RESEARCH ARTICLE

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Identifying protective and risk behavior patterns of online communication in young people

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Abstract

Introduction: Research has investigated the association between time spent online and mental well-being, however the nuances between specific online behaviors and well-being have been less explored. This research examines how specific online behaviors (i.e., how young people are engaging online and with whom), are associated with one another, and how these patterns of behaviors are related to well-being.

Methods: We used the November 2020 and March 2021 Understanding Society COVID-19 Panel data. The sample consisted of 1432 adolescents aged 10–15 years, who participated in November 2020. Latent class analysis was used to explore patterns of online behaviors. We also investigated how sociodemographic characteristics differed across the classes, along with physical, social, and mental well-being as distal outcomes both cross-sectionally and longitudinally.

Results: We identified four classes: "*Avid users*," "*Scholars*," "*Midways*," and the "*Passengers*." The avid users had the highest frequency of posting online content regularly, likewise the scholars also posted online content regularly, however the scholars were differentiated by their higher frequency of schoolwork and news intake online. The midways had more complex activity characterized by talking to friends often and having a social media account, but posted online content less frequently. The passengers were the least active online as they posted pictures and videos less (76% said "never") and only 63% had a social media account. The avid users had the lowest well-being cross-sectionally and longitudinally, and the midways had lower social well-being and appearance dissatisfaction.

Conclusions: Online behaviors such as regularly posting or talking to internet-only friends could be related to lower well-being. Policymakers should consider both improving regulations online and building an evidence base to enable caregivers from all backgrounds to support young people.

KEYWORDS
adolescence, mental health, online communication, social media, well-being

1 | BACKGROUND

The last decade has seen the internet, mobile devices, and social media use grow exponentially. A recent report by the UK's telecommunications regulator Ofcom (2022) details that 91% of 12–15 year olds in the United Kingdom use social media, with 36% of those aged 8–17 years having "seen something worrying or nasty" online. While it is generally acknowledged that online social networking is "here to stay" (Dubicka & Theodosiou, 2020), the harms related to social media and online communication behaviors have received considerable attention from researchers, the media, and caregivers of young people.

However, research findings are mixed, with some studies finding that social media has a negative association with health and well-being both cross-sectionally (Azhari et al., 2022; Barthorpe et al., 2020; O'Dea & Campbell, 2011; Tandon et al., 2020; Yan et al., 2017) and longitudinally (Thorisdottir et al., 2020), whilst other studies do not report an association (Coyne et al., 2020; Kelly et al., 2022). In addition, much of the research field has focused on *time spent* on social media, rather than specific behaviors which enable us to understand *how* young people are engaging with social media and *with whom* (Tang & Patrick, 2020). Therefore, research must understand specific and related social media behaviors, enabling us to gain a greater understanding of the mechanisms that contribute to well-being.

1.1 | Research on social media and online communication behaviors

Existing research on *how* young people use social media have found that using social media to connect with preestablished offline relations can increase friendship quality (Valkenburg & Peter, 2011), help expand friendship groups (D'Rozario, 2020), and form and maintain social capital (Ifinedo, 2016). Recent work found that frequent online communication with close friends and larger friendship groups is associated with higher well-being (Anthony et al., 2023). However, in contrast higher frequency o contact with virtual friends was significantly negatively correlated with well-being, particularly for girls (Anthony et al., 2023). Other research also explores relationships between social media and gender with mixed-results on associations with well-being (Di Cara et al., 2022; Coyne et al., 2020; Faelens et al., 2021; Kelly et al., 2018). Moreover, online social networking has the potential for cyberbullying, with a recent survey revealing that 17% of young people in Wales, UK stating that they had experienced "some" or "extensive" cyberbully victimization (Anthony et al., 2023), which is associated with mental health problems (Hamm et al., 2015; John et al., 2018; Richards et al., 2015).

Differences in well-being are also observed following passive versus active use of social media. Passive use is defined as "monitoring the online life of other users without engaging in direct exchange" (Verduyn et al., 2020, p. 2), this includes behaviors such as "scrolling" through social media, or looking at another's social media profile. This is compared to active social media use, which is defined as "targeted one-on-one exchanges" (Verduyn et al., 2020) such as sending an individual a private message or posting a status update. Passive social media use is thought to be more detrimental to well-being— hypothesized to increase the opportunity for upward social comparison, whereby the individual compares their lives to others' lives relating to feelings of inferiority (Appel et al., 2016; Frison & Eggermont, 2016; Valkenburg et al., 2022; Verduyn et al., 2020). Whereas active social media use is related to more positive well-being, focused on maintaining existing offline relationships. However, a recent scoping review noted caution in equivalising low well-being to ill-being, and strongly suggested that research should explore both positive and negative outcomes to gain a comprehensive understanding of this (Valkenburg et al., 2022).

Civic participation has also been investigated in relation to social media use (Kahne & Bowyer, 2018; Zhu et al., 2019). A meta-analysis from Boulianne and Theocharis (2020) found positive associations between digital media use and political engagement, as well as a strong correlation between online and offline forms of political participation. Interestingly, political participation appears to be a protective factor for young people only (Boulianne, 2015), with Boulianne and Theocharis (2020)'s meta-analysis observing a coefficient strength of 0.14 for young people only. It has also been argued that social media has the potential to bridge formal and informal learning through participatory digital cultures, although the majority of young people adopt the role of consumers rather than full participants (Greenhow & Lewin, 2018). In addition, creativity in relation to social media has been studied (e.g., Acar et al., 2021; Vilarinho-Pereira et al., 2021), however it has largely focused on *how* to use social media creatively, but not the *impact*. Other research has focused on how the use of specific applications (i.e., Instagram, YouTube, etc.) relate to well-being, which has been studied in adults using data from 2016 to 2017 (Di Cara et al., 2022). In short, research that has gone beyond the amount of time spent on social media has developed a more nuanced understanding of online communication and social media behaviors and their associations with well-being.

1.2 | The present study

Reflecting on prior research we move beyond a "variable-centered approach" (Tang & Patrick, 2020) and explore patterns of internet and social media use from multiple, detailed measures of online behaviors—going beyond screen-time proxies (Przybylski et al., 2020). We examine several sociodemographic variables including age, gender, socioeconomic status, and ethnicity. Research suggests that social media use usually starts when adolescents are aged 13–14 years, with 68% of those aged 15–16 years noting that they had experienced something online which upset them or made them feel uncomfortable (Gray, 2018). Moreover, it is known that girls engage more with social media (Tang & Patrick, 2020), and while they are maybe more likely to derive benefits, they are also more prone to adverse consequences, such as negative emotions (Kreski et al., 2021) and poorer well-being (Anthony et al., 2023; McCrae et al., 2017). Evidence also suggests that young people from lower socioeconomic positions may be more at risk of higher social media use (Tang & Patrick, 2020) and negative

experiences related to this (Skogen et al., 2022); however, further research is needed in this area. Further, emerging evidence suggests a complex picture around the benefits and risks to social media among young people from different ethnicities (Tang & Patrick, 2020), but this again needs further research. Lastly, researchers must recognize the contribution of mental health in relation to social media use, and the reciprocal relationships that may exist (Dubicka & Theodosiou, 2020; Hollis et al., 2020). Understanding these areas further provides tailored support to young people's needs, particularly as they are developing their understanding of "typical" online behaviors.

In this paper, we aim to examine young people's online communication with the following objectives:

(i) Use an array of perceived risky online behaviors (i.e., talking to people that young people do not know) and protective online behaviors (i.e., political participation, talking to "real-life" friends or family online), along with other general social media variables (i.e., posting of content) to derive patterns of online communication behaviors.

(ii) Explore if young people of different sexes, ethnicity, or socioeconomic status are more or less likely to be associated with a specific pattern of online communication behaviors.

(iii) Explore if there are statistically significant differences in mental, social, and physical well-being across the patterns of social media and online communication behaviors.

2 | METHODOLOGY

2.1 | Sample

We used data from Understanding Society, the UK Household Longitudinal Study, a panel survey of UK households (Institute for Social and Economic Research, 2022). Our sample came specifically from the COVID-19 study where existing participants in the most recent waves were invited to a further 20 minute questionnaire (Institute for Social and Economic Research, 2021). For the adults in the sample (aged 16 years and above), the first survey was administered in April 2020 which then followed them regularly until the final wave in September 2021 (Institute for Social and Economic Research, 2021). Of the adults sampled in July 2020 ($N = 4139$), young people related to the adult (aged 10–15 years) were invited to a youth paper survey and reinvited again in November 2020 and March 2021. We use the November 2020 and March 2021 youth survey ($N = 1432$) as our primary sample, along with data from their parents/households who were living at the same address in the COVID-19 study and original panel survey as recommended (Institute for Social and Economic Research, 2021). Our final sample included 1432 young people aged 9–16 years from the November 2020 sample.

2.2 | Public involvement and engagement

The United Nations Committee on the Rights of the Child Article 12 outlines the importance of involving the views of children and young people when conducting work which may shape their outcomes (Tisdall, 2017; UNICEF, 2004). We worked with two already established public involvement groups of young people: the TRIUMPH Network[1] and the Wolfson Centre for Young People's Mental Health Youth Advisory Group (YAG) at Cardiff University.[2] In the first session, young people in both TRIUMPH and the Wolfson Centre's YAG were encouraged to discuss their thoughts of the study, rank the most important social media and online behavior measures, and discuss the relevance of the well-being measures. We used the highest-ranking social media and online behavior variables from these consultations in our analysis. In our second meeting with the Wolfson Centre's YAG, the young people responded to our results, defined, and named the groups identified in the analysis, and recommended dinosaur comics as an effective resource for young people; resources are noted in the acknowledgments. Young people received a voucher of £25 per session.

Although an ongoing dialogue with young people would have been preferable, aligning with Tisdall's definition of "coproduction" (2017), the time frame did not allow for this, and the meetings were limited due to the length of the study. Notwithstanding this, the young people's input was invaluable and provided a crucial insight on the activities and issues relating to social media, with their opinions largely influencing the data analysis. In this sense, the goal was to position young people as "coresearchers" (Clark et al., 2022) and their views were prioritized and balanced with the academic literature.

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[1]http://triumph.sphsu.gla.ac.uk/
[2]https://www.cardiff.ac.uk/wolfson-centre-for-young-peoples-mental-health/take-part/youth-advisory-group

2.3 | Measures

2.3.1 | Social media and online behaviors

We used 13 variables to identify social media and online behaviors. We used frequency information on watching videos, playing games, schoolwork, posting pictures or videos, looking at the news, taking part in social or political discussions, creating videos or music, and streaming music (responses: "Never," "Less than a month," "At least once a month," "At least once a week," "Everyday"). Also, we included frequency of speaking to family, friends, and 'anyone else' online ("Never," "Hardly ever," "At least once a week," "Daily or almost daily," "Several times each day," "Almost all the time"), and whether young people had 'internet friends' or a social media account ("Yes" or "No"). Lastly, we explored their reported feelings regarding the time spent online ("A lot less," "A little less," "About the same," "A little more," and "A lot more").

2.3.2 | Outcomes

To determine mental health we used a continuous measure of the five item emotional problems subscale and the conduct problems subscale of the Strengths and Difficulties Questionnaire (Goodman, 2001); this was used as a cross-sectional (November 2020) and longitudinal (March 2021) measure. For social well-being, we analyzed the number of close friends' young people had, feelings on their appearance (rate between one to seven, from best to worst), loneliness ("Hardly ever," "Some of the time," "All of the time"), and how supported they felt by friends or family ("Most of the time," "Some of the time," "Never"). For physical well-being, we explored numbers of hours slept ("less than 7 h," "8–10 h," and '10+ h"), and frequency of waking during the night ("None," "Little," "Some," "Good bit," "Most of the time," "All of the time"). We also used a continuous score of overall life (dis)satisfaction which intersects all areas of well-being (rate between one and seven, from best to worst).

2.3.3 | Covariates

We used measures of age, sex (boy or girl), highest parental qualification, ethnicity (dummy variables to estimate differences across Asian, White, Black, Mixed, and Other (i.e., identified as another ethnicity group), and emotional and conduct problems cross-sectionally.

2.4 | Data analysis

Data were managed using Stata version 15.2 (StataCorp., 2017), descriptive statistics were analyzed using SPSS version 28 (IBM Corp., 2021), and latent class analysis was used to distinguish qualitatively different subgroups (Weller et al., 2020) with covariates and distal outcomes analyzed on Mplus version 8.4 (Muthén & Muthén, 2017). We identified the number of classes which best represented the data first, and then estimated the associations between covariates and distal outcomes.

To decide on the number of classes we used maximum likelihood parameter estimates with standard errors approximated by first-order derivatives and a conventional χ^2 statistic, recommended by Asparouhov and Muthén (2014a). Models with two, three, four, and five latent classes were estimated first until model fit assessment suggested otherwise. Model fit assessment was determined by balancing interpretability and fit criteria (Lowthian et al., 2021; Melendez-Torres et al., 2019). Six criteria were used to determine fit including: Akaike information criterion (AIC), Bayesian information criterion (BIC), scaled relative entropy whereby 100% indicates perfect certainty in classification (Melendez-Torres et al., 2019), the Vuong–Lo–Menell–Rubin and Lo–Mendell–Rubin adjusted likelihood ratio tests given as standard by Mplus, and the Bootstrap likelihood ratio test (BLRT). To determine the association of covariates on the classes we used the Bolck, Croon, and Hagenaars method as recommended (Asparouhov & Muthén, 2014b; Bolck et al., 2004; Muthén & Muthén, 2017), then we used the automatic three-step method to determine the equality of means and probabilities across the classes (Asparouhov & Muthén, 2014a; Lanza et al., 2013; Muthén & Muthén, 2017); Mplus code was adapted from Lowthian et al. (2021).

3 | RESULTS

3.1 | Study sample

Overall, 1432 young people aged 9–16 years were included, equally distributed among boys (48%) and girls (52%). Two-thirds of young people were of White or Irish ethnicity, 16% were of Asian ethnicity, 9% were Mixed ethnicity, 4% were Black

ethnicity, and a small proportion identified as another ethnicity termed "Other." Nearly two-thirds had a parent with a degree or an equivalent qualification, while a very small percentage lived with parents with no qualifications (1%), suggesting our sample composed of higher socioeconomic young people (Table 1).

3.2 | Latent class analysis

The four-class solution showed the best model fit overall balancing statistical criterion and theoretical interpretation (Melendez-Torres et al., 2019; see Table 2). It had a lower AIC than the three-class solution, higher entropy (0.71), and the BLRT suggested that four classes were better than three; although, the BIC was increased from two-classes, and the standard LRTs did not suggest it was better than three-classes ($p = .09$). It is important to note that the BLRT is considered superior to the standard LRTs (Nylund et al., 2007). The two-class was not chosen due to the three-classes improvement (as suggested by the LRT tests and BLRT), and the three-class solution was too simplistic given the four-class solution had more classes given its similar, improved entropy value (0.68 compared to 0.71) and was supported by the BLRT. The five-class solution had a higher BIC, similar entropy, and the standard LRT test suggested it was not improved compared to a four-class solution ($p = .76$), with the BLRT not converging despite increases in random starts (Asparouhov & Muthén, 2012). Hence, the four-class solution appeared to be the best solution which balanced interpretability and fit statistics.

3.3 | Sample proportions of the four-class solution

3.3.1 | Class 1: Avid users (14%)

The avid users were characterized by greater posting of content compared to any other class. Over a third (36%) were posting pictures/videos every day, and a further 29% at least once a week, but many did not use online devices for the news and political discussions (51% and 67% using less than monthly). However, 28% were creating music and videos every day, and 62% streamed music every day. Many seemed content with their time online, with half (53%) wanting to spend the same amount of time online. Over half (58%) spoke online with "anyone" daily or more, and half (50%) had internet-only friends. Near all had a social media account (93%), 87% spoke to friends daily online, and 57% spoke to family daily online.

TABLE 1 Demographics of sample.

	N/%
Sex (n = 1432, 100%)	
Male	689 (48.1%)
Female	743 (51.9%)
Age (n = 1432, 100%)	12.46/13 (1.80)
Ethnicity (n = 1399, 93%)	
White or Irish	932 (65.1%)
Mixed	125 (8.7%)
Asian	224 (15.6%)
Black	51 (3.6%)
Other	7 (0.5%)
Highest parental qualification (n = 1313, 91.7%)	
No qualification	18 (1.3%)
GCSE or equivalent	166 (11.6%)
A-level or equivalent	242 (16.9%)
Degree, higher, or equivalent	887 (61.9%)

TABLE 2 Latent class solutions with model fit statistics.

	AIC	BIC	Entropy	VLMR LRT	LMR LRT	Bootstrapped LRT
2 classes	41,541.97	42,063.39	0.72	$p < .05$	$p < .05$	$p < .05$
3 classes	41,286.12	42,070.88	0.68	$p < .05$	$p < .05$	$p < .05$
4 classes	41,128.69	42,176.78	0.71	$p = .09$	$p = .09$	$p < .05$
5 classes	40,990.56	42,302.00	0.71	$p = .76$	$p = .76$	Non-convergence

Abbreviations: AIC, Akaike information criterion; BIC, Bayesian information criterion.

3.3.2 | Class 2: Scholars (17%)

The scholars were characterized by their weekly or more schoolwork (99%), news intake (81%), and engagement in social or political discussions (51%). This group posted fewer pictures/videos (13% said every day) and did not create videos or music often (35% said never) when compared to the avid users; although, activity was higher than the sample proportions shown in Supporting Information S1: Table 1 (9% and 56%, respectively). They generally felt that the time they spent online should be the same (47%) or a little less (40%). They spoke to "anyone" online less than the avid users (67% weekly or less), but more than the sample average (37%), and 25% had "internet friends." Almost all (91%) spoke with friends daily, and 61% spoke with family daily.

3.3.3 | Class 3: Midways (36%)

The midways were characterized by more complex activity, with 96% having a social media account. They played games and completed schoolwork often (46% and 51% every day) but did not often post pictures/videos (68% said at least once a month or less) and 58% never created videos or music. Most said that they never engaged in political discussions (70%), and over half (59%) looked at the news less than monthly or never. Most said that they wanted their time online to be the same or a little less (85%). They did not often chat online with "anyone" compared to the sample average (58% never, or hardly ever compared to average 43%) and 85% had no "internet friends" compared to the sample average of 79%. This class notably spoke less to family as 68% said weekly or less compared to the sample average of 49%, but in regard to friends it was often a daily occurrence (83%), higher than the sample average of 61%.

3.3.4 | Class 4: Passengers (33%)

The Passengers had the lowest online activity, with only 63% having a social media account. They played games and completed schoolwork often (52% said every day) but did not post pictures/videos often (76% said never) or create videos or music (84% said never). They also did not look at the news often (46% said never), and 83% said that they never engaged in political discussions online. About half wanted to spend the same amount of time online (47%), but 31% said that they wanted to spend less, and 22% said they wanted more time online. Near two-thirds never spoke to "anyone" online (62%), and 88% did not have "internet friends." Only 38% spoke with friends daily, and 25% spoke to family daily.

For class probabilities and proportions in full, see Supporting Information S1: Table 3.

3.4 | Demographics

The avid user's class was the reference class in Table 3. Girls were less likely to be in the passengers class (odds ratio [OR]: 0.46, 95% CI: 0.27–0.78), as were young people at an older age (OR: 0.56, 95% CI: 0.48–0.66). Young people of an Asian ethnicity were more likely to be in the scholars class (OR: 2.87, 1.02–8.10) and passengers class (OR: 6.77, 2.75–16.67) compared to all other ethnic groups (White, Irish, Black, Mixed, Other). The scholar and passenger classes were more likely to have parents with higher qualifications compared to the avid user's class with OR's ranging from 1.44 to 1.55. All classes were less likely to have conduct problems cross-sectionally compared to the avid users, with OR's ranging from 0.73 to 0.80, suggesting potential bidirectional associations. Only the scholars were less likely to have emotional problems cross-sectionally compared to the avid users (OR: 0.88, 95% CI: 0.77–0.99).

TABLE 3 Associations between sociodemographic characteristics and latent classes ($n = 1237$); odds ratios (OR) are shown with 95% confidence intervals (CI), bold indicates no intersect of the null for the 95% CIs.

	Avid users	Scholars	Midways	Passengers
Age	1.00 (ref)	1.10 (0.91–1.32)	0.93 (0.80–1.07)	**0.56** (0.48–0.66)
Sex (female)	1.00 (ref)	0.93 (0.50–1.71)	0.72 (0.43–1.21)	**0.46** (0.27–0.78)
Mixed ethnicity	1.00 (ref)	2.12 (0.72–6.20)	1.52 (0.56–4.11)	1.72 (0.64–4.65)
Asian ethnicity	1.00 (ref)	**2.87** (1.02–8.10)	2.03 (0.77–5.36)	**6.77** (2.75–16.67)
Black ethnicity	1.00 (ref)	1.47 (0.34–6.46)	1.26 (0.33–4.79)	0.94 (0.22–4.10)
Parental qualifications	1.00 (ref)	**1.55** (1.07–2.25)	1.28 (0.96–1.70)	**1.44** (1.06–1.96)
Emotional problems (T1)	1.00 (ref)	**0.88** (0.77–0.99)	0.95 (0.86–1.05)	0.91 (0.82–1.01)
Conduct problems (T1)	1.00 (ref)	**0.78** (0.64–0.94)	**0.80** (0.69–0.93)	**0.73** (0.62–0.86)

3.5 | Well-being outcomes

For mental well-being, we found that the avid users had the highest emotional problems both at the same time-point (9.53) and after 4 months (9.04). The passengers had the lowest symptoms of emotional problems at the same time-point (7.72), and after 4 months (7.62). The equality of means tests suggested there were statistically significant differences overall both cross-sectionally ($\chi^2 = 36.17$, $p < .05$) and longitudinally ($\chi^2 = 13.96$, $p < .05$). Significant differences between the classes were more prevalent cross-sectionally rather than longitudinally, see Table 4. The avid users also had the highest conduct problems at the same time-point (8.30) and after 4 months (7.55). The scholars had the lowest problems at the first time-point (6.14), and the midways had the lowest problems at the second time-point (6.00). The equality of means tests suggested that there were statistically significant differences overall both cross-sectionally ($\chi^2 = 79.57$, $p < .05$) and longitudinally ($\chi^2 = 54.97$, $p < .05$); statistically significant differences between the classes were somewhat prevalent at both time points. See Figure 1 for plots of the mean scores in November 2020 (T1) and March 2021 (T2) and Table 4 for equality of mean and Wald tests.

Figure 2 shows plots of social well-being variables including feeling supported by family and friends, loneliness, and number of close friends by latent classes. The scholars had the highest proportion of feeling supported by friends (80.5%) and family (86.4%) "most of the time"; in reverse, the avid users had the lowest proportion of feeling supported by family (59.9%) and the passengers had the lowest proportion for support by friends (68.6%) "most of the time." Both the avid users and the passengers had higher proportions of feeling "not at all" supported by friends (4.8% and 3.9%, respectively). Wald tests showed that feeling supported by family ($\chi^2 = 16.13$, $p < .05$) and friends ($\chi^2 = 12.64$, $p < .05$) were statistically significant overall; specific class comparisons suggested that only the scholars and the passengers had a statistically significant difference for friend support, whereas only the avid users had statistically significant differences for family support. For loneliness, the avid users had the highest proportion, with 13.5% stating that they felt lonely "all the time," and a further 45.1% stating "some of the time"; near two-thirds of the passengers "hardly ever or never" felt lonely (61.4%), but the midways were the second most lonely, followed by the scholars. Wald tests suggested that loneliness comparisons were overall statistically significant ($\chi^2 = 18.66$, $p < .05$), however class-comparisons showed that the avid users were statistically significantly different from the scholars and passengers; see Table 4. The passengers and the scholars had the highest average of close friends (7.97 and 7.42, respectively) whereas the midways (4.22) had the least. The overall Wald test was statistically significant ($\chi^2 = 103.39$, $p < .05$), but significant class differences were observed only for the midways.

Figure 3 shows physical well-being, we found that the avid users were the most likely to sleep less than 8 h (20.7%), followed by the midways (8.5%) and the scholars (7.1%); however, the scholars were the most likely to sleep 8–10 h (80.7%) and over half of the passengers slept over 10 h (52.4%). The overall Wald test for sleep hours was statistically significant ($\chi^2 = 95.84$, $p < .05$), with significant differences between all classes except the midways compared to the avid users. For waking up at night, we found that 16% of avid users said that they woke up "All the time" or "Most of the time," compared to the midways (6%), passengers (7%), and scholars (7%). In contrast, the passengers and scholars had similar proportions of being woken "none of the time" (41.3% and 38.8%, respectively). The midways and scholars had a larger proportion than other classes of being woken "a good bit of the time" (10%). The overall Wald test shows a statistically significant difference ($\chi^2 = 25.62$, $p < .05$), with significant differences between the avid users and midways, and midways and passengers; see Table 4.

Figure 4 shows appearance dissatisfaction and life dissatisfaction; higher scores indicate a lower rating. Appearance showed least satisfaction among the midways (3.51) and avid users (3.45), but less so with the passengers (2.19) and scholars (2.42). Life dissatisfaction was the highest among the avid users (3.57), whereas the midways, passengers, and scholars were relatively similar in scores (2.42, 2.17, 2.12, respectively). Equality of means tests showed overall statistically significant

TABLE 4 Equality of means and Wald tests.

|	Emotional problems T1	Emotional problems T2	Conduct problems T1	Conduct problems T2	Lonely	Appearance	Number of close friends	Wake up	Sleep hour	Supported by family	Supported by friends	Life satisfaction
Overall test	$\chi^2 = 36.17$, $p < .05$	$\chi^2 = 13.96$, $p < .05$	$\chi^2 = 79.57$, $p < .05$	$\chi^2 = 54.97$, $p < .05$	$\chi^2 = 18.66$, $p < .05$	$\chi^2 = 107.39$, $p < .05$	$\chi^2 = 103.39$, $p < .05$	$\chi^2 = 25.62$, $p < .05$	$\chi^2 = 95.84$, $p < .05$	$\chi^2 = 16.13$, $p < .05$	$\chi^2 = 12.64$, $p < .05$	$\chi^2 = 61.77$, $p < .05$
Avid users versus midways	$\chi^2 = 8.81$, $p < .05$	$\chi^2 = 2.21$, $p = .14$	$\chi^2 = 27.87$, $p < .05$	$\chi^2 = 29.39$, $p < .05$	$\chi^2 = 5.69$, $p = .06$	$\chi^2 = 0.07$, $p = .80$	$\chi^2 = 4.51$, $p < .05$	$\chi^2 = 14.80$, $p < .05$	$\chi^2 = 4.86$, $p = .09$	$\chi^2 = 5.96$, $p = .05$	$\chi^2 = 3.32$, $p = .19$	$\chi^2 = 2.45$, $p = .12$
Avid users versus scholars	$\chi^2 = 10.52$, $p < .05$	$\chi^2 = 3.31$, $p = .07$	$\chi^2 = 78.31$, $p < .05$	$\chi^2 = 1.29$, $p = .26$	$\chi^2 = 7.44$, $p < .05$	$\chi^2 = 23.24$, $p < .05$	$\chi^2 = 0.46$, $p = .50$	$\chi^2 = 6.79$, $p = .24$	$\chi^2 = 10.12$, $p < .05$	$\chi^2 = 10.51$, $p < .05$	$\chi^2 = 1.96$, $p = .38$	$\chi^2 = 32.43$, $p < .05$
Avid users versus passengers	$\chi^2 = 35.01$, $p < .05$	$\chi^2 = 12.64$, $p < .05$	$\chi^2 = 40.61$, $p < .05$	$\chi^2 = 6.47$, $p < .05$	$\chi^2 = 14.98$, $p < .05$	$\chi^2 = 38.41$, $p < .05$	$\chi^2 = 3.10$, $p = .08$	$\chi^2 = 8.43$, $p = .13$	$\chi^2 = 24.83$, $p < .05$	$\chi^2 = 13.37$, $p < .05$	$\chi^2 = 1.86$, $p = .40$	$\chi^2 = 41.70$, $p < .05$
Midways versus scholars	$\chi^2 = 0.80$, $p = .37$	$\chi^2 = 0.47$, $p = .49$	$\chi^2 = 3.23$, $p = .07$	$\chi^2 = 11.18$, $p < .05$	$\chi^2 = 1.50$, $p = .47$	$\chi^2 = 51.75$, $p < .05$	$\chi^2 = 11.66$, $p < .05$	$\chi^2 = 2.49$, $p = .78$	$\chi^2 = 11.36$, $p < .05$	$\chi^2 = 3.39$, $p = .18$	$\chi^2 = 1.75$, $p = .42$	$\chi^2 = 0.28$, $p = .60$
Midways versus passengers	$\chi^2 = 9.28$, $p < .05$	$\chi^2 = 4.87$, $p < .05$	$\chi^2 = 0.04$, $p = .84$	$\chi^2 = 13.13$, $p < .05$	$\chi^2 = 2.49$, $p = .29$	$\chi^2 = 67.89$, $p < .05$	$\chi^2 = 40.61$, $p < .05$	$\chi^2 = 13.24$, $p < .05$	$\chi^2 = 16.65$, $p < .05$	$\chi^2 = 4.11$, $p = .13$	$\chi^2 = 5.14$, $p = .08$	$\chi^2 = 0.14$, $p = .71$
Passengers versus scholars	$\chi^2 = 3.06$, $p = .08$	$\chi^2 = 1.45$, $p = .23$	$\chi^2 = 5.49$, $p < .05$	$\chi^2 = 0.91$, $p = .34$	$\chi^2 = 1.41$, $p = .50$	$\chi^2 = 2.54$, $p = .11$	$\chi^2 = 0.19$, $p = .66$	$\chi^2 = 3.17$, $p = .67$	$\chi^2 = 78.04$, $p < .05$	$\chi^2 = 0.51$, $p = .78$	$\chi^2 = 6.83$, $p < .05$	$\chi^2 = 0.09$, $p = .77$
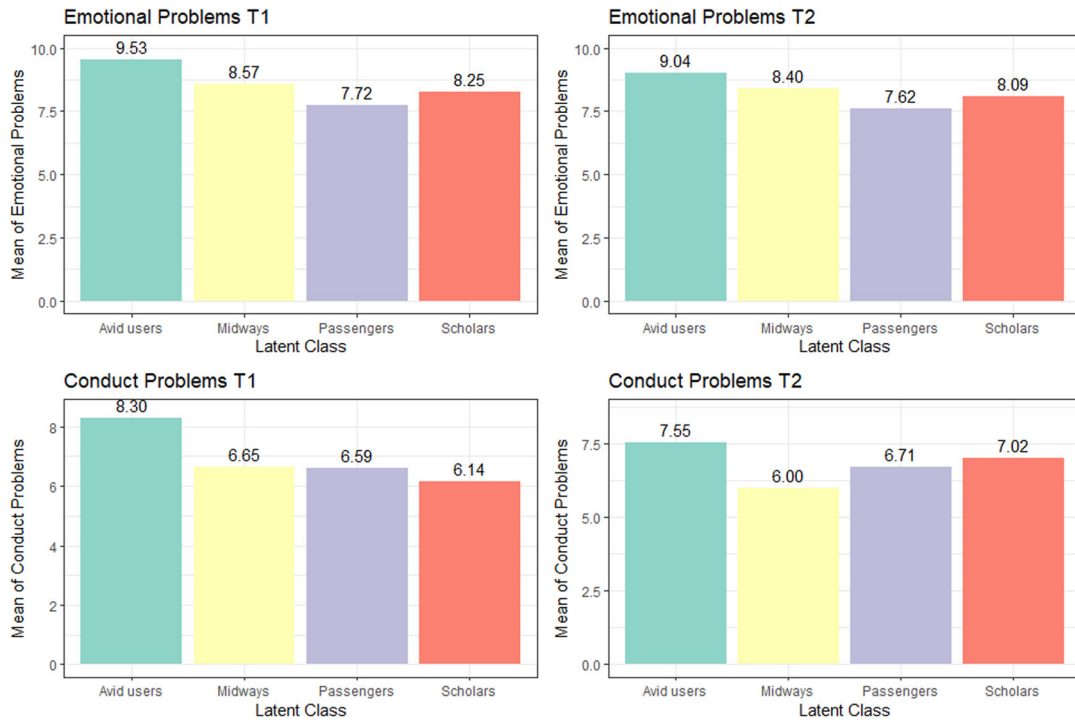
FIGURE 1 Mean scores for each latent class for emotional and conduct problems at Time 1 (T1) and Time 2 (T2).
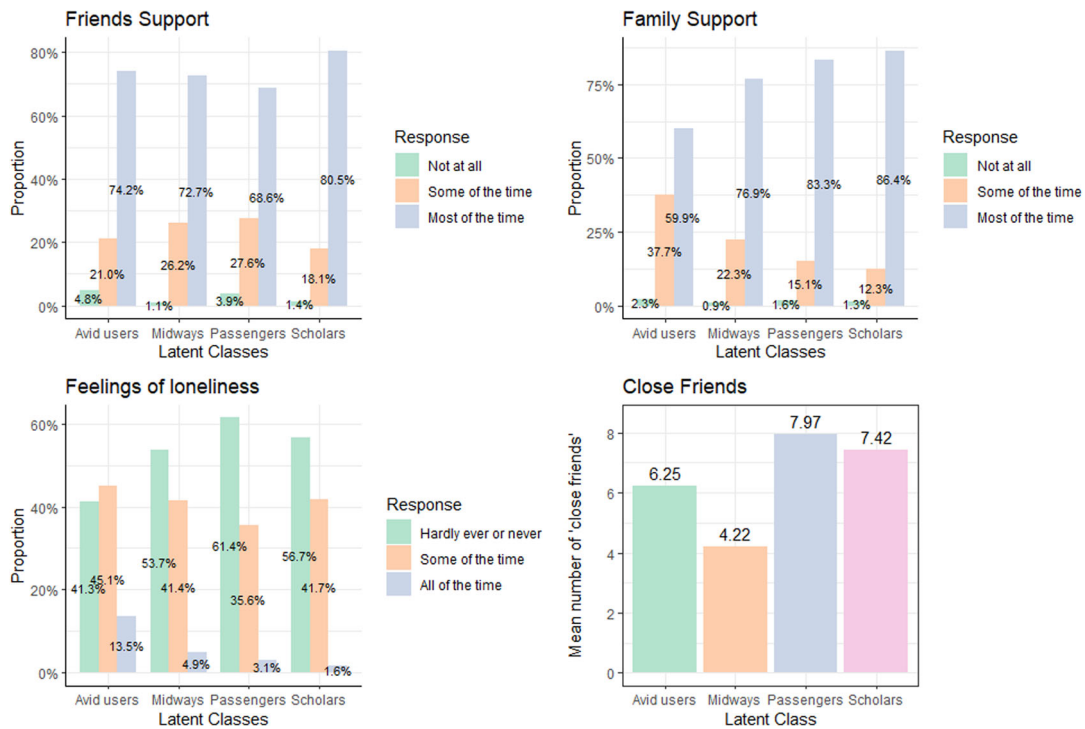

FIGURE 2 Feelings of being supported by family and friends, loneliness, and numbers of close friends by latent classes.
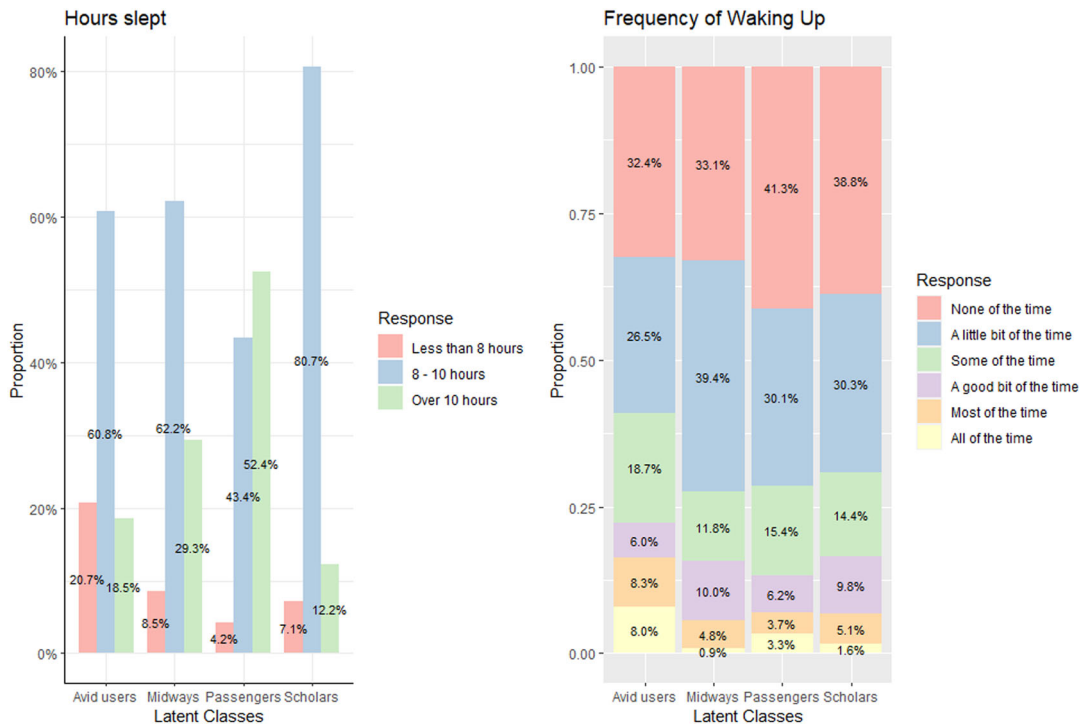
FIGURE 3 Hours slept and frequency of waking up for the latent classes.
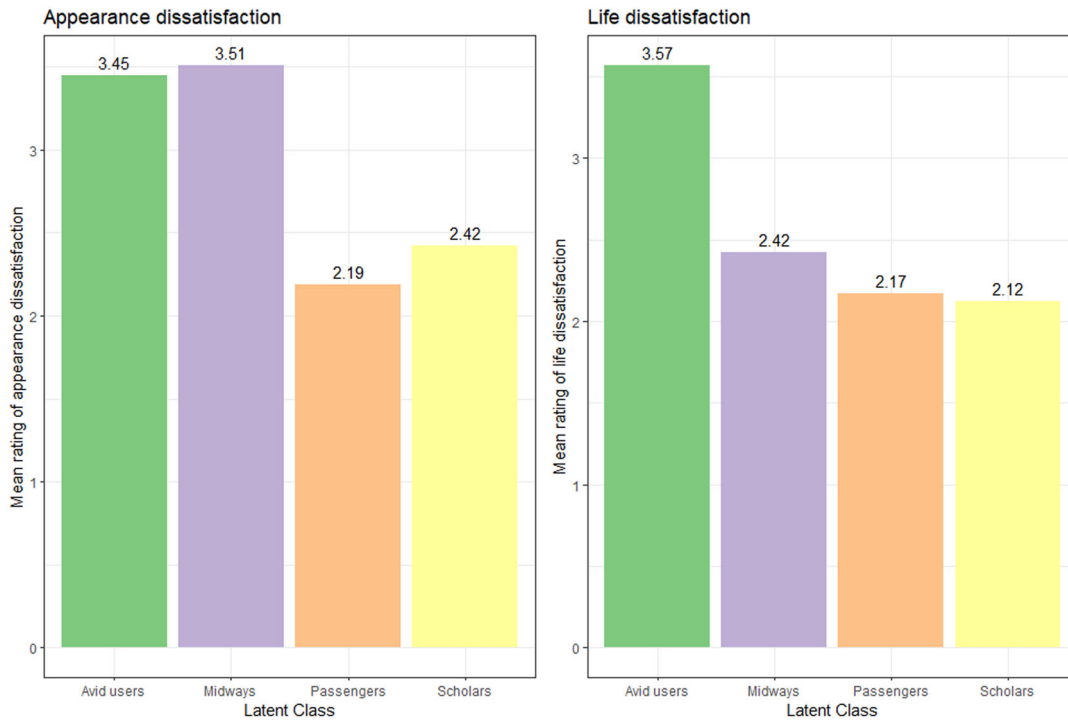

FIGURE 4 Mean score of appearance and life dissatisfaction among latent classes.

differences for life dissatisfaction ($\chi^2 = 61.77$, $p < .05$) and appearance ($\chi^2 = 107.39$, $p < .05$). Statistically significant differences for life dissatisfaction were observed between both the scholars and passengers when compared to the avid users. For appearance, there were significant differences between the classes except the avid users compared to the midways, and passengers compared to the scholars.

4 | DISCUSSION

Our findings extend the understanding of *how* young people use social media and *with whom* they are speaking to, going beyond variable-centered approaches (Tang & Patrick, 2020; Winstone et al., 2022). We identified four classes based on social media use and online communication behaviors: the "Avid users," "Scholars," "Midways," and "Passengers." We found differences in the classes mental, physical, and social well-being, along with associations with sociodemographic characteristics. We found similar classes to other studies that used comparable techniques to classify online communication behavior and social media use (Tang & Patrick, 2020; Winstone et al., 2022); the avid users class aligns with the "broadcaster" and "constant users" class discussed in other studies which mirrors the finding that this class has the lowest well-being (Tang & Patrick, 2020; Winstone et al., 2022).

We found that the avid users had the highest frequencies of online communication, specifically interacting with people they did not know in real-life, and this was associated with poor well-being. As in Anthony et al. (2023), young people who spent time speaking to virtual friends had poorer mental well-being, which is reflective of our study. We also found a quarter of the avid users had sleep problems whereby they slept less than 8 h a night and were more likely to wake up "a good bit of the time" or more, despite sleep being integral for adolescent development. In support of our findings, Woods and Scott (2016) found that greater social media use was associated with poorer sleep quality, but specifically night time specific social media use and emotional investment was more associated with sleep problems. They theorize that the mechanisms related to this could be attributed to phone alerts at all times of the day, creating a difficulty to "disconnect" from social media via "fear of missing out" (Woods & Scott, 2016). We press that caregivers and young people should establish healthy sleep hygiene and follow the recommended guidance of reducing screen-time 1 h before sleeping (American Psychological Association, 2023).

In respect to other classes, the midways were a complex group of adolescents who were less likely to post content and were distinguished by their less frequent chatting with family and increased chat with friends. Interestingly, 96% of this group had a social media account (the highest), but did not post content, which could constitute passive social media use, which is suggested to be related to lower well-being (Anthony et al., 2023; Verduyn et al., 2020; Wang et al., 2018). This passive use of social media (not posting but being online with friends) may help explain the associations observed in relation to greater loneliness and the lower number of close friends. However, further mechanisms must be explored in relation to passive social media use as Valkenburg et al. (2022) found that the current associations related to active and passive social media use are too simplistic, and confuse ill-being and well-being; they argue that measures of passive social media use should include privateness or publicness, the receivers (person-specific), and the senders (preexisting mood and motivations) which our research cannot conduct.

Our two other classes—the scholars and the passengers—generally had the highest well-being. The scholars were distinguished by their high frequencies of schoolwork, reading the news, and political participation. Wider literature suggests that civic engagement and political discussions offer a small protective factor for well-being (Boulianne, 2015; Boulianne & Theocharis, 2020), which our study supports, despite semi-frequent posting and talking to virtual friends. However, this class were more likely to have parents with more qualifications, which aligns with McNamee et al. (2021) and Top (2016), that found greater parental monitoring of screen-based media use existed in higher socioeconomic families. Moreover, the scholars were also more likely to be of an Asian ethnicity, mirroring research conducted by Tang and Patrick (2020). The mechanisms for this are relatively unknown, however Top (2016) found greater parental monitoring when it came to media usage among Asian parents. Furthermore, wider studies have found that Asian parents are more likely to have an emphasis on academic pursuits (Ang et al., 2009) and perhaps the use of the internet for knowledge (Shin & Lwin, 2022); although, these studies are not from the United Kingdom and research with representative samples are needed to confirm findings. With the passengers, this class was characterized by its absence of posting and chatting to friends, with only 63% having a social media profile (the lowest). Notably, this group were more likely to be younger, so greater parental monitoring is likely to occur, and they were more likely to be boys, who generally have lower social media use compared to girls (Twenge & Martin, 2020). As a result, we anticipate that the low frequency social media use in combination with the characteristics of the group support our understanding of their well-being scores overall.

We also examined feelings of loneliness, which has been conceptualized as more of a predictor than an outcome, as Frison and Eggermont (2020) found that loneliness was related to increased Facebook use. In a systematic review by O'Day & Heimberg (2021), they state that it is less understood how social media use predicts loneliness and discuss the likelihood of this relationship being reciprocal. In our study, we found that the avid users were the most likely to feel lonely, with nearly 60% feeling lonely at least "some of the time"; around 45% of the midways felt lonely to the same extent, and other groups were around 40%. While our study is unable to ascertain the directions in loneliness and social media, we support the finding that these could be reciprocal whereby using social media increases feelings of loneliness, and loneliness encourages social media use and vice-versa. We encourage researchers to collect and analyze data on young people specifically to ascertain reciprocal relationships.

Reciprocal relationships are a longstanding challenge in this area of research (Di Cara et al., 2022; Dubicka & Theodosiou, 2020; Hollis et al., 2020; Wang et al., 2018). When comparing to the avid users, all classes had a lower likelihood

of conduct problems being associated with their online communication behaviors; however, only the scholars were at a lower risk of emotional problems being related to their online communication behaviors. Additionally, when considering the relationship in reverse, the avid users had the highest scores of emotional and conduct problems at two time-points. Wang et al. (2018) found that both well-being and passive social media use (not active) reciprocally were associated over two time-points; the sample size was however small, and participants were adolescents in China, so perhaps not easily generalizable to other contexts. Still, less is known about the reciprocal nature and Dubicka and Theodosiou (2020) recommend that research should compare social media use of adolescents with and without mental health problems. In addition, our work was conducted during high social restriction periods of the COVID-19 pandemic, and subsequently our study provides a unique insight on both the online communication behaviors of young people during the pandemic, along with levels of well-being. We anticipate that well-being outcomes are likely to be poorer compared to periods with low social restrictions (Lee et al., 2022), and the use of the internet and social media may be higher due to longer periods spent indoors (Rouleau et al., 2023). Future studies should consider our findings, along with others (e.g., Hamilton et al., 2022), to explore if social media and online behaviors have changed, and if this subsequent change is related to areas of health and well-being.

Our main recommendations for those in policy contexts is to support the caregivers of young people who are using social media. This support should focus on having conversations about healthy social media use, with extra support for those with existing mental illness who could be vulnerable. Open conversations should be held regarding *who* young people are speaking to, and how do they *feel* when using social media, while balancing autonomous development as young people age. The American Psychological Association (2023) makes a number of recommendations for young people aged 10–14 years with regard to feelings of social media use, interference of sleep or physical activity, and limits on appearance-related content (Dubicka & Theodosiou, 2020); all of which are vital given windows of development are around this age (Orben et al., 2022). Moreover, with various national-level policy interventions focusing on developing cross-curricular digital competence, data literacy, and media literacy (Arthur et al., 2013, p. 20; Brown et al., 2014; Welsh Government, 2021), there is an opportunity for young people to become more informed. This is explicit in the new Curriculum for Wales from September 2022, with digital competence a statutory cross-curricular skill alongside literacy and numeracy, framed by four overarching "purposes" to the curriculum, aiming to develop digitally competent, confident, and capable future citizens of Wales (Crick, 2022). Indeed, research is also currently exploring how social media can be utilized as a positive health-related educational resource for young people (Goodyear & Armour, 2021).

At a more macro-level, the UK Government issued the Online Harms White Paper (Online Harms White Paper: Full government response to the consultation, 2020) which subsequently led to the Online Safety Bill (2020) (under parliamentary scrutiny at the time of writing). This aims to create "a safer internet ecosystem" and give "more regulatory substance to the ambitions set out in the original White paper" (Trengove et al., 2022, p. 3) such as cyberbullying, safe-guarding, and mental health. There also has been a call for increased accountability in social media platforms (Lavorgna et al., 2023; Leerssen, 2015), with the conclusion that self-regulation is not sufficient on its own, and social media companies must have a regulatory framework which outlines the responsibilities to its users without stifling discussion, or preventing harm reporting by young people (Wise, 2019). Indeed, this "paradox mindset" is complex, there lies a question in how we "embrace tensions and foster creative solutions" (Yap & Lim, 2023, p. 2), as social media and online communication both offers positive aspects, as noted by young people themselves (O'Reilly, 2020), yet can host unsafe, unhealthy environments. This is particularly pertinent in an online world increasingly permeated with "fake news," disinformation and misinformation (Aïmeur et al., 2023) as well as content automatically generated from AI tools and technologies (Dwivedi et al., 2023). Yap and Lim (2023) suggest that all stakeholders at the micro (i.e., parents), meso (i.e., educators and psychologists), and macro-levels (i.e., policymakers, businesses) should ensure that the content children are exposed to is appropriate and empowering, with the macro-level paying particular attention to regulation and safeguarding.

4.1 | Strengths and limitations

The current study has several strengths, including a large sample size, adjustment for covariates, a broad range of online communication behaviors and a range of mental, physical, and social outcomes. Our sample also included a broad age range (9–16 years), and while the minimum recommended user age for most platforms is 13 years old, our research further confirm that children and young people are using them at a younger age (Ofcom, 2022; Orben et al., 2022). However, there are important limitations to consider. First, while the data included two time points, cross-sectional and longitudinal, the second time point was only 4 months later; thus, longitudinal research over a longer time period is needed as the use of cross-sectional designs fail to capture direction effects (Coyne et al., 2020). Second, self-reported data may have been biased by standard limitations (e.g., memory recall biases, social desirability, etc.), particularly considering the sensitive nature of certain survey questions. A meta-analysis of the relationship between self-reported media usage and actual use showed that adolescents are poor reporters (Scharkow, 2019). Moreover, the data was collected largely in periods of high COVID-19 social restrictions, with resulting impact on schools and the education system (Marchant et al., 2022), and may be less

generalizable to periods without social restrictions. In addition, we were unable to identify which applications young people use to do certain activities, this is despite research suggesting specific applications have a different impact on mental health (Di Cara et al., 2022). Lastly, it is likely that there may be additional social media activities not captured within the study variables, such as the type of application used to conduct specific behaviors (e.g., Twitter/X for political participation).

4.2 | Conclusion

Our findings demonstrate the relationship between adolescent social media and online communication behaviors and mental, physical, and social well-being, along with identifying demographic differences. We find that a typology of regular posting of social media content, along with talking to people young people only know online could be specific risk factors for mental, physical, and social well-being. We encourage policymakers to develop an effective evidence-base for caregivers to enable them to support young people further with their social media use, and feelings related to their time spent online interacting with others, alongside embedding this into the learning curriculum. In addition, we encourage social media bodies to consider the importance of regulations and safeguarding for children and young people, with the aim to protect and empower them on these platforms. Lastly, further research must begin to use detailed longitudinal data to confirm the associations observed and establish an understanding of reciprocal relationships between social media behaviors and well-being.

CONFLICT OF INTEREST STATEMENT
The authors declare no conflict of interest.

DATA AVAILABILITY STATEMENT
This data was accessed via the UK Data Archive: University of Essex, Institute for Social and Economic Research, (2021). Understanding Society: COVID-19 Study, 2020–2021. [data collection]. 11th Edition. UK Data Service. SN: 8644, https://doi.org/10.5255/UKDA-SN-8644-11. The data that support the findings of this study are available from UK Data Archive. Restrictions apply to the availability of these data, which were used under license for this study. Data are available from https://doi.org/10.5255/UKDA-SN-8644-11 with the permission of UK Data Archive.

ETHICS STATEMENT
This study was approved by Swansea University ethics board on 8 August 2022 (SU-Ethics-Staff-080822/506).

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SUPPORTING INFORMATION

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