Computers in Human Behavior xxx (2012) xxx–xxx

Contents lists available at SciVerse ScienceDirect

Computers in Human Behavior

journal homepage: www.elsevier.com/locate/comphumbeh

An exploration of social networking site use, multitasking, and academic performance among United States and European university students

Aryn C. Karpinski [a,*], Paul A. Kirschner [b], Ipek Ozer [a], Jennifer A. Mellott [a], Pius Ochwo [a]

[a] School of Foundations, Leadership, and Administration, Kent State University, United States
[b] Centre for Learning Sciences and Technologies, Open University of the Netherlands, Netherlands

ARTICLE INFO

Article history:
Available online xxxx

Keywords:
Social networking sites
Academic performance
Multitasking

ABSTRACT

Studies have shown that multitasking with technology, specifically using Social Networking Sites (SNSs), decreases both efficiency and productivity in an academic setting. This study investigates multitasking's impact on the relationship between SNS use and Grade Point Average (GPA) in United States (US; $n = 451$) and European ($n = 406$) university students using quantitative and qualitative data analysis. Moderated Multiple Regression analysis results showed that the negative relationship between SNS use and GPA was moderated by multitasking only in the US sample. This may be due to European students being less prone to "disruptive" multitasking. The results provide valuable cautionary information about the impact of multitasking and using SNSs in a learning environment on university students' GPAs.

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0. Introduction

Most research on the use of Social Networking Sites (SNSs) and academic performance is parochial in scope, limited to a specific university or at most, a specific country. This exploratory study investigates the relationship between quantitative and qualitative SNS use (i.e., how often/how much are SNSs used and how/in what way are SNSs are used) and academic performance from an international perspective, comparing university students' usage and perceptions of multitasking in general and "multitasking" with SNSs in the United States (US) and Europe. The main research questions are: (1) Does multitasking moderate the relationship between SNS use and academic achievement for both US and European students? and (2) How do university students' perceptions of multitasking and SNS use compare in the US and Europe?

Academic information (i.e., Grade Point Average [GPA]) was used to link academic performance to SNS use (e.g., minutes per day on SNSs) with multitasking while studying as a potential moderator. General and SNS-specific multitasking survey questions compared perceptions of multitasking in the US and Europe. Information presented can provide useful information to guide university officials and students in understanding how multitasking can impact performance on the main task at hand (i.e., studying). Additionally, as the students prepare for their economic and social future in a world increasingly using SNSs, it is important to understand how countries compare in the technological advances and potentially related cognitive mechanisms (i.e., multitasking) that can impact academic performance.

1. Literature review

SNSs are hot. On February 24, 2012 Twitter® was reported to have exceeded 500 million users (Marketing Magazine., 2012) while that number was "just" 300 million on May 18, 2011 (Bennett, 2011). Facebook® had approximately 700 million users on June 30, 2011 and 800 million on December 31 (Internet World Stats Usage, 2011). This phenomenal increase makes it almost ludicrous to present statistics on the use of SNSs. They have continued to increase in use and account for 19% of time spent online, and 1.2 billion users, 82% of the world's online population, spent 1 out of every 5 min online using SNSs in 2011 (comScore, 2011).

Facebook® is the leading SNS in the majority of countries with Twitter® and LinkedIn® following in popularity (comScore, 2011). Specific to Facebook® use, in March 2011, Europe had the largest membership at 234.6 million visitors (i.e., which increased 38% from March 2010), followed by North America with 163.9 million (i.e., a 26% increase from March 2010). In the US alone, 185.2 million social networkers averaged 6.9 h on SNSs, and 441.2 minutes per visitor on average were spent on Facebook® in 2011 (comScore). With the large amount of time dedicated to SNS use internationally, especially by college students, it is understandable how students might engage in SNS activity while studying (i.e., multitask).

* Corresponding author. Address: Kent State University, College of Education, Health, and Human Services, School of Foundations, Leadership, and Administration, Evaluation and Measurement, 316 D White Hall, Kent, OH 44240, United States. Tel.: +1 330 672 2012; fax: +1 330 672 3063.

E-mail addresses: akarpins@kent.edu (A.C. Karpinski), paul.kirschner@ou.nl (P.A. Kirschner), iozer@kent.edu (I. Ozer), jamellot@kent.edu (J.A. Mellott), pochwo@kent.edu (P. Ochwo).

0747-5632/$ - see front matter Published by Elsevier Ltd.
http://dx.doi.org/10.1016/j.chb.2012.10.011

Multitasking is the simultaneous/concurrent execution of two or more cognitive or information processing activities. Note that this does not include activities that are fully automated, as these – per definition – do not require conscious or unconscious processing (e.g., walking and talking at the same time though even this can lead to falls and other accidents; Herman, Mirelman, Giladi, Schweiger, & Hausdorff, 2010). In order for two processes to be carried out at the same time, there needs to be as many processors as there are processes (e.g., multi-core computers). Humans, due to the cognitive architecture of their brains and the limits that this architecture places on processing information, are incapable of true multitasking. What is possible is task-switching. While "multitasking," in the case of humans, is not possible, for the sake of indexing and referencing, the term will be used throughout the document, as this is more common than use of the term "task-switching."

While many people erroneously assume that they are capable of multitasking without loss of efficiency or effectiveness (Kirschner, Sweller, & Clark, 2006; Sweller, Kirschner, & Clark, 2007), research has shown that frequently switching between tasks – what many people incorrectly refer to as multitasking – leads to poorer learning results and performance on tasks when compared to serially carrying out those same tasks (American Psychological Association [APA], 2006; Ophir, Nass, & Wagner, 2009) and longer times to carry out those tasks (Fox, Rosen, & Crawford, 2009). In other words, with task-switching (i.e., multitasking) comes a concomitant decrease in both performance efficiency and performance effectiveness.

When task-switching, first the goal needs to be shifted from one task to another and thus a "decision" is made to divert attention away from the task at hand to another, and then a rule is activated where instructions for executing one task are switched off, and those for executing the other are switched on. This activity involves dividing one's attention between the tasks, and because each task competes for a limited amount of cognitive resources, the performance of one interferes with that of the other. This has been shown at both the cognitive, information processing level (Brumby & Salvucci, 2006) as well as at the neural level (Dux, Ivanoff, Asplund, & Marois, 2006). According to Brumby and Salvucci:

> Constraints on the human cognitive architecture often limit perfect task parallelism during such multitasking situations. As a consequence, task operators must be interleaved. . .there is a central cognitive bottleneck that operates to limit performance and that control between two or more primary tasks must be passed through a queuing mechanism. (p. 2451)

And according to Dux and colleagues (2006):

> When humans attempt to perform two tasks at once, execution of the first task leads to postponement of the second one. This task delay is thought to result from a bottleneck occurring at a central, amodal stage of information processing that precludes two response selection or decision-making operations from being concurrently executed. (p. 1109)

Borst, Taatgen, and van Rijn (2010) refer to this as the *information bottleneck*. When switching between tasks, each task requires the maintaining of what they call a "problem state" (i.e., a directly accessible intermediate representation of the current state of a task) in short-term memory. Doing this – even for very short periods of time – causes the tasks to interfere with each other causing decreases in performance levels. Borst (2012) states that "[D]epending on the requirements of the tasks at hand, these bottlenecks lead to different patterns of interference. Thus, the key assumption. . .is that although several tasks can be active at the same time, a particular resource can only be used by a single task at a time" (p. 11).

This is not only the case for "learners" or novices, but this has also been shown to be the case when experts (i.e., doctors with high levels of expertise) are required to switch between tasks, for example, in a hospital emergency room. The increased burden of memory load resulting from the need to combine multiple, simultaneous tasks and deal with numerous interruptions, has been found to result in an increase in the number of medical errors (Coiera, Jayasuriya, Hardy, Bannan, & Thorpe, 2002; Laxmisan et al., 2007).

Studies have shown that multitasking with technology, specifically SNS(s) such as instant messaging (IMing), decreases efficiency and productivity in an academic setting (Bowman, Levine, Waite, & Gendron, 2010; Fox et al., 2009; Jacobsen & Forste, 2011; Xu, 2008). With respect to multitasking, several studies show that when students have access to laptops in the classroom, they often engage in distractive multitasking behaviors, which is associated with a decrement in performance (Fried, 2008; Grace-Martin & Gay, 2001; Hembrooke & Gay, 2003; Junco & Cotten, 2010, 2012; Kraushaar & Novak, 2010; Rosen, Lim, Carrier, & Cheever, 2011; Wainer et al., 2008; Wood et al., 2012; Wurst, Smarkola, & Gaffney, 2008).

Some have theorized that the negative relationship between SNS use and GPA may be due in part to multitasking (Kirschner & Karpinski, 2010). An increasing number of studies have observed that university students engage in several multimedia activities (e.g., IMing, SNS use, YouTube®) while simultaneously performing their academic tasks (Grinter, Palen, & Eldridge, 2006; Huang & Leung, 2009; Junco & Cotten, 2010, 2012). Ellis, Daniels, and Jauregui (2010) studied, for example, exam results of two groups of students attending a university class lecture. Half of the students were allowed to multitask in the form of texting during the lecture while the other half were not allowed to text. Regardless of gender or GPA, exam scores of students who texted in class were significantly lower than the exam scores of students who did not text in class. Thus, multitasking may be one mechanism driving the negative relationship between SNS use and academic performance (Ellis et al., 2010; Golub & Miloloža, 2010; Junco & Cotten, 2012). No studies have sought to examine the role of multitasking as a moderator in the above relationship from and international perspective comparing US and European students.

2. Methods

2.1. Participants

Data were collected from 590 undergraduate and 285 graduate students across the United States and Europe ($N = 875$). The sample consisted of 216 (29.7%) male participants, and 615 female participants (70.3%). The majority of participants identified themselves as Caucasian ($n = 775$; 88.6%), with the next largest group identified as Black/African-American ($n = 53$; 6.1%). Other ethnicities represented included Asian (2.4%), Hispanic/Latino (1.1%), Multi-Racial (1.0%), Middle Eastern (0.5%), Indian (0.2%), and American Indian/Alaskan Native (0.1%). Thus, 775 (88.6%) of the participants were Caucasian, and 100 were categorized as other (11.4%). Participants were predominantly traditional college students with undergraduate (67.4%) and graduate (32.6%) students having a mean age of approximately 21.98 ($SD = 3.87$) and 28.15 ($SD = 6.78$), respectively.

2.2. Materials

A survey was developed in 2008 containing five sections of closed-response (e.g., Yes/No and Likert-type scaling) and open-

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response items and was used in a study examining the relationship between Facebook© use and academic achievement (Kirschner & Karpinski, 2010). After that study, the authors revised the survey to meet future research needs, which included asking general questions about SNS use, adding more questions about the specifics of how SNSs are used, and including questions relating to multitasking behavior. In this revised survey, Section 1 asked respondents to provide demographic and other general information (e.g., age, rank in school, major, multitasking perceptions). Section 2 invited students to provide academic information (e.g., GPA, hours spent studying, extracurricular involvement). Section 3 asked about computer and Internet use (e.g., hours spent on the Internet, computer familiarity). The fourth section was specific to SNS use (e.g., types of SNS used, minutes of SNS use, multitasking and SNS use). Finally, the fifth section asked for participants' SNS use reflections in a series of open-ended questions.

Two faculty members and two graduate students used the following guidelines to review the survey for specific validity criteria: (1) Clarity in wording, (2) Relevance of the items, (3) Use of Standard English, (4) Absence of biased words and phrases, (5) Formatting of items, and (6) Clarity of the instructions (Fowler, 2002). Based on the reviewers' comments, the survey was revised prior to administration.

For the main variables of interest in the current study, the dependent variable (i.e., GPA) was collected by asking participants, "What is your current cumulative grade point average?" Because different scales are used for GPA in different countries, a follow-up question was necessary – "Out of how many points is the scale for your grade point average?" For comparison purposes, all GPAs were placed on a scale from 0 to 4.0. For the independent variables of interest, SNS use information was collected by asking participants, "Approximately how many hours per DAY do you spend using Social Networking Sites?" Amount of study time was collected by asking, "Approximately how many hours per DAY do you spend studying (i.e., outside the classroom)?" SNS use and study time were converted to minutes per day after data collection. Other covariates in the model such as ethnicity and major were open-ended (e.g., "What is your ethnicity?" and "For both undergraduate and graduate students, what is/are your major(s)?"). After data collection, responses were analyzed independently by research assistants, coded, and placed into categories. These categories were further consolidated into "Caucasian" and "Other" for ethnicity and "Social Science/Humanities" (e.g., Sociology, English, Education), and "Science/Business" (e.g., Engineering, Biology, Accounting) for major. Finally, the act of multitasking with SNSs while studying was collected by asking, "Do you use SNSs or have SNSs on in the background while studying?"

2.3. Procedure

Data ($N = 875$) were collected online from a survey-hosting website from multiple universities in the US and across Europe. Data collection began in March 2010 and was completed in December 2011, and occurred through e-mail invitation to complete a web-based survey. Recruitment e-mails were sent directly to faculty members and instructors at various universities, which included a link to the survey that was to be forwarded to their students. Instructors and students were encouraged to pass the survey information along to other university students who were eligible to participate. Thus, the sampling method began as convenience sampling, which developed into snowball sampling (Goodman, 1961) as more instructors and students recommended other participants. A description of the instructions was also included at the top of the survey. The survey took approximately 20–25 min to complete.

2.4. Data analysis

Quantitative data were analyzed using Predictive Analytics Software (*PASW*) Statistics version 18.0 (SPSS, Inc., 2009), and addressed the first research question, "Does multitasking moderate the relationship between SNS use and academic achievement for both US and European students?" Aside from basic descriptive analyses, the main quantitative analytic techniques implemented included the following: (1) Correlations to examine relationships between all variables in the regression models, (2) Moderated Multiple Regressions to investigate the relationship between SNS use and academic performance moderated by multitasking in the US and European samples, and (3) Independent t Tests to compare multitasking perceptions between US and European students. These correlational data analysis techniques were considered the most appropriate for the exploratory and descriptive nature of the study (i.e., survey data; Wiersma & Jurs, 2009).

Two Moderated Multiple Regressions were conducted to determine which variables predict GPA in the US and European samples. Using a hierarchical approach, predictors were inserted into the model in blocks or groups ordered based on theory. The groups, in order, included: (1) demographics and other covariates (i.e., age, sex, ethnicity, major, minutes studying per day, minutes of SNS use per day, and multitasking) and (2) the multitasking and SNS use interaction.

Studies have found that some demographic variables are important to consider when examining SNS and technology use (Hargittai, 2008; Hargittai & Hinnant, 2008; Junco, Merson, & Salter, 2010; Pasek, More, & Hargittai, 2009; Zillien & Hargittai, 2009). Minutes studying per day was included as a covariate because of its relationship to GPA. Finally, in the second block, the interaction was included with multitasking as moderator. A moderator is a variable that changes the relationship between an independent and dependent variable (Baron & Kenny, 1986). A significant interaction between a moderator (i.e., multitasking) and an independent variable (i.e., SNS use) in the regression model means that the effect of the independent variable on the dependent variable changes depending on the level of the moderator (Baron & Kenny, 1986). The current study proposes that the hypothesized negative relationship between SNS use and GPA is moderated by multitasking. For example, if a student is not multitasking while studying, there will be a negative relationship between SNS use and GPA, but if a student is multitasking while studying, the negative relationship between SNS use and GPA is stronger.

For the categorical covariates in the demographic block in the regression analyses, sex was coded as Male = 0 and Female = 1, ethnicity was coded as Other = 0 and Caucasian = 1, and major was coded as Science/Business = 0 and Social Science/Humanities = 1. The continuous covariates of age, minutes per day studying, and minutes of SNS use per day were all centered. It is common practice to center continuous predictors prior to doing Moderated Multiple Regressions to improve interpretation of the results (Aiken & West, 1991; Kromrey & Foster-Johnson, 1998).

Open-response items were analyzed using Qualitative Data Analysis (QDA; Caudle, 2004). QDA is used to examine meaningful and symbolic content of qualitative data in order to identify someone's interpretations. This involves two major sub-processes: (1) Data reduction and pattern identification, and (2) Producing objective analytic conclusions and communicating them. Data for each open-response item (i.e., "Do you think that using your SNS(s) has had an impact [i.e., positive and/or negative] on your academic performance? Explain." and "Is there anything else that you would like to add? Please use the following space to provide any additional information, thoughts, and/or reflections.") were reduced to the major themes and patterns within these themes were identified. Conclusions were drawn based on these patterns. The

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authors conducted the above process separately, and convened to compare their individual results. Major themes identified by the authors were interpreted further and reported. The use of multiple coders engaged in the QDA process added to the reliability and validity of the results and conclusions. An inter-rater reliability analysis using the Kappa statistic was performed to determine consistency among independent raters (i.e., qualitative coders).

In the following section, the sample and main variables will be described, followed by the Moderated Multiple Regression results and Independent *t* Tests, and a qualitative examination of the open-ended questions to support the results found in the quantitative analyses.

3. Results

3.1. Outlier detection and description of the analysis sample

Outliers were detected and removed from subsequent analyses to enhance statistical conclusion validity. Ten cases were deleted because participants reported no GPAs or GPAs of 0. Residual diagnostics were consulted (i.e., studentized residuals), which suggest unusual outcomes (i.e., *Y* values in the regression formula) for specific cases. Large studentized residuals (i.e., >±3.0) indicate poor prediction of Y for each case. Three cases were flagged with extreme studentized residuals. All outcome values (i.e., GPA) for these three cases represented extreme values for the dependent variable with regard to the independent variables in the equation. Cook's D for the three potential extreme values indicated that the values were close to one (i.e., values close to 1 or 2 indicate potential problems). Finally, by examining Mahalanobis distance, all previously mentioned cases above were confirmed as strongly influential in the model ($p < .05$). After removing these three cases, no other outliers were indicated in the sample.

To be thorough, outlier analysis was implemented in the separate US and European samples. In the US sample, four cases were flagged due to large studentized residual values (i.e., >±3.0). These cases had unusual GPAs based on the combination of predictors in the equation (e.g., minutes of SNS use per day similar to the full sample). In the European sample, only one case was found to have an extreme GPA (i.e., >±3.0). Cook's D and Mahalanobis distance were examined and both indices confirmed that the cases above were indeed outliers. In summary, 18 cases were removed from subsequent analyses (i.e., 7 males and 11 females; 5 US and 13 Europe; 15 undergraduates and 3 graduate students; 16 Caucasian and 2 other).

The final analysis sample ($N = 857$) included 451 participants from US universities across a number of states (52.6%; e.g., Georgia, New York, Ohio, etc.) with the remaining participants from Europe ($n = 406$; 47.4%; e.g., United Kingdom, Germany, Netherlands, etc.; Students from Turkey were included in the European sample). There were 557 (65%) undergraduate and 300 (35%) graduate students with mean ages of 21.99 ($SD = 3.96$) and 27.73 ($SD = 6.75$), respectively. In the undergraduate sample, approximately 16% ($n = 89$) of the sample were in their first year as undergraduate students, 26.2% ($n = 146$) were in their second year, 27.3% ($n = 152$) were in their third year, and 30.5% were in their fourth or fifth years ($n = 170$). Of the graduate students, 68.7% ($n = 206$) were Masters and 24% ($n = 72$) were Doctoral students. Graduate professional students (e.g., Education Administration, Law, etc.) accounted for only 7.3% ($n = 22$) of the sample.

Two-hundred fifty three (29.5%) were males and 604 (70.5%) were females. This is "normal" (i.e., representational) for the primary population in both Europe and the United States (Meulders, Plasman, Rigo, & O'Dorchai, 2010; U.S. Department of Education, 2007), which was predominantly Social Science/Humanities majors (e.g., Sociology, English, Education; $n = 497$; 59.7%), and the remainder representing Science/Business majors (e.g., Engineering, Biology, Accounting; $n = 335$; 40.3%) with 25 cases not reporting their majors. The overwhelming majority of the sample was full-time students ($n = 789$; 92.3%), with 7.7% ($n = 66$) claiming to be part-time students with two cases not reporting their status. Finally, the majority of participants were Caucasian ($n = 759$; 88.6%). Table 1 shows the above demographic composition of the final analysis sample in the US and Europe separately.

Table 1
Demographic information for European and United States students ($N = 857$).

Demographic Information	European ($n = 406$)	United States ($n = 451$)
Age	22.23 (3.19)	25.55 (7.05)
Sex		
Male	154 (37.9)	99 (22)
Female	252 (62.1)	352 (78)
Ethnicity		
White (Non-Hispanic)	400 (98.5)	359 (79.6)
Other	6 (1.5)	92 (20.4)
Student status		
Undergraduate	323 (79.6)	234 (51.9)
First year	77 (23.8)	12 (5.1)
Second year	104 (32.2)	42 (17.9)
Third year	85 (26.3)	67 (28.6)
Fourth (or more) year	57 (17.6)	113 (48.3)
Graduate	83 (20.4)	217 (48.1)
Masters	75 (90.4)	131 (60.4)
Doctoral	7 (8.4)	65 (30.0)
Professional	1 (1.2)	21 (9.7)
Major		
Social science/humanities	130 (32.0)	367 (81.4)
Natural science/business	257 (63.3)	78 (17.3)
Missing	19 (4.7)	6 (1.3)

Note: Standard deviations appear in parentheses next to means for age. Percentages of *n* appear in parentheses next to frequencies for all other variables.

3.2. Descriptive analysis of main variables

US students' GPAs on average were 3.40 ($SD = .53$), and European students' GPAs, when linearly translated to a US based 4-point scale, were 2.70 ($SD = .63$).[1] Student reports of minutes studying per day were higher for US students compared to European students ($M = 164.43$, $SD = 128.74$ and $M = 146.90$, $SD = 98.95$, respectively; $t = -2.22$, $df = 855$, $p < .05$). All participants indicated using SNSs with Facebook® being the most popular ($n = 835$; 97.7%). Other SNSs used included Twitter, Hyves, MySpace, and Orkut. In the US, 277 students (61.8%) and in Europe 207 students (51.9%) claimed to use SNSs multiple times per day. Additionally, US students claimed to use SNSs slightly more on average ($M = 146.32$, $SD = 119.58$ min/day) than European students ($M = 142.38$, $SD = 119.94$ min/day). With regard to multitasking with SNSs while studying, similar majorities of US and European students indicated that they do use SNSs or have them on in the background while studying ($n = 277$ [61.8%] and $n = 278$ [69.5%], respectively).

3.3. Correlations

Correlations between the variables in the regression models are displayed in Table 2 for the US and Europe. Depending on the level of measurement, different correlation coefficients were used: (1) the Phi Coefficient for two dichotomous variables, (2) Point Biserial correlations to examine the relationship between a dichotomous and a continuous variable, and (3) Pearson correlations for two continuous variables. For the main variables of interest, in the US sample, the relationships between minutes spent studying per day and GPA ($r = .23$, $p < .001$) and minutes spent using SNSs per day and GPA ($r = -.61$, $p < .001$) were both significant and in

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Table 2
Correlation matrices for the predictor and criterion variables for United States (n = 451) and European (n = 406) students.

Variable	1	2	3	4	5	6	7	8
Age (1)	–	−.06	.01	.09	.00	−.01	−.01	.05
Sex (2)	−.05	–	−.05	.36***	.211***	−.00	−.07	.11*
Ethnicity (3)	.05	.04	–	.18***	−.08	.00	−.04	.00
Major (4)	.11*	.24***	.13**	–	.21***	.17**	−.09	.03
Study (5)	.07	.05	−.01	.03	–	.01	−.10*	.23***
SNS use (6)	−.23***	−.10*	−.11*	−.17***	−.15**	–	.03	−.27***
Multitasking (7)	−.19***	−.01	−.02	−.10*	−.16**	.38***	–	.01
GPA (8)	.24***	.16**	.21***	.25***	.23***	−.61***	−.28***	–

Note: The European student correlation matrix is above the diagonal line and the United States student correlation matrix is below the diagonal line.
Coding: Male = 0 and Female = 1, Other = 0 and White = 1, Science/Business = 0 and Social Science/Humanities = 1, No Multitasking = 0 and Yes Multitasking = 1. Study is the minutes per day spent studying; SNS use is the minutes per day spent using SNSs. The Phi Coefficient was used for two dichotomous variables. Point Biserial correlations were used for a dichotomous and an interval-level variables. Pearson correlations were used for two interval-level variables.
* $p < .05$.
** $p < .01$.
*** $p < .001$.

the hypothesized direction. Additionally, the negative relationship between minutes per day studying and minutes per day of SNS use was significant ($r = -.15$, $p < .01$).

In the European sample, the relationship between minutes spent studying per day and GPA ($r = .23$, $p < .001$) was the same in magnitude as the US sample. The relationship between minutes spent using SNSs per day and GPA ($r = -.27$, $p < .001$) was significant and negative, but considerably smaller in magnitude compared to the US sample. Finally, the relationship between minutes per day studying and minutes per day of SNS use was not significant in the European sample ($r = .01$, $p > .05$).

3.4. Moderated Multiple Regressions

Two Moderated Multiple Regressions were used to examine the first research question as to whether multitasking while studying (i.e., "Do you have (a) SNS(s) active in the background on a computer or other device while studying?") moderates the relationship between SNS use and academic performance for US (n = 451) and European students (n = 406).

3.5. Assumption checking

Before examining the Moderated Multiple Regressions, the basic assumptions of linear regression were investigated to improve statistical conclusion validity. Examining residual scatterplots of Y and $\hat{Y}$ indicated that linearity was met, and sampling confirmed that independence was upheld (i.e., no participant can complete the survey more than once). Independence was also confirmed with the Durbin–Watson Test. Homoscedasticity was examined with scatterplots of the predictors and the dependent variable, and the dispersion of the values around the regression line remained fairly constant for all values of X. Finally, the errors appeared to be approximately normally distributed by viewing the histogram of the standardized residuals for GPA. These assumptions were also checked in each group as well (i.e., US and European students).

From the correlation matrix, multicollinearity was not a concern in this analysis. The highest correlation among the independent variables for the European sample was between Sex and Major ($r = .36$, $p < .001$), and for the US sample, between SNS use and multitasking ($r = .38$, $p < .001$), which are both low moderate correlations. The tolerances for all the predictors are within acceptable limits for both the US and European samples with the variance inflation factors (VIFs) corroborating this evidence. The collinearity diagnostics do not indicate any overlap in the contribution of the percentages to the model, and the condition indices are all within acceptable limits (i.e., <30).

3.6. Moderated Multiple Regression – United States

After Step 1 (i.e., covariates only), R^2 was significant ($R^2 = .439$, $F(7, 434) = 48.43$, $p < .001$). At Step 2, there was a significant increment in R^2, indicating that the interaction term was a significant additional predictor of GPA ($\Delta R^2 = .009$, $F(8,433) = 43.90$, $p < .001$). Together, all predictors accounted for 44.8% of the variance in GPA. In the full model, age, sex, ethnicity, major, minutes studying/day, minutes using SNS(s)/day, and the interaction were significant predictors ($p < .05$). There was also a negative relationship between minutes using SNS(s)/day and GPA. Overall, for US students, the negative relationship between minutes of SNS use/day and GPA changes depending on if a student is multitasking using SNS(s) while studying (see Table 3).

3.7. Moderated Multiple Regression – Europe

After Step 1, R^2 was significant ($R^2 = .108$, $F(7,373) = 6.57$, $p < .001$). At Step 2, there was not a significant increment in R^2, indicating that the interaction was not a significant predictor of GPA for European students ($p > .05$). The final model indicated that R^2 was significant and together the predictors accounted for 10.9% of the variance in GPA ($F(8,372) = 5.66$, $p < .001$; see Table 4). Minutes studying/day and minutes using SNS(s)/day were the only statistically significant predictors ($p < .01$). There was a negative relationship between minutes of SNS use/day and GPA. Overall, for European students, the negative relationship between minutes of SNS use per day and GPA does not change depending on whether a student is multitasking using SNS(s) while studying.

3.8. Interaction plots

The plot of the significant interaction between SNS use and multitasking while studying revealed that for US students who do not multitask while studying, GPA was higher for those who report spending fewer minutes on SNS(s)/day than those who report spending more ($r = -.69$, $p < .001$; $t = -8.32$, $df = 438$, $p < .001$). For those who report multitasking while studying, GPA was slightly higher for those who report spending fewer minutes on SNS(s)/day compared to those who report spending more ($r = -.52$, $p < .001$; $t = -2.69$, $df = 438$, $p < .01$; see Fig. 1). The negative relationship between SNS use and GPA was stronger for those who do not multitask (Cohen & Cohen, 1975).

Please cite this article in press as: Karpinski, A. C., et al. An exploration of social networking site use, multitasking, and academic performance among United States and European university students. *Computers in Human Behavior* (2012), http://dx.doi.org/10.1016/j.chb.2012.10.011

Table 3
Moderated multiple regression of social networking site use and multitasking on cumulative grade point average in United States students ($N = 451$).

Step	Variable	β	pr_j	sr_j	t	R^2	ΔR^2	F
1	Age	.091	.116	.088	2.44*	.439	.439	48.43***
	Sex	.083	.107	.081	2.24*			
	Ethnicity	.145	.187	.142	3.96***			
	Major	.097	.122	.092	2.57*			
	Study	.138	.178	.136	3.77***			
	SNS use	−.512	−.521	−.457	−12.71***			
	Multitasking	−.030	−.036	−.027	−.75			
2	Age	.078	.099	.074	2.07*	.448	.009	43.90***
	Sex	.083	.107	.080	2.25*			
	Ethnicity	.148	.193	.146	4.09***			
	Major	.092	.117	.088	2.46*			
	Study	.134	.174	.131	3.68***			
	SNS use	−.705	−.383	−.308	−8.62***			
	Multitasking	.006	.007	.005	.14			
	SNS use X Multitasking[a]	.203	.129	.096	2.70**			

Note: Sex was coded as Male = 0 and Female = 1; Ethnicity was coded as Other = 0 and Caucasian = 1; Major was coded as Science/Business = 0 and Social Science/Humanities = 1. Study is minutes per day spent studying. SNS use is minutes per day of SNS use. Multitasking is, "Do you have (a) SNS(s) active in the background on a computer or other device while studying?" (i.e., No = 0 and Yes = 1). pr_j represents the partial correlation for the jth variable in the model; sr_j represents the semi-partial (i.e., part) correlation.
* $p < .05$.
** $p < .01$.
*** $p < .001$.
[a] Only the interaction was included in Step 2 of the model.

Table 4
Moderated multiple regression of social networking site use and multitasking on cumulative grade point average in European students ($N = 406$).

Step	Variable	β	pr_j	sr_j	t	R^2	ΔR^2	F
1	Age	.036	.038	.035	.73	.108	.108	6.47***
	Sex	.071	.069	.065	1.33			
	Ethnicity	.031	.032	.030	.62			
	Major	.017	.016	.016	.32			
	Study	.054	.212	.205	1.09			
	SNS use	.214	−.231	−.224	4.18***			
	Multitasking	−.227	.056	.053	−4.59***			
2	Age	.039	.040	.038	.77	.109	.001	5.66***
	Sex	.071	.069	.065	1.34			
	Ethnicity	.031	.032	.031	.63			
	Major	.017	.016	.015	.31			
	Study	.213	.210	.203	4.14***			
	SNS use	−.247	−.158	−.151	−3.09**			
	Multitasking	.055	.057	.054	1.10			
	SNS use X Multitasking[a]	.025	.016	.015	.31			

Note: Sex was coded as Male = 0 and Female = 1; Ethnicity was coded as Other = 0 and Caucasian = 1; Major was coded as Science/Business = 0 and Social Science/Humanities = 1. Study is minutes per day spent studying. SNS use is minutes per day of SNS use. Multitasking is, "Do you have (a) SNS(s) active in the background on a computer or other device while studying?" (i.e., No = 0 and Yes = 1). pr_j represents the partial correlation for the jth variable in the model; sr_j represents the semi-partial (i.e., part) correlation.
* $p < .05$.
** $p < .01$.
*** $p < .001$.
[a] Only the interaction was included in Step 2 of the model.

The plot of the nonsignificant interaction between SNS use and multitasking while studying revealed that for European students who do not multitask while studying, GPA was higher for those who report spending fewer minutes on SNS(s)/day than those who report spending more ($r = -.28$, $p < .01$; $t = -2.47$, $df = 377$, $p < .05$). Similarly, for those who report multitasking while studying, GPA was slightly higher for those who report spending fewer minutes on SNS(s)/day compared to those who report spending more ($r = -.23$, $p < .001$; $t = -3.08$, $df = 377$, $p < .01$; see Fig. 2). The negative relationship between SNS use and GPA was slightly stronger for those who do not multitask. Interestingly, European students who do not multitask have lower GPAs regardless of SNS use compared to their multitasking counterparts who have higher GPAs overall.

3.9. Independent t Tests – multitasking

To examine the second research question on general perceptions of multitasking comparing US and European students, Independent t Tests were conducted. Three survey questions were used: (1) "I find multitasking easy.", (2) "I am capable of effectively multitasking.", and (3) "Multitasking does not interfere with the

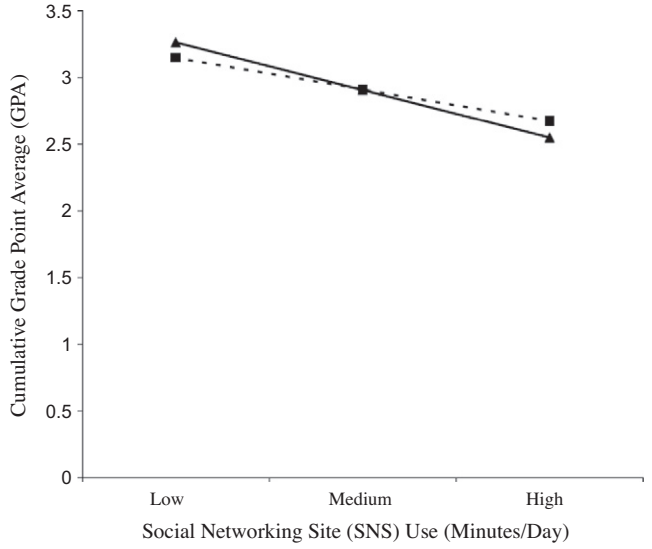

Fig. 1. The above plot is the significant interaction between SNS use and SNS multitasking while studying for US students. The *X* axis is SNS use in minutes per day from low to high usage. The *Y* axis is cumulative GPA. The dotted line represents a "Yes" response to the multitasking question and the solid line represents "No.".

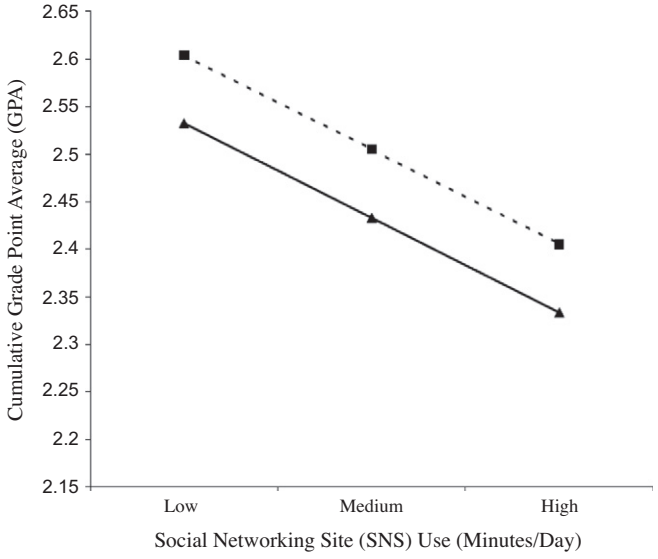

Fig. 2. The above plot is the nonsignificant interaction between SNS use and SNS multitasking while studying for European students. The *X* axis is SNS use in minutes per day from low to high usage. The *Y* axis is cumulative GPA. The dotted line represents a "Yes" response to the multitasking question and the solid line represents "No.".

main task/activity in which I am engaged." All questions were answered on a 5-point Likert scale (i.e., Strongly Agree = 4, Agree = 3, No Opinion = 2, Disagree = 1, Strongly Disagree = 0).

The assumptions of independence, normality, and homogeneity of variance (HOV) were examined for each group. Independence was ensured based on how the data were sampled. The normality assumption was violated in that the data in each group – for each of the three questions – were significantly positively skewed based on an examination of histograms and skewness statistics. Additionally, the HOV assumption was not upheld for questions 1 and 2 above ($p > .05$). Therefore, research has shown that when normality and HOV are both violated, a modified version of Welch *t* Test should be used. The Welch *t* Test in conjunction with a rank transformation of the variables of interest counteracts the effects of both non-normality and unequal variances (Zimmerman & Zumbo, 1993). First, data are ranked from highest to lowest regardless of group membership, and then the Welch *t* Test is applied (Lomax, 2007). If non-normality is present, but there is not a violation of HOV, then an Independent *t* Test with ranked data is recommended (Lomax, 2007).

Using the modified Welch *t* Test just described for questions 1 and 2, significant differences between the groups were observed with US students having overall higher means ($p < .05$). Using an Independent *t* Test with ranked data for question 3, significant differences between the groups were also found with the US students again having a higher mean ($p < .01$). Thus, US students claimed to find multitasking easier, to be more capable of multitasking, and to indicate that it does not interfere with main tasks compared to their European counterparts (see Table 5).

In addition to these Independent *t* Tests, participants were asked, "Do you often multitask or actively do more than one thing at a time with the computer?" The majority of students regardless of group claimed to multitask. For US students, 85.9% admitted to multitasking, and 72.5% for European students. Participants were also asked to provide the approximate percentage of study time that she/he uses SNSs or have it/them turned on while studying. Significant differences between groups were noted with US students reporting having SNS(s) active a higher percentage of their study time on average (61.7%) compared to European students (49.3%; $t = -3.24$, $df = 360$, $p < .01$). Finally, a slightly larger, though not significant percentage of US students (61.4%) noted that when using their SNS(s), they attend to incoming messages immediately compared to European students (55.9%).

3.10. Qualitative Data Analysis (QDA)

QDA was conducted to help explain the quantitative findings from the above analyses. Participants were asked to explain the perceived positive and negative impacts of SNS usage on their academic performance, or if they believe SNS usage has no impact on their academic performance. The researchers used a QDA method of constant comparison to identify, reduce, and validate themes (Glaser & Strauss, 1967). After reading the overall qualitative responses, initial themes were entered into a spreadsheet, each column representing a distinct theme. The responses were examined separately (i.e., US and European students), and coded depending on the themes that emerged from the student responses. For the purposes of this study, only student open-ended responses containing themes of general multitasking or multitasking with SNSs are discussed in detail with the percentages and frequencies for each group (i.e., US and European).

The major multitasking themes included: (1) Students stating that they do not multitask while studying (Theme #1), and (2) Students claiming to be "good at" multitasking (Theme #2). Two independent reviewers examined the data with substantial agreement for the above themes (Kappa = .84, $p < .001$; Landis & Koch, 1977). All results reported are based upon self-report and, thus, reflect what students perceive. So as not to burden the reader, the qualification of student perception (e.g., students perceived they are good multitaskers) will not be repeated when reporting the themes below. Of the final quantitative data analysis sample ($N = 857$), frequencies and percentages were reported separately for the US and European students for Theme #1, Theme #2, and if multitasking in some form was not mentioned in their open-ended responses (i.e., the focus of a student's response to the open-ended question was not multitasking). Missing data were also reported (i.e., no response to the open-ended question; see Table 6).

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Table 5
Independent *t* tests comparing United States and European students on multitasking ($N = 857$).

Survey question	Location		*t*	*df*
	US ($n = 451$)	Europe ($n = 406$)		
1. I find multitasking easy	2.79 (.97)	2.33 (1.03)	−7.15***	847.01
2. I am capable of effectively multitasking	2.85 (.92)	2.53 (.97)	−5.50***	843.09
3. Multitasking does not interfere with the main task/activity in which I am engaged	2.27 (1.09)	2.03 (1.05)	−3.39***	855

Note: Standard Deviations appear in parentheses next to Means. Due to the violations of normality and homogeneity of variances (HOV) for questions 1 and 2 ($p < .05$), a ranked Welch *t*-Test was used. A ranked Independent *t* Test was used for question 3, where HOV was met. Means and Standard Deviations reported are the raw scores from the Likert scale for each question (i.e., Strongly Agree = 4, Agree = 3, No Opinion = 2, Disagree = 1, Strongly Disagree = 0), not the ranked data used in the *t* Test analyses.
*$p < .05$.
**$p < .01$.
***$p < .001$.

3.10.1. US sample

Results showed that 68.1% ($n = 307$) of the US students did not discuss multitasking with SNSs in their open-ended responses. A small percentage (14.2%; $n = 64$) of the respondents stated specifically that they did not multitask with SNSs while doing homework or studying. Some of the sample responses for Theme #1 (i.e., No multitasking while studying) include the following:

> *"I am able to do my work when I need to. I usually do some work, take a Facebook® break, then go back to school work."*

> *"School comes first. I don't tend to my SNS(s) while studying. No one on my SNS(s) is worth me getting failing grades."*

> *"I do not spend excessive amounts of time on my SNS, do not go on it during class, and do not have it up while doing homework"*

A few students (2.7%; $n = 12$) stated that SNSs do not impact their academic performance and mentioned being "good at multitasking." The sample responses for Theme #2 (i.e., Being good at multitasking) include the following:

> *"I know how to multitask while trying to get an assignment done, so I never let a social network have more time over my homework."*

> *"I don't allow SNS(s) to impact my academics. They are always running whether it be on my phone or computer, and when I get a message I respond maybe not immediately, but I respond. My academics are my main focus and therefore will be attended to before anything else whether it is physical social networking or networking online"*

> *"I am a good multitasker and do not let social networking sites impinge on my academic/work obligations. In fact, I think it is a good outlet to sometimes vent about academic struggles and have friends who are in similar situations respond/provide feedback."*

3.10.2. European sample

The results indicated that 78.3% ($n = 318$) of the European students did not discuss multitasking with SNSs in their open-ended responses. A fewer number of European students (8.9%; $n = 36$), compared to the US sample, discussed logging out of their SNSs when studying or not multitasking with SNSs (i.e., Theme #1). The sample responses include the following:

> *"I have two computers: when I am studying I use the one without internet. Also, I like to check Facebook® daily, but I don't spend that much time on it."*

> *"If I am doing my work for school, I do not check my SNS. When I take a break, I check my SNS and e-mail account. So I'm not doing those two things at the same time."*

> *"I only use SNS when I have the time for it or when I am on a study break."*

A small percentage (2.0%; $n = 8$) of European students mentioned being good at multitasking (i.e., Theme #2). The sample responses for Theme #2 (i.e., Being good at multitasking) include the following:

> *"I think that I use it merely in my free time and when I am studying it does not disturb me. It is turned on, but I do not look at it whole the time. I just look once."*

> *"I can concentrate equally well when it's off or on. I do not check it constantly. If a sign appears that someone said something, I will read it and maybe reply and go back to studying."*

> *"Despite my use of social media, I'm still very concentrated when I'm studying. I know how to combine these things in a good way."*

Table 6
Qualitative data analysis examining multitasking themes in an open-ended response question for United States ($n = 451$) and European ($n = 406$) students.

Category	United States *n* (%)	European *n* (%)
Theme #1	64 (14.2)	36 (8.9)
Theme #2	12 (2.7)	8 (2.0)
Multitasking not mentioned	307 (68.1)	318 (78.3)
No response to question (i.e., missing)	68 (15.1)	44 (10.8)

Note: Theme #1 = Students stating that they do not multitask while studying; Theme #2 = Students claiming to be "good at" multitasking.

4. Discussion

This study compared students' perceptions of multitasking and the impact of multitasking on the possible negative relationship between SNS use and academic performance in the US and Europe. The main research questions were: (1) Does multitasking moderate the relationship between SNS use and academic achievement for both US and European students? and (2) How do university students' perceptions of multitasking and SNS use compare in the US and Europe? Results showed that the negative relationship between SNS use and GPA was moderated by multitasking only in the US sample. Thus, the above negative relationship does not change regardless of whether European students are multitasking or not.

The US sample regression results showed that SNS use in minutes/day was negatively predictive of overall GPA. Pertaining to the focus of the study, the interaction between multitasking and SNS use was also a significant predictor. Unsurprisingly, this indicated that for those who do not multitask with SNS(s) while studying, GPA was higher for those who spend fewer minutes on SNS(s)/day than those who spend more on SNS(s)/day. Additionally, for those who multitask with SNS(s) while studying, GPA was higher for those who spend fewer minutes on SNS(s)/day compared to those who spend more on SNS(s)/day. These findings are related

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to the theoretical and empirical cognitive psychology literature base, and also recent research demonstrating using Facebook® and texting in class is negatively related to performance on exams in those classes (Kraushaar & Novak, 2010; Rosen et al., 2011; Wood et al., 2012). The same was recently found for multitasking outside the classroom, as in the current study (Junco & Cotten, 2012).

As shown in the interaction plot, US multitaskers compared to non-multitaskers spending a larger number of minutes/day on SNSs had slightly higher GPAs. Thus, for those US students who use SNSs for more minutes/day, those who multitask while studying had slightly higher GPAs than those who claimed to not multitask. Post hoc analyses, however, indicated that the differences in GPA between multitaskers ($M = 3.38$, $SE = .03$) and non-multitaskers ($M = 3.44$, $SE = .03$) were not significant when controlling for minutes of SNS use per day ($F = 1.988$, $df = 1, 445$, $p = .159$).

The European sample regression results showed that SNS use in minutes/day was negatively predictive of overall GPA; however, it was not as strong of a predictor compared to the US sample. Also, as mentioned above, the interaction between multitasking and SNS use was not a significant predictor. Again, as with the US sample, for those who do not multitask with SNS(s) while studying, GPA was higher for those who spend fewer minutes on SNS(s)/day than those who spend more on SNS(s)/day. For those who multitask with SNS(s) while studying, GPA was higher for those who spend fewer minutes on SNS(s)/day compared to those who spend more on SNS(s)/day. Interestingly, European students who do not multitask have lower GPAs regardless of SNS use compared to their multitasking counterparts who have higher GPAs overall. However, as with the US sample, post hoc analyses indicated that the differences in GPA between multitaskers ($M = 2.72$, $SE = .04$) and non-multitaskers ($M = 2.70$, $SE = .05$) were not significant when controlling for minutes of SNS use per day ($F = .126$, $df = 1, 397$, $p = .723$).

Though there may be cultural issues to consider, one conclusion is that this may be due to European students being less prone to what can be called "disruptive" multitasking. That is, they do not attend to incoming messages on their SNS(s) immediately or have SNS(s) active a larger percentage of the time when studying, inducing less attention division, task-switching, and task interference. This may be seen as a self-regulation strategy that students in Europe apply. Quan-Haase (2010) found, for example, that Instant Messaging (IM) was disruptive, and that using IM in a multitasking way led to losses in productivity. To counteract this negative influence, some users of IM employed different self-regulation strategies to control overuse, one of which was ignoring incoming messages. This aspect of self-regulation is in line with research carried out by Rouis, Limayem, and Salehi-Sangari (2011) who found that students with higher levels of self-regulation demonstrated lower levels of cognitive absorption in Facebook®. They also found that students with both high use of Facebook® and high levels of cognitive absorption had lower study achievement.

Interestingly, US students noted that they felt that multitasking does not interfere with the main task and that they are more capable at it as compared to how European students perceive this. This finding could be explained by US students simply having SNS(s) active a higher percentage of their study time. An interesting finding in this respect (Ophir et al., 2009) was that in a study on the ability of university students to focus their attention (i.e., avoid switching tasks), the mere presentation of a secondary, non-relevant stimulus was enough to distract students from a simple primary task of attending to a stimulus. Their cautious conclusion was that students may be "losing" the ability to concentrate, or as they state "...likely due to reduced ability to filter out interference from the irrelevant task set. These results demonstrate that media multitasking, a rapidly growing societal trend, is associated with a distinct approach to fundamental information processing" (p. 15583).

Referring to the qualitative results, both US and European students reported that they are very good at multitasking, with slightly higher percentages of US students mentioning this. Research has noted that people assume that they are "good at" multitasking without loss of efficiency or effectiveness (Kirschner et al., 2006; Sweller et al., 2007), but in reality, switching between tasks leads to poorer learning results and performance on tasks when compared to carrying out those same tasks serially (American Psychological Association., 2006; Ophir et al., 2009). As Clifford Nass (2009) in his video "Multitasking works? Not really." notes, while students report that they are good at multitasking, one thing is evident, namely that "multitaskers are lousy at multitasking." Thus, perception and reality are worlds apart.

Specifically, for US students overall, those who multitask have lower GPAs on average compared to those who do not multitask. The non-multitaskers had higher GPAs on average, and the highest GPAs if they used SNS(s) for a small amount of minutes/day. The results for the US users might be a traditional case of quality of use versus quantity of use. As noted from our results, US SNS users tend to be online actively for a large percentage of their study time and are perhaps considered highly absorbed/involved in their SNS use which, according to Rouis et al. (2011), was strongly correlated with lower academic achievement. One might say that the quality of use for US users is "high" (i.e., they are more cognitively involved in SNS use). If the research on task-switching and cognitive processing of information is taken into account, then one could say that these highly-involved users are constantly experiencing an information bottleneck (Borst, 2012), and it is not so much how often they use SNSs, but rather how involved they are in using them.

4.1. Implications

Results highlight a negative relationship between SNS use and GPA for all students, and also the negative effects of multitasking. SNS use is something done concurrently with studying or other academic activities, and the negative relationship may be an indication of a deleterious effect of trying to carry out these two thought/information processing processes at the same time. In other words, it is not the use of SNSs which are deleterious, but the disruptive use of them. Conceivably, any task implemented concurrently with studying may have this same effect; however, with Internet and SNS accessibility at an all time high on a myriad of devices concurrently, it makes it easier to engage in such activities while studying. The results from this study provide valuable cautionary information about the impact of multitasking and using SNS(s) in a learning environment on students' GPA.

For the research community, this study contributes to the literature in many unique ways. This study is the first to compare large populations in two completely different cultures (i.e., US and Europe) with regards to SNS use, multitasking, and academic performance. Additionally, this exploratory study shows different styles of SNS use (i.e., disruptive and non-disruptive) with respect to the two sub-populations and that this differentially impacts academic performance. Finally, although the combination of quantitative and qualitative data in a study is not new (i.e., mixed-methods research), this approach has been less common in examining SNS use. Frequencies and percentages have been tallied, and correlations and regressions have been used, but analyzing qualitative responses to open-ended survey questions (i.e., or other qualitative methods such as conducting interviews, focus groups, or observations) has not been applied regularly in this area of research.

For university administrators and policy makers, this research gives pause to think. There is an increasing debate/dispute about using social media in education. Mobile learning with smart devices is often seen as a method for contextualizing learning and "expanding" the classroom. Social networks in the form of

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communities (i.e., of learners, of practitioners, of interest) are seen as possible tools for knowledge development, creation and sharing. The results of the research reported here, coupled with the findings of researchers such as Quan-Haase (2010) and Rouis et al. (2011), expose the downside of implementing this. These researchers/research teams found that students have problems regulating their use of social network applications. Thus, while educators and policy makers espouse the possible benefits of using such applications and tools for knowledge development, creation, and sharing, the inability of its users to limit themselves to using it for the prospective goals undermines their use for even legitimate reasons.

4.2. Limitations and future directions

It should be noted that this is only one correlational study out of many that need to be implemented in order to build a strong literature base in examining SNS use and its correlates. Thus, one of the main limitations of the current study is that it is correlational (i.e., survey research). Due to the correlational design, causation cannot be determined in examining the hypothesized relationship between SNS use and GPA. Other designs should be used (e.g., longitudinal) to further investigate how SNS use may (or may not) be related to academic performance. Although it would bring an important contribution to this area of research, intervention studies would be difficult if not impossible to conduct. In addition, finding a group of individuals that do not use or who have never used SNSs is equally challenging. Though such a group possibly exists, one could argue that these people deviate from a "normal" population in numerous ways that they would not be able to be compared to a group of SNS users.

Another limitation is that the sample, while expansive and covering a wide range of countries, cannot be considered to be representative for all countries in Europe and all states in the US. Although generalization to the US and Europe as a whole is nearly impossible, few studies have examined the cultural differences even though this could play an important role in SNS use. Culture, which can be seen as the shared perception of social environment, shapes the way that people behave, the way that they interact and communicate with each other, and how they build relationships with each other (Gudykunst et al., 1996; Hofstede, 2001). Research has shown that cultures or cultural contexts can influence both the patterns of media usage (i.e., amount and/or duration of use) and attitudes toward them (Garramone, Harris, & Anderson, 1986; Papacharissi & Rubin, 2000). Kim et al. (2011; p. 365) found, for example, that with respect to SNS use, Korean college students:

> ...put more weight on obtaining social support from existing social relationships, while American students place relatively greater emphasis on seeking entertainment. Additionally, American college students' networks in an online social venue are far larger than their Korean counterparts, which may reflect the cultural difference between the two countries regarding developing and managing social relationships. (p. 365)

Future studies should, thus, consider examining SNS use, specifically taking culture and cultural differences into account.

The voluntary response sample also is a limitation in that there is no way to corroborate self-reported information; unfortunately, this is often the nature of Internet-based survey research. Additionally, recruiting methods may have biased sample towards individuals who use social media, since recruiting and data collection were both electronic. Future studies should find alternative methods of collecting information (e.g., transcripts for student GPAs). With respect to measurement of variables, self-reported time spent studying, time spent on SNSs per day, and multitasking perceptions and frequency are problematic for obvious reasons. For example, all of the multitasking questions were self-report and therefore subject to a host of concerns (e.g., social-desirability, inaccuracy, poor memory). Determining the most accurate ways to collect these data will enhance the validity of future studies' findings.

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Please cite this article in press as: Karpinski, A. C., et al. An exploration of social networking site use, multitasking, and academic performance among United States and European university students. *Computers in Human Behavior* (2012), http://dx.doi.org/10.1016/j.chb.2012.10.011

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Please cite this article in press as: Karpinski, A. C., et al. An exploration of social networking site use, multitasking, and academic performance among United States and European university students. *Computers in Human Behavior* (2012), http://dx.doi.org/10.1016/j.chb.2012.10.011