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The impact of cell phone texting on the amount of time spent exercising at different intensities

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ABSTRACT

This study assessed the effect of cell phone texting during a 30-min bout of treadmill exercise on the amount of time spent exercising at different intensities. Thirty-two college students participated in two conditions (*cell phone* and *control*). During the *cell phone* condition participants could use their cell phone only for texting purposes. During the *control* condition participants did not have access to their cell phone nor any interaction with other individuals or electronics. Heart rate was measured continuously and was used to determine how much time was spent exercising at different intensities. Vigorous intensity minutes was significantly greater ($p = 0.001$) in the *control* condition (12.94 ± 8.76 min) than the *cell phone* condition (7.09 ± 8.38 min). Low intensity minutes was significantly greater ($p = 0.001$) in the *cell phone* condition (9.47 ± 9.73) than the *control* condition (3.44 ± 6.52). Moderate intensity minutes in the *cell phone* (13.44 ± 8.43) and *control* (13.69 ± 8.13) conditions were not significantly ($p = 0.89$) different. In conclusion, using a cell phone for texting can interfere with treadmill exercise by promoting greater participation in low intensity exercise and less participation in vigorous intensity exercise due to a possible dual-tasking effect.

1. Introduction

Cell phones have become a near-ubiquitous tool for communicating, with 97% of young adults (age 18–29) owning cell phones (Smith, 2011). Among these young adults, besides reporting using their cell phone primarily for talking, 73% also reported using their cell phones primarily for texting (Smith, 2011). Because of the cell phone's inherent portability, users can now engage in communicating via texting nearly anywhere and anytime. To illustrate, recent research has found that the cell phone is commonly used for texting during work, in the classroom while learning or studying, while watching movies and sporting events, during meals, and while going to the bathroom (Harrison & Gilmore, 2012; Tindell & Bohlander, 2011). While the increased ability to communicate with others that cell phones provide likely has benefits, the concern here is that frequent cell phone use may become a distraction that in some circumstances negatively affects performance on other tasks.

One example of an important daily task in which cell phone use may become a distraction and negatively affect performance is while driving an automobile. Results have consistently shown that cell phone use while driving an automobile is a distraction and significantly impairs performance (Hancock, Lesch, & Simmons, 2003; Horrey & Wickens, 2006; Rakauskas, Gugerty, & Ward, 2004). The phenomenon that explains this decrease in performance is the dual-task effect (Neider et al., 2011). The dual-task effect simply is when individuals simultaneously divide their attention between dual tasks and neither task receives the attentional resources it would have if it were attempted alone (Neider et al., 2011). Another example of an important daily task in which cell phone use may become a distraction is crossing a street. Several studies have examined the dual-task effect of cell phone use on simulated street crossing behavior in a virtual environment with an integrated treadmill (Neider et al., 2011; Neider, McCarley, Crowell, Kaczmarski, & Kramer, 2010; Schwebel et al., 2012). Findings from these studies have shown that when individuals use their cell phone for texting purposes they take more time to initiate a street crossing and are more likely to error during a street crossing (e.g. disobey lights, cross into oncoming traffic) in comparison to an

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undistracted condition (i.e. no cell phone) (Neider et al., 2010, 2011; Schwebel et al., 2012). Observational studies have also noted that pedestrians are less likely to recall objects passed along the way (Hyman, Boss, Wise, McKenzie, & Caggiano, 2010) and are more likely to display unsafe street crossing behaviors (Nasar, Hecht, & Wener, 2008; Thompson, Rivara, Ayyagari, & Ebel, 2013). The importance of understanding cell phone related dual-task effects is growing as the use of these attention-demanding devices increasingly occurs during other activities. The strength of these previously mentioned studies is that most have utilized an experimental design, allowing for clear causal inferences to be made. Beyond this line of research, however, the use of experimental design to understand the effects of cell phone use on other common human behaviors is rare.

Recently, the relationship between cell phone use and physical fitness has been receiving attention (Lepp, Barkley, Sanders, Rebold, & Gates, 2013; Rebold, Lepp, Sanders, & Barkley, 2015). Cell phones provide constant access to entertainment activities that are traditionally associated with increased sedentary behavior (e.g. surfing the internet, watching videos, playing video games) and sedentary behavior is negatively associated with physical activity and fitness (Ford, Kohl, Mokdad, & Ajani, 2005; Must & Tybor, 2005; Santos et al., 2014; Tremblay et al., 2011). Conversely, cell phones are a mobile device and can be used while standing, walking, and during some forms of moderate-intensity physical activity (e.g., pedaling a stationary exercise bike). Thus, the relationship between cell phone use and physical activity/fitness may be different than the use of traditional sedentary devices (e.g., watching television).

Findings from a recent study that assessed the relationship between cell phone use and cardiorespiratory fitness (i.e., peak oxygen consumption or VO_2 peak ml kg^{-1} min^{-1}) in a sample of college students revealed that VO_2 peak was negatively associated with all measures of cell phone use (texting, calls made, and total minutes of use) (Lepp et al., 2013). Participants from the study were interviewed about their daily physical activities, sedentary behaviors, and cell phone use habits. Responses from these interviews revealed two potential explanations for why cell phone use was negatively associated with cardiorespiratory fitness. First, participants described cell phone use as a sedentary behavior. Furthermore, high frequency cell phone users, relative to low frequency users, reported engaging in a greater number of sedentary behaviors while using their cell phone (e.g. playing video games, watching TV, etc.) (Lepp et al., 2013). Second, participants identified cell phone use as a potential distraction during planned exercise and described how it disrupts a given exercise bout (Lepp et al., 2013). As these responses suggest, cell phone use during about of planned exercise may cause a distraction and potentially reduce exercise intensity. If so, this could limit the ability of an exercise bout to enhance fitness and provide a partial explanation for the negative relationship between cell phone use and cardiorespiratory fitness described above.

According to the American College of Sports Medicine (ACSM), healthy individuals should accumulate $\geq$ 150-min $week^{-1}$ of moderate intensity (40–<60% heart rate reserve) exercise, or ≥75-min $week^{-1}$ of vigorous intensity (60–<90% heart rate reserve) exercise, or a combination of moderate and vigorous exercise (Whaley, Brubaker, & Otto, 2006). Failure to achieve these recommendations by healthy individuals over time may result in poor health-related fitness and the early onset of chronic diseases (Whaley et al., 2006). Light intensity (30–<40% heart rate reserve) exercise is considered beneficial only in deconditioned individuals or previously sedentary individuals (Whaley et al., 2006). Findings from another recent study demonstrated that using a cell phone for talking or texting during treadmill exercise significantly reduces the workload (i.e., average speed) of that exercise (Rebold et al., 2015). These previous studies (Lepp et al., 2013; Rebold et al., 2015) provides clear insight into cell phone use during exercise and how it has the potential to cause a distraction and therefore, reduce exercise intensity, however, it is unclear from these previous studies how much cell phone use during exercise deters individuals from achieving the moderate and vigorous exercise intensity recommendations set forth by the ACSM.

Cell phones are ubiquitous among today's young adults (Smith, 2011). However, we are only just now beginning to discover some of the behavioral effects that the use of these devices may have. The purpose of this study was to assess the effect of cell phone texting on the amount of time spent exercising at different intensities during a bout of 30-min of treadmill exercise. This study utilized a within-subjects design to compare the amount of time spent exercising at different intensities (low, moderate, vigorous), average speed, and total distance of 30-min bouts of self-selected treadmill exercise during two conditions (*cell phone*, *control*). It was hypothesized that texting would distract from treadmill exercise and result in greater time spent exercising at a low intensity and less time spent exercising at both moderate and vigorous intensities relative to a control condition during a bout of 30-min of treadmill exercise. It was also hypothesized that texting during treadmill exercise would result in a lower average speed and total distance relative to a control condition.

2. Methods

2.1. Participants

Thirty-two college students ($n = 18$ females, $n = 14$ males, age 19.54 ± 1.29 years, Table 1) each participated in two, separate, 30-min exercise conditions (*cell phone*, *control*) on a treadmill on separate days. The order of the two conditions was randomized and each participant completed both conditions (i.e., within-subjects design). Participants were excluded if they did not own a cell phone or if they had a cell phone without the ability to send and receive text messages, and if they had any contraindications to exercise (i.e., orthopedic injuries). Prior to participation in the study participants were instructed on the benefits and risks and to refrain from caffeinated related-substances (e.g., drinks, foods, supplements) at least 2-h prior to their visit, completed medical history forms, and signed an informed consent form. This study was approved by the Bloomsburg University of Pennsylvania Institutional Review Board.

2.2. Procedures

Participants reported to the Exercise Physiology Laboratory on two separate days. During each visit participants completed one of two exercise conditions (*cell phone*, *control*). This was a within-subjects design as each participant completed both exercise conditions. Prior to initiation of each 30-min exercise condition each participant's resting heart rate was obtained by having them sit

Table 1
Average height, weight, and age.

	Males ($n = 14$)	Females ($n = 18$)
Height (cm)	177.62 ± 9.32 cm[a]	163.83 ± 6.76 cm
Weight (kg)	76.3 ± 9.64 kg[a]	62.15 ± 8.69 kg
Age (years)	19.36 ± 1.01 years	19.72 ± 1.57 years

All data are means ± SD.
$p < 0.05$ for all.
[a] Males significantly greater than females for height and weight.