognitive Service API (application program interface; Sole, 2018)—an artificial intelligence (AI) tool which relies on a discrete model of emotions and can detect eight emotions from faces on pictures. During the last years, emotion recognition using computer vision has become a very interesting domain for many researchers (Aguilar et al., 2016; Khanal et al., 2018). This labeling method, which is largely

considered as the gold standard for measuring emotion in the emotion detection industry, stems from a system called the Emotion Facial Action Coding System (EMFACS), developed in 1978 by Paul Ekman, along with Wallace Friesen. The scientific assumption is based on the hypothesis of six universal emotions—anger, disgust, fear, happiness, sadness, and surprise—that are hardwired into us and can be detected across all cultures by analyzing muscle movements in the face (Ekman, 2016). The system is used to measure all visually distinguishable facial movements for encoding, which results in the changes in the appearance of the face movements of facial muscles. This field of human–computer interaction and affective computing focus on emotion recognition is a new frontier that could have relevant consequences in health care or education. The algorithm uses facial detection and semantic analysis to interpret mood from photos and videos both static and real time (Deshmukh & Jagtap, 2017). Technology that reveals human feelings could be used to identify students in trouble in a classroom environment, help autistics better interact with others, and encourage better relationships based on empathy and understanding. These applications may be helpful to advance this area of research crucially.

One of the main advantages provided by this approach concerns an integrated measurement of both textual and image-based materials. In other words, it allows focusing on two related aspects at the same time: emotions on Instagram and other concepts which the emotional images refer to. The *hashtag* is used to make this bridge and link emotional images to any type of other topics. A crucial topic concerns how people emotionally depict even delicate aspects of themselves on Instagram, such as the way they perceive their own body (Fardouly et al., 2018; Wagner et al., 2016). In the next paragraph, we deepened this aspect.

Body and Emotions on Instagram

Many studies have investigated Instagram posts as reflections of user's characteristics (Pilař et al., 2016), such as the body (Fardouly et al., 2018). Instagram plays a significant role in the acceptance and construction of body standards (Aziz, 2017). Abundant literature showed the relevance of body image on social media communities (Fardouly et al., 2018; Ferguson et al., 2011; Kakish et al., 2018; Lewallen & Behm-Morawitz, 2016; Tiggemann & Zaccardo, 2018). Alarming implications on body acceptance both for females and males are due to social media exposure (Fardouly et al., 2017; Fardouly & Vartanian, 2016; Holland & Tiggemann, 2016). Specifically, the repeated exposure and publication of particular photos that promote specific beauty ideals, might lead to a greater body dissatisfaction and self-objectification, and lower self-confidence (Brown & Tiggemann, 2016; Lenhart, 2015; Myers & Crowther, 2009; Riva et al., 2015; Slater et al., 2019; Vandenbosch & Eggermont,

2012). Based on theory and practice, body image is a multidimensional construct consisting of perceptions, cognitions, emotions, and behaviors pertaining to one's appearance, body shape, and size (Cash et al., 2004). Body image refers to the perceptions and attitudes that individuals hold about their own bodies in relation to larger cultural expectations (Davison & McCabe, 2005). It involves self-assessments of many different bodily features (Szymanski et al., 2011) and entails making social and cultural comparisons that might feed into a person's sense of physical attractiveness and larger self-worth (Cash et al., 2004). In recent years, the development of measures of the perceptual, cognitive, emotional, and behavioral components of body image construct has grown rapidly with a particular explosion of interest in the last two decades (Cash & Pruzinsky, 2002; Thompson, 2004), and mainly in relation to several components of this aspect, such as affective and attitudinal perceptions of one's body (Stice & Whitenton, 2002; Thompson & Stice, 2001; Van den Berg et al., 2002). If the body image-affective link has been extensively investigated in experimental research, how it develops on a larger scale it is still an open issue. Specifically, despite the increasing posting of body-related hashtags and posts on Instagram, and the widespread #bodypositivity and #bodyneutrality movement on Instagram (Cwynar-Horta, 2016; Sastre, 2014) to encourage body acceptance, there is no evidence on how this relevant dimension of body are emotionally represented on Instagram.

In this study, we operationalized body image as defined by Cash and Pruzinsky (2002) in terms of body-related hashtag on Instagram and the integration of the prominence of thin-inspiration images posted on Instagram (Tiggemann & Zaccardo, 2018). Body and body image were investigated in terms of hashtags as a superordinate construct since there are evidence on their prominence on Instagram (Fardouly et al., 2017, 2018; Fardouly & Vartanian, 2016; Ferguson et al., 2011; Kakish et al., 2018; Tiggemann & Zaccardo, 2018). Looking specifically at the construction of body image, it is also decisive how the body is experienced and evaluated by the subjects himself (Mills et al., 2018).

Then, we carried out an image-based emotion detection by means of the Azure Cognitive Service (Sole, 2018)—an AI tool which relies on a discrete model of emotions and can detect eight emotions from faces on pictures. This integrated approach allowed us to capture the complexity of body–emotion link on a larger scale and in a granular mode for the first time, to our best knowledge. Our aim was to elucidate peculiar pathways between body image–related hashtag and emotional images the hashtags refer to. As part of a larger research project on the emotionally, bodily, and personality expression on Instagram, this article offers an initial challenge on this matter, evaluating the emotional detections and how the facets of body image are represented and depicted on Instagram.

Despite the preliminary nature of this study, we have been able to formulate these specific hypotheses:

1. According to previous studies on positive bias and positive valence on Instagram, hashtags in general were mostly related to positive emotions (vs. negative ones).
2. According to previous studies on the role that Instagram plays in the acceptance and construction of body standards, hashtag related to thin inspiration and body fitness were significantly related to negative emotions (vs. positive ones) while body, body image, and body confidence were related to positive emotions.
3. According to the existing literature, female faces expressed significantly more positive emotions compared with male ones.

Method

Sample and Data Collection

The sample consisted of 500 Instagram photos of both males and females. To obtain a random sample of photos, each hashtag was entered on Instagram's public timeline, which displays a subset of Instagram media that was most recent at that moment, most of which were female (86.2% females). This majority of female's picture might suggest that body hashtags are mainly posted by women than men. The hashtags were selected accordingly to a web-ranking on the most commonly used hashtags for body on Instagram. A list of body image-related hashtags was compiled and included: *#body*, *#bodyimage*, *#bodyconfidence*, *#bodyfitness*, and *#thininspirational*.

According to Cash and Pruzinsky's (2002) definitions of body image, we explored the body confidence hashtag as an attitudinal dimension of body image since it comprises evaluative, affective, and cognitive subcomponents. Exploring body confidence hashtags on Instagram provides the representation and the expressions of the mainstream beliefs and thoughts linked to the body (Neagu, 2015; Petersen, 2017). Furthermore, we investigated body fitness hashtag as a behavioral component of body image since Instagram's fitness culture seems to influence users' body perception and body satisfaction (Carrotte et al., 2017). The behavioral manifestations of body image include actions intended to monitor the condition of the body. In this term, the investigation of body fitness tag on Instagram might provide a behavioral indication of users' perceptions and feeling about their bodies. Finally, we investigated thin inspiration construct as nowadays thin inspiration images are one of the most prominent photos posted on Instagram designed to motivate people to exercise, to eat healthily, or to be skinnier. This hashtag refers to content posted on Instagram that inspires a user to be thin, and this is typically achieved through the presentation of images that contain thin bodies (Tiggemann & Zaccardo, 2018).

The inclusion criteria for emotion recognition envisaged to meet photos that showed only faces, and not the entire body, of female and men. A basic requirement for photo selection was the image clarity: the picture needed to be clear, sharp, with the faces in the foreground, and not blurry. Exclusion criteria regarded photos that showed multiple faces and not clear images. The photos were randomly downloaded on 28 October 2019 for each hashtag to select those that fulfilled the criteria for the recognition of emotions. The dataset does not include posts from private accounts and videos.

Measures

The emotions expressed in each photo were measured using the Emotion API from Microsoft Azure Cognitive Service (Sole, 2018) introduced in November 2015 and relying on machine learning algorithms. This technology can detect eight emotions based on Ekman's FACS (anger, contempt, disgust, fear, happiness, neutral, sadness, and surprise) from faces on a given photo and assign a score to the emotional categories for each detected face so that the sum of the eight scores will be one (Kim & Kim, 2018). The analysis of still images consists in finding the face in the image, extracting the relevant features (facial action units, AUs), and finally classifying the image using algorithms trained through machine learning techniques (Bryant & Howard, 2019). The emotion detection is performed after detecting the face. The confidence (values between 0 and 1) gives the likelihood for each class of emotion.

This software allows to obtain at least one highest emotion from the face that defines the intensity of the emotion expressed. Emotion recognition using facial image processing seeks to predict the real feeling of a person expressed through facial appearance.

Results

Preliminary Analyses

A preliminary repeated measures analysis of variance (ANOVA) revealed that Instagram's images related to the *#body* are characterized by specific emotions, each one with a different emotional intensity, $F(1, 499) = 1,986.49, p < .001, \eta_p^2 = .799$. Overall, happiness and neutral emotions were the most intense and recognizable, and resulted to be significantly different from all other emotions, $t_s(499) \geq 19.01, p_s < .001$ (Bonferroni-corrected).

Emotion Detection in Five Different Body Hashtags

To elucidate the different pathways linking specific emotions to specific body-related hashtags, we ran a mixed ANOVA four (Within-Subject: Emotion) \times five (Between-Subject: # category [*#body*, *#bodyimage*, *#bodyconfidence*, *#bodyfitness*,

Table 1. Average *Emotional Intensity* According to Emotion Type (Anger, Contempt, Disgust, Fear, Happiness, Neutral, Sadness, and Surprise) and Body Hashtag Category (#bodyimage vs. #bodyconfidence vs. #body vs. #bodyfitness vs. #thininspirational).

Emotion	Body hashtag				
	#bodyimage M (SD)	#bodyconfidence M (SD)	#body M (SD)	#bodyfitness M (SD)	#thininspirational M (SD)
Anger	.001 _a (.008)	.010 _a (.047)	.004 _a (.035)	.006 _a (.036)	.001 _a (.002)
Contempt	.008 _a (.029)	.008 _a (.027)	.006 _a (.020)	.008 _a (.038)	.011 _a (.067)
Disgust	.001 _a (.003)	.006 _a (.027)	.001 _a (.003)	.001 _a (.009)	.000 _a (.001)
Fear	.001 _a (.003)	.001 _a (.008)	.004 _a (.035)	.001 _a (.003)	.004 _a (.032)
Happiness	.574 _b (.450)	.648 _c (.410)	.332 _e (.434)	.346 _g (.445)	.204 _h (.366)
Neutral	.392 _b (.426)	.281 _d (.370)	.620 _f (.421)	.611 _g (.427)	.712 _i (.376)
Sadness	.008 _a (.017)	.024 _a (.090)	.013 _a (.029)	.020 _a (.045)	.036 _a (.080)
Surprise	.010 _a (.037)	.013 _a (.047)	.018 _a (.053)	.009 _a (.042)	.017 _a (.086)

Note. Emotional intensity for each emotion ranged from 0.000 to 1.000. Column means with different subscripts differ significantly from each other at $p < .002$ (Bonferroni-corrected). Standard deviations (SD) are displayed in parenthesis.

and #thininspirational]). Each emotion was considered as a repeated measure across the five # category (#body, #bodyimage, #bodyconfidence, #bodyfitness, and #thininspirational) as the between-subjects variable. As expected, the analysis revealed a significant interaction effect of emotion type and body hashtags on emotional intensity, $F(4, 495)=16.70$, $p < .001$, $\eta_p^2 = .119$), and no main effect of hashtag categories on emotional intensity, $F(4, 495)=.65$, $p = .628$, $\eta_p^2 = .005$. Before proceeding with post hoc tests, we corrected for Bonferroni within each set of pairwise comparisons, that is, separately for between and within comparisons, with critical p values set at .005 and .002, respectively. Post hoc multiple pairwise comparisons showed that happiness intensity was significantly higher in photographs tagged with #bodyimage and #bodyconfidence than with the other hashtags, $t_s(198) \geq 3.59$, $p_s < .001$. By contrast, results showed comparatively higher levels of neutral emotion in photographs tagged with #body, #bodyfitness, and #thininspirational, $t_s(198) \geq 3.64$, $p_s < .001$. Still, both happiness and neutral emotions were highly detected—and systematically differed from other emotions—within each hashtag category, $t_s(99) \geq 4.29$, $p_s < .001$. Table 1 summarizes the overall pattern of results for emotional intensity as a function of emotion type and body hashtag categories.

Gender Differences

Further analyses showed a significant association between gender and hashtag categories, $\chi^2(4)=91.53$, $p < .001$. In particular, all of the Instagram's photographs tagged with #thininspirational portrayed females (adjusted residual $r_a=4.5$). Likewise, photographs tagged with #bodyconfidence portrayed more females than proportionally expected (adjusted residual $r_a=3.8$), while photos tagged with #bodyfitness more frequently showed males (adjusted residual $r_a=8.8$).

Finally, we tested the hypothesis that gender could be associated with different detected emotions. The analysis

revealed no main effect of gender on emotion detection, $F(1, 497)=.68$, $p = .410$, $\eta_p^2 = .001$, nor an interaction effect between gender and emotion type on detected emotional intensity, $F(1, 497)=2.23$, $p = .136$, $\eta_p^2 = .004$.

Discussion

This study adopted an AI-based discrete emotional analysis for detecting emotions in Instagram images marked with hashtags referring to body image-related components. This approach allowed analyzing emotions in a fine-grained way to deepen the understanding of the link with body image facets (Hyvärinen & Beck, 2018).

Despite the preliminary nature of this study, our results confirmed the positivity bias (Waterloo et al., 2018) that we posited as a first hypothesis, thus showing that happiness was one of the most intense and recognizable emotion expressed in all photos. Specifically, findings evidenced that positivity was mainly expressed through happiness, as a specific discrete emotion. Moreover, our study added to existing literature another crucial information related to neutrality. A balance between positivity and neutrality emerged as a constant emotional component across all hashtags. This finding may offer a preliminary scientific evidence of current trends on body image acceptance on Instagram overcoming the need to accept our body unconditionally. On one hand, positivity bias—mainly evident in the widespread #bodypositivity movement on Instagram (Cwynar-Horta, 2016; Sastre, 2014)—relies on a forced acceptance of the body despite its shape and its health (i.e., the fat acceptance movement or the national association to advance fat acceptance). As a counterpart, it has taken hold a new movement around a more realistic and attainable body acceptance view, which has been translated in the increasing use of #bodyneutrality instead of #bodypositivity. Therefore, it might be useful to further investigate the neutrality expressed online linked to the body both defined as a symbol, a word, or emotions. By going into

detail, according to our second hypothesis, significant interactions between specific emotions and different dimensions of body image hashtags were found. Specifically, happiness and neutral resulted to be significantly detected within each hashtag category. In particular, happiness intensity was significantly higher in images with *#bodyimage* and *#bodyconfidence* compared with all other hashtags, whereas higher levels of neutral emotion were found in images tagged with *#body*, *#bodyfitness*, and *#thininspirational*. Our findings on happiness were in line with previous studies on the self-promotional use and the more socially desirable way of self-presentation found on Instagram, compared with other social networks. According to this, Sheldon and Bryant (2016) in their study showed that one major goal of many Instagram users was to gain a substantial amount of “likes” on their posts as well as achieving a high number of followers. Moreover, Nadkarni and Hofmann (2012) indicated the same needs at the base of the use of social networks, and as a further result, they showed also the need to belong as a key motivational factor. Our findings were also in line with the hyperpersonal perspective (Walther, 2007) assuming that individuals more typically present themselves in a socially desirable way (i.e., positively) due to the control provided by online settings over one’s self-presentation. Furthermore, Waterloo and colleagues (2018) focused on the norms among expressions of emotions on Facebook, Twitter, Instagram, and Whatsapp, and they found that the expressions of positive emotions were generally considered more appropriate than expressions of negative emotions across all platforms and especially on Instagram. Thus, they suggested that the specific features of a social media platform may facilitate certain types of expressions and beliefs on what may be considered appropriate, beyond differences in perceived behavioral privacy. With this regard, it has been demonstrated that an overuse of self-promotional content on Instagram is due to its visual properties (Sheldon & Bryant, 2016). On the other hand, the higher neutrality found in *#body*, *#bodyfitness*, and *#thininspirational* is in contrast with our second hypothesis. This neutrality might be interpreted as a form of emotional flatness due to the positive bias found on Instagram (Wildes et al., 2010). Users might prefer showing neutral emotions or nothing in particular, rather than expressing negative emotions perceived as considerably less appropriate (Caltabiano & Smithson, 1983). Interestingly, neutrality resulted as mainly associated with *#bodyfitness* and *#thininspirational* referring to the most prominent Instagram posts which push toward physical activity, eating healthily, or being skinnier (Talbot et al., 2017). Crucially, there is evidence that being exposed to posts illustrating thin, muscular, and unrealistic but socially desirable body ideals can increase body dissatisfaction and self-objectification tendencies with salient clinical implications (Myers & Crowther, 2009; Riva et al., 2015; Santarossa & Woodruff, 2017; Vandenbosch & Eggermont, 2012). Specifically, users’ choice to present themselves mainly with neutral images could be consistent with the

mitigation of emotional expressions or the expression of nothing in particular, which is typical of eating disorders (EDs; McLean et al., 2017; Meyer et al., 2010). Despite the preliminary nature of this study, results suggest the need and the value of a deeper investigation of neutrality across image-based social media as a further theoretical and methodological step to (a) promote an up-to-date grounded analysis of new trends on Instagram (e.g., *#bodyneutrality*), and to (b) disambiguate the link between emotions and specific delicate processes on Instagram, such as in the case of body image.

Finally, we did not find support for our third hypothesis on the link between expressed emotions on Instagram and gender. Instead, we evidenced a significant association between gender and specific body-related hashtags. Specifically, results evidenced that images marked with body hashtags related to body esteem and thinness showed more female faces, while those images marked with *#bodyfitness* showed males faces more frequently. Crucially, a recent study (Lavender et al., 2017) demonstrated different tendencies in posting on Instagram between female and males. Rather than extreme thinness, there is an increase trend among men (Lavender et al., 2017) of many images featuring male bodies and the desire leanness and muscularity, using extreme exercise and dieting to achieve the right picture of themselves.

Conclusion

This study adopted an AI-based discrete emotional analysis for detecting emotions in Instagram images marked with hashtags referring to body image-related components. To our knowledge, this is the only existing study showing a positivity–neutrality balance across Instagram pictures featuring facial expressions marked with body image-related #. Specifically, this study extended the previous literature on the emotional expression on Instagram specifically linked to body image dimensions. The current results showed that happiness and neutrality were the main emotions expressed on Instagram related to body image dimensions and these findings could provide a constant up-to-date emotional picture of Instagram body-related trends. This is a sensitive topic that could be analyzed in detail using this advanced methodology—AI—enabling for a finer investigation, which other would be too demanding or excessively costly. Another major contribution of this study to the existing literature on emotions in general and social network research in particular is that it embraces the techniques that can analyze photos on content. This study has successfully analyzed what a given photo is about, and what emotion is expressed on a given photo and described by a specific hashtag. This approach allowed analyzing emotions in a fine-grained way (Hyvärinen & Beck, 2018) to deepen the understanding of the link with body image facets. Finally, the study presents some limitations. One limitation of the study, which will be addressed in further research, is related to the need a higher

number of photos to analyze. Another limit is related to the imbalance numbers of images depicting males compared with females that limited the gender differences analysis. Finally, the use of only public unknown accounts denied the possibility to contact participants and ask them more demographic informations, Instagram's use, their relationship with the body, and body image perception. Further studies are necessary to better understand the emotional nuances found in our results, with a particular focus on neutrality emotion and its implication on self-presentation and body depiction, as well as a higher number of pictures. These preliminary findings might be extended also looking at the personality of the users to offer a broader vision of Instagram involvement on the main aspects of the everyday life, emotions, body perception, and interactions.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: This article was supported by the Italian MIUR research project "Unlocking the memory of the body: Virtual Reality in Anorexia Nervosa" (201597WTTM).

ORCID iD

Clelia Malignetti  <https://orcid.org/0000-0002-1321-8784>

References

- Aguiar, D. E., Souza, A. F., Santos, T. O., & Lopes, A. T. (2016). Facial expression recognition with Convolutional Neural Networks: Coping with few data and the training sample order. *Pattern Recognition*, *61*, 610–628. <https://doi.org/10.1016/j.patcog.2016.07.026>
- Alhabash, S., & Ma, M. (2017). A tale of four platforms: Motivations and uses of Facebook, Twitter, Instagram, and Snapchat among college students? *Social Media+ Society*, *3*, 2056305117691544. <https://doi.org/10.1177/2056305117691544>
- Aziz, J. (2017). *Social media and body issues in young adults: An empirical study on the influence of Instagram use on body image and fatphobia in Catalan university students* [Doctoral thesis]. Universitat Pompeu Fabra.
- Barrett, L. F., & Bliss-Moreau, E. (2009). Affect as a psychological primitive. *Advances in Experimental Social Psychology*, *41*, 167–218. [https://doi.org/10.1016/S0065-2601\(08\)00404-8](https://doi.org/10.1016/S0065-2601(08)00404-8)
- Brown, Z., & Tiggemann, M. (2016). Attractive celebrity and peer images on Instagram: Effect on women's mood and body image. *Body Image*, *19*, 37–43. <https://doi.org/10.1016/j.bodyim.2016.08.007>
- Bryant, D. A., & Howard, A. (2019). A comparative analysis of emotion-detecting AI systems with respect to algorithm performance and dataset diversity. In *Proceedings of the 2019 AAAI/ACM Conference on AI, Ethics, and Society* (pp. 377–382). <https://doi.org/10.1145/3306618.3314284>
- Caltabiano, M. L., & Smithson, M. (1983). Variables affecting the perception of self-disclosure appropriateness. *The Journal of Social Psychology*, *120*, 119–128. <http://dx.doi.org/10.1080/0224545.1983.9712017>
- Carrotte, E. R., Prichard, I., & Lim, M. S. C. (2017). "Fitspiration" on social media: A content analysis of gendered images. *Journal of Medical Internet Research*, *19*, e95. <https://doi.org/10.2196/jmir.6368>
- Cash, T. F., & Pruzinsky, T. (2002). Future challenges for body image theory, research, and clinical practice. In T. F. Cash & T. Pruzinsky (Eds.), *Body images: A handbook of theory, research, and clinical practice* (pp. 509–516). Guilford Press.
- Cash, T. F., Thériault, J., & Annis, N. M. (2004). Body image in an interpersonal context: Adult attachment, fear of intimacy, and social anxiety. *Journal of Social and Clinical Psychology*, *23*, 89–103. <http://dx.doi.org/10.1521/jscp.23.1.89.26987>
- Chaikin, A. L., & Derlega, V. J. (1974). Variables affecting the appropriateness of self-disclosure. *Journal of Consulting and Clinical Psychology*, *42*, 588–593. <http://dx.doi.org/10.1037/h0036614>
- Chou, C., & Tsai, M. J. (2007). Gender differences in Taiwan high school students' computer game playing. *Computers in Human Behavior*, *23*, 812–824. <https://doi.org/10.1016/j.chb.2004.11.011>
- Clore, G. L., & Schnall, S. (2005). The influence of affect on attitude. In D. Albarracín, B. T. Johnson, & M. P. Zanna (Eds.), *The handbook of attitudes* (pp. 437–489). Lawrence Erlbaum.
- Cohn, M. A., & Fredrickson, B. L. (2009). Positive emotions. In S. J. Lopez & C. R. Snyder (Eds.), *Oxford library of psychology. Oxford handbook of positive psychology* (pp. 13–24). Oxford University Press.
- Cwynar-Horta, J. (2016). The commodification of the body positive movement on Instagram. *Stream: Inspiring Critical Thought*, *8*(2), 36–56. <http://journals.sfu.ca/stream/index.php/stream/article/view/203>
- Davison, T. E., & McCabe, M. P. (2005). Relationships between men's and women's body image and their psychological, social, and sexual functioning. *Sex Roles: A Journal of Research*, *52*, 463–475. <http://dx.doi.org/10.1007/s11199-005-3712-z>
- de Vries, D. A., Möller, A. M., Wieringa, M. S., Eigenraam, A. W., & Hamelink, K. (2018). Social comparison as the thief of joy: Emotional consequences of viewing strangers' Instagram posts. *Media Psychology*, *21*, 222–245. <https://doi.org/10.1080/15213269.2016.1267647>
- Derks, D., Fischer, A. H., & Bos, A. E. (2008). The role of emotion in computer-mediated communication: A review. *Computers in Human Behavior*, *24*, 766–785.
- Deshmukh, R. S., & Jagtap, V. (2017). A survey: Software API and database for emotion recognition. In *2017 International Conference on Intelligent Computing and Control Systems (ICICCS)* (pp. 284–289). IEEE. <https://doi.org/10.1145/3306618.3314284>
- Ekman, P. (2016). What scientists who study emotion agree about. *Perspectives on Psychological Science*, *11*, 31–34. <https://doi.org/10.1177/1745691615596992>
- Fardouly, J., Pinkus, R. T., & Vartanian, L. R. (2017). The impact of appearance comparisons made through social media, traditional media, and in person in women's everyday lives. *Body Image*, *20*, 31–39. <http://dx.doi.org/10.1016/j.bodyim.2016.11.002>
- Fardouly, J., & Vartanian, L. R. (2016). Social media and body image concerns: Current research and future directions. *Current*

- Opinion in Psychology*, 9, 1–5. <http://dx.doi.org/10.1016/j.copsyc.2015.09.005>
- Fardouly, J., Willburger, B. K., & Vartanian, L. R. (2018). Instagram use and young women's body image concerns and self-objectification: Testing mediational pathways. *New Media & Society*, 20, 1380–1395. <https://doi.org/10.1177/1461444817694499>
- Ferguson, C. J., Winegard, B., & Winegard, B. M. (2011). Who is the fairest one of all? How evolution guides peer and media influences on female body dissatisfaction. *Review of General Psychology*, 15, 11–28.
- Gasper, K., Spencer, L. A., & Hu, D. (2019). Does neutral affect exist? How challenging three beliefs about neutral affect can advance affective research. *Frontiers in Psychology*, 10, Article 2476. <https://doi.org/10.3389/fpsyg.2019.02476>
- Haferkamp, N., Eimler, S. C., Papadakis, A. M., & Kruck, J. V. (2012). Men are from Mars, women are from Venus? Examining gender differences in self-presentation on social networking sites. *Cyberpsychology, Behavior, and Social Networking*, 15, 91–98. <https://doi.org/10.1089/cyber.2011.0151>
- Holland, G., & Tiggemann, M. (2016). A systematic review of the impact of the use of social networking sites on body image and disordered eating outcomes. *Body Image*, 17, 100–110. <https://doi.org/10.1016/j.bodyim.2016.02.008>
- Howell, A., & Conway, M. (1990). Perceived intimacy of expressed emotion. *The Journal of Social Psychology*, 130, 467–476. <http://dx.doi.org/10.1080/00224545.1990.9924608>
- Hyvärinen Beck, R. (2018, January 3). *Emotions trump facts: The role of emotions in on social media: A literature review* [Conference session]. 51st Hawaii International Conference on System Sciences. <http://hdl.handle.net/10125/50113>
- Kakish, H., Olney, A., & Becerra, M. B. (2018). A qualitative analysis of body image on social media: Implications for public health practice. *Open Access Journal of Public Health*, 2.
- Khanal, S. R., Barroso, J., Lopes, N., Sampaio, J., & Filipe, V. (2018). Performance analysis of Microsoft's and Google's emotion recognition API using pose-invariant faces. In *Proceedings of the 8th International Conference on Software Development and Technologies for Enhancing Accessibility and Fighting Info-exclusion* (pp. 172–178). <https://doi.org/10.1145/3218585.3224223>
- Kim, Y., & Kim, J. H. (2018). Using computer vision techniques on Instagram to link users' personalities and genders to the features of their photos: An exploratory study. *Information Processing & Management*, 54, 1101–1114. <https://doi.org/10.1016/j.ipm.2018.07.005>
- Lavender, J. M., Brown, T. A., & Murray, S. B. (2017). Men, muscles, and eating disorders: An overview of traditional and muscularity-oriented disordered eating. *Current Psychiatry Reports*, 19, 32. <https://doi.org/10.1007/s11920-017-0787-5>
- Lee, E., Ahn, J., & Kim, Y. J. (2014). Personality traits and self-presentation at Facebook. *Personality and Individual Differences*, 69, 162–167. <http://dx.doi.org/10.1016/j.paid.2014.05.020>
- Lenhart, A. (2015). *Teens, social media & technology overview 2015*. Pew Research Center. <https://www.pewresearch.org/internet/2015/04/09/teens-social-media-technology-2015/>
- Lewallen, J., & Behm-Morawitz, E. (2016). Pinterest or thinterest? Social comparison and body image on social media. *Social Media+ Society*, 2, 2056305116640559. <https://doi.org/10.1177/2056305116640559>
- Lin, H., Tov, W., & Qiu, L. (2014). Emotional disclosure on social networking sites: The role of network structure and psychological needs. *Computers in Human Behavior*, 41, 342–350. <http://dx.doi.org/10.1016/j.chb.2014.09.045>
- McLean, C. P., Miller, N. A., & Hope, D. A. (2007). Mediating social anxiety and disordered eating: The role of expressive suppression. *Eating Disorders*, 15, 41–54. <https://doi.org/10.1080/10640260601044485>
- Meyer, C., Leung, N., Barry, L., & De Feo, D. (2010). Emotion and eating psychopathology: Links with attitudes toward emotional expression among young women. *International Journal of Eating Disorders*, 43, 187–189. <https://doi.org/10.1002/eat.20659>
- Mills, J. S., Musto, S., Williams, L., & Tiggemann, M. (2018). “Selfie” harm: Effects on mood and body image in young women. *Body Image*, 27, 86–92. <https://doi.org/10.1016/j.bodyim.2018.08.007>
- Myers, T. A., & Crowther, J. H. (2009). Social comparison as a predictor of body dissatisfaction: A meta-analytic review. *Journal of Abnormal Psychology*, 118, 683–698. <http://dx.doi.org/10.1037/a0016763>
- Nadkarni, A., & Hofmann, S. G. (2012). Why do people use Facebook? *Personality and Individual Differences*, 52(3), 243–249. <http://dx.doi.org/10.1016/j.paid.2011.11.007>
- Naveed, N., Gottron, T., Kunegis, J., & Alhadi, A. C. (2011). Bad news travel fast: A content-based analysis of interestingness on twitter. In *Proceedings of the 3rd International Web Science Conference* (pp. 1–7). ACM. <https://doi.org/10.1145/2527031.2527052>
- Neagu, A. (2015). Body image: A theoretical framework. *Proceedings of the Romanian Academy*, 17, 29–38.
- Petersen, K. (2017). *Social cognitive perspectives on the development of body image in adult women* [Doctoral dissertation]. North Dakota State University.
- Pilař, L., Balcarová, T., & Rojik, S. (2016). Farmers' markets: Positive feelings of Instagram posts. *Acta Universitatis Agriculturae et Silviculturae Mendelianae Brunensis*, 64, 2095–2100. <http://dx.doi.org/10.11118/actaun201664062095>
- Qiu, L., Lin, H., Leung, A. K., & Tov, W. (2012). Putting their best foot forward: Emotional disclosure on Facebook. *Cyberpsychology, Behavior, and Social Networking*, 15, 569–572. <https://doi.org/10.1089/cyber.2012.0200>
- Reinecke, L., & Trepte, S. (2014). Authenticity and well-being on social network sites: A two-wave longitudinal study on the effects of online authenticity and the positivity bias in SNS communication. *Computers in Human Behavior*, 30, 95–102. <http://dx.doi.org/10.1016/j.chb.2013.07.030>
- Riva, G., Gaudio, S., & Dakanalis, A. (2015). The neuropsychology of self-objectification. *European Psychologist*, 20, 34–43. <http://dx.doi.org/10.1027/1016-9040/a000190>
- Russell, J. A. (2003). Core affect and the psychological construction of emotion. *Psychological Review*, 110(1), 145–172. <https://doi.org/10.1037/0033-295X.110.1.145>
- Santarossa, S., & Woodruff, S. J. (2017). # SocialMedia: Exploring the relationship of social networking sites on body image, self-esteem, and eating disorders. *Social Media+ Society*, 3, 2056305117704407. <https://doi.org/10.1177/2056305117704407>
- Sastre, A. (2014). Towards a radical body positive: Reading the online “body positive movement.” *Feminist Media Studies*, 14(6), 929–943. <https://doi.org/10.1080/14680777.2014.883420>

- Savicki, V., & Kelley, M. (2000). Computer mediated communication: Gender and group composition. *CyberPsychology & Behavior*, 3(5), 817–826. <https://doi.org/10.1089/10949310050191791>
- Schimmack, U., & Crites, S. L., Jr. (2005). The structure of affect. In D. Albarracín, B. T. Johnson, & M. P. Zanna (Eds.), *The handbook of attitudes* (pp. 397–435). Lawrence Erlbaum.
- Sheldon, P., & Bryant, K. (2016). Instagram: Motives for its use and relationship to narcissism and contextual age. *Computers in Human Behavior*, 58, 89–97. <http://dx.doi.org/10.1016/j.chb.2015.12.0590747-5632/>
- Slater, A., Cole, N., & Fardouly, J. (2019). The effect of exposure to parodies of thin-ideal images on young women's body image and mood. *Body Image*, 29, 82–89. <https://doi.org/10.1016/j.chb.2015.12.059>
- Sole, A. D. (2018). *Microsoft computer vision APIs distilled: Getting started with cognitive services*. Apress.
- Sonne, J., & Erickson, I. (2018, July). The expression of emotions on Instagram. In *Proceedings of the 9th International Conference on Social Media and Society* (pp. 380–384). ACM. <https://doi.org/10.1145/3217804.3217949>
- Stice, E., & Whitenton, K. (2002). Risk factors for body dissatisfaction in adolescent girls: A longitudinal investigation. *Developmental Psychology*, 38, 669–678. <http://dx.doi.org/10.1037/0012-1649.38.5.669>
- Szymanski, D. M., Moffitt, L. B., & Carr, E. R. (2011). Sexual objectification of women: Advances to theory and research 1ψ7. *The Counseling Psychologist*, 39(1), 6–38.
- Talbot, C. V., Gavin, J., Van Steen, T., & Morey, Y. (2017). A content analysis of thinspiration, fitspiration, and bonespiration imagery on social media. *Journal of Eating Disorders*, 5, Article 40. <https://doi.org/10.1186/s40337-017-0170-2>
- Thompson, J. K. (2004). The (mis) measurement of body image: Ten strategies to improve assessment for applied and research purposes. *Body Image*, 1, 7–14. [https://doi.org/10.1016/S1740-1445\(03\)00004-4](https://doi.org/10.1016/S1740-1445(03)00004-4)
- Thompson, J. K., & Stice, E. (2001). Thin-ideal internalization: Mounting evidence for a new risk factor for body-image disturbance and eating pathology. *Current Directions in Psychological Science*, 10, 181–183. <http://dx.doi.org/10.1111/1467-8721.00144>
- Tiggemann, M., & Zaccardo, M. (2018). 'Strong is the new skinny': A content analysis of #fitspiration images on Instagram. *Journal of Health Psychology*, 23, 1003–1011. <https://doi.org/10.1177/1359105316639436>
- Van Den Berg, P., Thompson, J. K., Obremski-Brandon, K., & Coovert, M. (2002). The tripartite influence model of body image and eating disturbance: A covariance structure modeling investigation testing the mediational role of appearance comparison. *Journal of Psychosomatic Research*, 53, 1007–1020. [https://doi.org/10.1016/S0022-3999\(02\)00499-3](https://doi.org/10.1016/S0022-3999(02)00499-3)
- Vandenbosch, L., & Eggermont, S. (2012). Understanding sexual objectification: A comprehensive approach toward media exposure and girls' internalization of beauty ideals, self-objectification, and body surveillance. *Journal of Communication*, 62, 869–887. <https://doi.org/10.1111/j.1460-2466.2012.01667.x>
- Wagner, C. N., Aguirre Alfaro, E., & Bryant, E. M. (2016). The relationship between Instagram selfies and body image in young adult women. *First Monday*, 21, 9. <http://dx.doi.org/10.5210/fm.v21i9.6390>
- Walther, J. B. (2007). Selective self-presentation in computer-mediated communication: Hyperpersonal dimensions of technology, language, and cognition. *Computers in Human Behavior*, 23, 2538–2557. <http://dx.doi.org/10.1016/j.chb.2006.05.002>
- Waterloo, S. F., Baumgartner, S. E., Peter, J., & Valkenburg, P. M. (2018). Norms of online expressions of emotion: Comparing Facebook, Twitter, Instagram, and WhatsApp. *New Media & Society*, 20, 1813–1831. <https://doi.org/10.1177/1461444817707349>
- Wildes, J. E., Ringham, R. M., & Marcus, M. D. (2010). Emotion avoidance in patients with anorexia nervosa: Initial test of a functional model. *International Journal of Eating Disorders*, 43, 398–404. <https://doi.org/10.1002/eat.20730>
- Yin, G., Zhang, Q., & Li, Y. (2014). *Effects of emotional valence and arousal on consumer perceptions of online review helpfulness* [Paper presentation]. Twentieth Americas Conference on Information Systems, Savannah, GA, United States.
- Zhang, H. (2015). *Gender, personality, and self-esteem as predictors of social media presentation* [Doctoral thesis]. East Tennessee State University.

Author Biographies

Clelia Malignetti (MA) is a PhD student of Psychology at the Catholic University of the Sacred Heart of Milan. Her research interests include the use of social networks and their impact on body perception, the study of inner body perception in eating disorders and the use of virtual reality for the treatment of body misperception and emotion regulation in eating disorders.

Simona Sciara (MA) is a PhD student of Psychology at the Catholic University of the Sacred Heart of Milan and an official member of the Laboratory of Social Psychology (UniSR-Social.Lab) at the Vita-Salute San Raffaele University of Milan. Her research interests include the effects of cognition and emotions on social relationships, and the study of motivational processes underlying online behaviors and the use of social media platforms.

Alice Chirico (PhD) is a Postdoc at the Catholic University of the Sacred Heart of Milan. Her research interest concerns complex experiences, including complex emotions, for human wellbeing and health, especially in Major Depression Disorder. She is currently involved in a project using sublime-oriented education.

Giuseppe Riva (PhD) is a full professor of General Psychology and Communication Psychology at the Catholic University of Milan and head researcher of the Applied Technology for Neuro-Psychology Laboratory - ATN-P Lab., Istituto Auxologico Italiano. He conducted several researches and published many papers about the use of social networks and computer-mediated communication. He pioneered much of the applications that enabled the diffusion of Virtual Reality and Internet in medicine and in training.