

Cell phone use predicts being an “active couch potato”: results from a cross-sectional survey of sufficiently active college students

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Abstract

Objective: “Active couch potato” describes an individual who is sufficiently physically active yet highly sedentary. Cell phones promote activities understood as sedentary behaviors (e.g. watching videos). Research demonstrates that cell phone use is positively associated with sedentary behavior. Although sedentary behavior typically displaces physical activity, no relationship between cell phone use and physical activity has been found. Thus, it is possible that some sufficiently active individuals are also high-frequency cell phone users and therefore highly sedentary. In other words, cell phone use may predict being an “active couch potato” among active people. Testing this hypothesis was the purpose of this study. “Active couch potatoes” are of concern as the negative effects of excessive sedentary behavior are independent of the benefits of physical activity.

Methods: College students (228) completed validated surveys assessing physical activity, sedentary behavior, and cell phone use. Using a previously validated method, participants were rated as sufficiently active or not based upon their physical activity survey score. Participants who were not sufficiently active were excluded from further analysis resulting in a final sample of 171. These sufficiently active individuals were categorized as “active couch potatoes” if they were also highly sedentary (i.e. sitting for eight or more hours/day). Logistic regression determined if cell phone use predicted being categorized as an “active couch potato.”

Results: Cell phone use was a significant, positive predictor of being an “active couch potato.” With each additional hour of daily cell phone use, the odds of becoming an “active couch potato” increased by 11.4% (Wald = 5.934, $P = 0.015$, $\text{Exp}(B) = 1.114$). On average, active couch potatoes used their cell phone 1.7 hours more each day than their sufficiently active but not overly sedentary peers.

Conclusion: Increased cell phone use was a significant predictor of being an “active couch potato.” Explanations and implications are discussed.

Keywords

Sedentary behavior, sitting, physical activity, mobile phone, cell phone, smartphone

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Background

The positive health effects of physical activity as well as the negative health effects of sedentary behavior (i.e. time allocated to activities, other than sleeping, where an individual is sitting) are well documented.^{1–9} Physical activity is inversely associated with all-cause mortality and the risk of developing a number of health

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problems including, but not limited to, cardiovascular disease, metabolic disease, and certain types of cancer.^{1–3} Conversely, sedentary behavior is positively associated with the development of many of these same health problems.^{4–9} Thus, researchers have suggested that it is important not only to be physically active, but to also minimize sitting.^{10–12} Furthermore, physical activity tends to displace sedentary behavior.¹³ A comprehensive review of 26 studies found that physical activity is negatively associated with all types of sedentary behavior (e.g., work related sitting, television watching, computer use, video games, driving, etc.).¹³ However, not all individuals fit this typical behavioral pattern. It is increasingly recognized that certain individuals are regularly physically active but still allocate large amounts of time to sedentary behavior. Such individuals are known as “active couch potatoes.”¹⁴ This “active couch potato” lifestyle is of concern as it is now understood that the negative health effects of sedentary behavior are independent of the benefits of physical activity.¹⁵ To illustrate, a meta-analysis of 47 studies concluded that sedentary behavior, independent of physical activity, was associated with greater risk of mortality, cardiovascular disease, particular cancers, and type 2 diabetes.¹⁵ Thus, it appears that participating in large amounts of sedentary behavior may have negative health consequences even for individuals who are sufficiently physically active.

Given the independent relationship of both physical activity and sedentary behavior to disease risk, it has been argued that too much sitting should be understood as a health risk distinct from too little physical activity.¹⁴ As a result, there has been a substantial amount of research investigating common sedentary behaviors.^{16,17} Of these, watching television (TV) has received the most attention, but a call has been made to extend the research on sedentary behavior beyond TV.¹⁴ Specifically, there is a need “to understand the potential health consequences of other common sedentary behaviors.”^{14, p. 9} Recent evidence has indicated that today’s internet-enabled cell phones have surpassed television as the most frequently used media platform among US adults.¹⁸ Given their ubiquity, accessibility, and near constant connectivity, cell phones allow users to participate in activities that may promote sedentary behavior (e.g. watching videos, surfing the internet) almost anytime and anyplace. This may have important health implications.

Our group has been studying the associations between cell phone use and health-related variables for several years. Our research has focused mostly on young adults aged 18–29 years as cell phone use is greatest among this demographic.¹⁹ In two independent studies, using cross-sectional surveys, we found a positive relationship between cell phone use and

sedentary behavior; that individuals most commonly used their cell phones while sitting (as opposed to while standing or moving about); and that high cell phone users sit 90 min more per day on average than their lower use peers.^{20–21} In a laboratory study, we found a significant and negative relationship between daily cell phone use and peak oxygen consumption during treadmill exercise (i.e., cardiorespiratory fitness) after controlling for sex, percent body fat, and self-efficacy for exercise behavior.²² This may be partially explained by the greater sedentary behavior among high cell phone users.^{20–21} Additionally, our group found that high frequency cell phone users are more likely to use the device during exercise.²⁰ In a separate laboratory-based controlled experiment, we found that using the device during exercise for purposes other than listening to music (e.g. talking, texting) reduces the intensity of that exercise.²³ We pursued this further with an observational field study and found that cell phone use during free-living walking significantly reduces walking speed.²⁴

In these prior studies there have been no significant relationships between cell phone use and the volume of an individual’s physical activity behavior. Initially, we hypothesized that cell phone use would displace physical activity as is the case with traditional sedentary behaviors.¹³ However, this was not the case.^{19,20} A possible explanation may be that, while many cell phone functions likely promote sedentary behavior, other functions may promote physical activity. For example, there is evidence that cell phones can successfully support public health interventions designed to increase physical activity.²⁵ Cell-phone-based physical activity monitors and fitness “apps” may also promote physical activity.²⁶ Finally, playing cell phone based physically interactive video games (e.g. Pokémon Go!) may increase physical activity.²⁷ It is likely that heavy users of cell phones utilize a wide variety of functions on their devices. This could include regularly using both the potentially sedentary cell phone functions and the functions that may promote physical activity. If this is the case, then high cell phone use may be associated with a greater likelihood of being an “active couch potato.”

In summary, research suggests that cell phone use is a sedentary behavior.^{20–21} The traditional view of sedentary behavior is that it displaces physical activity.¹³ Thus, as cell phone use increases then physical activity should decrease. However, this does not seem to be the case.^{19–20} The explanation proposed here is that cell phone use may be different than traditional sedentary behaviors. Some cell phone functions might encourage sedentary behavior while other cell phone functions might encourage physical activity. Thus, some individuals who are heavy cell phone users may at times utilize

functions that promote physical activity and at other times sedentary behavior. If sufficiently active and highly sedentary, then these individuals would be active couch potatoes. Their presence in a population could convolute the expected negative relationship between cell phone use and physical activity, while supporting the expected positive relationship between cell phone use and sedentary behavior. As such, the purpose of the present study was to assess whether or not cell phone use predicts being an “active couch potato” in a sample of sufficiently active college students. We hypothesized that, as cell phone use increased, so will the odds of being an “active couch potato.” Additionally, we were interested in examining sufficiently active individuals as they are likely to perceive their active lifestyle as protective from a number of health concerns. Yet, prior research has indicated that the elevated sedentary behavior in the “active couch potatoes” puts them at greater risk for a variety of cardio-metabolic disorders relative to their peers who are also sufficiently active but less sedentary.^{14,15} Thus, research examining this population’s predictors of sedentary behavior is warranted.

Methods

An initial sample of 228 undergraduate students (21.0 ± 2.0 years old, $n = 125$ females) from a large, public, university in the Midwestern USA provided consent and then completed a brief questionnaire of valid and reliable measures assessing the variables of interest: cell phone use, physical activity, and sedentary behavior. Because this study was interested in sufficiently active individuals, those individuals determined to be not sufficiently active were excluded from the analysis ($n = 57$). The procedure used in making this determination is described in detail below and resulted in a final sample of 171 sufficiently active, undergraduate students (20.9 ± 1.9 years old, $n = 90$ females). Only a few instruments were included in the survey in order to minimize the burden of participation. As a result, this survey could be completed in less than 10 min and most people invited to participate agreed to do so. The sample was obtained by a trained research assistant who was positioned at various high-foot-traffic areas across a largely pedestrian campus. Data collection occurred at different times of the day and on different days of the week to increase the representativeness of the sample. Every fifth person that walked past the research assistant was invited to complete the survey. Initial screening questions assured that all participants were undergraduate students between 18 and 29 years of age. After agreeing to participate, participants were handed a clipboard, the survey, and a pen. The research assistant explained that the intent of the

survey was to assess students’ physical activity and sedentary behavior, and asked participants to take as much time as necessary to complete the survey accurately. All data were collected during a single academic semester. All procedures were approved by the university institutional review board. Accordingly, the free and informed consent of all participants was obtained.

Survey measures

Cell phone use was assessed by asking the participants the following question: “As accurately as possible, please estimate the total amount of time you spend using your cell phone each day. Please consider all uses except listening to music. For example: consider calling, texting, sending photos, gaming, surfing, watching videos, Facebook, Twitter, e-mail, and all other uses driven by ‘apps’ and software.” As reported previously, this self-report measure was carefully developed to assure content validity, and subsequent testing with college students provided evidence of construct and criterion validity.²⁸ Furthermore, it is similar to other surveys assessing the use of electronic devices for media consumption (e.g. TV),³⁰ and has been used in previously published research.^{21,28,30,31} In this sample, mean cell phone use (±standard deviation (SD)) was 302 ± 248 min/day (5.03 ± 4.13 h/day). This is similar to results from recent independent samples using the same measure (e.g. $M = 278 \pm 218$ min/day, $N = 536$; $M = 347 \pm 249$ min/day, $N = 516$).^{30,31}

Physical activity was assessed using the Godin Leisure-Time Exercise Questionnaire (GLTEQ)—a valid and reliable assessment tool for adolescents and adults across a wide range of ages.^{32–34} Using previously established and validated guidelines,^{35,36} a physical activity score was calculated for each participant, using the Godin questionnaire. The sample’s mean physical activity score (±SD) was 43 ± 34.

Sedentary behavior was calculated using the previously-validated International Physical Activity Questionnaire (IPAQ).³⁷ Previous research has demonstrated that IPAQ sedentary measures have adequate reliability and validity for the assessment of sedentary behavior independent of physical activity.³⁸ Participants were asked to think “about the time you spent sitting on weekdays and weekends during the last 7 days.” They were asked to include “time spent sitting at a desk, visiting friends, reading, or sitting or lying down to watch television.” Estimates were then provided for weekday sitting and weekend sitting. Average daily sitting was calculated as follows: $\text{Sitting} = [(\text{week-day sitting} \times 5) + (\text{weekend sitting} \times 2)] / 7$. In this sample, mean daily sitting (± SD) was 436 ± 210 min/day which is similar to previous research examining a similar population [^{20,21}].

Operationalizing the “active couch potato”

Conceptually, the “active couch potato” is sufficiently physically active and simultaneously highly sedentary. Validity evidence supports using the GLTEQ score for categorizing healthy adults as either sufficiently active or insufficiently active.^{35,36} This evidence suggests that individuals with GLTEQ scores ≥ 24 should be considered sufficiently active.^{35,36} In this sample, 75% ($n = 171$, 90 females, 81 males) had a score of ≥ 24 . This study was interested in understanding active couch potatoes in comparison to similarly active individuals who sit much less. Therefore, these 171 sufficiently active individuals represented the final sample utilized for analyses and would include any potential active couch potatoes. In addition to being sufficiently active, the active couch potato is highly sedentary. While there is not a widely accepted standard for healthy and unhealthy sedentary time, research has found that sitting less than 8 h per day, while meeting accepted physical activity standards, protects against all-cause mortality.³⁹ This suggests that 8 h per day could be considered a meaningful threshold for sedentary behavior. As such, we operationalized the active couch potato as an individual who is sufficiently physically active (i.e., GLTEQ score ≥ 24) while simultaneously sitting for more than 8 h each day. By this measure, the sample used in our final analysis ($n = 171$) included 53 active couch potatoes and 118 sufficiently active individuals who sit < 8 h per day.

Data Analysis

First, a correlation analysis assessed the relationships between the three main study variables: cell phone use, sedentary behavior, and physical activity. This was to determine if the relationships between these variables were consistent with previous research. Then a binary logistic regression was used to determine if cell phone use can predict being an “active couch potato.” In order to improve the interpretation of the logistic regression’s estimated odds ratios (i.e. the odds of being an active couch potato given a one unit change in cell phone use), cell phone use was converted from

minutes per day to hours per day. Additionally, biological sex (0 = male, 1 = female) was included in the regression as a statistical control as research suggests that there are physical activity differences between males and females.⁴⁰ Even in this sample of sufficiently active individuals, an independent-samples *t*-test revealed that males had a significantly higher mean GLTEQ score (70.7 ± 32.3 versus 60.63 ± 24.6) than their female counterparts ($t = 2.30$, $P = 0.023$). Finally, independent-samples *t*-tests were conducted to compare mean daily cell phone use, mean daily sitting, and mean physical activity score between sufficiently active individuals who sit *less* than 8 h per day and “active couch potatoes” (i.e. sufficiently active individuals who sit *more* than 8 h per day). All data analysis was conducted using the Statistical Package for the Social Sciences (SPSS version 21).

Results

The correlation analysis determined that sedentary behavior was positively related to cell phone use ($r = .31$, $P < .001$) and negatively related to physical activity ($r = -.19$, $P = .016$). Cell phone use was not related to physical activity ($r = .02$, $P = .82$). These results are congruent with previous research.^{13,21,22} We thus proceeded to test the logistic regression model (e.g., active couch potato = sex + cell phone use).

Chi-Square goodness of fit tested the null hypothesis that all regression model coefficients are zero. The null hypothesis was rejected ($\chi^2 = 7.9$, $P = 0.019$, $df = 2$) and the model was determined to be significant. Table 1 presents a summary of the logistic regression results which demonstrate that, in this sample of sufficiently active college students, cell phone use was a significant, positive predictor of being an “active couch potato.” Specifically, with each additional hour of daily cell phone use, the odds of becoming an active couch potato increased by 11.4% (Wald = 5.934, $P = 0.015$, Exp(B) = 1.114). Sex was not a significant predictor of being an “active couch potato” (Wald = 1.062, $p = 0.303$).

Table 1. Summary of logistic regression predicting “active couch potato” from cell phone use, controlling for sex.

	B	SE	Wald	df	Sig.	Exp(B)	95% CI for Exp(B)	
							Lower	Upper
Sex	0.35	0.34	1.062	1	0.303	1.425	0.727	2.795
Cell phone use	0.12	0.04	5.934	1	0.015	1.114	1.021	1.215

Male is the baseline reference category for sex. Cell phone use = h/day. Exp(B): Exponentiated B.

* $P < 0.05$

Results from the independent samples *t*-tests, including group means and SD, are presented in Table 2. These results demonstrate that “active couch potatoes,” compared with “not active couch potatoes” are significantly more sedentary ($t = 13.64$, $P \leq 0.001$); and spend significantly more time each day using the cell phone ($t = 2.49$, $P = 0.015$). There was no difference in physical activity score ($t = 0.85$, $P = 0.396$).

Discussion

It was hypothesized that, among sufficiently active individuals, cell phone use predicts being an “active couch potato” (an individual who meets physical activity standards yet is highly sedentary). Results from the present study, utilizing a sample of sufficiently active college students, support this hypothesis. Previous research has identified a positive relationship between cell phone use and sedentary behavior.^{20–22} However, these previous studies did not find a significant relationship between cell phone use and physical activity behavior.^{20,21} Traditional sedentary behaviors (e.g. watching TV) are typically negatively correlated with physical activity behavior.¹³ Cell phone use is not; and in this way it may differ from traditional sedentary behaviors. This is evident among the “active couch potatoes” identified in this study. These sufficiently active individuals spent significantly more time using the cell phone each day, and were significantly more sedentary, than their comparably active peers. A possible explanation is that particular cell phone functions may promote sedentary behavior, while other cell phone functions may promote physical activity. For example, functions that mimic traditional television watching (i.e. streaming video content) are likely sedentary. In contrast, using the cell phone for physically interactive video games (e.g. Pokémon Go!) may increase physical activity.²⁷ Additionally, there is a growing number of cell phone based physical activity monitors and fitness “apps” which may also promote

physical activity.²⁶ It may be that the “active couch potatoes” identified in this study utilized a wide variety of functions on their cell phones, including both physical activity displacing and physical activity promoting functions. An area of future research is to better understand how particular cell phone functions relate to physical activity, sedentary behavior, health, and well-being.

Future research is warranted as a better understanding of the “active couch potato” phenomenon is needed.^{14,41} Particularly since sufficiently physically active individuals may not be concerned about their time spent being sedentary. As the first study to operationalize the “active couch potato” phenomenon, it demonstrated that sufficiently physically active individuals can also be highly sedentary. In other words, that the “active couch potato” is a measurable phenomenon and deserves further study. The “active couch potato” is of concern as previous research suggests that physically active individuals are also at risk of the deleterious health effects of prolonged sitting despite their regular physical activity.¹⁵ Specifically, these “active couch potatoes” exhibit a greater waist circumference, and elevated blood glucose, triglycerides, systolic blood pressure, and mortality risk from cardiovascular disease relative to their peers who are also physically active yet are less sedentary.¹⁵ Therefore, it is important to raise the public’s awareness that it is not enough only to be sufficiently physically active, one should also minimize time spent sitting. Among sufficiently physically active people, high frequency cell phone users may be an appropriate group to target with this message. Presently, we have provided evidence of a positive relationship between cell phone use and the likelihood of being an “active couch potato” among sufficiently active individuals. This represents another troubling finding regarding the potential health implications associated with excessive cell phone use which has previously been linked to greater sedentary behavior, lower cardiorespiratory fitness, lower exercise intensity

Table 2. Summary of independent samples *t*-test comparing “active couch potatoes” ($n = 53$) with “not active couch potatoes” ($n = 118$) for cell phone use, physical activity, and sitting.

	Active couch potato		Not active couch potato		<i>t</i>	<i>p</i>
	Mean	SD	Mean	SD		
Daily cell phone use	5.9	4.2	4.2	3.3	2.50	0.015*
Physical activity	51.4	21.8	56.0	36.4	0.851	0.396
Daily sitting	658.2	177.5	304.3	96.4	13.638	$\leq 0.001^{**}$

Daily cell phone use = h/day, daily sitting = min/day. Physical activity recorded as a score.³³ Equal variances not assumed for cell phone use and sitting (Levene’s test for equality of variances ≥ 4.5 , $P \leq .036$).

* $P < 0.05$; ** $P < 0.001$

and free-living walking pace, and increased anxiety.^{19–21,23,24,30} Accordingly, reducing cell phone use may yield positive outcomes for interventions designed to reduce sedentary behavior, including programs targeting “active couch potatoes.”

While this is the first study we are aware of to assess the potential relationship between cell phone use and the likelihood of being an “active couch potato,” it is not without limitations. First, this is a non-experimental study and thus we cannot infer whether high cell phone use causes an individual to be an “active couch potato” or if individuals who are highly sedentary yet participate in sufficient physical activity are heavy cell phone users for some other reason. Experimental and longitudinal designs that manipulate cell phone use and examine the effect upon sedentary behavior, physical activity, and the “active couch potato” phenomenon are warranted. Second, the survey methods, while valid, are subjective. Objective measures of cell phone use, physical activity, and sedentary behavior are warranted for future studies. Third, this study assessed only one type of portable internet enabled device (albeit the most commonly used one, cell phones). Nevertheless, other common portable, internet-enabled devices (e.g. tablets) should be studied for their relationship with physical activity, sedentary behavior, and the active couch potato phenomenon (e.g. Kobak et al.⁴²). Finally, this study focused only on individuals who were sufficiently active. Individuals who were not sufficiently active were omitted from the final analysis. Future studies might consider a broader range of interactions between physical activity and sedentary behavior (i.e. low physical activity and high sedentary behavior; low physical activity and low sedentary behavior) in addition to the interactions studied here (sufficient physical activity and low sedentary behavior; sufficient physical activity and high sedentary behavior). Additional predictors such as self-efficacy for exercise, the use of smartphone fitness apps and activity trackers in addition to daily cell phone use would add nuance and complexity to the model developed here.

Conclusion

These findings provide two original contributions to the literature. First, a method for operationalizing the “active couch potato” concept, based upon validated physical activity and sedentary behavior surveys, was presented. Further testing and refining of this variable are warranted. Second, this study demonstrated that cell phone use predicts being an “active couch potato” using data from a cross-sectional survey of sufficiently active undergraduate college students. Previous research has shown that high frequency cell phone

use is associated with greater sedentary behavior.^{19–21} The present study demonstrates that this is true even for individuals who are regularly physically active. This is concerning as excessive sedentary behavior in individuals who are regularly physically active (i.e. active couch potatoes) is associated with a greater risk of developing cardio-metabolic health disorders relative to individuals who are similarly physically active yet less sedentary. Future research examining if reducing cell phone use could cause a reduction in sedentary behaviors is warranted. Such an intervention should include sufficiently active individuals as they too may be susceptible to the increased sedentary behavior associated with high-frequency cell phone use.

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Contributorship: AL and JEB shared all study responsibilities equally, including conceptualizing the design, obtaining IRB approval, data collection, processing and analysis, and writing the manuscript.

Declaration of Conflicting Interests: The authors declare that they have no competing interests.

Ethical approval: All procedures were approved by the Kent State University institutional review board, protocol #14-441. An oral consent process was used. Specifically, the Informed Consent form was the first page of the survey. Potential respondents were asked to read the Informed Consent form before agreeing to participate. Any questions that potential respondents had were answered at that time. Potential respondents then signaled agreement to participate orally and by taking the survey which began on page two.

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