

Check your likes but move your body! How the use of social media is influencing pre-teens body and the role of active lifestyle

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Keywords: body image, pre-teens, social media, active lifestyle, physical appearance, well-being.

ABSTRACT LENGTH: 308 words

MANUSCRIPT LENGTH: 5374 words

NUMBER OF TABLES: 4

Abstract

The use of social media has been increasing among pre-teens (10-12 years) effects on body image concerns and disordered body image behaviours. In particular, pre-teens using image-centred social media (e.g., Instagram, Tik Tok, etc.) may perceive other users to be more attractive than them with negative influence on their self-esteem increasing body concerns and by impacting evaluations of one's personal attributes, including physical appearance. It is also associated with a lower propensity to be physically active. This cross-sectional study aimed to test a model of relationships between active lifestyle, body image satisfaction and the use of social media among pre-teens.

A sample of 2378 Italian pre-teens (Mage= 12.02 years, SD= 0.82) was recruited. Two anonymous and self-administered questionnaires were used to investigate: social media use, including typology, intensity, image-based use, type of profiles; the representation of the bodies through the social media; the body image; the level of physical activity. Descriptive statistics were computed for all the investigated variables. A multiple linear regression was used to explore the association between body satisfaction (dependent variable) and physical activity levels and the dualism (independent variables).

It emerged that the massive use of social media and the exposure to images and videos promoting certain beauty standards are associated with body concerns and disaffection. However, the daily use of the body for walking, practicing sport, etc. helps individuals to establish a positive link between the self and the body, and to mitigate the negative effect of the altered sociocultural models of the body. Pre-teens that were active showed a lower propensity toward body concerns related to the use of social media. Therefore, it can be assumed that the engagement of pre-teens in offline activities counteracts the undesirable consequences of the virtual interactions as it may increase their emotional health and their social skills and reduce the negative effect of social media engagement.

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1. Introduction

The present study aimed to test a model of relationships between active lifestyle, body image satisfaction and the use of social media among pre-teens. It was hypothesized that an active lifestyle along with an attitude to be more physically active is positively associated with body satisfaction. It also represents a variable that could mediate the negative effect of the massive use of image-centred social media.

The human experience of embodiment

Body image represents one of the most complex and profound human experiences of embodiment. It is generally defined as a multidimensional construct encompassing the way one sees, thinks, feels, and behaves in relation to the appearance and function of one's body (Cash and Smolak, 2011). Recent research on body image has articulated this complex construct through several dimensions (Smolak, L., Thompson, 2009; Cash, 2012). The subjective and affective dimensions are essentially related to satisfaction with one's body. In this light, body image is primarily concerned with the conscious appraisal of our own physical appearance (Byrne, 2012) and with the satisfaction related with the perception of the appearance. These two dimensions are interlinked with the cognitive dimension that encompasses the thoughts, beliefs, attributions, and attitudes related to an individual's appearance and with the behavioral dimension that describes a person's body image-related behaviors such as avoidance of mirrors or body-monitoring behaviors. The assessment and the analysis of all these dimensions offer a comprehensive understanding of the individual experience related to body image.

Broadly, it is postulated that body image is an elastic and changeable human experience that can be influenced by outside variables, such as peers and media (Cash, 2012). The **Tripartite Influence Model** (Thompson et al., 1999) is generally taken into consideration to understand the influence of the outside variables on body image's dimensions. In particular, three main elements are considered as directly affecting body image: peers, parents, and media. The model has been largely used as it brings together sociocultural, psychological, and biological factors that influence the way the individual, through the body, lives, interacts with others and experiences the world. (Shroff and Thompson, 2006) have applied the model to explain the processes leading to body dissatisfaction and eating disturbances among adolescent girls. In addition, it has also been applied as a conceptual framework for understanding factors that might influence boys' body image concerns (Smolak et al., 2005). Finally, it has received further support with young adult samples (van den Berg et al., 2002).

The application of the Tripartite Influence Model to the analysis of the modern form of influence on body image's dimensions shows how, nowadays, technology and social media are the variables that, more than others, have an impact on body perception. (Giddens, 1997) that with modernity, people started to live in a secular age in which individuals are responsible for defining their own body. The technology offers the opportunity to (re)shape the body "in our image" or in line with the body ideals. Social media, in particular, artificial body images are represented and spread through, reflecting unrealistic sociocultural standards that are impossible to attain. Spending time browsing social media is likely to be linked with body concerns as it allows users to engage in a constant process of comparison with idealised, and often altered, models of **bodies** (Eyal and Te'eni-Harari, 2013; Tatangelo and Ricciardelli, 2017). In addition, advances in artificial intelligence and the opportunity to use filters and apps that can modify appearance has further exacerbated this process (Digennaro, 2022).

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Appearance-focused media content

Sociocultural theorists suggest that the appearance-focused media content may be associated with the internalisation of appearance (Schaefer et al., 2015); individuals might experience concern over personal body image when the perceived appearance is compared with another imagined or idealised person (Thompson, 1990). More recently, following the Foucaudian idea of panoptic power mechanism (Foucault, 1995, 2005), Sæle et al. (2021) developed **the BOPS** (body and body pressure, omniopticon, panopticon and synopticon) model supporting the idea that, nowadays, young people's body image is linked to body pressure and subjected to various strategic power strategies including authorities, individuals, peers, family, celebrities, or social media. The pervasive presence of social media makes difficult to distinguish between the real from the unnatural, the tangible from the virtual, the artificial from the natural. The youngest generations, in particular, consider the existence as a fusion of the real and the virtual life, an *onlife* dimension in which the lived experience is characterized by an 'ever-increasing' pervasiveness of information and communication technologies (Floridi, 2014). Individuals are not just passive consumers, but also producers of content that is disseminated on social media. This determines a sort of *omniopticon* in which the many see the many, influencing each other (Sæle et al., 2021) and in which the passive fruition of ideal images of the body is combined with the active manipulation and dissemination of idealized body models. The result is a relentless process of remixing and reshaping the body, with potential negative consequences.

Body image development, social media and lifestyles

Childhood and adolescence are two crucial periods for the development of body image, as growth is accompanied by major changes in their body, their self-concept, mood, and social interactions (Cash and Smolak, 2011). A low level of self-esteem may increase risk of body concerns by impacting evaluations of one's personal attributes, including physical appearance (Rodgers et al., 2020).

Effectively, a high frequency of use of social media platforms, especially the image-centred platforms (i.e., Facebook, Instagram, and Snapchat), corresponds to greater body image concerns and eating disorder symptoms in men (Griffiths et al., 2018). Similar results were also found for adolescent girls; in fact, Meier and Gray (2014) reported that an elevated appearance exposure was significantly correlated with weight dissatisfaction, drive for thinness, thin ideal internalization, and self-objectification.

Furthermore, it has been suggested that age might be an important moderating factor of vulnerability to exposure to highly visual social media content, with younger adolescents most likely to experience negative outcomes. Moreover, women and individuals for whom appearance is strongly tied to attractiveness and self-worth may be at increased risk to be negatively influenced by social network platforms (Rodgers and Rousseau, 2022).

Effectively, pre-teens nowadays are **eager social media users**, even though the use of the most common social media - such as Instagram, TikTok, etc. - is not intended for them since those platforms have set an age limit of 13 or over, with several differences across Europe (Smahel et al., 2020). Despite existing limits, age verification mechanisms and parental consent tools, the limits to the use of social media among pre-teens are still ineffective (Rideout et al., 2022). Pre-teens can be exposed to risks such as inappropriate content, bullying, grooming, child sexual abuse, body shaming or radicalisation. Such age-inappropriate content is easily accessible and, often, without the direct control of the adults potentially mitigating the negative impacts (Fardouly et al., 2018).

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The high investment in terms of time spent on social media suggests that this significant usage may influence pre-teens' self-evaluation, including body satisfaction, within a period of life in which the body image is shaped. A growing body of research shows that excessively investing in the body may contribute to the development of unhealthy behaviours and body concerns such as dieting, social anxiety, inactive lifestyles, and related behaviours considered risk factors for chronic body image problems (Holland and Tiggemann, 2016). Although adolescence appears to be a major transitional period in body image (Fabian and Thompson, 1989), it has been demonstrated that in the modern society the phase of transition begins earlier, during the preadolescence (Klump, 2013); the rapid transition from childhood to adolescence is associated with the onset of body image issues, posing the risks of persistent social and health concerns (Evans et al., 2017; Hughes et al., 2018).

According to the social comparison theory (Festinger, 1954), the need for self-evaluation leads people to compare themselves with others who are similar rather than dissimilar to themselves. This comparison might be in the direction to profiles considered worse (downward social comparison) or better (upward social comparison) (Vani et al., 2021). Broadly, in our society, physical appearance has become a relevant construct as it represents an important component of how individuals feel about themselves as a whole (Tiggemann and Barbato, 2018). As a matter of fact, Chua and Chang (2016) found that adolescent girls compare themselves and their appearance to peers with higher appreciation on social networking sites, with the number of *likes* representing a parameter used for the social comparison process. The upward social comparison, with posts receiving a higher number of likes than usual, might induce a decrease in perceived self-worth and body satisfaction; conversely, downward comparisons, with social network users with less likes than usual, preserve body satisfaction and self-esteem (Tiggemann and Polivy, 2010).

Additionally, it has been demonstrated that when an individual receives a "like" on a social network, the nucleus accumbens (a key brain structure activated by things that make an individual happy) is more active (Meshi et al., 2013). This mechanism might lead to the continuous need of posting altered pictures aiming to respond to the beauty standards proposed on social networks with the goal of receiving more "likes" and to counteract the self-doubting induced by social networks (Eshiet, 2020). This phenomenon is common especially among teens. Contrarily, if the posted picture does not obtain the expected number of likes, the post is often removed (Jang et al., 2015). In particular, girls associate "likes" with peer appreciation of their physical beauty, resulting in the tendency to post selfies with the aim of getting "likes" and followers (Chua and Chang, 2016). Nevertheless, the exposure to manipulated photos might lead to a lower body satisfaction, especially for girls (Kleemans et al., 2018) and the social comparisons are associated with negative mental health among preadolescents (Fardouly et al., 2020).

This condition of body dissatisfaction represents a potential risk factor for the development of depressive mood, notably for early adolescent girls (Paxton et al., 2006). Body dissatisfaction and depressive symptoms are directly associated with differences in relation to gender and over development. In particular, body dissatisfaction among girls tends to be associated with an increase in depressive symptoms over time, beginning in the early teenage years. For boys, the picture is more complicated, with evidence for both directions of association with differing prominence over development (Sharpe et al., 2018).

It has been previously reported that physical activity might be a possible positive mediator, counteracting the negative effects on body image satisfaction. For instance, Fernández-Bustos et al. (2019) found that physical activity, as well as body mass index, directly affect body image: individuals practicing sport or physical activity report lower scores on many measures capturing negative body

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image constructs (Sabiston et al., 2019). Nevertheless, the nature of this relationship between physical activity and body dissatisfaction should be considered as bi-directional since body image has the potential to deter or motivate physical activity and sport participation (Sabiston et al., 2019). To this regard, it is worthy to mention that higher amounts of sedentary time spent using digital media increases the risk for pre-teens of being overweight. However, this association was not found for pre-teens being active for at least 6 hours per week in leisure-time physical activity, suggesting that adequate levels of physical activity during preadolescence may protect against the harmful long-term impact of high amounts of sedentary digital media use on weight (Engberg et al., 2021). In line with these findings, Rutter et al. (2021) found that for adolescents a higher use of social media was associated with symptoms of depression, anxiety, and loneliness. Conversely, increased physical activity was associated with decreased depression and anxiety symptoms suggesting that physical activity has the potential to mediate the relationship between social media use and depression and anxiety. Under these circumstances, it can be maintained that an active lifestyle might contribute to counteracting the detrimental effects of sedentary behaviors and body dissatisfaction among preteens, as further demonstrated by Jankauskiene et al. (2020) who found that adolescents practicing sports might have greater body appreciation, self-esteem and lower body dissatisfaction than adolescents not practicing any sport.

2. Material and methods

2.1. Data collection and sample

The study involved a sample of 2378 Italian pre-teens aged 11-13 years (Mage= 12.02 years, SD= 0.82). The data collection was implemented during school hours in collaboration with the teachers. The strategy adopted was based on two anonymous and self-administered questionnaires aimed at investigating: social media use, including typology, intensity, image-based used, type of profiles (public/private); the representation of the bodies through the social media; the relationship between the natural and the virtual bodies; the body image; the level of physical activity. Ethical approval was obtained from the Institutional Review Board of the Department of Human Sciences, Society and Health of the University of Cassino and Southern Lazio (Approval number: 3RA2.2022.06.15). Informed parent consent was also obtained along with the authorizations from all the schools involved in the survey. Measurements

A questionnaire based on an adapted version of the Instagram Image Activity Scale (IIAS) and the Instagram Appearance Comparison Scale – IACS (di Gesto et al., 2020) was adopted to investigate the combined influence of social media use and peer factors. The questionnaire was composed of 15 items assessing the frequency with which various types of image-related activities are carried out on social networks (e.g., posting or watching photos, videos, stories, direct; ‘liking’ photos and videos) related to the self, friends, and celebrities. The response options for the items were *never* (1), *rarely* (2), *frequently* (3), *very frequently* (4). The scale adopted (4-point scale) has demonstrated good internal consistency ($\alpha = 0.85$), 2-week test-retest reliability, and structural validity among the preadolescents.

To estimate the dualism between the virtual and the real body, 4 statements were presented (e.g., have you ever wanted to be in real life as you appear with the filters used to edit your body on social media?) with 3 possible responses: *yes, often* (2); *yes, sometimes* (1); *never* (0). The dualism score is obtained by the composite mean of the 4 items.

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Body satisfaction was investigated by means of an adapted version of the Italian Body Image State Scale (BISS) (Cash et al., 2002; Carraro et al., 2010). The questionnaire is composed of 6 items with a 9-point response format for each item and the body satisfaction score is obtained by the composite means of the 6 items. With the view to providing a better representation of the respondents' opinion the response format was rescaled to 4 points. The scale adopted (4-point scale) has demonstrated good internal consistency ($\alpha = 0.83$), 2-week test-retest reliability, and structural validity among the preadolescents.

Finally, the level of physical activity was measured using the Italian version of the Physical Activity Questionnaire for Older Children (PAQ-C) (Gobbi et al., 2016). The PAQ-C is a self-administered questionnaire providing a summary physical activity score derived from nine items, each scored between 1 (low level) and 5 (high level) with reference to the activities occurring the seven days before the administration of the questionnaire (Kowalski et al., 2004).

2.2. Statistical analysis

Considering that data were not normally distributed, non-parametric analyses were conducted for descriptive statistics. Generally, the extent of missing data was moderate, ranging from 0 to 10%. Descriptive statistics were computed for all the investigated variables. Results from both the univariate - Shapiro-Wilk's W test - and multivariate tests suggested that data did not come from normally distributed univariate or multivariate distributions. Transformations did not correct normality. Consistent with this, non-parametric analysis was conducted for descriptive statistics. Generally, the extent of missing data across each outcome was moderate.

A multiple linear regression was used to explore the association between body satisfaction (dependent variable) and physical activity levels and the dualism (independent variables). Statistical analysis was performed using R Studio statistical software version 4.2.2 (R Foundation, Boston, MA, USA) and the level of significance was set at $p < 0.05$.

3. Results

In total 2378 (52.8% males) pre-teens were involved in the data collection. Among them, 2078 (87.5%) are social media users and 99% use messaging apps such as WhatsApp or Telegram, with the majority (60.9%) having a private profile. More specifically, males showed the higher frequency of having public profiles (63.8%). Focusing on the details of the most used social media platforms, it emerged that the most used are TikTok (74.4%), Instagram (57.2%), Snapchat (27.9%). WhatsApp is the most used instant messaging app (99.9%).

Concerning the daily time spent on each of these social media platforms, for TikTok 66.2% of respondents declared to spend 2 or more hours (72.7% females); for Instagram 41.9% of respondents declared to spend 2 or more hours (55.7% females); for Snapchat 9.2% of respondents declared to spend 2 or more hours (68.9% females); for WhatsApp 54% of respondents declared to spend 2 or more hours (57.6% females).

Focusing on the IAS scale, for the activity "*take several selfies and share the best*" on social media platforms results showed that, among the whole sample, 869 (69.5%) participants answered never whereas 423 (53.5%), 441 (18.8%), 241 (10.3%) answered rarely, often, or always, respectively.

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Regarding the activity “*modify selfies and videos before sharing*” on social media platforms, results showed that, among the whole sample, 1265 (53.9%) participants answered never whereas 602 (25.7%), 341 (14.5%), 137 (5.8%) answered rarely, often, or always, respectively.

For the activity “*send pictures or videos of myself to friends for approval before sharing*” on social media platforms, results showed that, among the whole sample, 1270 (54.1%) participants answered never whereas 471 (20.1%), 375 (16%), 231 (9.8%) answered rarely, often, or always, respectively.

Moreover, for the activity “*remove tags from pictures of videos with me I do not like*” on social media platforms, results showed that, among the whole sample, 869 (37.2%) participants answered never whereas 536 (23%), 516 (22.1%), 413 (17.7%) answered rarely, often, or always, respectively.

The last activity investigated with the IIAS scale focused on the frequency of “*removing pictures or videos if I do not receive enough likes*”. Overall, 1860 (79.8%) participants declared to never do this activity, whereas 1860 (79.8%), 288 (12.4%), 118 (5.1%) answered rarely, often, or always, respectively.

The overall results of the IIAS scale, for males and females separately, are reported in Table 1.

TABLE 1 ABOUT HERE

The following level of investigation of the activities on image-centred social networks was obtained through the administration of the Instagram Appearance Comparison Scale (IACS). Firstly, the attention has been focused on the active usage of the preferred platform (regarding the self).

For the whole sample, 725 (31.5%) of respondents declared to never “*sharing selfies or videos with me*”; 863 (37.5%), 571 (24.8%), 142 (6.2%) answered rarely, often, or always, respectively.

Regarding “*posting stories or live stories with me*” results indicated that 1116 (48.3%) never do this activity; 588 (25.4%), 405 (17.5%), 204 (8.8%) answered rarely, often, or always, respectively.

Overall, participants watch stories or live stories posted by themselves less frequently: 1317 (56.8%) answered never, 475 (20.5%) rarely, 318 (13.7%) often, and 207 (8.9%) always.

Furthermore, overall, 891 (38.7%) respondents never “*check the number of likes and visualizations of my videos or pictures*”; 514 (22.3%), 457 (19.8%), 441 (19.2%) answered rarely, often, or always, respectively.

The results of the IACS scale concerning the active use of social networks, for males and females separately, are reported in Table 2a.

TABLE 2a ABOUT HERE

The second part of the IACS scale dealt with the passive use of social networks with a particular attention to the interaction with peers. Results indicated that for the whole sample only 246 (10.6%)

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never watch peers' profiles, while 596 (25.7%), 1047 (45.1%), 432 (18.6%) declared to rarely, often, or always, watch peers' profiles, respectively.

Concerning the activity of "*watching videos or pictures with me posted by peers*", 655 (28.3%) answered never, 677 (29.3%) rarely, 677 (29.3%) and 303 (13.1%) always.

For the activity "*watching videos or pictures posted by peers*", 432 (18.7%) answered never, 772 (33.4%) rarely, 863 (37.3%) and 246 (10.3%) always.

Additionally, 469 (20.3%) participants never "*watch peers' live stories*" whereas 701 (30.3%), 845 (36.5%), 300 (13%) rarely, often, or often do this activity, respectively.

Furthermore, 719 (31.1%) of respondents never "*like videos or pictures with me posted by peers*"; 499 (21.6%), 555 (24%), 538 (23.3%) declared to rarely, often, or always, do this activity, respectively.

Regarding the activity "*like videos or pictures posted by peers*" 464 (20.1%) pre-teens declared to never do this activity, whereas 454 (19.6%), 793 (34.3%), 603 (26.1%) declared to rarely, often, or always, do this activity, respectively.

The last proposed activity dealing with the interaction with peers on social networks was "*checking the number of likes and visualizations of peers' pictures and videos*". From the results it emerged that the majority - 1223 (52.8%) - never do this activity, while 696 (30.1%), 276 (11.9%), and 121 (5.2%) declared to rarely, often, or always do this activity, respectively.

The results of the IACS scale concerning the interaction with peers on social networks, for males and females separately, are reported in Table 2b.

TABLE 2b ABOUT HERE

The last part of the IACS scale focused on the interaction with celebrities' profiles (passive use of social networks).

It emerged that 289 (12.5%) never watch celebrities' pictures or videos, 355 (15.4%) do this activity rarely; 849 (36.7%) and 819 (35.4%) often and always, respectively.

For the activity "*watching celebrities' live stories*" 418 (18.1%) respondents declared to never do this activity while 407 (17.6%), 753 (32.6%) and 730 (31.6%) rarely, often, or often do this activity, respectively.

The last question of the IACS scale was used to investigate how frequently pre-teens "*like celebrities' pictures or videos*". Overall, it emerged that 413 (17.9%), 479 (20.8%), 766 (33.2%), and 653 (28.3%) declared to never, rarely, often, and always do this activity, respectively.

The results of the IACS scale concerning the interaction with celebrities on social networks, for males and females separately, are reported in Table 2c.

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TABLE 2c ABOUT HERE

With regards to the physical activity levels, it emerged that overall, the PAQ-score resulted in 2.59 ± 0.68 , with males reporting higher values (PAQ-score: 2.77 ± 0.67) than females (PAQ-score: 2.41 ± 0.65).

In order to explore body satisfaction in pre-teens, the Body Image State Scale was administered with a total of 1308 respondents (692 males). The first item of the questionnaire assesses the feelings of individuals regarding their physical appearance. From our sample the most common feelings resulted in being slightly/moderately satisfied (496; 39.9%) for both males (297; 59.9%) and females (199; 33.8%).

The second item of the BISS scale aimed to explore the feelings of individuals regarding their body size and shape. Also in this case, for the whole sample the most common feelings resulted in being slightly/moderately satisfied (463; 37.3%) for both males (270; 58.3%) and females (193; 41.7%).

Afterwards, the questionnaire focused on the feelings of individuals regarding their weight. Also in this case, for the whole sample the most common feelings resulted in being slightly/moderately satisfied (389; 31.3%). For males results were in line with the overall results (209; 53.7%) whereas for females lower scores were found, with the most common feeling being moderately/slightly dissatisfied with their weight (183; 48.9%).

Moreover, regarding the feelings about being physically attractive, results showed that for the whole sample the most common feeling was being slightly/moderately physically attractive (527; 42.7%) for both males (285; 54.1%) and females (242; 45.9%). Same results were found for the feeling about the looks (all: 583- 47.2%; males: 322-55.3%; females: 261-44.8%).

The last item of the BISS scale explored the feelings of respondents compared to how their peers look. As for the third item of the questionnaire, for the whole sample the most common feelings resulted in being just slightly/somewhat better (476; 38.6%) than peers' looks. For males results were in line with the overall results (294; 61.8%) whereas for females lower scores were found, with the most common feeling being moderately/slightly dissatisfied with their weight (215; 53.4%).

On average the body satisfaction score was 2.5 ± 0.9 , with a higher score for males (2.6 ± 0.9) than females (2.4 ± 0.8).

The last part of the present study aimed at investigating the dualism between the virtual and the real self. Results showed that, overall, 467 (46.4%) of respondents declared to have never thought about being in real life as themselves altered with beauty filters. Notwithstanding, the majority of female respondents (249; 62.1%) reported to have sometimes thought of being in real life as themselves with beauty filters. The same tendency was found regarding the question "*Have you ever shared selfies or videos without beauty filters?*" Considering the whole sample, 340 (33.7%) participants answered "*No*". Interestingly, most female respondents (198; 58.6%) declared to share selfies or videos without applying beauty filters sometimes, differently from the majority of males answering "*No*" (188; 55.3%).

Furthermore, it has been asked "*have you ever used filters and apps to see how your body and appearance might look if modified in reality?*". In this case the trend for females (311; 48.7%) and

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males (328; 51.3%) was in line with the results for the whole sample (639; 63.3%) answering “No”. Coherently with this result, 872 (87.8%) of respondents declared to have never taken a survey on social media using a photo or video with a filter to decide whether to make changes to their physical appearance, in both males (413; 47.4%) and females (459; 52.6%).

On average the dualism score was 1.2 ± 0.8 , with a higher score for females (1.4 ± 0.7) than males (1.1 ± 0.8).

Results from the multivariable linear regression analysis showed that body satisfaction is significantly ($F=54.69$; degrees of freedom= 884; $R^2 = 0.11$; $p<0.001$) influenced by the dualism (slope -0.42; SE:0.06; t-value: -6.787; $p<0.001$) and the level of physical activity (slope= 0.24; SE= 0.03; t-value= 7.59; $p<0.001$). The estimated intercept for the model is 2.67 (SE= 0.14; t-value= 19.55; $p<0.001$).

4. Discussion

The present study aimed at investigating the influence of dualism and physical activity levels on pre-teens' body satisfaction. Results showed that the dualism negatively influences the body satisfaction whereas physical activity levels have a positive influence, hereby representing a possible mediator for the detrimental effects induced by the exposure to the models proposed on image-centred social media platforms.

In modern societies, image-centred social media provide a novel context for the formation of identity, with their impact that still remains to be fully elucidated. According to our model, the use of filters and dedicated apps to alter one's physical appearance with the view to build a better reputation on social media is negatively associated with body satisfaction. Previous studies have supported this assumption (e.g., Jones et al., 2004; Tatangelo and Ricciardelli, 2017).

The efforts to populate personal social media with selected images and videos and the pursuit for a higher social reputation among peers stimulate the use of filters and dedicated apps with the scope to adhere to sociocultural models that are considered desirable. Under these circumstances, pre-teens prefer to compare with peers in order to make cognitive judgments about their own appearance relative to others. Unstable identity commitment, insecurities and health-related problems are the potential negative consequences related to these behaviors (Holland and Tiggemann, 2016; Steers, 2016; Tremblay et al., 2021). Even though, social media might represent a supportive environments for young people (Kysnes et al., 2022), the present data showed how the continuous exposure to filtered images, combined with the increased interpersonal uncertainty experienced during the preadolescence, enhance the risk to open a gap between fiction and reality, and between the real body and the virtual representation of the body image.

Unsurprisingly, from the exploration of the active and passive use of social networks results showed that for all the proposed activities preteen females pose more attention to their appearance on social networks and they seek for appreciation more than males.

In fact, concerning body satisfaction, present results indicated that female pre-teens are less satisfied about their body shape, weight, or physical aspect than males. As a confirmation, from the exploration of dualism' phenomenon results showed that this condition is more pronounced among female pre-teens, underlying a higher gap between the virtual and the real self.

Effectively, it is not new that social media filters and beauty images might affect self-esteem and the perception of body image, especially among young women (Eshiet, 2020). Moreover, unrealistic

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beauty standards may cause insecurity about the physical aspect, inducing the use of beauty filters to hide imperfections and photoshop their bodies, and to make comparisons with others social media users (Eshiet, 2020). In this context, peers are characterized by several roles such as imaginary audiences, judges, vicarious learning sources, and comparison targets in shaping teenage girls' perceptions and presentation of beauty (Chua and Chang, 2016).

For the present study it has been hypothesized that an active lifestyle could act as a positive mediator toward the detrimental effects of beauty standards promoted on image-centered social media platforms. Interestingly, an active lifestyle along with an attitude to be more physically active as part of the daily routine was positively associated with body satisfaction. Thus, it can be hypothesized that the daily use of the body for walking, practicing sport, etc. helps individuals to establish a positive link between the self and the body, in its tangible dimension. In fact, a previous study demonstrated that sport or a physical activity session might exert a positive effect on an individual's body image perception (Carraro et al., 2010). In this light, the promotion of physical activity as part of preadolescents' daily routine may be considered as a strategy to contrast the negative effects on body image related to the type of social media use.

Considered in broad terms, the study has both theoretical and practical implications. In terms of theoretical implications, the results are expected to further clarify the nature of sociocultural influences on pre-teens' body image. The study is also expected to contribute to further understanding the influence of an active lifestyle on the individuals' quality of life. Furthermore, the analysis of the processes that determine the formation of the body image are regarded to provide a better insight into the profound human experiences of embodiment.

In terms of practical implications, the study suggests that pre-teens who report a higher propensity to manipulate their physical appearance and to have image-centred active and passive interactions on social media are at a greater risk for developing body image problems and concerns. However, pre-teens may benefit from the adoption of an active lifestyle. In these terms, it must also be highlighted the importance of the protective role of the school in which an appropriate conversation about media models and active lifestyles should be promoted with the view to reduce misconceptions about the self-perception of the body. In particular, the engagement of preadolescents in offline activities that promote a positive sociocultural model about the body and foster an active lifestyle may increase their social skills and reduce the negative effect of social media use. It might also help to reduce the dualism between the virtual and the real body. Broadly, it is emerging the need to rethink the mechanisms of control that should prevent pre-teens and children from using social media and apps that are not intended for them. Unless the age limits are clearly set in many countries, the application of the limitations appears to be ineffective.

In the future, in order to develop goal-oriented and effective interventions there is the need to further investigate how social media engagement impacts body image, among which preadolescents this effect occurs most strongly, and under which conditions the effects come about.

Concerning the study, several limitations must be taken into consideration. The study was based on a cross-sectional approach. Thus, causality or direction cannot be assumed. A second limitation is related to the measurement of the type of social media engagement, and to the capacity of the research tools to clearly describe the types of interaction through social media. Pre-teens can compare themselves to others on social media in a variety of different domains (e.g., numbers of followers, sport experience, etc.), which may also be linked to body image concerns. Finally, the sample used in this study consisted

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of a homogenous group of public-school Italian students with a common cultural background. Future research could examine whether the same associations are evident amongst different cultural groups.

4. Conflict of Interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

5. Ethics statement

The studies involving human participants were reviewed and approved by the Institutional Review Board of the Department of Human Sciences, Society and Health of the University of Cassino and Southern Lazio (Approval number: 3RA2.2022.06.15). Informed parent consent was also obtained along with the authorizations from all the schools involved in the survey.

6. Author Contributions

SD contributed to the conceptualization, methodology, investigation, formal analysis, writing – review and supervision of the manuscript; AI contributed to the conceptualization, methodology, investigation, formal analysis, writing – original draft, and editing of the manuscript.

SD and AI contributed equally to this work and share first authorship

7. Acknowledgments

Authors would like to express their gratitude to the heads of the involved schools and the participants' parents for allowing us to conduct the research and to all the students who volunteered to participate.

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9. Data Availability Statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

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Table 1. Frequency of activities on social media platforms by male and female participants, according to the Instagram Image Activity Scale (IIAS).

Activity	Frequency of activity				Total
	Never	Rarely	Often	Always	
<i>Take several selfies and post the best</i>	n (%)	n (%)	n (%)	n (%)	n
Males	604 (48.9)	423 (34.3)	148 (12)	59 (4.8)	1234
Females	265 (23.9)	367 (33.1)	293 (26.5)	182 (16.4)	1107
<i>Total</i>	<i>869 (69.5)</i>	<i>423 (53.5)</i>	<i>441 (18.8)</i>	<i>241 (10.3)</i>	<i>2341</i>
<i>Modify pictures and videos before posting</i>					
Males	791 (63.9)	252 (20.4)	133 (10.8)	61 (4.9)	1237
Females	474 (42.8)	350 (31.6)	208 (18.8)	76 (6.9)	1108
<i>Total</i>	<i>1265 (53.9)</i>	<i>602 (25.7)</i>	<i>341 (14.5)</i>	<i>137 (5.8)</i>	<i>2345</i>
<i>Send pictures or videos to friends for approval before posting</i>					
Males	837 (67.6)	219 (17.7)	122 (9.9)	60 (4.9)	1238
Females	433 (39)	252 (22.7)	253 (22.8)	171 (15.4)	1109
<i>Total</i>	<i>1270 (54.1)</i>	<i>471 (20.1)</i>	<i>375 (16)</i>	<i>231 (9.8)</i>	<i>2347</i>
<i>Remove tag do not like</i>					
Males	573 (46.5)	299 (24.3)	228 (18.5)	132 (10.7)	1232
Females	296 (26.9)	237 (21.5)	288 (26.1)	281 (25.5)	1102
<i>Total</i>	<i>869 (37.2)</i>	<i>536 (23)</i>	<i>516 (22.1)</i>	<i>413 (17.7)</i>	<i>2334</i>

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Remove pictures or videos with few likes

Males	1018 (82.6)	134 (10.9)	49 (3.9)	31 (2.5)	1232
Females	842 (76.6)	154 (14)	69 (6.3)	35 (3.2)	1100
<i>Total</i>	<i>1860 (79.8)</i>	<i>288 (12.4)</i>	<i>118 (5.1)</i>	<i>66 (2.8)</i>	<i>2332</i>

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Table 2a. Frequency of activities regarding the active use of social networks by male and female participants, according to the Instagram Appearance Comparison Scale (IACS).

Activity	Frequency of activity				Total
	Never	Rarely	Often	Always	
<i>Sharing selfies or videos with me</i>	n (%)	n (%)	n (%)	n (%)	n
Males	482 (40)	455 (37.7)	223 (18.5)	46 (3.8)	1206
Females	243 (22.2)	408 (37.3)	348 (31.8)	96 (8.8)	1095
Total	725 (31.5)	863 (37.5)	571 (24.8)	142 (6.2)	2301
<i>Me posting a live story</i>					
Males	684 (56.4)	297 (24.5)	154 (12.7)	78 (6.4)	1213
Females	432 (39.3)	291 (26.5)	251 (22.8)	126 (11.5)	1100
Total	1116 (48.3)	588 (25.4)	405 (17.5)	204 (8.8)	2313
<i>Me watching a live story</i>					
Males	764 (62.9)	245 (20.2)	134 (11)	71 (5.9)	1214
Females	553 (50.1)	230 (20.9)	184 (16.7)	136 (12.3)	1103
Total	1317 (56.8)	475 (20.5)	318 (13.7)	207 (8.9)	2317
<i>Me checking likes and number of visualizations of videos or pictures</i>					
Males	520 (43)	263 (21.8)	230 (19)	196 (16.2)	1209
Females	371 (33.9)	251 (22.9)	227 (20.8)	245 (22.4)	1094

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Total	891 (38.7)	514 (22.3)	457 (19.8)	441 (19.2)	2303
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Me checking likes and number of visualizations of live stories

Males	559 (46.2)	220 (18.2)	222 (18.3)	210 (17.3)	1211
Females	303 (27.6)	223 (20.3)	245 (22.3)	328 (29.9)	1099
Total	862 (37.3)	443 (19.2)	467 (20.2)	538 (23.3)	2310

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Table 2b. Frequency of activities regarding the interaction with peers on social networks by male and female participants, according to the Instagram Appearance Comparison Scale (IACS).

Activity	Frequency of activity				Total
	Never	Rarely	Often	Always	
<i>Watching peers' profiles</i>	n (%)	n (%)	n (%)	n (%)	n
Males	165 (13.6)	356 (29.3)	521 (42.9)	172 (14.2)	1214
Females	81 (7.3)	240 (21.7)	526 (47.5)	260 (23.5)	1107
Total	246 (10.6)	596 (25.7)	1047 (45.11)	432 (18.6)	2321
<i>Watching videos or pictures with me posted by peers</i>					
Males	413 (34.1)	377 (31.1)	291 (24)	131 (10.8)	1212
Females	242 (22)	300 (27.3)	386 (35.1)	172 (15.6)	1100
Total	655 (28.3)	677 (29.3)	677 (29.3)	303 (13.1)	2312
<i>Watching videos or pictures posted by peers</i>					
Males	260 (21.5)	413 (34.1)	429 (35.5)	108 (8.9)	1210
Females	172 (15.6)	359 (32.6)	434 (39.4)	138 (12.5)	1103

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Total	432 (18.7)	772 (33.4)	863 (37.3)	246 (10.6)	2313
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Watching peers' live stories

Males	290 (23.9)	383 (31.6)	400 (33)	141 (11.6)	1214
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Females	179 (16.3)	318 (28.9)	445 (40.4)	159 (14.4)	1101
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Total	469 (20.3)	701 (30.3)	845 (36.5)	300 (13)	2315
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Like videos or pictures with me posted by peers

Males	469 (38.6)	264 (21.8)	242 (19.9)	239 (19.7)	1214
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Females	250 (22.8)	235 (21.4)	313 (28.5)	299 (27.3)	1097
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Total	719 (31.1)	499 (21.6)	555 (24)	538 (23.3)	2311
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Like videos or pictures posted by peers

Males	297 (24.5)	272 (22.4)	385 (31.7)	259 (21.4)	1213
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Females	167 (15.2)	182 (16.5)	408 (37.1)	344 (31.2)	1101
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Total	464 (20.1)	454 (19.6)	793 (34.3)	603 (26.1)	2314
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Checking the number of likes and visualizations of peers' pictures and videos

Males	651 (53.6)	345 (28.4)	147 (12.1)	71 (5.9)	1214
Females	572 (51.9)	351 (31.9)	129 (11.7)	50 (4.5)	1102
Total	1223 (52.8)	696 (30.1)	276 (11.9)	121 (5.2)	2316

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Table 2c. Frequency of activities regarding the interaction with celebrities on social networks by male and female participants, according to the Instagram Appearance Comparison Scale (IACS).

Activity	Frequency of activity				Total
	Never	Rarely	Often	Always	
<i>Watching celebrities' pictures or videos</i>	n (%)	n (%)	n (%)	n (%)	n
Males	165 (13.6)	158 (13.1)	473 (39.1)	415 (34.3)	1211
Females	124 (11.3)	197 (18)	376 (34.2)	404 (36.7)	1101
Total	289 (12.5)	355 (15.4)	849 (36.7)	819 (35.4)	2312
<i>Watching celebrities' live stories</i>					
Males	242 (20)	207 (17.1)	399 (33)	363 (30)	1211
Females	176 (16)	200 (18.2)	354 (32.3)	367 (33.5)	1097
Total	418 (18.1)	407 (17.6)	753 (32.6)	730 (31.6)	2308
<i>Like to celebrities' pictures or videos</i>					
Males	229 (18.9)	248 (20.4)	415 (34.2)	322 (26.6)	1214
Females	184 (16.8)	231 (21.1)	351 (32)	331 (30.2)	1097
Total	413 (17.9)	479 (20.8)	766 (33.2)	653 (28.3)	2311