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Short Abstinence from Online Social Networking Sites Reduces Perceived Stress, Especially in Excessive Users

Highlights

- Abstinence and stress are clinically significant in cases of excessive technology use
- We study the effects of several days of social media abstinence on perceived stress
- We employed a pre(t1) -post(t2), case (abstinence) - control (no abstinence) design
- Abstinence of about one week produced stress reduction
- Stress reduction was significantly more pronounced in excessive users.

Abstract

Online social networking sites (SNSs), such as Facebook, provide frequent and copious social reinforcers (e.g., "likes") delivered at variable time intervals. As a result, some SNS users display excessive, maladaptive behaviors on these platforms. Excessive SNS users, and typical users alike, are often aware of their intense use and psychological dependence on these sites, which may lead to elevated stress. In fact, research has demonstrated that use of SNSs alone induces elevated stress. Other research has begun to investigate the effects of short periods of SNS abstinence, revealing beneficial effects on subjective wellbeing. We aligned these two lines of research and hypothesized that a short period of SNS abstinence would induce a reduction in perceived stress, especially in excessive users. Our results confirmed our hypothesis and revealed that both typical and excessive SNS users experienced reduction in perceived stress following SNS abstinence. The effects were particularly pronounced in excessive SNS users. The reduction in stress was not associated with academic performance increases. These results indicate a

benefit—at least temporarily—of abstinence from SNSs and provide important information for therapists treating patients who struggle with excessive SNS use.

Keywords: Social media, social networking sites, Facebook, Excessive use, Addiction, Abstinence, Stress

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1. Introduction

When humans obtain a reward that is temporally linked to their behavior, they will likely perform that behavior again—in other words, the behavior has been reinforced (Sutton and Barto, 1998). Reinforcement occurs to a greater degree when rewards are obtained on a variable, intermittent reward schedule (Ferster and Skinner, 1957). This type of reinforcement can lead to substance abuse and behavioral addictive disorders (Clark and Limbrick-Oldfield, 2013; Everitt and Robbins, 2005). Online social networking sites (SNSs) like Facebook provide myriad social rewards delivered on a frequent yet variable basis (Meshi et al., 2015), and the neuroscience underlying this social reward processing is similar to the neuroscience underlying the processing of other, potentially addictive rewards (He et al., 2017a, 2018; He et al., 2017b; Meshi et al., 2016; Meshi et al., 2013a, b; Meshi et al., 2015; Turel et al., 2018a; Turel et al., 2018b, c; Turel et al., 2014). In addition, similar to other more established addictions, some people engage with SNSs compulsively and display salience, withdrawal, relapse, tolerance, mood modification and conflict symptomology (Griffiths et al., 2014). Consequently, the concept of excessive SNS use, sometimes termed as SNS "addiction", has emerged as a potential disorder that merits research. To note, agreement regarding use of the term addiction (versus terms such as excessive or problematic use) to describe such issues and regarding classification criteria is still lacking

(Carbonell and Panova, 2017). Therefore, here we use the term excessive SNS use and define it as a state of dependency on the use of these platforms manifested by a maladaptive obsessive-compulsive pattern of engaging in and pursuing SNS use (Turel et al., 2014).

We specifically focus on Facebook in this study, given that it is among the most popular social media sites, and the accumulating evidence that some of its users can present excessive behaviors that manifest in addiction-like symptomology(Banyai et al., 2017; Turel et al., 2018d; Turel and Qahri-Saremi, 2016). Classification criteria that have been proposed for this phenomenon are similar to those used in DSM 5 for classifying pathological gamblers. Using these criteria for classifying people as excessive users, a sample can be divided into an "at risk" group (presenting symptoms similar to those observed in other excessive behaviors) and a low/no-risk group (Banyai et al., 2017). Among Facebook users, the at-risk group is often over 10%; for example 15.2% in (Turel et al., 2018a) and 17.8% in (Tang et al., 2016).

Excessive SNS users are likely aware of the harm that their problematic state inflicts on their lives (Griffiths et al., 2014). This awareness may instigate stress, which reflects a sense of psychological and emotional difficulty in a situation or life in general (McEwen, 2007). Indeed, experiencing addiction-related symptoms in the context of technology use can be stressful (Samaha and Hawi, 2016), and so is the mere use of an SNS (Afifi et al., 2018). One line of research in the literature thus far has examined various possibly stressful outcomes of excessive SNS use, including for example reduced wellbeing, mental health, and social and academic functioning (Baker and Algorta, 2016; Junco, 2012; Tromholt, 2016; Verduyn et al., 2017). Another line of research has examined the growing trend of abstaining from SNS use in response to the induced stress and inhibition of daily functioning (Maier et al., 2015a; Maier et al., 2015b; Turel, 2015). Thus far, these research streams have not been integrated and knowledge regarding

possible effects of abstinence from SNS use on stress, especially in excessive SNS users, is lacking.

The interplay between abstinence from SNS use and stress merits a research focus for several reasons. First, SNS abstinence attempts can be part of treatment protocols for people who present with excessive SNS use (Young and Brand, 2017). Second, people who feel they simply use social media too much may attempt abstinence from SNSs as a key self-improvement tactic (Turel, 2015, 2016). Third, in the context of abstinence from substance addiction, increases in stress can induce relapse in both humans (Hall et al., 1990) and animals (Shaham et al., 2000). With the above in mind, we conducted a study to address whether several days of abstinence from SNS use changes people's perceived stress levels.

On the one hand, the disengagement from SNS use could increase stress, because breaking use habits is hard, and people may experience stressors such as withdrawal, temporary social isolation, emptiness, reduced rewards (Turel, 2015, 2016) and increased fear-of-missing-out (Przybylski et al., 2013). On the other hand, abstaining from SNS use may reduce stress by allowing people to reduce what is perceived to be a forced constant investment in social relationship maintenance (Fox and Moreland, 2015). SNS abstinence may also allow for an increased focus on other meaningful activities, as well as reduced social comparisons (Tromholt, 2016), and reduced overload of information and exhaustion (Maier et al., 2015a; Maier et al., 2015b). While evidence in support of both arguments exists, the literature suggests that the possible stress reduction effects of abstinence are typically stronger. For example, in a large study with 1,095 participants, people who abstained from Facebook for one week experienced improved wellbeing compared to controls (Tromholt, 2016). Moreover, activity on Facebook (compared to no activity) can negatively affect people's mood (Sagioglou and Greitemeyer,

2014). Therefore, we hypothesize that SNS abstinence for several days will reduce people's levels of perceived stress **(H1)**.

With specific regard to abstinence in excessive SNS users and stress, this knowledge is lacking—no study has yet investigated this topic. This gap impedes progress in the development of efficacious self-cure and professional interventions. Similar to the discussion above, two forces may operate regarding abstinence and stress in excessive SNS users. On the one hand, people with stronger addiction symptomology are likely to experience stronger withdrawal symptoms and more negative mood, which can be viewed as stressors, during abstinence periods (Koob and LeMoal, 1997). On the other, people with stronger addiction symptomology have more to benefit from abstinence; it allows them to take control over their lives, and restore normal social, academic and work functioning (Turel, 2015, 2016). While there is no direct evidence regarding which set of forces is stronger, it has been shown that heavy SNS users and those who experience stronger envy for others (not necessarily excessive users, though) experience larger wellbeing improvements over a one-week abstinence period (Tromholt, 2016). Assuming that excessive SNS users align more with the heavy and envious user groups in Tromholt (2016), it is reasonable to hypothesize that the stress reduction hypothesized in H1 would be larger in excessive SNS users **(H2)**.

2. Method

2.1. Participants

Students (n = 555, 238 women, M_{age} =24.01) were recruited from a large introductory-level course at a university in the U.S. by an in-class announcement asking them to participate in a study about Facebook use behaviors. All procedures were approved by the Institutional Review Board of the university and participation was voluntary and encouraged with extra credit points

for the course. Only those who used Facebook as their primary social media site and were at least 18 years old at the time of study were included. For sample characteristics, please see Table 1.

2.1. Procedure

We employed a randomized 2 x 2 factor design: treatment (abstain/control) and SNS use (typical/excessive). Twenty sections of the course (~40 students in each section) were randomly either asked to abstain from Facebook use[1] (abstain condition; 15 course sections yielding 413 participants; 68.8% response rate, 170 women, , M_{age} =24.26) or given no instruction regarding their SNS use (control condition; 5 course sections yielding 142 participants; 71.0% response rate, 68 women, , M_{age} =23.29). The use of different sections of the same class ensured no overlap between treatment conditions. The control group completed two online surveys (see Measures section below) at t1 and t2, one week apart. The abstain group completed the same surveys but, importantly, participants in this group were allowed to resume SNS use earlier than one week if they felt they could not abstain any longer and they were instructed to complete the second survey before use resumption. We chose an abstinence target period of one week because we wanted to balance the feasibility of the study, not asking for longer abstinence periods, and the effects of the intervention, which may be smaller in shorter periods of abstinence. Shorter abstinence periods may also result in stress increases (Elhai et al., 2018), which are presumed to

[1] Language used in the treatment condition: "In between the surveys, you are asked embrace a personal challenge- to abstain from using Facebook for up to one week (seven days). To do this, we ask that you log out of Facebook on your computer, cellphone, tablet and any other devices, and that you consider uninstalling the app from your phone or tablet. If you find that you absolutely cannot make it the full seven days, please complete survey 2 before you resume use of Facebook."

be temporary and may be overcome over time (people may get used to the abstinence idea, and learn to enjoy it).

---Table 1---

2.3. Measures

Survey 1 captured descriptive information regarding demographics, social media use, as well as severity of addiction symptoms that characterize excessive SNS use; and psychological stress in the previous week. Survey 2 captured psychological stress in the previous, experimental week. See items in the Appendix. We used self-reports because they are reasonably reliable. For example, prior research has demonstrated moderate significant correlations between self-reported social media behavior and actual behavior (Burke et al., 2010; Junco, 2013) and between self-reported and physiological markers of stress (Walvekar et al., 2015).

2.3.1 Descriptive Variables

Age [Years] was captured with a numerical entry. Sex was captured with a binary choice variable [Women=1]. Facebook use profile was captured with seven-point Likert scales. For Facebook contacts the scale ranged from 1="0-10" to 7=" more than 1000"; for use frequency it ranged from 1="less than once a week" to 7="many times per day"; for days per week it ranged from 1="one" to 7="seven/ every day"; for hours per day it ranged from 1="less than 1" to 7="at least 6"; for overall use extent it ranged from 1="very light use" to 7="very heavy use". Abstinence time was captured in survey 2 of the abstain group with an eight-point Likert scale ranging from 1="less than 1 day" to 8="the whole week". Grade point average (GPA) for the semester prior to the study semester, as well as for the semester in which the study was conducted (recorded about 8 weeks after the study) were collected from the university's system.

2.3.2 Study Variables

Excessive SNS use was captured with the Bergen Facebook Addiction Scale (BFAS) (Andreassen et al., 2012). Each item of this scale captures the frequency (1=" rarely/never" to 7="very often") of symptoms that characterize excessive use (salience, withdrawal, tolerance, mood modification, relapse and conflict). The scale was reliable (α_{all} =0.90, $\alpha_{control}$ =0.89, α_{case} =0.90). Therefore, its sum reasonably represented the level of one's excessive SNS use symptoms. Regarding the sum, there is no agreed upon threshold cutoff for a clinical classification. Nevertheless, based on clustering and classification techniques, it has been suggested that a score of 19 on a five-point scale (Banyai et al., 2017) and 26.6 on a seven-point scale (Turel et al., 2018a) can be used for separating typical Facebook users from excessive ones. The 26.6 cutoff was employed in this study.

Stress was assessed in both surveys with the short version of the perceived stress scale (Cohen et al., 1983). The items captured the frequency of feeling stressed using a 1="never" to 7="almost always" scale. The measure was reliable in both surveys (Survey 1: α_{all} =0.90, $\alpha_{control}$ =0.89, α_{case} =0.91; Survey 2: α_{all} =0.89, $\alpha_{control}$ =0.90, α_{case} =0.89). Change in stress was operationalized in two ways. First, a simple difference between the stress scores (t1 stress minus t2 stress) was calculated. Second, a relative change score was calculated by taking this difference and dividing it by the baseline stress (t1 stress). This operationalization implies that an absolute change in stress can be considered more substantial if the baseline stress is lower; and less substantial when baseline stress is higher.

Relative change in academic performance was used as a potential long term exogenous indictor for the possible effect of the intervention. It was operationalized as the difference between the GPA in the semester of the study and the GPA of the prior semester divided by the GPA of the prior semester.

2.4. Statistical Analyses

All analyses were conducted with SPSS 24. Bootstrapping with 1,000 re-samples and 95% bias-corrected confidence intervals (CI) was employed in order to circumvent distributional assumptions. We used Pearson correlations with two-tailed significance to test whether absolute and relative change in stress, initial stress, stress at t2 and BFAS scores correlated with abstinence duration. We tested our research questions with two-way analysis of covariance models. These examined the effects of treatment (abstain or control), SNS use group (typical or excessive), and their interaction, on the two operationalizations of change in stress (absolute and relative), after controlling for age and sex. We also used analysis of variance models to examine possible differences in initial stress levels between the abstain and control groups, in stress reduction between the sexes, and in stress reduction between the excessive SNS use groups in both the abstain and control samples. Lastly, we used a regression model to predict how changes in stress may translate into changes in academic performance, and ANCOVA to see if there is a direct effect of abstinence treatment on academic performance changes.

3. Results

Multivariate Analysis of Variance (MANOVA) indicated that the abstain and control groups did not have omnibus differences in their Facebook use facets (contacts, use frequency, days per week, hours per day, overall use extent, and addiction symptoms) and academic performance (prior semester's GPA) (Pillai's Trace=0.020, $F_{7,544}$=1.60, p=0.13). They were therefore deemed to be reasonably equivalent before the treatment intervention. In contrast, a second MANOVA model indicated that the typical SNS use and excessive SNS use groups differed significantly in the abovementioned Facebook use facets (Pillai's Trace=0.354, $F_{6,545}$=49.67, p<0.001). Facebook contacts, use frequency, days per week, hours per day, and overall use extent were significantly

larger in the excessive SNS use group (at least at $p<0.024$). Prior semester's GPA did not significantly differ between the excessive and normal use groups ($p<0.31$). These differences and similarities are expected and further support sample validity.

Most participants in the abstain group (251, 61.8%) managed to cease Facebook use for the whole week. A group of 99 (24.0%) managed to abstain for a large portion of the week (4-6 days). A minority (63, 15.2%) managed to abstain for less than 4 days. Abstinence duration, without accounting for covariates, was not significantly correlated with stress at t1 or with absolute and relative change in stress. It was significantly negatively correlated with stress at t2 (r=-0.14, p=0.004, 95%CI=[-0.23,-0.04]) and with excessive use scores (r=-0.11, p=0.026, 95%CI=[-0.21,-0.01]). This suggests that people with excessive SNS use and higher stress during the abstinence period were relatively less successful at maintaining abstinence. Regarding baseline stress (at t1), ANOVA indicated no significant difference (p=0.88) between the baseline stress of the abstain group (mean=4.10, SD=1.50, 95%CI=[3.95,4.24]) and the control group (mean=4.12, SD=1.31, 95%CI=[3.90,4.33]). Hence, the samples were equivalent in their initial stress levels.

ANCOVA results for the two outcome variables (controlling for age, sex, and the prior semester's GPA) are given in Table 2. The results are largely consistent across outcomes. The first part of the table addresses H1. It shows that when collapsing across SNS use types in the samples, the abstain group reported a significantly larger ($p<0.035$) absolute decrease in stress (95%CI=[0.62;0.82]) compared to the control group (95%CI=[0.33;0.68]). The difference in relative stress reduction between the abstain (95%CI=[0.10;0.17]) and control (95%CI=[0.04;0.15]) groups was in the expected direction but not significant ($p<0.139$).

The second part of the table addresses H2. After accounting for age and sex effects, reduction in stress was influenced by the interaction between treatment (abstain/control) and SNS use type (typical/excessive). In the control group, there were no significant differences between the stress reductions (p<0.51 for absolute reduction and p<0.41 for relative reduction) of typical (absolute 95%CI=[0.34;0.70]; relative 95%CI=[0.05;0.15]) and excessive (absolute 95%CI=[-0.14;0.80]; relative 95%CI=[-0.14;0.17]) users. These differences became pronounced (p<0.001 for absolute reduction and p<0.002 for relative reduction) in the abstain group (Typical users: absolute 95%CI=[0.50;0.72]; relative 95%CI=[0.08;0.15]; Excessive users: absolute 95%CI=[-1.14;1.76]; relative 95%CI=[0.22;0.33]). Stress reductions as a function of the treatment and SNS use type are displayed in Figure 1.

---Table 2---

---Figure 1---

Table 2 indicates that sex was also a differentiator. A supplemental ANOVA revealed that females had significantly higher stress reduction compared to males (95% CI for absolute change in stress: males=[0.46;0.69], females=[0.65;0.90], p=0.04; 95% CI for relative change in stress: males=[0.06;0.13], females=[0.13;0.19], p=0.01). Splitting the sample to abstain and control groups revealed that these differences in sex are mostly in the control group (Absolute stress difference: p<0.008; Relative stress difference: p<0.013) and not in the abstain group (not significant for both absolute and relative stress change measures).

We next tested post-hoc whether the changes in stress due to abstinence from SNS and abstinence treatment can contribute to GPA changes. A regression model revealed that after controlling for sex (β=0.03, p<0.53), age (β=-0.03, p<0.50), treatment (β=-0.08, p<0.057) and excessive use classification (β=-0.104, p<0.015), relative reduction in stress did not significantly

increase one's relative GPA improvement (β=0.039, p<0.359). Repeating the model with the absolute stress variable instead of the relative ones also revealed no significant association between stress reduction and GPA improvement (β=0.033, p<0.446). ANCOVA with indicators for excessive use and treatment group as the dependent variables, and sex and age controls revealed no significant effects on GPA changes ($p_{treatment}$<0.080, $p_{SNS\ Use\ Type}$<0.124, $p_{interaction}$<0.436).

4. Discussion

This study sought to examine (1) whether abstinence for one week from social media use can change people's perceived stress, and (2) whether this stress reduction differs with respect to excessive SNS users. Regarding the first research question, we hypothesized that short-term abstinence from social media use leads to a reduction in stress. Our findings support this hypothesis when tested with absolute stress reduction, although the results for relative stress reduction are inconclusive. This suggests that, in line with prior research (Sagioglou and Greitemeyer, 2014; Tromholt, 2016), regardless of degree of SNS use, temporarily quitting SNSs can be beneficial in terms of absolute stress reduction (initial stress minus stress a week later). This stress reduction was positively but not significantly associated with relative improvement in academic performance in the semester in which the study was done; the act of abstaining from SNS did not have a significant direct effect on GPA increase. Future research should consider using both stress reduction measures, absolute and relative, while acknowledging that the relative change measure may be more conservative, as our manipulation and analysis did not reveal a difference. It should also examine possible outcomes of stress reduction, such as academic performance changes.

Regarding the second research question, we hypothesized that a reduction in stress will be more substantial for excessive SNS users compared to typical SNS users. Our hypothesis was supported as we found reductions in both absolute and relative change in perceived stress due to our abstinence manipulation. Our results demonstrate that the interaction of treatment and SNS use type predicts stress reduction; while there was no significant stress reduction in the control group, both absolute and relative stress reductions were significantly larger in the excessive SNS group. This extends the findings of prior abstinence research focusing on light vs. heavy Facebook users and changes in wellbeing (Tromholt, 2016) to the area of clinically relevant excessive SNS use and changes in stress.

Our findings suggest that if people with strong SNS addiction-like symptomology can be convinced to abstain from social media use (e.g., by parents, teachers, or therapists), they may have much to benefit in terms of stress reduction. Stress reduction should not be taken lightly in this context, because other interventions that demonstrate reduced stress, such as mindfulness meditation, improve wellbeing, as well as physical and mental health (Grossman et al., 2004). Furthermore, reduced stress due to abstinence supports the maintenance of quitting attempts among excessive SNS users, and may prevent relapse and reinstatement (Shaham et al., 2000; Sinha, 2001). Hence, strategies such as "#ditchfacebook", or "#dropfacebook"—which are modern adaptations of self-detoxification strategies commonly employed in substance (Cinciripini et al., 1995) and behavioral addictions (Bruner and Bruner, 2006)—may help, at least in the short run, in people who present excessive SNS use and the accompanying addiction symptomology.

Additional implications beyond the hypothesized associations are noteworthy. First, as per the ANCOVA results, people with higher initial stress were relatively less successful at

maintaining SNS abstinence. This is in line with prior research on the role of stress in promoting relapse and low motivation for abstinence (Niaura et al., 2002). From a practical standpoint in the current context, our finding suggests that therapists and SNS users could improve the likelihood of success in abstinence attempts by reducing stress levels before the attempt commences. Techniques such as mindfulness training may work (Grossman et al., 2004), but their efficacy in the examined context should be tested in future research. Second, our results regarding sex-based differences are informative. Our findings indicated that women had a higher stress reduction compared to men, but that this took place in the control group only, without any intervention. This may be explained by the idea that women were perhaps more stressed by the initial survey itself, and upon experiencing no negative outcomes after the survey at t1, this alleviated stress for them when taking the survey at t2. In contrast, not using SNSs in the abstain group might have prevented such stress declines in women. Such sex-based differences in stress processing are common (Turel et al., 2018d), but merit further research. In the meantime, specifically with regard to abstinence, it appears that the sexes respond to ceasing SNS use with a relatively equal stress reduction. Thus, therapists and SNS users may expect (until further evidence is found) similar effects on stress reduction in both men and women with an abstinence in SNS use.

It is also worth noting that while this study has focused on stress reduction, the findings may be extended to other undesirable traits and states. For example, excessive Internet use can be linked to reduced self-esteem, increased narcissism, and increased use of "selfies" on social media (Pantic et al., 2017); Facebook intrusion (which is likely high among excessive users) is negatively associated with satisfaction with life (Blachnio and Przepiorka, 2018); and involuntarily losing access to social media for two days can be associated with anxiety and

depression (Elhai et al., 2018). Hence, abstinence from social media use may have broader implications, beyond stress, that should be studied in future research. Moreover, differences in emotion regulation may explain some of the variation in the observed stress reduction; it has been shown that when imagining losing access to social media for two days, increased suppression of emotion regulation and reduced cognitive reappraisal contribute to elevated levels depression and stress (Elhai et al., 2018). This implies that including variables such as emotion regulation in future research, can help "opening the black-box" between voluntary abstinence from social media and its outcomes, such as changes in stress levels and improved academic performance; and explain why some people are more resistant (or sensitive) than others to abstinence conditions.

Several limitations are noteworthy. First, our sample was limited to North American university students with active Facebook accounts, and our manipulation of social media abstinence concerned only Facebook use. Although university students are among the most active users of social networking sites, and Facebook is among the most popular of these sites, additional studies will be required to increase the generalizability of these results. Second, psychological stress was self-reported in ours study, and we did not account for many potential confounds, especially exogenous stressors (e.g., menstrual cycle, life stressors). Future research should collect physiological measures. Moreover, while our manipulation worked under the assumption that exogenous stressors average across the groups, future work may extend our findings by measuring and controlling for confounding variables. Finally, this study relied on a trust system regarding abstinence. Subjects in the abstinence group were encouraged to log out and uninstall the app from their phones, but whether they actually abstained or not could not be

tested. Future research should consider finding subjective measures of abstinence or ethical ways to enforce abstinence.

5. Conclusions

Online social networking sites provide a valuable resource of beneficial social rewards, but these rewards can reinforce behaviors, and excessive use of these online platforms may develop. This excessive use may interfere with daily functioning and has motivated therapists and SNS users to develop strategies for reducing frequent checking and time spent online. Our findings demonstrate that a short abstinence from SNS use results in reduced perceived stress, especially in excessive SNS users. Our results are encouraging; they provide evidence that current SNS quitting strategies have benefits—at least temporarily. Furthermore, our results provide important information for therapists treating patients who struggle with excessive SNS use.

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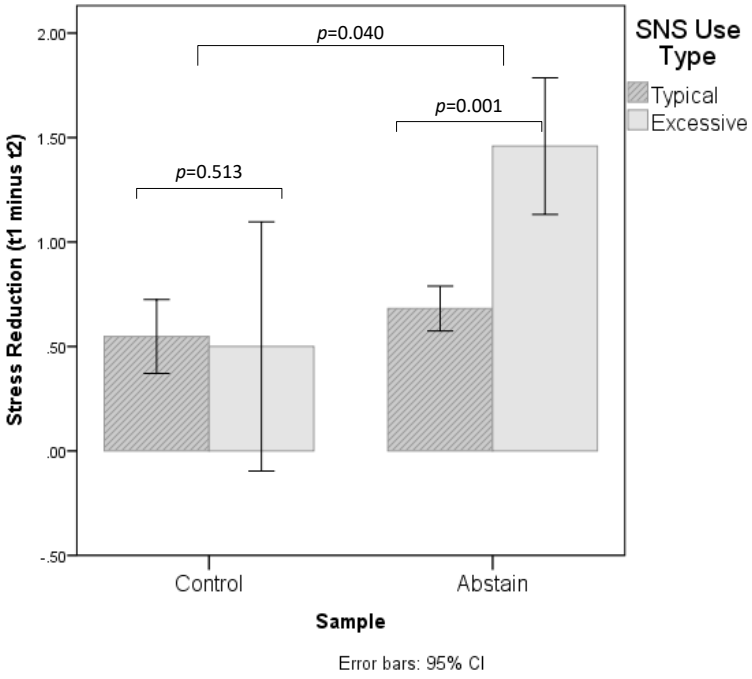
Figures

Panel A:



Panel B:

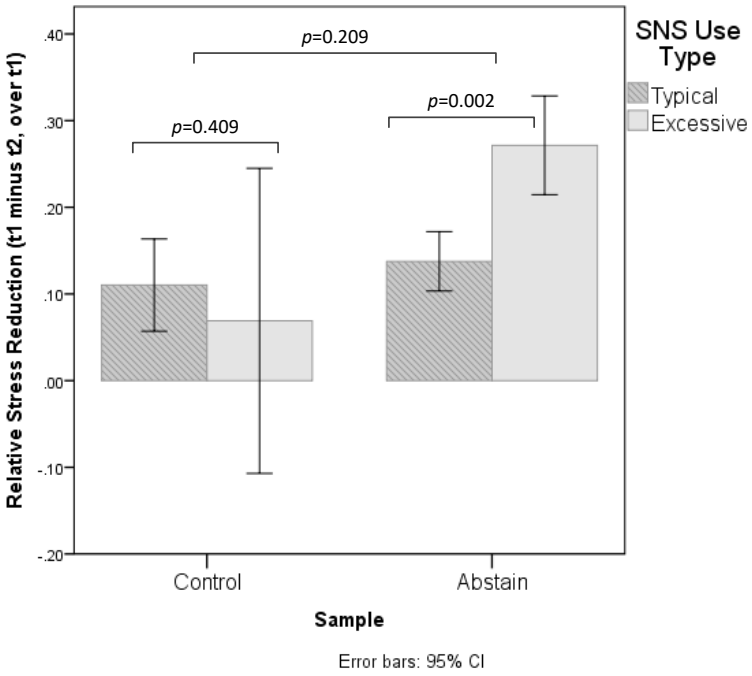


Figure 1: Comparison of stress reduction (Panel A: Absolute reduction; Panel B: Relative reduction) between the abstain and control groups and the typical and excessive SNS groups.*

* ANOVA-based (with no controls) two-tailed *p*-values are reported for between- and within-group comparisons on the charts

Tables

Table 1: Attributes of Samples

	Control Group (n=142)			Abstain Group (n=413)		
	Typical SNS	**Excessive SNS**	**All**	**Typical SNS**	**Excessive SNS**	**All**
n	128 (90.14%)	14 (9.86%)	142	364 (88.14%)	49 (11.86%)	413
Sex [Male/Female]	69/59	5/9	74/68	218/146	25/24	243/170
Age [Mean, Range, (SD)]	23.43, 20-38 (3.31)	22.00, 19-28 (2.29)	23.29, 19-38 (3.24)	24.30, 20-54 (5.12)	23.92, 20-40 (4.47)	24.26, 20-54 (5.04)
Facebook Contacts [Mean (SD)]	4.69 (1.47)	5.00 (1.30)	4.72 (1.45)	4.48 (1.59)	5.04 (1.24)	4.55 (1.56)
Facebook Use Frequency [Mean (SD)]	4.59 (2.32)	5.93 (1.77)	4.72 (2.30)	4.43 (2.24)	6.18 (1.27)	4.63 (2.22)
Facebook Days/Week [Mean (SD)]	4.15 (2.42)	6.50 (1.60)	4.38 (2.45)	4.07 (2.41)	6.45 (1.12)	4.35 (2.42)
Facebook Hours/Day [Mean (SD)]	1.84 (1.14)	4.14 (1.87)	2.07 (1.40)	1.95 (1.32)	4.76 (1.81)	2.28 (1.66)
Overall Facebook Use Extent [Mean (SD)]	2.69 (1.67)	5.36 (1.22)	2.95 (1.82)	2.71 (1.54)	5.29 (1.12)	3.02 (1.71)
Excessive Facebook Use Score [Mean (SD)]	11.49 (5.30)	30.57 (3.06)	13.37 (7.67)	12.37 (5.71)	30.96 (3.36)	14.58 (8.14)
GPA - Prior semester [Mean (SD)]	2.76 (0.57)	2.93 (0.49)	2.77 (0.57)	2.71 (0.54)	2.75 (0.51)	2.71 (0.54)
GPA - Study semester [Mean (SD)]	2.83 (0.63)	2.99 (0.70)	2.85 (0.64)	2.72 (0.65)	2.51 (0.67)	2.70 (0.66)
Abstinence Days [Mean (SD)]	N/A			6.79 (1.97)	6.38 (2.28)	6.75 (2.01)

Table 2: Analysis of Covariance Results for Stress Reduction[*,**]

		Outcome= Absolute stress difference				Outcome= Relative stress difference			
	Source	**F**	**Sig.**	**Partial Eta^2**	**Marginal Means**	**F**	**Sig.**	**Partial Eta^2**	**Marginal Means**
Model For testing H1	Sex	4.35	***0.037***	0.008	Co= 0.50 Ab= 0.72	6.05	***0.014***	0.011	Co= 0.09 Ab= 0.14
	Age	0.14	0.707	0.000		0.07	0.787	0.000	
	Prior Semester GPA	3.73	0.054	0.007					
	Treatment (Abstinence)	4.49	***0.035***	0.008		2.20	0.139	0.004	
Model For testing H2	Sex	3.59	0.059	0.007	Co= 0.40 Ab= 1.04	5.57	***0.019***	0.010	Co= 0.06 Ab= 0.19
	Age	0.08	0.775	0.000		0.09	0.758	0.000	
	Prior Semester GPA	4.335	***0.038***	0.008		2.34	0.126	0.004	
	Treatment (Abstinence)	13.48	***0.000***	0.024		6.33	***0.012***	0.011	
	Use Type (typical or excessive)	3.74	0.054	0.007		0.56	0.453	0.001	
	Treatment * Use Type	9.57	***0.002***	0.017		4.99	***0.026***	0.009	

* Co: Control; Ab: Abstain

** Significant effects at $p<0.05$ are bolded and italicized

Appendix

Survey Items:

Demographics

- What is your sex?

- What is your age?

Facebook Use Descriptors

- Approximately how many friends/connections/followers do you have on Facebook?

- Overall, how often do you use Facebook?

- Considering your average behavior for the previous 4 weeks ---- How many DAYS PER WEEK do you typically use Facebook?

- Considering your average behavior for the previous 4 weeks ---- How many HOURS PER DAY do you typically spend on using Facebook?

- Overall, how do you consider the extent of your current use of Facebook?

Excessive SNS Use

How often during the last year have you . . .

- Spent a lot of time thinking about Facebook or planned use of Facebook?

- Felt an urge to use Facebook more and more?

- Used Facebook in order to forget about personal problems?

- Tried to cut down on the use of Facebook without success?

- Become restless or troubled if you have been prohibited from using Facebook?

- Used Facebook so much that it has had a negative impact on your job/studies/ social life?

Psychological Stress

Please respond to the following questions regarding how you have you been feeling during the last week. In the last week [in survey 2: Since completing the first survey]…

- how often have you felt that you were unable to control the important things in your life?

- how often have you felt NOT confident about your ability to handle your personal problems?

- how often have you felt that things were NOT going your way?

- how often have you felt difficulties were piling up so high that you could not overcome them?