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Not for everyone: Personality, mental health, and the use of online social networks

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Running head: *Online socialising and mental health*

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Abstract*: Much previous research has examined the relationship between online socialising and mental health, but conclusions are mixed and often contradictory. In this present paper we unpack the online social networking - mental health relationship by examining to what extent the relationship between these variables is personality-specific. Consistent with the idea that communicating through the internet is fundamentally different from face-to-face socializing, we find that on average, use of social networking web-sites is negatively associated with mental health. However, we find that the mental health response is dependent upon an individual's underlying personality traits. Specifically, individuals who are either relatively extraverted or agreeable are not substantively affected from spending significant amounts of time on social networking web-sites. On the other hand, individuals who are relatively more neurotic or conscientiousness are much more likely to experience substantive reductions in their mental health from using social networking web-sites. We suggest that if the aim of public policy is to mitigate the adverse mental health effects from excessive internet use, then one-size-fits all measures will likely be misplaced. More generally, our research highlights the importance of conducting differentiated analyses of internet users when examining the health effects from internet use.*

Keywords: personality traits; psychological health; internet; social interaction

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Abstract: Much previous research has examined the relationship between online socialising and mental health, but conclusions are mixed and often contradictory. In this present paper we unpack the online social networking - mental health relationship by examining to what extent the relationship between these variables is personality-specific. Consistent with the idea that communicating through the internet is fundamentally different from face-to-face socializing, we find that on average, use of social networking web-sites is negatively associated with mental health. However, we find that the mental health response is dependent upon an individual's underlying personality traits. Specifically, individuals who are either relatively extraverted or agreeable are not substantively affected from spending significant amounts of time on social networking web-sites. On the other hand, individuals who are relatively more neurotic or conscientiousness are much more likely to experience substantive reductions in their mental health from using social networking web-sites. We suggest that if the aim of public policy is to mitigate the adverse mental health effects from excessive internet use, then one-size-fits all measures will likely be misplaced. More generally, our research highlights the importance of conducting differentiated analyses of internet users when examining the health effects from internet use.

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1. Introduction

There is much research to suggest that social interaction can bring about significant mental health benefits (Cohen, 2004; Ho, 2016). Traditionally, face-to-face meetings, especially within neighbourhoods has been an important mechanism for facilitating social interaction, as geographical constraints meant that people commonly had few strong ties outside their locality (Howley et al., 2015). Yet as a result of advances in transportation systems and information technologies, many individuals have come to rely less and less on those who live in their locality (Wellman, 2001). This leads to the question as to whether the shift towards electronic modes of socialising has an influence on psychological outcomes. Specifically, we are interested in whether the use of online social networks brings about the same mental health benefits as 'real' social interaction? Some suggest that use of the internet is causing people to become socially isolated and cut off from genuine social relationships, as the internet lacks nonverbal cues important for normal social interaction (Kraut et al. 1998; Stepanikova et al. 2010). This viewpoint is based on the idea that communicating through the internet is fundamentally different from face-to-face socializing and such 'impoverished' interaction may lead to feelings of anonymity and isolation (Kraut et al., 1998). On the other hand, some research suggests that online interaction could bring about significant benefits when it comes

to our psychological health by freeing people from the constraints of geography and thereby allowing individuals to more easily pursue the types of social networks that would bring them the most value (Robinson, 2000; Nie et al., 2002; Valentine and Holloway, 2002; Brynin and Kraut, 2006).

Unfortunately, the empirical work in this area is somewhat mixed and often contradictory. Kraut et al. (1998) found that greater use of the internet was associated with an increase in individuals' depression and loneliness. This finding was dubbed as an "Internet paradox" because use of the internet, a technology for social contact, actually led to the reduction of offline social ties. However, the authors subsequently found in a 3 year follow up of respondents in their initial study that many of these negative effects dissipated (Kraut et al., 2002). Much of the more recent work in this area has examined the association between using the internet for social purposes and psychological health for young adults, in particular University students. Findings from this work generally suggest a negative correlation between time spent on social networking sites and mental health (Matsuba, 2006; Kim et al., 2006; Whitty & McLaughlin, 2007; Kross et al., 2013). Using a large nationally representative survey of US citizens, Stepanikova et al. (2010) found similar patterns among the general population, i.e. as time spent on web browsing, surfing, and creating websites increased, loneliness increased and life satisfaction decreased. Still, other research points to the potential benefits that using the internet for socialising can have on mental health. Howard et al. (2001) and Shklovski et al. (2004), for instance, finds a positive relationship between emailing and the probability that people will visit friends and relatives. Robinson et al. (2000) observed that internet users were likely to spend more time communicating face-to-face and over the phone with family and friends. Research by Pendry and Salvatore (2015) suggests that engagement

with online discussion forums can have beneficial impacts on well-being and also lead to increased engagement in offline civic action.

One potential limitation with existing research in this area, which is the focus of this study, is that research to date has focused on ascertaining the average mental health impact of using online social networks across society. It may, however, prove to be too simplistic to assume a 'catch all' average effect. Specifically, the hypothesis explored in this paper is that different personality types will have different reasons for using the internet, and this in turn, will predict the extent to which they are positively or negatively affected by using social networking sites (SNSs). Consistent with the idea that the internet can cause people to become isolated from genuine social relationships, we find that using SNSs is positively related with poor mental health as captured by the Generalised Health Questionnaire (GHQ). We find, however, that personality traits have an important role in moderating these effects. For instance, individuals with relatively higher levels of neuroticism or conscientiousness are at much greater risk of being negatively affected by use of SNSs. On the other hand, those who score relatively highly on extraversion and agreeableness are not substantively affected from spending significant amounts of time on SNSs. Such findings pose new questions on the link between online socialising and mental health and highlights the importance of conducting differentiated analyses of internet users when examining the health effects from internet use.

2. Personality traits and internet use

Personality is typically described as encompassing "the psychological component of a person that remains from one situation to another" (Wood & Boyce, 2014) and is most typically captured by psychologists using the influential Five Factor Model (McCrae & Costa, 2008). The Five Factor Model consists of five over-arching traits: agreeableness, conscientiousness,

extraversion, neuroticism, and openness. Personality measures such as the Five Factor Model, enable the exploration of whether an individual's mental health response of engaging in some activity, such as online social networking, is dependent upon an individual's underlying personality traits. Previous research has highlighted the important role that personality plays not just in predicting our overall well-being (Steel et al., 2008), but also how an individual might respond to both positive and negative life events such as unemployment (Boyce, Wood, and Brown, 2010), widowhood (Pai and Carr, 2010), income changes (Boyce and Wood, 2010; Boyce, Wood, and Ferguson, 2016), and retirement (Kesavayuth, Rosenman, & Zikos, 2016). We expect personality to have a similarly (if not more so) important role in moderating the effects from use of SNSs on mental health. This is because, personality is likely to be an important predictor as to how individuals use and engage with the internet (Amichai-Hamburger, 2002).

For example, neurotic individuals, who are characterised as being more prone to negative emotions such as anxiety and anger, as well as feelings of vulnerability, have been shown to be more likely to use the internet to feel a sense of belonging (Amiel & Sargent, 2004) and find support for various emotional problems (Blumer & Renneberg, 2010). Although such use of the internet can be beneficial for their mental health, neurotic individuals are also more sensitive to negativity (Nettle, 2006) and prone to internet addiction (Kayis et al., 2016), both of which might lead to adverse effects on mental health. Extraverts who are characterised as being assertive, active, and outgoing generally spend less time in internet chat rooms than less extraverted (introverted) individuals (McElroy et al., 2007) and more time using online social networks (Correa et al., 2010). Although it has been suggested that the internet offers advantages for introverted individuals to compensate socially (Valkenburg & Peter, 2009) it is

suggested that this may also result in compulsive internet use which has been shown to be detrimental for mental health (Kayis et al., 2016).

Like extraversion and neuroticism, the role of conscientiousness in predicting how individuals will use and engage with SNSs is not clear-cut. On the one hand, individuals who are relatively conscientiousness in nature are less likely to experience problematic use with the internet, because of their tendencies toward order and self-discipline (Kayis et al., 2016). Conscientious individuals are, however, also less likely to welcome distraction (Wehrli, 2008) and therefore overall time spent online may result in a negative impact on their well-being. Agreeable individuals, who are characterized with high levels of trust and compliance, tend to experience higher regret regarding online posts whilst using social media (Moore & McElroy, 2012), whereas disagreeable individuals, who are less compliant and are less modest, may be less likely to have favourable social interactions online (Wehrli, 2008). Finally, individuals who score high on openness, i.e. tend to value aesthetics, creativity, and feelings, may use internet as a tool to further their appetite for new information and insights into their understanding of the world (Tuten & Bosnjak, 2001).

3. Data

The data used in this analysis comes from Understanding Society: the UK household longitudinal study (UKLS). This is a comprehensive household survey that started in 2009 with a nationally-representative stratified, clustered sample of around 50,000 adults (16+) living in the United Kingdom. There was a supplemental 'social networks' module added to the main stage questionnaire in wave 3 of the UKLS (2011-2013). This additional module asked individuals about their use of social networking web-sites and as these questions are only asked in this module, our analysis is limited to wave 3 of the UKLS. The indicator of mental health

we use is the Generalised Health Questionnaire (GHQ) which consists of a 12 item scale designed to assess somatic symptoms, anxiety and insomnia, social dysfunction and severe depression. It is possibly the most common assessment of mental health used in the literature to date (Goldberg et al., 1997; Jackson, 2007). Higher scores represent relatively worse mental health and for ease of use we refer to this indicator of mental health as psychological distress.

Within the social networks module contained in wave 3 of the UKLS, respondents were asked two questions in relation to their use of online social networks. The first question simply asked them to report whether they belonged to any social networking web-sites (yes/no). Overall, 45 percent of individuals report that they do belong to a social networking web-site. In the regression analysis that follows we refer to this variable as '*social web-site'*. The second question of interest to this study asked respondents who stated that they belonged to a social networking web-site '*how many hours they spend chatting or interacting with friends through social web-sites on a normal week day, that is Monday to Friday*?.' They were given five options ranging from none to 7 or more hours. The distribution of respondents across the various categories can be seen in table 1 and hereafter we refer to this variable as '*hours online*'. *Social web-site* and *hours online* formed the key explanatory variables in our regression analysis of mental health.

Based on prior research, we include a rich set of commonly observed predictors of mental health as control variables (see Dolan, 2008 for a review of this literature). These include variables such as age, equivalent household income, gender, relationship status, number of children, education and labour force status. We also included variables reflecting more traditional means of socialising with others as additional controls such as the extent to which individuals talk with their neighbours, whether they have close friends living nearby, and the

degree to which they socialise with friends in their area. To control for differences in health which could be confounded with the extent to which individuals rely on the internet for social interaction and their mental health, we also include a measure of individual's general assessment of their health in the model specification. Finally we supplement these variables with a full set of regional controls to capture any regional differences in the extent to which opportunities for online social networking are available to survey respondents.

To obtain a measure of personality traits, participants were asked to what extent they agree/disagree with 25 statements beginning with the quote "I see myself as someone who". Each statement is classed in one of five categories: extraversion, agreeableness, conscientiousness, neuroticism and openness. A composite score for each the Five Factor Model personality traits is then derived by summing the scores for each of the individual categories. To test if there are important personality-SNSs interaction effects we interact each of our measures of personality with first our variable capturing whether a respondent is a member of a social networking web-site (social web-site) and second with our variable reflecting the amount of time respondents' spend chatting online ('hours online'). When presenting our interaction effects, we first standardised individual's scores on each of the five personality traits with a mean of zero and a standard deviation of one. This aids in the presentation of the interaction effects as it allows any unit effects to be interpreted with respect to standard deviations.

4. Analysis

The analysis begins by assuming that mental health (H) as captured by the Generalised Health Questionnaire is explained by a vector of socio-economic and demographic characteristics (X),

personality traits (P) and a dummy variable indicator capturing whether respondents are a member of a social networking web-site (S). This yields the following explanatory model:

$$H = a_0 + \beta_1 X + \beta_2 P + \beta_3 S + \beta_4 (S * P) + \varepsilon$$

Support for the hypothesis that personality traits will moderate the relationship between being a member of a social networking web-site and mental health can be obtained when the latter two mental health determinants (S*P) is statistically significant, which would suggest that the effect[1] derived from being a member of a social networking web-site will partly depend on individuals underlying personality traits.

Following the same procedure, albeit this time we focus solely on individuals who are a member of a social networking web-site and add a variable (T) reflecting '*how many hours they spend chatting or interacting with friends through social web-sites on a normal week day, that is Monday to Friday*' as an explanatory variable to our regression analysis such that we end up with the following model specification:

$$H = a_0 + \beta_1 X + \beta_2 P + \beta_3 T + \beta_4 (T * P) + \varepsilon$$

In this specification, mental health (H) is again a function of a vector of socio-economic and demographic characteristics (X), personality traits (P), but this time we substitute our variable T capturing the amount of time individuals spend on social web-sites (hours online) for our dummy indicator S. Support for the hypothesis that personality traits will moderate the mental health effect of online social networking can again be obtained when the latter two mental health determinants in this specification (T*P) is statistically significant.

[1] Due to the mixed results from previous research we make no a priori judgement as to whether the overall association between being a member of a social networking web-site and mental health will be positive or negative

Under this specification we are focusing specifically on individuals who belong to a social networking web-site when examining the relationship between time spent on SNSs (hours online) and mental health. An alternative modelling approach would just have been to attribute a zero value for hours online for those respondents who do not belong to a social networking web-site. This would, in turn, have allowed us to examine the relationship between hours online and mental health for the entire sample as opposed to just those who belong to a social networking web-site. The main disadvantage of this approach is that it would have grouped people who do not belong to a SNS with those who do, and it is perhaps questionable how useful it is to uncover the mental health response from time spent on SNSs for individuals who do not even belong to a SNS.

On the other hand, one could argue that focusing specifically on individuals who do belong to a social networking web-site, as we do in this study, could give rise to a sample selection bias if individuals who do not belong to a social networking web-site would have a different mental health response from spending time using SNSs. As such, in a robustness check we tested the sensitivity of our results discussed later to this alternative modelling approach whereby we simply attached a zero value for the variable hours online for respondents who do not belong to a SNS. We then ran our regression analysis on the entire sample. Our key findings discussed later relating to the relationship between time spent chatting with friends online (hours online) and mental health did not change when adopting this alternative modelling approach.

5. Results

i) Belonging to a social networking web-site

Table 2 reports the basic regression results designed to examine if there are any differences in mental health between those who belong to a social networking web-site and those who don't. Specification 1 includes socio-economic, health and regional controls. The results relating to these control variables are all along expected lines, and correspond with the results widely documented in previous literature (see Dolan et al., 2008). We also included variables which can be thought of as reflecting more 'traditional' means of socialising in the regression analysis, and these results were also along expected lines. Specifically, individuals who regularly talk with their neighbours, go out socially or have friends living locally are likely to have better mental health than individuals who don't. The key explanatory variable of interest in this specification is the dummy variable indicating if a respondent belongs to a social networking web-site ('*social web-site')*. Under this specification, there is no significant association between this variable and psychological distress.

One potential threat to the validity of this result is due to 'personality induced bias' as personality traits are significantly correlated with mental health and internet use. As such, Specification 2 tests the sensitivity of the results outlined under Specification 1 to the inclusion of the Five Factor Model personality traits. The results relating to our measures of personality are in keeping with previous research (see Steel et al., 2008). Individuals who score higher on extraversion or conscientiousness are likely to have better mental health than individuals who score relatively lower. We find the opposite relationship with neuroticism, i.e. neuroticism is associated with poor mental health. Looking specifically at the findings in relation to '*social web-site'* we can see that there is a now a statistically significant positive association between this variable and psychological distress. In other words, individuals who belong to a social networking site (SNS) are likely to have significantly higher scores on our measure of

psychological distress (worse mental health), than individuals who don't belong to a SNS. This suggests that unobserved heterogeneity, i.e. personality induced bias could be significantly biasing the results under Specification 1 and indeed much of the previous cross sectional research which do not include personality controls in their model specification.

Next we test our hypothesis that personality traits will act to moderate the relationship between use of SNSs and psychological distress. To examine if there are any personality-SNS interaction effects we interact our dummy variable (social web-site) indicating if a respondent is a member of a SNS with each of our personality measures and include these interaction variables in our model specification. The results are presented in table 3 and we can see that there are a number of significant interaction effects. First, looking at extraversion, we find that the while the main effect between social web-site and psychological distress is positive, the interaction between extraversion and social web-site is negative and statistically significant. This suggests that extraversion attenuates downwards the negative association between being a member of a social networking web-site and mental health. In other words, extraverts are less likely to be negatively affected when it comes to their mental health by being a member of a social networking web-site. On the other hand, the interaction between both neuroticism and conscientiousness with social web-site is positive and statistically significant. This, in turn, suggests that individuals who score relatively highly on neuroticism or conscientiousness, in contrast to extraversion, are more likely to be negatively affected when it comes to their mental health by being a member of a social networking web-site.

ii) Time spent on social networking web-sites

Next we restrict our analysis to those individuals who report that they are a member of a social networking web-site (55% of respondents) and examine the association between the amount of time '*they spend chatting or interacting with friends through social web-sites on a normal week day, that is Monday to Friday*?' (*hours online*) and psychological distress (see table 4). Specification 1 includes the basic set of control variables (i.e. socio-economic, health and regional). We can observe a clear positive relationship between hours online and psychological distress. In other words, individuals who spend relatively more time on SNSs are likely to have poorer mental health than individuals who spend relatively less time. Furthermore, this relationship increases significantly with each additional hour spent on SNSs. For example, an individual who spends one hour on SNSs will have a higher score on our measure of mental health of approximately 0.22 units than someone who spends less than one hour. This effect increases substantially to a 1.31 unit difference when looking at individuals who spend 7 or more hours.

Under Specification 2 we test the sensitivity of the regression results to the inclusion of the five personality traits. We find that the coefficients related to our key explanatory variables are significantly smaller after adding in personality traits as additional control variables[2]. These differences, like those reported between specification 1 and 2 in table 2, again support the suggestion that failure to add in personality traits in conventional cross sectional analysis of the relationship between use of SNSs and psychological outcomes may give rise to significant omitted variable bias.

[2] In specification 1 the point estimates were 0.22, 0.41, 0.71 and 1.31 respectively which compares to 0.17, 0.24, 0.39 and 1.01 under specification 2.

To test our hypothesis that personality traits will moderate the relationship between use of SNSs and mental health, we interact our variable reflecting the amount of time individuals spend on SNSs during a normal weekday (hours online) with each of our measures of personality. To aid in the presentation of our results, we converted our categorical variable reflecting the amount of hours individual's spend on SNSs (hours online) to one continuous variable by simply taking the midpoint of the relevant categories (see table 1) and interacted this variable with each of our personality measures. When it comes to respondents who report that they spend 7 or more hours on SNSs, we made the simplifying assumption that this served as a maximum value, although in practice some respondents could at least in theory spend more time per day on social web-sites.

There are a number of significant interaction effects which suggest that certain personality types are more likely to be adversely affected when it comes to their mental health by using SNSs (see table 5). These interaction effects are best illustrated in figure 1 and we can see here that they are substantial. First, looking at conscientiousness, we can see that relatively conscientiousness individuals (here defined as one standard deviation above the mean level) enjoy significantly better mental health (i.e. score 0.71 lower on psychological distress) than less conscientiousness individuals (defined as one standard deviation below the mean) when they don't spend any time during a normal weekday on SNSs. However, we can see that this difference dissipates as time spent on SNSs increases, e.g. there is no significant difference in the mental health of relatively more and less conscientiousness individuals when they spend 7 hours or more per weekday on SNSs.

When it comes to neuroticism, we can see in figure 1 that the relationship between neuroticism and mental health is large, i.e. irrespective of online social networking use there are large level

differences in psychological distress between those that are one standard deviation above and below mean levels of neuroticism. That being said, online social networking use appears to have a more substantive negative relationship with the mental health of individuals that are relatively more neurotic (again defined as one standard deviation above mean levels). For example, at zero hours of use, relatively neurotic individuals (defined as one standard deviation above the mean level) experience significantly worse mental health (i.e. score 4.65 higher on psychological distress) than less neurotic individuals (again defined as one standard deviation below the mean). Although as the hours of use increases, both groups experience worsening psychological distress, this is more pronounced for those with above mean levels of neuroticism. As such, at 7 hours use, relatively neurotic individuals score 5.40 higher on psychological distress than less neurotic individuals. Thus the difference extends from 4.64 at zero hours use to 5.40 at seven hours use.

Whereas individuals who score relatively highly on conscientiousness and neuroticism are more likely to be negatively affected by time spent on SNSs, individuals who score higher on extraversion and agreeableness are less likely to be negatively affected. For those that are high in agreeableness or extraversion, we can see in figure 1 that more time spent using SNSs translates to some adverse effects on mental health. However, this negative association is much less pronounced for those with high as opposed to low levels of agreeableness or extraversion. For instance, as can be observed in figure 1 individuals who are one standard deviation above and below the mean level of agreeableness and extraversion respectively, have a similar score on our psychological distress indicator when they spend one hour or less on SNSs, i.e. the mental health of both groups are broadly comparable. However, a significant mental health gap emerges between both these groups as the time spent on SNSs increases. Put differently, relatively extraverted and agreeable individuals do not appear to be greatly affected from

spending significant amounts of time using SNSs, whereas those who are more introverted or disagreeable appear to be negatively affected to a much more significant degree. For example, there is an estimated 0.41 and 0.79 unit difference in the levels of psychological distress for individual's one standard deviation below and above the mean level of agreeableness and extraversion respectively, when they spend 4 hours per weekday on SNSs. This increases further to 0.77 and 1.21 for individuals who spend 7 hours or more on SNSs.

6. Conclusion

The rapid evolution of social networking web-sites have caused significant changes in the way many people socialise and interact with each other. This leads us to the question as to the effect of these changes on mental health. For many, the use of SNSs can have a number of positive psychological outcomes, in that they can help individuals feel connected to others, irrespective of where they are. Furthermore, the internet has aided the efficiency in which people can coordinate their social activities and this may, in turn, have a double dividend in not only reducing the stress associated with setting up social activities but also in freeing up more time for face-to-face socialising (Stepanikova et al., 2010). While SNSs no doubt have value to many, there is much research, however, to suggest that online social networks may not bring about the same benefits as more traditional forms of social interaction. In fact, much recent research documents a negative association between the use of SNSs and mental health. The negative association between use of SNSs and mental health is thought to occur because communicating through the internet is fundamentally different from face-to-face socializing and such 'impoverished' interaction may give rise to feelings of anonymity and social isolation (Kraut et al., 1998). There is also some recent research to suggest that social networking sites can trigger things like FOMO (fear of missing out), and low self-esteem from comparisons with others (Bevens et al., 2016).

In this study we focused on the role of personality traits in helping us to understand the relationship between use of SNSs and mental health. An advantage of this study is that while research to date has concentrated on the average effect from using SNSs across the entire population, we show that the effect of using SNSs on mental health is personality-specific. In other words, not everyone will be affected by using SNSs in the same way, and it could be problematic to assume that they do. Specifically, individuals who can be characterised as relatively neurotic or conscientious are much more likely to be negatively affected by using SNSs. On the other hand, individuals who are relatively extraverted or agreeable are not substantively affected from spending significant amounts of time on social networking web-sites. One possible explanation for these differences is that different personality types will have different reasons for using the internet (Amichai-Hamburger, 2002) and certain individuals may be more prone to unhealthy internet behaviours, such as internet addiction (Kayis et al., 2016).

In terms of future work, it seems likely that previous findings are likely to have been affected by numerous sources of endogeneity bias. For example, given the cross sectional nature of research in this area, many studies are likely to be affected by omitted variable bias. This study highlighted one potential source of omitted variable bias, namely personality traits, as we find that adding in personality measures to the regression analysis attenuated the coefficient estimates relating to the relationship between time spent on SNSs and mental health downwards. In addition to the presence of confounding factors, it can difficult to conclude which variable is the cause and which is the effect. For instance, using SNSs may negatively affect the mental health for some, but also people more at risk of poor mental health may be

more likely to engage with online social networks. Longitudinal and ideally experimental designs will help disentangle the nature of these relationships.

We make no causal claims in this work relating to the effect of using SNSs on psychological health, albeit the broad array of control variables (e.g. personality traits) used in this study is an advantage of this relative to much of the existing research in this area. Our study has highlighted that quite apart from issues in relation to the precise identification of the effect of using SNSs on mental health, any findings are likely to be personality-specific. Some people will be negatively affected by using SNSs while for others it may lead to positive outcomes. It would be useful, therefore, for future research to aim at better understanding the heterogeneity of impacts across society. Overall our results serve as a note of caution when using mental health and well-being indicators for policy and/or research purposes in that assuming a 'catch all' average effect and thereby not accounting for differences in how an individual might respond to both positive and negative events may in some instances be of limited value.

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Table 1: Hours spent interacting with friends through social websites

	Freq.	Percent
None	3,269	15.79
Less than an hour	11,144	53.83
1-3 hours	4,926	23.79
4-6 hours	922	4.45
7 or more hours	443	2.14
Total	20,704	100

Table 2: Factors related with psychological distress

	Specification 1		**Specification 2**	
	Coef.	Std. Err.	Coef	Std. Err
Equivalent household income	-0.35 ***	0.04	-0.27 ***	0.04
Age	0.00	0.00	0.03 ***	0.00
Female	1.20 ***	0.05	0.33 ***	0.05
In a relationship	-0.28 ***	0.06	-0.33 ***	0.05
Number of children	0.02	0.03	0.09 ***	0.03
Had a degree qualification	-0.10 *	0.06	-0.03	0.05
Self-employed - employed is the reference category	-0.05	0.10	0.11	0.09
Unemployed	2.18 ***	0.12	1.75 ***	0.11
Retired	-0.47 ***	0.10	-0.60 ***	0.09
Familycare	0.78 ***	0.11	0.42 ***	0.10
Training	-0.06	0.12	-0.27 ***	0.11
Disabled	6.31 ***	0.15	4.64 ***	0.14
Other	-0.29	1.03	-0.81	0.92
Talk regularly with neighbours	-0.35 ***	0.03	-0.17 ***	0.03
Local friends mean a lot	- 0.55 ***	0.03	-0.40 ***	0.03
Go out socially	-1.36 ***	0.08	-0.93 ***	0.07
Completely satisfied with health	-1.36 ***	0.08	-1.68 ***	0.08
Social web-site	0.05	0.06	0.12 **	0.06
Regional control variables unreported for parsimony				
Openness			0.02 **	0.02
Agreeableness			0.00 **	0.02
Extraversion			-0.09 **	0.02
Neuroticism			1.59 **	0.02
Conscientiousness			-0.32 **	0.02
N	40,452		40,386	
R^2	0.14		0.30	

*** statistically significant at 1% level, ** 5 % level, * 10 % level

Table 3: Personality interactions

Personality – social website interactions	**Coef.**	**Std. Err.**
Openness to experience	0.052	0.049
Agreeableness	-0.053	0.049
Extraversion	-0.125 ***	0.049
Neuroticism	0.179 ***	0.047
Conscientiousness	0.129***	0.050

*** statistically significant at 1% level, ** 5 % level, * 10 % level

*Note: We exclude the results relating to the control variables from the personality interactions column both in this table and table 5 as they are similar to those reported in table 2 and 4.

Table 4: Factors related with psychological distress

	Specification 1		**Specification 2**	
	Coef.	Std. Err.	Coef	Std. Err
Equivalent household income	-0.42 ***	0.06	-0.31 ***	0.06
Age	0.02 ***	0.00	0.05 ***	0.00
Female	1.19 ***	0.08	0.35 ***	0.08
In a relationship	-0.37 ***	0.09	-0.44 ***	0.08
Number of children	0.01	0.04	0.06 *	0.04
Had a degree qualification	-0.07	0.08	-0.01	0.08
Self-employed - employed is the reference category	-0.07	0.15	0.08	0.14
Unemployed	2.00 ***	0.17	1.66 ***	0.15
Retired	-1.17 ***	0.21	-1.21 ***	0.19
Familycare	0.90 ***	0.16	0.54 ***	0.14
Training	0.08	0.14	-0.12	0.13
Disabled	7.02 ***	0.25	5.25 ***	0.23
Other	-0.76	1.46	-1.28	1.31
Talk regularly with neighbours	-0.31 ***	0.05	- 0.13 ***	0.04
Local friends mean a lot	-0.60 ***	0.05	- 0.45 ***	0.04
Go out socially	-1.16 ***	0.13	-0.68 ***	0.11
Completely satisfied with health	-2.95 ***	0.12	-1.75 ***	0.11
Hours online (None is the reference category)				
Less than one hour	0.22 **	0.11	0.17 *	0.10
One to three hours	0.41 ***	0.13	0.24 **	0.12
Four to six hours	0.71 ***	0.21	0.39 **	0.19
Seven or more hours	1.31 ***	0.29	1.01 ***	0.26
Regional control variables unreported for parsimony				
Openness			0.05	0.03
Agreeableness			-0.03	0.04
Extraversion			-0.14 ***	0.03
Neuroticism			1.65 ***	0.03
Conscientiousness			-0.26 ***	0.04
N	19,246		19,237	
R^2	0.14		0.30	

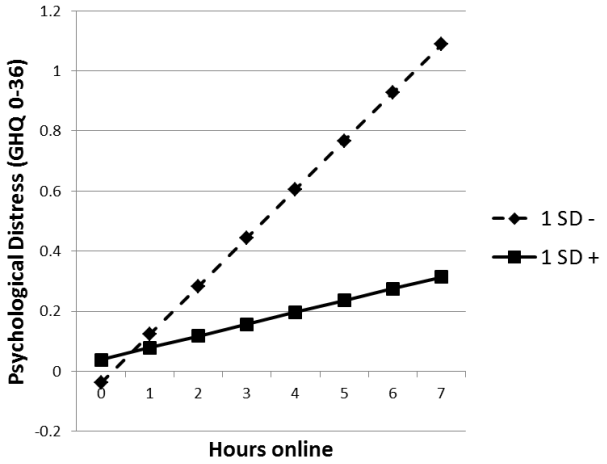
*** statistically significant at 1% level, ** 5 % level, * 10 % level

Table 5: Personality interactions

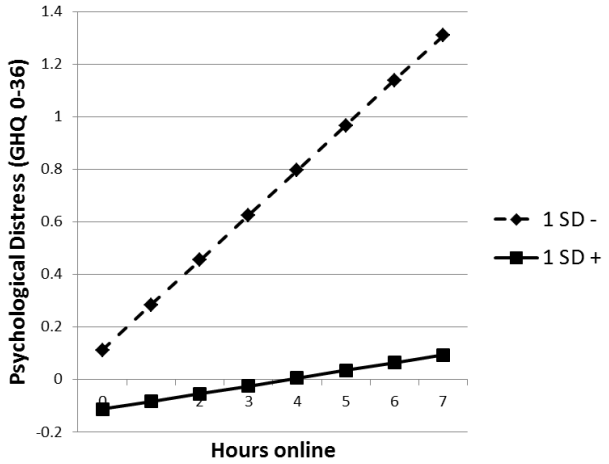
Personality – hours online interactions	**Coef.**	**Std. Err.**
Openness to experience	0.010	0.026
Agreeableness	-0.061 ***	0.024
Extraversion	-0.071 ***	0.027
Neuroticism	0.054 **	0.025
Conscientiousness	0.052 **	0.025

*** statistically significant at 1% level, ** 5 % level, * 10 % level

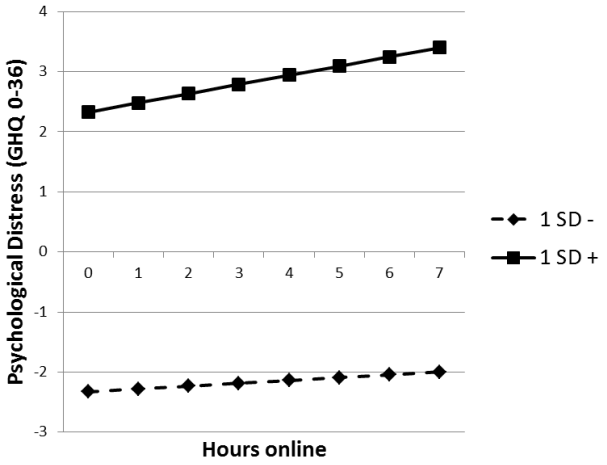
Figure 1: Psychological distress from hours spent online moderated by personality



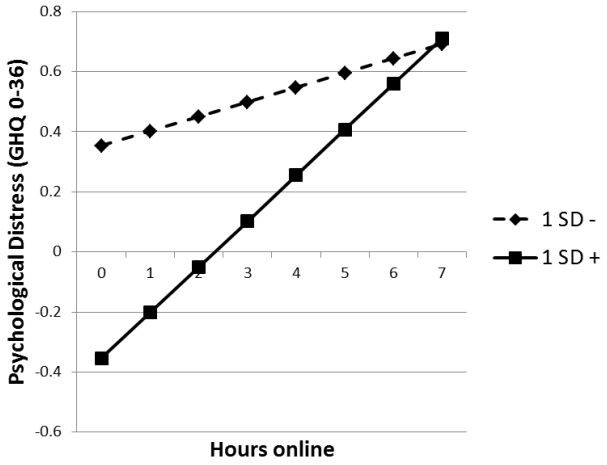
i) Agreeableness



ii) Extrvaersion



ii) Neuroticism



iv) Conscientiousness