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Social networking sites and cognitive abilities: Do they make you smarter?

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ABSTRACT

The purpose of the present study was to investigate the impact of social networking sites (SNS) on cognitive abilities and reported levels of social connectedness in adolescents. In order to provide a reliable measure of cognitive skills, standardized tests of verbal ability, working memory, and academic attainment were administered. Students also responded to questions about the length and type of social media use (Facebook, YouTube, and Twitter). The findings indicated that young people who had used Facebook (but not YouTube) for more than a year had higher scores in tests of verbal ability, working memory, and spelling, compared to their peers who had used it for a shorter time period. The type of Facebook activities seemed to have an impact, as regression analyses confirmed that checking a friend's status updates was a significant predictor of verbal ability scores. However, regular or 'active' engagement with SNS (each hour versus once a month) did not make a difference to their cognitive scores. Longer Facebook use, but not YouTube, was linked to higher reported levels of social connectedness. This pattern of results is interpreted in light of previous research, as well as the key physiological and social developments that occur during the adolescent period.

1. Introduction

1.1. Social networking sites (SNS)

Social networking sites (SNS) have grown to be technology powerhouses, providing a plethora of services for their users. From being able to watch videos of how to fix a doorknob on YouTube, to connecting with a long-lost cousin halfway round the world, SNS, in a manner of speaking, are able to knock down walls to foster a sense of a global community. The number of SNS users in North America is estimated at 219 million and 223 million in Europe (Cosenza, 2011). In America specifically, 80% of 12–17 year-olds reported that they had a profile on a social networking site (Lenhart, Purcell, Smith, & Zickuhr, 2010). With such a majority of youth taking part in SNS, we asked the question: How is engagement with SNS affecting young people? In particular, we were interested in the impact of SNS on cognitive abilities, as well as reported levels of social connectedness.

1.2. SNS and grades

The growing use of SNS is often accompanied by parental worry of the potential detriment to their children's academic success (O'Keeffe & Clarke, 2011). One of the first studies that investigated the effect of Facebook on academic success was conducted by Kirschner and Kirpinski (2010). Based on over two hundred surveys completed by college students, they found that non-Facebook users had higher self-reported GPAs, compared to their Facebook-using counterparts. There was also a similar trend in relation to Facebook use and time spent studying, where Facebook users reported spending less time studying than non-Facebook users. Participants who reported that Facebook had an impact on their academic performance indicated that they had poor time management skills and Facebook allowed them to procrastinate instead of studying. One explanation for this pattern of results could be that SNS per se do not necessarily have a negative

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impact on GPA. Rather, the individual may have a natural proclivity for procrastination and be drawn to whatever medium allows them to express this.

In a larger study, Junco (2011) surveyed almost 2000 college students about how much they used Facebook, what they did on Facebook, how often the checked Facebook, and compared this with their high school and current college GPA, as well as how much time they spent studying for classes. Although Junco reported a negative relationship between time spent on Facebook and GPA, the student had to spend a considerable amount of time on Facebook (about 200 min) before it had a negative effect on their GPA. An interesting finding from this study was the type of Facebook activity that impacted GPA. For example, posting status updates or chatting was linked to a lower GPA; while sharing links or reading friends' status updates was associated with a higher GPA. According to Junco, some Facebook activities, such as chatting, require considerable cognitive resources and if the student is also trying to successfully engage in an unrelated task, like preparing for a class, this may lead to multitasking errors as a result of cognitive overload.

1.3. SNS and social connectedness

While the negative effects of SNS have been discussed, there is also potential for benefits stemming from its use. SNS by nature are meant to facilitate social relationships and with that, social connectedness. A recent study by Gao, Dai, Fan, and Kang (2010) sought to determine what features are necessary in SNS to promote a 'social climate'. They found that interaction richness, support for formal interaction, people, benefits and purposes, and self-presentation were significant characteristics that determine how participants perceived the sociability of a social software or an SNS. The two most important factors that contributed to an SNS's perceived sense of sociability were the people who were using the site (specifically the number of people) and the benefits and purposes that they get from the site. An interesting aspect of this social climate is that social interaction online tends to reflect offline behavior. Wright and Li (2011) investigated prosocial behavior and found that a person who is likely to act in prosocial ways around people in personal settings is almost just as likely to do the same online. One explanation for this behavioral trend is the co-construction theory, which suggests that humans essentially create ourselves online in similar ways that we are offline (Subrahmanyam, Šmahel, & Greenfield, 2006). This could explain why most people will not a join a cause unless others are joining it. Likewise, people may not engage with SNS unless they know their peers are doing so as well, and are thus assured of a social benefit.

Another SNS that have been investigated with respect to social connectedness is YouTube. Research by Lange (2008) suggests that YouTube acts as a filter that users can manipulate in order to adjust their comfortable level of connectedness with other users. This filter can also manipulate certain aspects of their connectedness by either revealing or not revealing their identities, or limiting access to their videos. A key difference between Facebook and YouTube is that while the former is based on personal connections, the latter is driven by connections based on commonalities or shared interests. As a result, these connections create virtual communities based on certain ideals or mindsets, much like the communities and groups formed offline (Cheng, Dale, & Liu, 2007). Jarrett's study (2008) extends this idea of 'connection through commonalities' by demonstrating that users have a sense of identity based on their video viewing and posting habits. As a result, users may connect who have never met each other socially, and may not engage with each other beyond their topic of interest.

1.4. The present study

The aim of the present study was to extend previous research on SNS and cognitive skills in several ways. To our knowledge, research to date on SNS and cognitive skills has primarily focused on college students (e.g., Junco, 2011; Kirschner & Kirpinski, 2010); however, we were interested in adolescents (ages 12–18). This age group is of interest for several reasons. First, the adolescent brain is an entity that is highly impressionable. This age period is characterized by decreased gray and white matter within the lobes of the brain, a still-developing prefrontal cortex that can lead to poorer decision making, and increased synaptic deletion (Giedd et al., 1999; Gogtay et al., 2004). During this time, the brain is setting itself up for increased but specific learning. Thus, if information is not being used, it could be synaptically deleted. Equally, the activities that the adolescent is engaged with (i.e., learning) are being engrained. The implication of this process is that these activities could act as precursors for future learning. So, if SNS use is detrimental, it is much more prudent to examine this possibility in adolescents who have greater potential for harm or maladaptive learning, rather than post-adolescents (ages 19–27), who are more resilient to stressors and have more experience with coping strategies (Gogtay et al., 2004; Howard, 2008). As the potential for maladaptive development is higher in adolescents than other age periods (Giedd et al., 1999; Harris, 1998; Howard, 2008; Kohut, 1984), potentially negative activities could be reduced earlier to facilitate optimal development.

Another reason for sampling adolescents in the present study is because these years represent a key period for the formation of the sense of connectedness (Kohut, 1984). Social connectedness can be defined as "…one's opinion of self in relations to other people. In particular…the emotional distance or connectedness between the self and other people, both friends and society" (Lee & Robbins, 1995, p. 233). The implications of a lack of connectedness could be that a person finds it harder to accept social roles and responsibilities, and as a result, reject realistic relationships. As adolescence represents a crucial time for the development of social connectedness, it is useful to explore the role of SNS in this process.

In the present study, we administered standardized tests to measure cognitive abilities. Previous research on SNS and grades has recorded student's GPA, either self-reported data (Kirschner & Kirpinski, 2010), or academically reported data from transcripts (Junco, 2011). While this method is convenient, self-reported answers may not be as reliable as standardized measures of academic performance. In addition, GPA can be affected by environmental variables, such as socio-economic status (usually an aggregate of parent's educational level, current occupation, and income level; Jeynes, 2002; McNeal, 2001). In order to address these potential confounds, we administered standardized measures of academic attainment that are included in the Wechsler Individual Achievement Test (Wechsler, 2001).

In addition to measures of academic attainment, we also tested students' working memory skills. Working memory is a higher-level skill that is linked to a range of cognitive activities from reasoning tasks to verbal comprehension (see Cowan & Alloway, 2008, for a review). In typically developing children, scores on working memory tasks predict reading achievement independently of measures of phonological skills (Swanson & Beebe-Frankenberger, 2004). Working memory is also linked to math outcomes: low working memory scores are closely related to poor performance on arithmetic word problems (Swanson & Sachse-Lee, 2001; also Alloway & Passolunghi, 2011) and poor

computational skills (Bull & Scerif, 2001; Geary, Hoard, & Hamson, 1999). Working memory skills at five years were an excellent predictor of academic success, six years later (Alloway & Alloway, 2010).

An additional cognitive skill that is linked with students' capacities to acquire knowledge in the school years is general ability. Tests of general intelligence are typically considered as good predictors of reading achievement (e.g., Stanovich, Cunningham, & Freeman, 1984). As this cognitive ability is distinct from, although associated with, measures of working memory (e.g., Conway, Cowan, Bunting, Therriault, & Minkoff, 2002; Engle, Tuholski, Laughlin, & Conway, 1999), we also included an index of verbal ability (vocabulary subtest) from the Wechsler Abbreviated Scale of Intelligence (WASI; Wechsler, 2005a, 2005b, 2005c).

The research questions examined in the present study were:

- Question 1: Does the length of engagement with different types of SNS impact cognitive skills and academic attainment?
- Question 2: Is there a difference in how active or passive engagement with SNS affects cognitive skills and academic attainment?
- Question 3: Is increased SNS engagement related to higher levels of social connectedness?

2. Material and methods

2.1. Participants

Participants were 104 students from a public high school in the UK. The students were aged between 15 years 4 months and 17 years 9 months (M = 15 years 9 months, SD = 5 months; 51.5% female). The demographic profile school was nationally representative based on academic tests and numbers of children obtaining free school meals (a measure of socio-economic status). Student consent was obtained from all those aged 16 and above, while parental consent was obtained from any students younger than 16 years old. One student was excluded from the dataset as a result of a diagnosis of dyslexia. No other participant reported having any clinical diagnosis (e.g., ADHD) or educational difficulties (e.g., dyslexia).

2.2. Procedure

Students were tested over two separate occasions. During the first testing occasion, the IQ tests and attainment tests were administered. The participants also completed a questionnaire on their technology usage. Due to school exams and a vacation period, a subsequent testing phase took place a few weeks later. During this time, a verbal working memory test was administered. However, as a result of school exams, only 56 participants were able to participate in this testing phase.

2.3. Materials

2.3.1. Verbal ability

Verbal ability was assessed using a Vocabulary test from the Wechsler Abbreviated Scale of Intelligence (WASI; Wechsler, 2005a, 2005b, 2005c). The participants had to provide a definition of a series of words that were spoken out loud. Test–retest reliability for vocabulary was .87 and the raw scores were converted to standard scores (M = 100; SD = 15) based on the normative sample.

2.3.2. Working memory

The Backward Digit Recall from the Automated Working Memory Assessment (AWMA, Alloway, 2007) was administered. The student was required to recall a sequence of spoken digits in the reverse order. Test trials began with three numbers and increased up to six numbers, with four trials per block. The number of correct trials was scored for each participant. Test reliability is .86 and raw scores were converted to standard scores (M = 100; SD = 15) based on a normative sample.

2.3.3. Learning outcomes

Standardized measures of spelling and arithmetic were also administered. The spelling test was taken from The Wechsler Objective Reading Dimensions (WORD; Wechsler, 2005a, 2005b, 2005c). The math test was taken from The Wechsler Objective Numerical Dimensions (WOND; Wechsler, 2005a, 2005b, 2005c) and consisted of 28 questions, relating to general arithmetic as well as fractions. These two subtests were selected for use in the present as they form the current Wechsler Individual Achievement Test-Revised Test (WIAT-II-A; Wechsler, 2001) and represent highly valid and reliable measures of academic attainment. Test–retest reliabilities for spelling and math are .91 and .85, respectively. Raw scores were converted to standard scores (M = 100; SD = 15) based on the normative sample.

2.3.4. Social Connectedness Scale

We also included seven of the eight questions from the Social Connectedness Scale (Lee & Robbins, 1995), which was used to assess how connected the participants felt with their family, friends, peers, or society. The scale items used in this present study represented two out of the three areas of belongingness: connectedness and affiliation. Participants responded to the statements using a Likert Scale (1 = agree very strongly to 6 = disagree very strongly). As the items were all phrased to represent a lack of social connectedness (e.g., 'I feel so distant from people' or 'I don't feel I participate with anyone or any group'), a high score indicates a more reported sense of social connectedness. Model fit statistics and cross-validation data are reported in Lee and Robbins (1995).

2.3.5. Social media questionnaire

The questions assessed the following: the length of usage of the particular type of social media (Facebook, Twitter, and YouTube) and then how often they use them for certain tasks. These tasks included activities such as playing games, quizzes, or writing on people's walls (social networking sites), checking tweets (Twitter), watching or posting videos online (YouTube). The questions reflected both active engagement ('How often do you comment on your friends' photos or write on their wall on social networking sites?') and passive

engagement ('How often do you check tweets of famous people on Twitter?'). Participants reported the frequency in which they interacted with these SNS using a Likert Scale (0 = 'Never', 1 = 'Once a month', 2 = 'Once a week', 3 = 'Once a day', 4 = 'Every 4–6 h a day' and 5 = 'Every 1–3 h a day'). Higher scores are representative of greater engagement with SNS.

3. Results

Data from 103 of the original 104 students were used in the subsequent statistical analyses. The results showed that the majority of high schoolers were Facebook users (85% had been using it for four months or longer) and 99% were regular YouTube users (they used it once a month or more frequently). However, as only 6% had been using Twitter for six months or longer, this dimension was removed from further analyses.

3.1. Cognitive skills and SNS (quantity/length of engagement)

- *Question 1: Does the length of engagement with different types of SNS impact cognitive skills and academic attainment?*

The descriptive statistics showed that the students performed in the average range in all four cognitive tests: Verbal ability ($M = 93.7$, SD = 13.2), Working Memory ($M = 121.0$, SD = 15.6), Math ($M = 108$, SD = 16.7), Spelling ($M = 102.0$, SD = 13.6).

3.1.1. Facebook use

In order to investigate whether the length of engagement with SNS had an impact on cognitive skills, the sample was classified into high Facebook users (>one year; $n = 81$) and low Facebook users (<one year; $n = 22$). Table 1 shows the cognitive scores of both groups. A series of independent sample *t*-tests indicated that the high Facebook users scored better in the following tests compared to low Facebook users: Working Memory [$t(61) = 2.19$, $p = .03$], Verbal ability [$t(98) = 3.21$, $p = .002$], and Spelling [$t(101) = 2.28$, $p = .03$], but not in Math [$t(101) = 1.54$, $p = .13$].

We wanted to find the best set of unique predictor variables of cognitive skills as a result of different Facebook activities. To that end, we conducted a series of stepwise regression analyses, with the standard scores of the different cognitive tests (verbal ability, working memory, and spelling) as the dependent variable, and the Facebook questions as the predictor variables. For example, we first examined which of the different Facebook activities best predicted verbal ability scores; then we conducted a separate stepwise regression analysis to explore which Facebook activities best predicted working memory scores; and in the final regression analysis, we investigated what Facebook activities best predicted spelling performance. Model statistics, as well as standardized beta values and *t*-statistics, are provided in Table 2. Performance in the verbal ability test was best predicted by one activity in Facebook: checking friend's status updates. No other Facebook activities predicted verbal working memory or spelling scores.

3.1.2. YouTube use

The sample was also classified into high YouTube users (>day; $n = 57$) and low YouTube users (1× a week or 1× month; $n = 44$). Table 1 shows the cognitive scores of both groups. A series of independent sample *t*-tests indicated that there was no difference between the high and low YouTube users on all the cognitive tests: Working Memory [$t(60) < 1$], Verbal ability [$t(96) < 1$], Spelling [$t(99) < 1$], and Math [$t(99) < 1$].

We wanted to find the best set of unique predictor variables of cognitive skills as a result of different YouTube activities. To that end, we conducted a series of stepwise regression analyses, with the standard scores of the different cognitive tests (verbal ability, working memory, and spelling) as the dependent variable, and the YouTube questions as the predictor variables. For example, we first examined which of the different YouTube activities best predicted verbal ability scores; then we conducted a separate stepwise regression analysis to explore which YouTube activities best predicted working memory scores; and in the final regression analysis, we investigated what YouTube activities best predicted spelling performance. Model statistics, as well as standardized beta values and *t*-statistics, are provided in Table 2. None of the YouTube activities predicted any of the cognitive test scores.

3.2. Cognitive skills and SNS (quality/type of engagement)

- *Question 2: Is there a difference in how active or passive engagement with SNS affects cognitive skills and academic attainment?*

Table 1
Descriptive statistics of cognitive skills as a function of SNS engagement level.

	Group	Facebook		YouTube		SNS	
		Mean	SD	Mean	SD	Mean	SD
Verbal ability	High/active	95.76	12.81	93.80	12.08	97.06	12.48
	Low/passive	85.65	11.74	94.19	14.44	88.05	15.62
Working memory	High/active	123.08	1.76	119.63	17.45	122.46	12.64
	Low/passive	112.77	6.41	122.48	13.28	117.93	19.82
Spelling	High/active	103.54	12.79	102.86	14.72	105.35	13.40
	Low/passive	96.23	15.26	101.27	11.87	96.71	16.98
Math	High/active	109.23	16.92	108.82	17.28	111.35	17.01
	Low/passive	103.05	15.70	107.18	16.40	105.33	16.77
Social connect	High/active	28.63	5.82	28.02	5.58		
	Low/passive	26.05	5.88	28.32	6.17		

Table 2
Stepwise regression analyses predicting scores in the cognitive tests.

	R^2	F change	β	t	p Value
Outcome: verbal ability					
Facebook	.04	5.03*	.221	2.24	.03
YouTube	.02	.59	–	–	–
Outcome: working memory					
Facebook	.08	.10	–	–	–
YouTube	.02	.71	–	–	–
Outcome: spelling					
Facebook	.03	1.57	–	–	–
YouTube	.01	.70	–	–	–

Note: *significant at alpha level .05.

3.2.1. Facebook use

In order to create an Active/Passive index as an indication of participants' user engagement with Facebook, we summed students' responses to the Facebook questions relating to the different activities, such as posting comments and updates, playing games, and so on (max = 20, $M = 8.6$, SD = 5.4). The top 16% (>1SD; $n = 30$) were labeled as Active Facebook users and were more likely to engage in Facebook activities up to an hour a day; and the bottom 16% (<1SD; $n = 24$) were classified as Passive Facebook users and engaged in these activities once a week or less. There was no significant impact of Active or Passive Facebook use on Working Memory [$t(33) < 1$], Verbal Ability [$t(50) < 1$], Spelling [$t(48) > 1$], or Math [$t(48) > 1$].

3.2.2. YouTube use

We also created an Active/Passive index as an indication of participants' user engagement with YouTube by summing participants' responses to the YouTube questions, such as posting and commenting on videos, and watching and telling friends to watch videos (max = 12, $M = 5$, SD = 2.6). The top 16% (>1SD; $n = 23$) were labeled as Active Social Media users (once a day or more), and the bottom 16% (<1SD; $n = 27$) were classified as Passive Social Media users (once a week or less). There was no significant impact of active or passive YouTube use on Working Memory [$t(31) < 1$], Verbal Ability [$t(46) < 1$], Spelling [$t(48) = 1.32$; $p = .19$], or Math [$t(48) < 1$].

3.3. Social connectedness and SNS

- *Question 3: Is increased SNS engagement related to higher levels of social connectedness?*

The participants scored in the average range in the Social Connectedness Scale ($M = 28.08$, SD = 6). The maximum score in this scale is 35 and high scores indicate a higher incidence of social connectedness. With respect to the length of engagement with SNS, there was a trend to higher social connectedness scores in the high Facebook users, though this was not significant [$t(101) = 1.84$, $p = .07$]. However, high and low YouTube users did not differ in their reported levels of social connectedness [$t(99) < 1$]. Active/passive SNS engagement also did not affect reported levels of social connectedness: [$t(36) = 1.23$, $p = .23$].

4. Discussion

- *Question 1: Does the length of engagement with different types of SNS impact cognitive skills and academic attainment?*

The results indicated that high schoolers who had used Facebook for over one year had significantly higher scores in working memory, verbal ability, and spelling compared to those who had used Facebook for less than a year. There was no difference between these two groups for math scores; nor was YouTube use linked to higher cognitive scores. One explanation for why working memory scores were significantly higher in those who were longer users could be due to a similarity in the cognitive processes involved in using Facebook and performing a working memory task. For example, when an individual logs into their Facebook account and is presented with a plethora of information, they must take in the information, process it, and manipulate it to determine if it is of interest to them, and then execute an action based on that assessment. This behavior could be to simply disregard it and continue viewing the page for other interests, or they could process the information for future use. These actions mirror the process of a working memory test where the individual is presented with a piece of information, has to manipulate it or make a judgment on it in order to guide a future action. Longer use with an SNS like Facebook might provide the individual with 'training' that could boost working memory scores. However, the data suggest that no single activity on Facebook was predictive of working memory scores—just the length of time they had been using Facebook.

Both verbal ability and spelling scores were also significantly higher in those who had used Facebook for more than a year. Tests of verbal ability are considered as a measure of crystallized intelligence—knowledge that a person has acquired through experience. It is possible that using Facebook provides a platform to expand knowledge, for example, through reading friends' shared posts about a news feature, or local event. Support for this idea comes from the finding that checking friend's status updates were predictive of verbal ability scores.

The higher spelling scores in those who used Facebook for longer than a year could be accounted for in light of the 'training' effect suggested previously. As the user engages with Facebook, they use language to communicate and this regular use could benefit specific skills such as spelling. The finding that math scores were not significantly different between the high and low Facebook users provides some support for this view, as math or related mathematical concepts are not typically featured in Facebook activities. It is worth noting that this idea is speculative and further research is necessary to replicate this finding. However, considering the increased potential for specific learning in adolescents (Giedd et al., 1999; Gogtay et al., 2004), Facebook use may act as a catalyst for these higher cognitive tests scores in

the present study. During the period of adolescence, another round of synaptic deletion occurs, allowing for whatever is being learned during this period to be retained (Giedd et al., 1999; Howard, 2008). Thus, it is possible that Facebook provides adolescents the opportunity to practice the underlying cognitive skills that also impact performance in tests of working memory, verbal ability, and spelling. Future research could examine Facebook's potential influence on these skills in a controlled, clinical setting to determine if the students are indeed benefiting from a 'training' effect.

Another issue to address is why Facebook use was associated with significantly higher scores in cognitive tests, while other studies did not report a similar pattern (e.g., Junco, 2011; Kirschner & Kirpinski, 2010; though some Facebook activities were linked to a higher GPA in Junco, 2011). This difference in patterns could be the result of cognitive tests used in the present study, rather than GPA. Scores in the latter can be modulated by a number of factors, such as motivation (Durik, Lovejoy, & Johnson, 2009) and even personality (Komarraju, Karau, & Schmeck, 2009). In contrast, individual differences in personality or motivation are less likely to impact scores on the standardized assessments used in the present study, and thus may provide a may accurate representation of the student's cognitive abilities and academic skills.

However, this finding should be interpreted with caution. As this was not a longitudinal study, it is possible that those who were using Facebook for longer than one year may be a different type of student from those who started using Facebook later. Thus, an alternative explanation for the pattern of results could be due to a self-selection bias. Future research could investigate the potential long-term impacts on cognitive skills to clarify this issue.

- *Question 2: Is there a difference in how active or passive engagement with SNS affects cognitive skills and academic attainment?*

The results indicated that there was no significant difference in cognitive skills and academic attainment between passive and active use of either Facebook or YouTube. Active versus passive engagement was based on the cumulative time the student regularly spent on the different Facebook activities, such as posting comments and updates, playing games; and different YouTube activities, like posting and commenting on videos. The data suggest that the regular amount of time they spent engaging with these activities (up to an hour a day or once a week) did not impact their cognitive tests scores. It is possible that regular SNS engagement has a greater impact on activities that directly affect GPA, such as time studying and preparing for classes (e.g., Junco, 2011; Kirschner & Kirpinski, 2010). In contrast, more stable constructs, such as working memory and verbal ability, may be less influenced by whether SNS engagement is on a regular or an ad-hoc basis (however, see research on the potential benefits of cognitive training on such skills; Alloway, 2012; Alloway, Bibile, & Lau, 2012; Jaeggi, Buschkuehl, Jonides, & Perrig, 2008).

An alternative explanation for this result could be related, again, to the adolescent's unique time of brain development. Given the fertile time for learning during this age period, perhaps the difference between active and passive SNS use is not relevant because students do not need frequent engagement in order to see potential cognitive benefits. Gains could be made even with irregular use, and then plateau, so that increased engagement may not yield additional benefits. Again, this suggestion is speculative and additional research is necessary both to replicate this finding and to explore whether this pattern would be evident in other age groups as well.

- *Question 3: Is increased SNS engagement related to higher levels of social connectedness?*

There was a trend to higher social connectedness scores in the high Facebook users (>1 year); however, there was no significant difference in reported levels of social connectedness between high and low YouTube users. There is much research that supports the view that our brains are built for being social and connecting with others to form social structures (Brothers, 2002). But research in body language and message interpretation suggests that the majority of what we say is interpreted through non-linguistic cues, such as tone of voice, leg and arm positioning, and even eye dilation (Pease & Pease, 2006). With increased SNS use, only a fraction of the intended message is being communicated, which could account for the low levels of reported social connectedness. Follow-up studies could directly examine the difference between people's reported levels of social connectedness when using SNS compared to when they speaking directly to another in person.

Another explanation for the trend toward longer Facebook use and higher levels of reported social connectedness could be due to the students sampled in the present study. Since the students were in high school, it is possible that most of them were spending between six to 8 h a day (the average public school time in the UK) in social structures and relationships with which they feel the most connected. Thus, Facebook is not a necessary social medium for these students, as they are already interacting with the people they share a social connection. Future research could examine social connectedness within a sample of post-adolescents or adults who do not necessarily have similarly high levels of continued face-to-face social relationships in order to explore Facebook's ability to facilitate higher levels of social connectedness.

Concerning YouTube and its lack of significant effect on social connectedness scores within the present sample, one possibility could lie in how YouTube is used. Most of the YouTube videos that are viewed do not involve interaction with other people. Rather, the categories of videos that are viewed the most are ones where the viewer watches other people do something. The only interaction that could account for a feeling of social connectedness through YouTube is through commenting on the videos watched. Thus, the lack of impact of YouTube use on reported levels of social connectedness is not surprising.

4.1. Conclusion

Results showed that duration of SNS use, specifically engagement with Facebook, had a significant effect on cognitive abilities and some aspects of academic attainment; however frequency of engagement (an hour a day versus once a week) did not.

We speculate that better performance in some of these cognitive tests could be the result of a 'training' effect, due to shared cognitive mechanisms that underpin these tasks. Also, results indicated that there was a trend to higher social connectedness scores in the high Facebook users, but not YouTube users. This pattern suggests that engagement with some SNS facilitates a social climate from which users can socially benefit.

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