Social media users potentially experience different withdrawal symptoms to non-social media users

Roberto Truzoli[1], Lorena Magistrati[1], Caterina Viganò[1], Stella Conte[2], Lisa A. Osborne[3,4], and Phil Reed[5]

[1]University of Milan, Italy; [2]University of Cagliari, Italy; [3]Swansea Bay University Health Board, UK; [4]The Open University, UK; [5]Swansea University, UK

Correspondence address: Phil Reed,
Department of Psychology,
Swansea University,
Singleton Park,
Swansea, SA2 8PP, UK.
e-mail: p.reed@swansea.ac.uk

Conflict of interest

Roberto Truzoli declares that he has no conflict of interest.

Lorena Magistrati declares that she has no conflict of interest.

Caterina Viganò declares that she has no conflict of interest.

Stella Conte declares that he has no conflict of interest.

Lisa A. Osborne declares that she has no conflict of interest.

Phil Reed declares that he has no conflict of interest.

Short title: Social media withdrawal.

Accepted by: *International Journal of Mental Health and Addiction*, June (2021).

Abstract

This study explored whether psychological distress produced by removal of a mobile device would be the same for younger (< 18 years) and older (18+ years) individuals, and for those using mobile devices to access social media versus other functions. 101 smartphone users participated. Participants' smartphone use was assessed, they completed a test for psychological distress (HADS), were allowed 15min smartphone access, then asked to stop using their device, and finally their psychological distress was measured again. Change in distress was stronger in those whose main usage was social media, but differed for younger and older participants. Younger participants demonstrated a decrease in psychological distress on removal of the mobile device; whereas older participants showed an increase in distress. These data suggest removal of mobile devices impacts psychological state, but does so differentially depending on the nature of the use and the age of the individual.

Keywords: internet addiction; mobile device use; social media use; younger versus older; withdrawal effects.

Since the introduction of the terms Problematic Internet Use (PIU; Kuss & Lopez-Fernandez, 2016), and 'Internet Addiction' (IA; Young, 1998), substantial changes have occurred in how and why individuals access digital resources (Caplan, 2018). Many individuals employ mobile devices for very different purposes (e.g., social media) to those for which PCs were employed when IA was initially studied (Škařupová, Ólafsson, & Blinka, 2016). As a result, basic unaddressed questions exist, such as whether similar psychological effects (e.g., psychological withdrawal on removal of access to the device) are seen for smartphone-generated PIU, compared to PC-generated PIU, (Romano, Osborne, Truzoli, & Reed, 2013; Reed, Romano, Re, Roaro, Osborne, Viganò, & Truzoli, 2017).

Previous studies have demonstrated physiological and psychological internet withdrawal effects for individuals with higher PIU levels after accessing the internet via a PC (Romano et al., 2013; Reed et al., 2017). However, with changes in usage patterns of those accessing digital resources (i.e. for social media rather than traditional internet resources), it is unclear whether withdrawal effects would be observed when higher PIU scores are associated with mobile device use for social media. Similarly, there is little evidence concerning whether withdrawal effects would be present for those who are younger (i.e. below 18 years) than the samples studied in previous explorations. This may be important, as younger individuals constitute a large proportion of those using mobile devices.

Given the paucity of knowledge, the current study adopted an exploratory strategy to investigate whether withdrawal effects, elicited on removal of access to a mobile device, differed between groups of individuals: in particular, younger versus older; and social media users versus nonusers. Withdrawal is complex, including cognitive, physiological, and emotional responses, and this study focused on subjective emotional responses. A previously employed design (Romano et al, 2013; Reed et al., 2017) was used, in which changes in psychological functioning of participants were assessed comparing before to after a period of

internet use. Psychological withdrawal effects would be seen if any change were greater for higher, compared to lower, PIU scorers. A second measure of withdrawal was also employed, based on the hypothesis that cues associated with accessing substances or activities that alleviate withdrawal will become positively valenced (Osborne, Romano, Re, Roaro, Truzoli, & Reed, 2016; Yeomans, Durlach, & Tinley, 2005). In a previous study, participants who displayed higher PIU, and who were given access to the internet after a period of abstinence, reported a change in their favourite colour in line with those colours seen during exposure to the internet (Osborne et al., 2016).

Motivation for using digital technology can be 'excitement-seeking' or 'escape-behaviour' (Lu, Yeo, Guo, & Zhao, 2019). Removal of access to digital resources may have different effects depending on the maintaining factors. Removal of access to escape-motivated activities can increase physiological arousal and psychological distress (Covi, Lipman, Pattison, Derogatis, & Uhlenhuth, 1973; Oldham & Desan, 2016). In contrast, removal from excitement-generating activities (stimulant-like) may produce the opposite effects on physiology and psychological distress (Murray, 1988). If internet access serves an 'escape-driven' purpose, as it apparently did for previous older, more traditionally-accessing users of the internet (Romano et al., 2013), then an increase in psychological distress should also be noted on removal of access. However, if participants access digital resources for excitement-seeking purposes, then a different impact of mobile device removal should be noted – with the most likely impact of being to reduce psychological distress.

Method

Participants

101 smartphone users (29 males, 72 females) were recruited from a target population of 12 to 30 year olds. All participants were volunteers, and received no payment or credit.

The mean age was 17.46 (±4.74; range 12–30). One sub-sample comprised 51 university students (mean age = 21.73±2.66; range 18–31). Another comprised 50 pupils from a middle school (mean age = 13.09±.41; range = 12–14), this allowed an age range including younger participants than have typically been studied. In response to the question: "*How long do you spend on your mobile phone each day?*": 52 (52%) indicated they spent 1–3 hours/day on their mobile phone; 40 (40%) 4–7 hours; 9 (9%) >7 hours. There was no gender difference in amount of time spent on the smartphone, $X^2(3)=5.86$, $p=.119$, $\phi=.241$, nor between the younger and older subsamples, $X^2(3)=3.08$, $p=.379$, $\phi=.175$.

Materials

Internet Addiction Test (IAT; Young, 1998) is a 20-item scale internet disruption of everyday life. The overall score ranges from 20 to 100. A cut-off score of 50 or more represents some PIU. The internal reliability (Cronbach α) of the scale is around .90 (Widyanto & McMurran, 2004).

Hospital Anxiety and Depression Scale (HADS; Zigmond & Snaith, 1983) is a self-report measure of psychological distress (anxiety, depression). It contains 14 items (7 anxiety; 7 depression), giving a range of 0 – 42, and the overall score is an index of distress (Khan, Whittal, Mansol, Osborne, Reed, & Emery, 2013). Internal reliability (α) ranges from .77 to .82 for a non-clinical population (Bjelland, Dahl, Haug, & Neckelmann, 2002).

Procedure

Participants were asked to turn off their smartphones for 60 min. In this time, they were given an introduction to the study, completed the HADS, and were asked to name the first color that came into their mind. Following this, participants were told the experimenter would return to complete the experiment, and were asked to wait and access the internet

through their mobile phones, which all participants did. A short 15min internet period was used, as this has been found long enough to produce psychological changes in high problem users (Reed et al., 2015). Moreover, shorter periods of internet use are reflective of current methods of interacting with mobile devices (Cheever, Rosen, Carrier, & Chavez, 2014).

At the end of the 15 min phone-use period, the experimenter returned, participants were asked to turn off their smartphone for 15min. After this period, they were again asked to name the first color that came to mind, and to complete the HADS, as well as answering two questions regarding their use of the internet: "*How long do you spend on your mobile phone each day?*"; and: "*What is your main use of your mobile phone (on average, the activity that occupies more than 50% of your time)*". Finally, they completed the IAT questionnaire.

Results

To explore whether mobile devices were primarily used to access social media, the sample was split into those who did, and did not, use social media as the main function on their mobile device. The sample was also divided into lower and higher internet addicts (using the cut-off point of the IAT), and into younger and older participants (under 18 or 18 and over). Whether the change in psychological distress from baseline to after mobile removal was significantly greater than zero was assessed by a series of Wilcoxon signed rank tests due to the change scores not being normality distributed, and the collinearity between the variables. Due to the exploratory nature of the analysis the key objective was not to commit a Type II error (McDonald, 2009).

----Figure 1----

Figure 1 shows the group-mean change scores (post-mobile use minus pre-mobile use) for psychological distress (HADS_T) for the lower and higher internet addiction groups,

groups using and not using social media as their main use of their mobile phone, and younger and older participants. These data suggest that changes in distress following cessation of mobile usage were limited to higher PIU scorers. They were different for the two age groups, and for those using and not using social media as the main function of their mobile device. For younger people, internet addicts using social media showed a decrease in distress after cessation, but a numerical increase in distress if they did not use social media. For the older participants, internet addicts using social media demonstrated an increase in distress in distress following cessation of mobile use, but those who did not use social media demonstrated a numerical decrease in distress.

There was a significant change from zero for the younger participants with higher-levels of internet addiction who used social media, z=1.997, p=.048, but not for the higher internet addiction group not using social media, z=.342, p>.30, or for the lower internet groups either using, z=1.265, p=.206, or not using, z=.588, p>.30, social media. For the older participants, there was a significant change from zero for those with higher-levels of internet addiction and who used social media, z=2.032, p=.042, but not for the higher internet addiction group not using social media, z=.319, p>.30, or for the lower internet groups whether using, z=.864, p>.30, or not using, z=.319, p>.30, social media.

It was also noted that 22/40 (55%) participants who showed a decrease in distress after mobile device removal changed their named colour; 23/36 (64%) who showed an increase in distress changed their colour, but only 8/25 (32%) who did not show any distress change changed their colour, $X^2(2)=6.185$, p=.045, ϕ=.247.

Discussion

The major novel finding was that the effect of removing a mobile device on psychological state depended not only on the level of PIU, but also on age, and the primary

usage of mobile devices. For older participants, removal of the mobile device for social media users increased psychological distress. In contrast, younger social media users showed a reduction in psychological distress on removal of the mobile device.

The results from the older group with higher PIU corroborate previous studies in which internet access was through a traditional PC (Romano et al., 2013; Reed et al., 2017). The increase in psychological distress after ceasing to use the mobile device suggests withdrawal effects consistent with the function of the mobile device being 'sedative' – withdrawal effects, typically, being the opposite of the effect of the activity/substance (Murray, 1988; Oldham & Desan, 2016). These effects were most pronounced for those whose primary function of the mobile device was social media. In contrast, younger participants (under 18 years) with higher PIU demonstrated a decrease in psychological distress when separated from their mobile device, most pronouncedly for social media users. These withdrawal effects are consistent with some previous reports concerning removal of stimulants, which can reduce anxiety and increase lethargy (Murray, 1988). Whatever the cause of these withdrawal effects, the effect of device removal for younger participants was strikingly different to that for older participants, and was greater for social media users.

The reasons underlying the apparently differing natures of withdrawal in younger and older participants require further exploration, but may include the function of internet access through the mobile device. Older participants may have more stressful lives, and need escape, whereas younger participants seek excitement. Thus, although the effect of age is indicative of an interesting controlling variable, any conclusion must remain speculative, as differences may reflect reasons other than age. The importance of mobile devices to older adults, perhaps using these devices for work emails, bills, banking, compared to younger users, who perhaps have, predominately, recreational usage, may impact any withdrawal effects.

Changes in psychological distress may not solely be associated with withdrawal effects, and could reflect the operation of mobile-removal induced stress, and the subsequent coping mechanisms. The difference between such effects and withdrawal is subtle, and would need to be explored further. It should be noted that there was a clear relationship between showing a change in psychological distress on removal of the mobile device, and showing a shift in colour preference. This phenomenon has been observed accompanying drug withdrawal in humans and nonhumans (Osborne et al., 2016; Yeomans et al., 2005), and implies the presence of withdrawal in the current experiment. Irrespective of the nature of the withdrawal effects, the presentation of the mobile did serve to elevate the psychological correlates, and appeared to endow any associated cues with positive hedonic properties (Osborne et al, 2016).

The current study was exploratory and attempted to highlight potential areas for further investigation. An area for further analysis is the precise impact of age, as each group contained a range. In particular, the younger group (12 to 14 years) may display within-group developmental changes. Preliminary analysis shows no relationship between age and internet addiction in this group ($r(50)=.069$, $p>.60$), but caution needs applying over statistical power involved. The nature of the data precluded parametric multivariate approaches, or exploration of the potential interactions. The alternative multiple testing allows possibly inflated error rates (somewhat offset by the reduction in power occasioned by nonparametric procedures). This study focused on subjective measures of emotion, and using a broader set of measures, perhaps that may show greater sensitivity to change over a short time period, would be a good addition. Furthermore, withdrawal includes cognitive, physiological, and emotional responses. While the psychological characteristics of withdrawal are as important as physiological changes, including physiological responses would bolster the findings (see Reed et al., 2017).

In summary, the current results demonstrated that withdrawal effects for those with higher levels of internet addiction can be seen in samples whose prime access of the internet is through mobile devices. These withdrawal effects were stronger in those whose main usage of the mobile device was social media. However, younger and older participants differed in the nature of the withdrawal effect that was noted. Younger participants demonstrated a decrease in psychological distress on removal of the mobile device, consistent with social media serving an arousing function. In contrast, older participants showed an increase in distress, indicating usage served a sedative function.

Declarations

Compliance with Ethical Standards: Informed Consent

All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2000 (5). Informed consent was obtained from all patients for being included in the study.

References

Aydın, B. (2017). Resorting to Internet: A look at university students' problematic Internet use through meaning in life, self-efficacy and self-esteem. *Journal of Human Sciences* 14, 1938-1950.

Bjelland, I., Dahl, A., Haug, T., and Neckelmann, D. (2002). The validity of the Hospital Anxiety and Depression Scale. *Journal of Psychosomatic Research* 52 (2), 69–77.

Blanco, C., Moreyra, P., Nunes, E. V., Saiz-Ruiz, J., & Ibanez, A. (2001, July). Pathological gambling: addiction or compulsion?. In *Seminars in clinical neuropsychiatry* (Vol. 6, No. 3, pp. 167-176).

Boffo, M., Mannarini, S., & Munari, C. (2012). Exploratory Structure Equation Modeling of the UCLA Loneliness Scale: A contribution to the Italian adaptation. *TPM – Testing, Psychometrics, Methodology in Applied Psychology*. Vol. 19, No. 4, 345-363.

Caplan, S. E. (2018). *The Changing Face of Problematic Internet Use: An Interpersonal Approach*. Peter Lang International Academic Publishers.

Carbonell, X., Chamarro, A., Oberst, U., Rodrigo, B., & Prades, M. (2018). Problematic use of the internet and smartphones in university students: 2006–2017. *International journal of environmental research and public health*, *15*(3), 475.

Costa, R. M., Patrão, I., & Machado, M. (2019). Problematic internet use and feelings of loneliness. *International journal of psychiatry in clinical practice*, *23*(2), 160-162.

Costantini M, Musso M, Viterbori P, et al. (1999). Detecting psychological distress in cancer patients: validity of the Italian version of the Hospital Anxiety and Depression Scale. *Support Care Cancer*, 7, 121-7.

Covi, L., Lipman, R. S., Pattison, J. H., Derogatis, L. R., & Uhlenhuth, E. H. (1973). Length of treatment with anxiolytic sedatives and response to their sudden withdrawal. *Acta*

Psychiatrica Scandinavica, *49*(1), 51-64.

Gray-Little, B., Williams, V.S.L., & Hancock, T. D. (1997). An item response theory analysis of the Rosenberg Self-Esteem Scale. *Personality and Social Psychology Bulletin*, 23, 443-451.

Ferraro, G., Caci, B., D'amico, A., & Blasi, M. D. (2006). Internet addiction disorder: an Italian study. *CyberPsychology & Behavior*, 10(2), 170e175.

Griffiths, M. (2000). Internet addiction-time to be taken seriously?. *Addiction research*, *8*(5), 413-418.

Ioannidis, K., Treder, M. S., Chamberlain, S. R., Kiraly, F., Redden, S. A., Stein, D. J., ... & Grant, J. E. (2018). Problematic internet use as an age-related multifaceted problem: Evidence from a two-site survey. *Addictive behaviors*, *81*, 157-166.

Khan, Z. A., Whittal, C., Mansol, S., Osborne, L. A., Reed, P., & Emery, S. (2013). Effect of depression and anxiety on the success of pelvic floor muscle training for pelvic floor dysfunction. *Journal of obstetrics and gynaecology*, *33*(7), 710-714.

Kuss, J.D., Griffiths, M., Karila, L., & Billieux, J. (2014). Internet addiction: A systematic review of epidemiological research for the last decade. *Current pharmaceutical design*, *20*(25), 4026-4052.

Kuss, D. J., & Lopez-Fernandez, O. (2016). Internet addiction and problematic Internet use: A systematic review of clinical research. *World journal of psychiatry*, *6*(1), 143.

Kuss, D.J., van Rooij, A.J., Shorter, G.W., Griffiths, M.D., & van de Mheen, D. (2013). Internet addiction in adolescents: Prevalence and risk factors. *Computers in Human Behavior*, 29, 1987-1996

Lu, X., Yeo, K. J., Guo, F., & Zhao, Z. (2019). Factor structure and a multiple indicators multiple cause model of internet addiction test: the effect of socio-demographic and internet use variables. *Current Psychology*, 1-13.

McDonald, J. H. (2009). *Handbook of biological statistics* (Vol. 2, pp. 6-59). Baltimore, MD: Sparky House Publishing.

Mei, S., Yau, Y. H., Chai, J., Guo, J., & Potenza, M. N. (2016). Problematic Internet use, well-being, self-esteem and self-control: Data from a high-school survey in China. *Addictive behaviors*, *61*, 74-79.

Murray, J. B. (1998). Psychophysiological aspects of amphetamine-methamphetamine abuse. *The Journal of psychology*, *132*(2), 227-237.

Nowland, R., Necka, E. A., & Cacioppo, J. T. (2018). Loneliness and social internet use: pathways to reconnection in a digital world?. *Perspectives on Psychological Science*, *13*(1), 70-87.

Odacı, H., & Çikrıkci, Ö. (2017). Differences in Problematic Internet Use based on Depression, Anxiety, and Stress Levels. *Addicta: The Turkish Journal on Addictions*, *4*, 41-61.

Oldham, M. A., & Desan, P. H. (2016). Alcohol and sedative-hypnotic withdrawal catatonia: two case reports, systematic literature review, and suggestion of a potential relationship with alcohol withdrawal delirium. *Psychosomatics*, *57*(3), 246-255.

Osborne, L. A., Romano, M., Re, F., Roaro, A., Truzoli, R., & Reed, P. (2016). Evidence for an internet addiction disorder: internet exposure reinforces color preference in withdrawn problem users. *The Journal of clinical psychiatry*, *77*(2), 269-274.

Prezza, M., Trombaccia, F. R., & Armento, L. (1997). La scala dell'autostima di Rosenberg: Traduzione e validazione italiana. *Bollettino di Psicologia Applicata*, 223, 35-44.

Reed, P., Romano, M., Re, F., Roaro, A., Osborne, L. A., Viganò, C., & Truzoli, R. (2017). Differential physiological changes following internet exposure in higher and lower problematic internet users. *PloS one*, *12*(5), e0178480.

Romano, M., Osborne, L. A., Truzoli, R., & Reed, P. (2013). Differential psychological

impact of internet exposure on internet addicts. *PLoS One, 8*(2), e55162.

Rosenberg, M. (1965). Society and the adolescent self-image. Princeton, NJ: Princeton University Press.

Rosenberg, M. (1979). *Conceiving the Self*. New York: Basic Books.

Russell, D. (1996). UCLA Loneliness Scale (Version 3): Reliability, validity, and factor structure. *Journal of Personality Assessment* 66 (1), 20-40.

Shapira, N. A., Goldsmith, T. D., Keck Jr, P. E., Khosla, U. M., & McElroy, S. L. (2000). Psychiatric features of individuals with problematic internet use. *Journal of affective disorders, 57*(1-3), 267-272.

Škařupová, K., Ólafsson, K., & Blinka, L. (2016). The effect of smartphone use on trends in European adolescents' excessive Internet use. *Behaviour & Information Technology, 35*(1), 68-74.

Vigna-Taglianti, F., Brambilla, R., Priotto, B., Angelino, R., Cuomo, G., & Diecidue, R. (2017). Problematic internet use among high school students: Prevalence, associated factors and gender differences. *Psychiatry research, 257*, 163-171.

Yeomans, M. R., Durlach, P. J., & Tinley, E. M. (2005). Flavour liking and preference conditioned by caffeine in humans. *The Quarterly Journal of Experimental Psychology Section B, 58*(1), 47-58.

Zeng, W., Ye, K., Hu, Y., & Ma, Z. W. (2016). Explicit self-esteem, loneliness, and pathological Internet use among Chinese adolescents. *Social Behavior and Personality: an international journal, 44*(6), 965-972.

Zigmond, A. S., & Snaith, R. P. (1983). The Hospital Anxiety and Depression Scale. *Acta Psychiatrica Scandinavica, 67*(6), 361–370.

Figure 1: Group-mean change scores (post-mobile use minus pre-mobile use) for distress scores (HADS_T) for the lower and higher internet addiction groups, and groups not using social media and using social media as their main use of their mobile phone, for younger and older participants.