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Social media use and adolescents' self-esteem and appearance satisfaction: The moderating role of school motivation

Harriet Smart [1], Emily Midouhas [2] and Joanne Lusher [1,*]

[1] *Regent's University, London.*
[2] *University College, London.*

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Abstract

Background: This large-scale investigation speaks to the growing concern associated with the use of social media on the psychological wellbeing of adolescents. The study explored time spent using social networking sites as a predictor of teenagers' self-esteem and appearance satisfaction and the protective role that motivation in school might play. Method: The sample comprised 10,546 adolescents at age 11 and 14 years, from the UK's Millennium Cohort Study. Multiple linear regression determined cross-sectional and longitudinal associations between use of social media and self-esteem and appearance satisfaction. Time spent using social networking sites significantly predicted teenagers' self-esteem and appearance satisfaction levels. Results: A significant interaction emerged with school motivation and social networking in relation to appearance satisfaction, suggesting that school motivation may help to buffer the negative effects of online social networking. Conclusion: In response to the ongoing concerns around the increase in adolescents who struggle with difficulties relating to their mental health, the finger of blame is frequently pointed to screen-based methods of social communication. It is anticipated that present findings will prompt the development of new interventions that target time spent using online social networking sites, particularly among teenage girls, during this new era of COVID-19-induced social isolation.

Keywords: Social media; Teenager; Self-esteem; Motivation; School; Appearance; Satisfaction

1 Introduction

Westerners belonging to the millennial generation are living in a culture of virtual interaction whereby social contact occurs predominantly from inside Social Networking Sites (SNSs); this has become exaggerated since the global lockdowns and increase in social isolation prompted by COVID-19-regulations (Ellakany, et al., 2022; Luijten, et al., 2021). Debate exists regarding the extent to which the finger of blame can be pointed at social media for the recent surge in adolescent mental health issues (Przybylski and Weinstein, 2017). Indeed, the prevalence of internet memes allows a sociocultural idea of behaviour or style to spread rapidly, with potentially dangerous body-conscious memes recently flourishing on social media (Fioravanti, et al., 2022). Moreover, research indicates associations between the growing impact of SNS usage and anxiety, depression, self-esteem issues and appearance dissatisfaction amongst young children and adolescents (Holland and Tiggermann, 2016; Steinsbekk, et al, 2021; Vandenbosch, et al., 2022).

Teenage years are a critical time for establishing self-esteem and a positive body image, with an increase in the developmental trajectory of self-esteem from age 14 to adulthood (Erol and Orth, 2011). Adolescence is characterised by acute self-awareness of the physiological, social, and cognitive changes that are taking place, and leaving teenagers with feelings of self-consciousness and negative body image. As a result of physiological changes adolescents are vulnerable to a cognitive bias that pays greater attention to appearance (Williamson, et al., 1999). Dissatisfaction occurs

* Corresponding author: Joanne Lusher
Regent's University London.

when negative perceptions overwhelm an individual's view of their body image in comparison to a perceived ideal. Self-esteem is intrinsically woven into emotions that teenagers attribute to their body image, with body satisfaction identified as the most significant predictor of self-esteem (Harter, 1999). Thus, body satisfaction plays a crucial role in the healthy development of adolescent mental health adding a protective factor against issues such as depression (Klaczynski, et al., 2004). A negative perception of body image is associated with lower self-esteem, which in turn is associated with an increased risk of psychological distress, (Duchesne, et al., 2016) and may result in increased internet addiction (Köronczai, et al., 2013).

According to Meier and Gray (2014), posting and viewing photographs online is significantly associated with young women's body image (Meier and Gray, 2014), with self-esteem acting as a potential moderator of the effects of profile pictures on body image (Haferkamp and Kramer, 2011). Additional investigation into the relationship between self-esteem and those at risk on social media, found that female students with low self-esteem were more vulnerable to the negative effects of Facebook comparisons (Kim and Park, 2016). Overall, research tends to point to appearance-focused social comparisons as mediating the role between SNS use, body dissatisfaction and low self-esteem (Holland and Tiggemann, 2016; Vandenbosch, et al., 2022).

Photo editing apps allow users of SNSs to showcase themselves in a complimentary mode, posting edited and enhanced photographs to elicit approval in the form of 'likes' from other users. This creates a sense of reward and satisfaction for the poster. However, the negative repercussions of attempting to live up to this image may result in anxiety and body dissatisfaction for the poster and feelings of negative comparison for those passively browsing profile pages. Social Comparison Theory (Festinger, 1954) and its revised versions (Suls and Wheeler, 2000) propose that the drive for self-evaluation causes people to seek out comparison with similar peers as they convey authoritative and direct meaning. This explanation contributes to the toxic relationship between SNSs and body image resulting in negative body perception because upward social comparisons with attractive peers can result in increased negative self-attractiveness ratings versus comparisons made with an attractive model, who is seen as less similar and thus less meaningful (Cash et al. 1983).

Mass media has portrayed an image of the contemporary ideal woman as thin, unattainable and beautiful. According to sociocultural theory (Thompson et al., 1999; Tiggemann, 2011) this unrealistic image has resulted in female body dissatisfaction due to a failure in achieving these ideal aspirations. Such depiction encourages women to internalise the ideal and engage in appearance comparison. Similarly, sociocultural theory provides an explanation for the negative effects of social media's portrayal of the ideal male body resulting in the internalisation and drive for the ideal muscular body (Fernandez and Pritchard, 2012). Social comparison has been found to mediate the association between SNS usage and body dissatisfaction in adolescents aged 12-19 years (Rousseau, et al., 2017). This longitudinal study found a reciprocal relationship between passive Facebook use, browsing the site but not actively posting, at Time 1 predicting increased body dissatisfaction at Time 2. Additionally, body dissatisfaction at Time 1 predicted an increased amount of time spent passively browsing through others' profiles.

Classic theoretical perspectives point to a complex transactional relationship between social media content and the individual's predisposed vulnerabilities (Slater, 2007). Those more vulnerable to the negative influence of comparison are the most likely to expose themselves to appearance-focused social media content in the hope of seeking gratification, reassurance, and validation (Perloff, 2014). The transactional model suggests that individuals who have low self-esteem, who are perfectionist by nature and whose appearance plays a central role to their sense of self-worth are motivated to seek on-line reassurances and gratifications.

Research has traditionally focused on overall time spent on SNSs as it continues to demonstrate a significant relationship with body image and disordered eating. For example, Tiggemann and Slater (2014) made comparisons between Facebook users and non-users, with users scoring significantly on all body image concerns measured than non-users. In addition, Tiggemann and Slater (2013) found a similar result for pre-adolescent girls aged 10-12 years. Moreover, a large-scale correlational study (n = 120,115) found that moderate use of digital technology was not intrinsically harmful and may indeed be beneficial in today's connected world (Przybylski and Weinstein, 2017), whereas high usage had a small but measurable negative influence on mental wellbeing, with differing effect sizes depending on the screen activity. The current investigation will offer valuable large-scale longitudinal evidence to contribute to this debate.

Having initially identified the intrinsic relationship between adolescents' self-esteem and appearance satisfaction it is key to investigate protective and supportive measures that ensure the healthy development of these two psychological constructs. Qualitative research demonstrates that children who are positively engaged with their school and have a strong sense of belonging are open to internalising the crucial messages that schools communicate with regard to social

media (Burnette, et al., 2017). Given that children and adolescents spend more than one third of their time at school the experience can be highly beneficial to their sense of positive belonging in a social context. This in turn supports the positive development of self-esteem and socio-emotional learning (Markowitz, 2016), and aids the development of friendships.

Friendships are largely formed within the school environment and evidence suggests that friendships are a protective factor in the relationship between self-esteem and appearance dissatisfaction (Delfabbro, et al, 2011). Safeguarding children from the negative influences of SNSs on body dissatisfaction and self-esteem is essential and school motivation appears to play a significant role in this. There has been limited research investigating the interaction effects of school motivation and SNSs usage on adolescent self-esteem and appearance satisfaction and considering that students have lost a third of their learning time during recent COVID-19 restrictions (Major, et al, 2021).

The present study therefore aimed to carry out a large-scale investigation to determine the protective role of school motivation on the effects of SNSs use on teenagers' appearance satisfaction and self-esteem and gender differences within these relationships. Information on time spent on SNSs was obtained from two sweeps of the Millennium Cohort Study (MCS) at ages 11 (sweep 5) and 14 (sweep 6). Data on school motivation, appearance satisfaction and self-esteem were drawn from sweep 6. Covariates from Sweep 6 were controlled, including teenage mental health; peer problems; emotional symptoms; body fat percentages; weight perception; maternal depression and education; family poverty; and participant's age, gender, and ethnicity.

2 Materials and methods

2.1 Methods

The MCS is a longitudinal survey drawing its sample from all births in the United Kingdom over a year, from September 1, 2000. The sample was disproportionately stratified to ensure adequate samples in the four UK Countries and electoral wards with disadvantaged and, in England, ethnic minority populations (Plewis, 2007).

Subsequent sweeps took place when cohort members were approximately age 3 years (Sweep 2), age 5 years (Sweep 3), age 7 years (Sweep 4), age 11 years (Sweep 5), age 14 years (Sweep 6) and age 17 years (Sweep 7). The NHS Multi-Centre Ethics committee granted ethical approval for the MCS and parents (and children, when old enough) gave informed consent before interviews took place. Ethical approval for this study was granted by the UCL Institute of Education.

2.2 Participants and procedure

A total 19,518 children participated in the MCS. The total number of contributing families at Sweep 5 was 13,287 and at Sweep 6 were 11,714. The final analytic sample consists of children who had data on the amount of time spent on SNS in both Sweep 5 (mean age: 11.14 years) and Sweep 6 (mean age: 13.77). In cases of twins or triplets, only the first-born child was selected. The final sample (n = 10,546) was drawn from all four countries of the UK. The non-analytic sample (n = 3,553) was comprised of children in the UK who did not have valid SNS usage data at both time points. The non-analytic sample was included only for the descriptive and bias analysis.

2.3 Materials

Use of SNSs at age 14 was measured using a single question reported by the cohort member: 'On a normal week-day, during term time, how many hours do you spend on social networking or messaging sites or Apps on the Internet such as Facebook, Twitter and WhatsApp?' The response options ranged 1 (none) to 8 (7 hours or more). SNS use at age 11 was measured with a single question: 'How often do you visit social networking sites such as Facebook or Bebo?' The response options were, "most days", "at least once a week", "at least once a month" or "less than once a month" and were scored from 1 to 4 respectively. Scores were reverse coded with the higher the score indicating more time spent visiting SNS, in line with age 14 responses. Both age 11 and 14 SNS usage variables were used as independent predictor variables in the regression analysis. The difference in the two questions' wording reflects the usage differences between the two age groups.

Appearance satisfaction at age 14 was measured using a single question: 'On a scale of 1 to 7 how happy do you feel about the way you look?' A higher score indicates greater happiness with appearance. This variable was used as a dependent variable in the regression analysis.

Self-esteem was measured using a shortened version of the Rosenberg Self-Esteem Inventory (Rosenberg, 1965). Five items were used from the original 10-item scale. Responses were provided on a 4-point scale with answers ranging from strongly agree to strongly disagree. The scores were reverse coded so that higher scores indicated higher self-esteem. This variable was used as a dependent variable in the regression analysis and had excellent internal consistency ($\alpha = 0.91$).

School engagement was measured at age 14 (Sweep 6) with five questions. The questions focus on how the cohort member feels about different aspects of school life such as 'how often do you feel unhappy at school' and 'how often do you try your best at school?' The response options were scored on a scale from 1 (all the time) to 4 (never). Two questions were recoded so that a higher score indicated greater school motivation. Internal consistency was good ($\alpha = 0.713$).

Child covariates used in this study were age, ethnicity, body fat percentage, weight perception at age 14, psychological distress at age 14, peer and emotional problems at age 14 and body fat percentage. At the child's age of 14, parent/family covariates were maternal depression, maternal education, and household poverty status. Age (at Sweep 6) was measured in years and gender and ethnicity variables were coded dichotomously with male and ethnic groups other than white as the reference groups. Body fat measurements were taken using Tanita™ scales. To establish the percentage body fat measurement a weak electronic current was sent around the body from one foot to the other. The scales measured the amount of resistance encountered by the current as it travelled round the body. As muscle and fat have different levels of resistance, the scales use this to calculate the body fat percentage. Percentage measurements were given to one decimal place. Weight perception at age 14 was measured with the question, "Which of these do you think you are?". Cohort members had to indicate either 1 (Underweight), 2 (About the right weight), 3 (Slightly overweight), or 4 (Very overweight).

The Mood and Feelings Questionnaire (SMFQ-short), child version (Angold, et al., 1995) was completed by the cohort member to measure psychological distress, specifically depressive symptoms. Examples of the questions are "I feel miserable or unhappy", "I felt I was no good anymore" and "I cried a lot" with a response scale of 1 (not true), 2 (sometimes) and 3 (true). The cohort member answered each question based on a timeframe of the previous two weeks by indicating their feelings and actions. Scores were totalled with an overall score of 12 and above indicating that a child may be suffering from depression. Internal reliability for the scale for the analytic sample was found to be excellent ($\alpha = 0.93$). Peer problems and emotional symptoms were measured with the Strengths and Difficulties (SDQ; Goodman, 1997) sub-scales, completed by the parent of the cohort member at Sweep 6 (age 14). Both sub-scales are measured and scored using five items rated as 0 (not true), 1 (somewhat true), or 2 (certainly true). Where appropriate positively worded questions were reverse coded to ensure that coding was consistent. Totals for each sub-scale were calculated with higher scores indicating more severe peer problems and emotional symptoms. Internal consistency for the emotional symptoms sub-scale was good (Cronbach's alpha = 0.73).

In terms of family/household variables, maternal depression was measured using the Kessler scale (K6) at age 14. The Kessler Scale is a six-item scale used to screen for serious mental health problems within the general population (Kessler et al., 2003) and was completed by the mother of the cohort member. Six questions were asked to determine how often in the last 30 days the mother felt depressive symptoms ($\alpha = 0.88$). Maternal education was measured with binary indicator of whether the mother was university-educated by the time the cohort member was aged 11. Family poverty level was determined as either being above 60% of the median household income (coded as 0) or below (coded as 1) according to OECD guidelines.

To evaluate the distribution of the data for all participants' bias analyses were conducted on both the analytic and non-analytic samples. Exploratory data analysis was run to determine if the data was normally distributed. A correlational analysis was run using all the independent and dependant variables and covariates (see Appendix 1). Bias analysis was conducted using independent samples t-tests and chi-squared tests depending on whether the variables were continuous or categorical in their measurement. Multiple linear regression models were run to investigate the predictive relationship between the main variables, SNSs usage, and appearance satisfaction and school motivation for participants at age 14. Longitudinal regression analyses were performed to investigate the predictive relationship between SNS usage aged 11 and appearance satisfaction aged 14 and SNS usage aged 11 and self-esteem aged 14. The stratified sampling design of MCS was recognized by including the nine MCS strata in all models: England-advantaged, England-disadvantaged, England-ethnic, Wales-advantaged, Wales-disadvantaged, Scotland-advantaged, Scotland-disadvantaged, Northern Ireland-advantaged, and Northern Ireland-disadvantaged. Moderation effects were run using Hayes PROCESS macros for SPSS (Hayes, 2015), to determine how the moderating variable, school motivation, interacts with the main predictor variable SNS usage to effect appearance satisfaction and self-esteem. Mediating effects of the

variable, school motivation, were also explored as a possible reason for high SNS usage being related to lower appearance satisfaction and self-esteem.

3 Results

Descriptive statistics were then conducted for continuous variables for boys and girls in sweeps 5 and 6. Analysis revealed that the mean time spent using SNS for boys (N 5224) aged 14 was 3.93 (SD 1.96), meaning on average boys spent between one and two hours per normal term time weekday using SNSs. In contrast, girls (N 5322) aged 14 spent between two to three hours on weekdays during term time using SNSs (M 5.00; SD 1.99). Boys (N 5224) and girls (N 5322) aged 11 made average weekly visits to SNSs of 3.80 (SD 1.60) and 3.60 (SD 1.70), respectively.

Correlation analyses revealed that time spent using SNSs at aged 14 was significantly negatively associated with both appearance satisfaction and self-esteem. This suggests that the more time spent on SNS the lower self-esteem and appearance satisfaction. Similarly, teenage depression was significantly negatively associated with time spent on SNS, suggesting that as time spent on SNS increases, depression increases. School motivation was significantly negatively correlated with time spent on SNS; therefore, an increase in time spent on SNS was related to a decrease in school motivation. Full correlation matrix can be found in Appendix 1.

3.1 Cross-sectional findings on SNS use, appearance satisfaction and self-esteem at age 14 years

Table 1 Cross-sectional analysis of the predictive association between SNS usage and Appearance satisfaction age14 years

Full Analytic Sample	**Model 1**		**Model 2**		**Model 3**		**Model 4**	
	B	**Beta**	**B**	**Beta**	**B**	**Beta**	**B**	**Beta**
Constant	5.04**		7.95**		6.13**		5.25**	
S6 Age	0.03	0.01	0.02	0	0.02	0.01	0.02	0.01
SNS Time	-0.15**	-0.19	-0.04**	-0.06	-0.02*	-0.03	0.16**	0.21**
Body fat %			-0.02**	-0.10	-0.02**	-0.12	-0.02**	-0.12**
Weight perception			-0.31**	-0.13	-0.29**	-0.12	-0.30**	-0.12**
Teenage Depression			-0.12**	-0.47	-0.11**	-0.41	-0.12**	-0.41**
Peer Problems			0.02	0.02	0.02*	0.02	0.02*	0.02
Emotional Symptoms			-0.02*	-0.03	-0.02	-0.02	-0.02	-0.02
Maternal Depression			0	-0.01	0	0	0	0.0
Poverty			0.06	0.02	0.09*	0.02	0.08*	0.02
England Disadvantaged			-0.06	-0.02	-0.06	-0.02	-0.06	-0.02
England ethnic			0.17*	0.03	0.14*	0.03	0.14*	0.03
Wales Advantaged			-0.06	-0.01	-0.07	-0.01	-0.07	-0.01
Wales Disadvantaged			0.02	0	0.02	0	0.03	0.01
Scotland Advantaged			-0.03	0	-0.02	0	-0.02	0.00
Scotland Disadvantaged			0.08	0.01	0.07	0.01	0.07	0.01
Northern Ire Advantaged			0.14	0.02	0.13	0.02	0.14	0.02
Northern Ire Disadvantaged			0.02	0	0.02	0	0.02	0.00
Maternal Education			0.05	0.02	0.05	0.01	0.04	0.01
School Motivation					0.09**	0.15	0.15**	0.25**
SNS x SM							-0.01**	-0.23**
Adjusted R	0.037		0.33		0.35		0.35	
F	148.38**		209.83**		213.63**		204.46**	

Note B = unstandardised coefficient, Beta = Standardised Coefficient. * p < .05 ** p < .001

Table 2 Cross-sectional analysis of the predictive association between SNS usage and Self-esteem age 14 years

Full Analytic Sample	**Model 1**		**Model 2**		**Model 3**	
	B	**Beta**	**B**	**Beta**	**B**	**Beta**
Constant	16.79**		21.07**		17.45**	
S6 Age	0.08	0.01	0.07	0.01	0.07	0.01
SNS Time	-0.26**	0.02**	-0.05**	-0.04**	-0.01	-0.01
Body fat %			-0.02**	-0.06**	-0.02**	-0.07**
Weight perception			-0.43**	-0.10**	-0.40**	-0.09**
Teenage Depression			-0.26**	-0.54**	-0.23**	-0.46**
Peer Problems			0.02	0.01	0.03	0.02
Emotional Symptoms			-0.09**	-0.07**	-0.08**	-0.06**
Maternal Depression			-0.01	-0.01	-0.00	0.00
Maternal Education			0.21**	0.03**	0.19**	0.03**
Poverty			-0.02	0.00	0.03	0.00
England Disadvantaged			0.06	0.01	0.06	0.01
England ethnic			0.47**	0.05**	0.43**	0.04**
Wales Advantaged			-0.04	0.00	-0.06	0.00
Wales Disadvantaged			-0.16	-0.02	-0.14	-0.02
Scotland Advantaged			0.20	0.02	0.21	0.02
Scotland Disadvantaged			0.26*	0.02*	-25*	0.02*
Northern Ire Advantaged			0.39*	0.03*	0.37*	0.03*
Northern Ire Disadvantaged			0.11	0.01	0.10	0.01
School Motivation					0.19**	0.16**
SNS x SM						
Adjusted R	0.035		0.39		0.41	
F	273.67**		265.95**		272.61**	

Note B is the unstandardised coefficient. * p < .05 ** p < .001

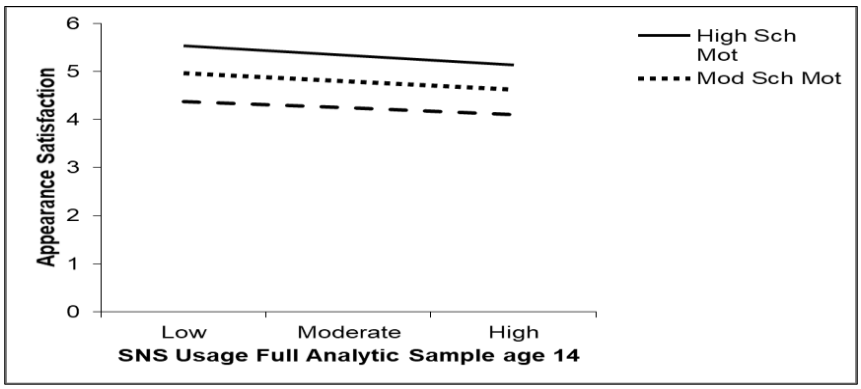

Figure 1 Effect of SNS usage and school motivation on appearance satisfaction age 14 for full analytic sample

The first model had time spent using SNSs as a predictor of appearance satisfaction. The initial effect was weak but significant and the significant effect remained when covariates were added. Therefore, more time spent on SNS predicted lower appearance satisfaction. School motivation was then added to the model and the main effect of SNS use on appearance remained significant at $p < 0.05$. To determine whether school motivation buffered the effect of SNS use on appearance satisfaction, a school motivation and SNS interaction variable was added to a fourth model. As shown in Table 1., a significant interaction effect emerged ($p < 0.001$).

Further analysis (presented in Table 2) revealed that school motivation buffers the effect of SNS usage on appearance satisfaction although interaction effects are extremely small (Figure 1).

Adolescents who are low frequency users of SNS and highly motivated at school were happier with their appearance. Subsequent analysis revealed that school motivation could explain away the effect of SNS time on self-esteem for the full analytic sample.

3.2 Longitudinal analysis of the predictive associations between SNS use at age 11 years and appearance satisfaction and self-esteem at age 14 years

The analysis conducted used the variable measuring time spent using SNSs at age 11 to predict appearance satisfaction at age 14 The initial effect was significant and remained when covariates were added, suggesting an increase in time spent on SNSs at age 11 years is related to lower satisfaction with appearance at age 14 years (see Table 3).

Table 3 Longitudinal analysis of predictive association between SNS use at age 11 and appearance satisfaction at 14 years

Full Analytic Sample	**Model 1**		**Model 2**	
	Unstandardised B	**Standardised B**	**Unstandardised B**	**Standardised B**
Constant	4.51		8.01	
SNS Time Sweep 5	0.04**	0.08**	0.01*	0.03*
Body fat %			-0.02**	-0.11**
Weight Perception			-0.30**	-0.12**
Teenage Depression			-0.13**	-0.48**
Peer Problems			0.02*	0.02*
Emotional Symptoms			-0.02*	-0.03*
Maternal Depression			0	-0.01
Maternal Education			0.07	0.02
Poverty			0.06	0.02
England Disadvantaged			-0.06	-0.02
England ethnic			0.16*	0.03*
Wales Advantaged			-0.05	-0.01
Wales Disadvantaged			0.02	0.01
Scotland Advantaged			-0.03	0
Scotland Disadvantaged			0.07	0.01
Northern Ire Advantaged			0.15*	0.02
Northern Ire Disadvantaged			0.01	0
Adjusted R	0.01		0.33	
F	48.79**		219.93**	

Then, we examined the relationship between SNS time at age 11 and self-esteem at age 14. The initial effect was negative (an increase in time spent on SNSs was related to lower self-esteem) and significant and remained when covariates were added to the model (see Table 4).

Table 4 Longitudinal analysis of a predictive association between SNS use age 11 and self-esteem at age 14 years

Full Analytic Sample	**Model 1**		**Model 2**	
	Unstandardised B	**Standardised Beta**	**Unstandardised B**	**Standardised Beta**
Constant	15.10		21.72	
SNS Time Sweep 5	0.08**	0.08**	0.02*	0.02*
Body fat %			-0.02**	-0.06**
Weight Perception			-0.416**	-0.09**
Teenage Depression			-0.27**	-0.55**
Peer Problems			0.02	0.01
Emotional Symptoms			-0.09**	-0.06**
Maternal Depression			-0.01	-0.01
Maternal Education				0.04**
Poverty			-0.02	0
England Disadvantaged			0.07	0.01
England ethnic			0.48**	0.05**
Wales Advantaged			-0.03	0
Wales Disadvantaged			-0.15	-0.02
Scotland Advantaged			0.21	0.02
Scotland Disadvantaged			0.26*	0.02
Northern Ire Advantaged			0.39*	0.03
Northern Ire Disadvantaged			0.09	0.01
Adjusted R	0.01		0.39	
F	45.89**		281.29**	

Note * p < .05 ** p < .001

4 Discussion

Teenagers growing up in the millennial generation are at increased risk of developing appearance dissatisfaction and low self-esteem, with pressure to conform to societies ideal body image presented by the mass media; and further compounded by peer-to-peer comparison that is facilitated by the interactive nature of social networking forums (Fioravanti, 2022; Perloff, 2014). With appearance satisfaction being a major contributor to overall levels of global self-esteem (Tiggemann, 2011), it is essential that protection from the negative effects of SNSs is provided.

Thus, utilising data from this large-scale study provides robust evidence of the association between frequency of SNS use and appearance dissatisfaction and low self-esteem in adolescents. Consideration must be addressed as to how best to safeguard teenagers from the negative effects of online social networking. The present study has contributed to this area of research by unravelling some of the intricate relationships between frequency of SNS use with appearance satisfaction and self-esteem, whilst simultaneously positioning the role that school motivation plays in protecting adolescents from the potential harm caused by online social interactions.

We found that the frequency of social networking was predictive of lower appearance satisfaction in adolescence, aligned with previous reports (De Vries et al., 2016), even after controlling for potential confounders. Differences between genders within this association were also apparent with SNS use having a greater impact on appearance satisfaction among girls. It is notable that weight perception was one of the strongest predictors of adolescent girls' dissatisfaction with their appearance. These findings could be explained as body dissatisfaction resulting from the internalisation of thinness ideals and negative comparison as posited by sociocultural theories (e.g., Thompson et al., 1999; Tiggemann, 2011).

One of the strengths of the present study is its longitudinal design which revealed a significant predictive association between SNS use and appearance satisfaction across two time-points, supporting cross-sectional evidence, suggestive that frequency of social networking is a possible target for intervention to address adolescent appearance satisfaction. However, these findings cannot shed light on the direction of this association as it may be that adolescent girls with lower appearance satisfaction are more likely to use SNSs more and/or may be more vulnerable to SNS use than girls with higher appearance satisfaction. This study also benefits from the inclusion of covariates in the regression analyses that assist in explaining the relationship between self-esteem and social networking by gender, in that the more time spent on SNSs, the lower self-esteem scores for adolescent girls. Of the covariates in the regression model, depressive symptoms were the strongest predictor of low self-esteem accounting for over half of the variance in the model. Notably, female perceptions of being overweight significantly predicted lower self-esteem. Descriptive statistics indicated that weight perception and body fat are associated, however body fat was not a significant predictor of self-esteem, which manifests how teenage girls' perceptions of their body size might differ from reality. Moreover, considering the predictive relationship between the frequency of SNS use and self-esteem was found among boys in this study, alternative factors such as weight perception and depressive symptoms are likely key determinants of low self-esteem scores for boys (Duchesne et al., 2016) and supports a self-objectification theory (Fredrickson and Roberts, 1997), whereby sociocultural factors are influencing the internalisation of muscularity.

Finally, school motivation was positively associated with both appearance satisfaction and self-esteem among 14-year-old adolescents. These results support previous findings that school connection is important in promoting an individual's long-term mental health (Markwoitz, 2016). School motivation was also associated with time spent using SNSs in the present study. Adolescents who reported spending more time on SNSs were less engaged with school. As the present findings signify, school motivation offers a protective element to the negative association between time spent using SNSs and appearance satisfaction. In support of this, Burnette et al., (2017) concluded that a positive school environment can protect girls from the negative influence of social media on body image dissatisfaction and social comparison. Therefore, school motivation appears to interact with the relationship between social media usage and appearance satisfaction and self-esteem. This suggests that school motivation may offer a possible moderating role, for example, adolescents who are more motivated by school may use SNSs less frequently meaning that they may be more protected from the negative impact of online social networking on self-esteem and appearance satisfaction. Future research is necessary to further probe the nature of this association.

Nevertheless, present outcomes should be considered in light of some limitations. Findings are restricted to self-reported data and there were missing data from parent-derived subscales. Peer problems and emotional symptoms subscales of the SDQ were completed by parent report only, which may have led to inaccurate reporting along with low internal consistency of the peer problems subscale. Future research should consider adopting alternative peer-relationship measures, particularly as peer relationships during adolescence contribute to social and emotional development and social learning (Coleman, 2011). Lastly, the findings reveal an association between the variables which means that directionality within the relationship between the variables cannot be assessed.

The longitudinal element of this study was limited by different measures used to assess SNSs usage between Sweep 5 and Sweep 6. However, SNSs usage from Sweep 6 captured detailed data adding validity to this study's findings. This study was limited by the assessment of SNS use and appearance satisfaction being based on single-item questions. Lastly, the school motivation measure has not been used in research outside the MCS and so validity and reliability beyond a test of internal consistency have yet to be established.

Appendix 1 Correlation Matrix for variables and covariates from analytic sample Sweep 5 and Sweep 6

Variable		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
Sweep 6																						
1.	SNS Time																					
2.	Body Fat	0.18**																				
3.	Appearance Satisfaction	-0.20**	-0.28**																			
4.	Weight Perception	0.08**	0.58**	-0.28**																		
5.	School Motivation	-0.26**	-0.05**	0.36**	-0.09**																	
6.	Self-Esteem	-0.18**	-0.24**	0.61**	-0.24**	0.40**																
7.	Teenage Depression	0.22**	0.21**	-0.51**	0.19**	-0.50**	-0.55**															
8.	Peer Problems	-0.07**	0.09**	-0.07**	0.08**	-0.11**	-0.12**	0.15**														
9.	Emotional Symptoms	0.04**	0.17**	-0.17**	0.10**	-0.18**	-0.23**	0.24**	0.40**													
10.	Maternal Depression	0.03*	0.06**	-0.07**	0.06**	-0.13**	-0.09**	0.12**	0.23**	0.31**												
11.	Maternal Education	-0.10**	-0.08**	0.03**	-0.05**	0.06**	0.07**	-0.01	-0.13**	-0.11**	-0.08**											
12.	Ethnicity (White)	-0.00	0.00	0.01	0.00	0.00	0.00	-0.00	-0.00	0.01	-0.01	0.01										
13.	Ethnicity (Mixed race)	-0.01	0.01	0.00	0.01	0.02	0.01	-0.01	-0.01	0.01	-0.01	-0.01	-0.26**									
14.	Ethnicity (Indian)	0.01	-0.01	-0.02	-0.01	-0.01	-0.01	0.02*	-0.01	0	0.01	0.01	-0.19**	-0.03**								

15.	Ethnicity (Pakistani//Bangladeshi)	0	0	-0.01	0.01	-0.02*	-0.01	0.01	0	0.01	0	0	-0.33**	-0.05**	-0.04**						
16.	Ethnicity (Asian Other)	0.01	-0.02	-0.1	-0.02	-0.01	0.01	-0.01	0.02	-0.01	0.02	-0.01	-0.12**	-0.02	-0.01	-0.02*					
17.	Ethnicity (Black)	-0.01	0	-0.01	0.01	0	-0.01	0	-0.02	0.01	0	0.01	-0.22**	-0.03**	-0.02*	-0.04**	-0.02				
18.	Ethnicity (Other)	0	0	-0.01	0	-0.02	0	0.01	-0.02*	0.02	0	-0.02	-0.14**	-0.02*	-0.02	-0.03**	-0.01	-0.02			
19.	Poverty	0.04**	0.09**	0.00	0.05**	-0.07**	-0.03**	0.02	0.16**	0.16**	0.20**	-0.30**	-0.01	0.00	0.00	0.00	0.00	0.00	0.00		
Sweep 5																					
20.	SNS Time	0.24**	0.09**	-0.09**	0.07**	-0.14**	-0.08**	0.07**	0.03**	0.06**	0.07**	-0.17**	0.01	0.00	0.00	0.01	0.01	-0.01	0.01	0.12**	

* p < .05 ** p < .001

5 Conclusion

SNSs are a popular medium through which adolescents of the millennium generation socialise. With increasing numbers of adolescent mental health concerns being reported, the finger of blame is pointed towards this screen-based medium of social communication. The present study provides evidence that SNSs are cause for concern with regard to adolescent psychological wellbeing. Frequency of SNS use should be targeted for future interventions the study is the first to investigate how best to protect adolescents from the negative impact of SNSs by investigating the protective role of school motivation. School motivation appears to interact with SNS usage and may play a protective role that can explain away the negative effect of SNS use. Future research should be directed towards further investigation of this relationship considering the amount of valuable schooling lost due to ongoing global COVI-19 restrictions.

Compliance with ethical standards

Acknowledgments

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Disclosure of conflict of interest

No conflict of interest.

Statement of ethical approval

Ethical approval for this study was granted by the UCL Institute of Education.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

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