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A daily diary approach to investigate the effect of ego depletion on intentions and next day behavior☆

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ABSTRACT

Objectives: Ego depletion impairs physical and cognitive capacities, but its effects on daily intentions and behavior remain unclear. This study provides insight into relationships between ego depletion, intentions, and exercise, leisure sitting and other non-activity related behaviors.
Design: The study involved repeated assessment using a daily diary.
Method: Australian university students (N = 103, 52% female, M age = 22 years) self-reported end-of-day ego depletion, decisional intentions, and behavior for time spent exercising, in leisure-time sitting, doing paid work, sleeping, studying, housework, and the amount of alcohol consumed across seven days.
Results: When people were more ego depleted at the time of reporting intentions, they intended to exercise for less time the next day than when people were less ego depleted. However, if people were highly ego depleted when reporting exercise intentions for the next day, they were subsequently more likely to reach those intentions. There were no significant effects of ego depletion on intentions or on the likelihood of achieving intentions for any behavior other than exercise.
Conclusions: Given that the effects of ego depletion on intentions and behavior were seen for exercise but not other daily behaviors, it may be that ego depletion only impacts intentions to engage in physically effortful behavior. Future research is needed to test replicability of the effects. Interventions may consider accounting for ego depletion in efforts to enhance behavioral intentions; however, the findings also highlight the importance of keeping behavior change (as opposed to change in intentions) as the main outcome focus.

1. Introduction

Most people do not exercise enough to gain substantial health benefits (Australian Bureau of Statistics, 2013; Physical Activity Guidelines Advisory Committee, 2008). On any given day, people may not exercise simply because they had no intentions to do so; alternatively, people may have made intentions to exercise but failed to follow through with them. For example, someone might have had a taxing day and felt drained, and as a result, reduced or eliminated their *decisional intention* (e.g., aim or outcome plan; Rhodes & Rebar, 2017 to exercise. This sensation of having limited cognitive and physical capacities as a result of taxed self-control is referred to as ego depletion (Baumeister & Vohs, 2016; Baumeister, Bratslavsky, Muraven, & Tice, 1998; Cunningham & Baumeister, 2016; Hagger, Wood, Stiff, & Chatzisarantis, 2010). Ego depletion should be particularly consequential for decisional intentions of effortful behaviors such as exercise but likely would not impact how much a person intends to do non-effortful activities such as sitting in leisure (e.g., sitting while watching television), drinking alcohol, sleeping, or studying. The aim of this study is to test how ego depletion at the time of making next-day decisional intentions predicts (a) the time people intend to engage in behavior and (b) the intention-behavior relationships (i.e., the extent to which individuals act in accordance with their intentions).

According to many socio-cognitive theories of behavior change, intentions are the primary precursor to behavior. Indeed, intentions do predict a substantial amount of variability in exercise behavior (Hagger, Chatzisarantis, & Biddle, 2002; McEachan, Conner, Taylor, & Lawton, 2011; Rhodes & Dickau, 2012; Webb & Sheeran, 2006), so it is important to understand what factors influence exercise intentions. Recently, it has been noted that intentions can refer to two distinct

☆ The study was carried out at the University of Western Australia, Perth, WA, Australia.

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motivational processes – decisions (e.g., do you intend to exercise tomorrow?) and degree of commitment to that decision (e.g., to what degree do you intend to exercise tomorrow) (Rhodes & Rebar, 2017; Sheeran, 2002). These are referred to as *decisional intention* and *intentional strength*, respectively. Whereas decisional intention is the pre-intentional processes that drive the initial intention, intentional strength is a reflection of the post-intentional processes that drive the implementation of the intentions. Comparatively, most research has focused on the impact of intentional strength on exercise behavior, showing that it is a robust mediator between social cognitive constructs and behavior (Rhodes & Rebar, 2017). As a result, it remains relatively unknown what predicts the initial decision of whether to exercise or not, which is crucial for instigation of deliberative motivation processes like planning.

In line with the theory of planned behavior, it has been shown that people who have more favorable attitudes about exercise experience more positive subjective norms about exercise, and perceive more control over their exercise behavior tend to make decisional intentions to exercise more than other people (Rhodes & Courneya, 2003). Beyond these socio-cognitive factors, decisional intentions may also be influenced by individuals' cognitive and/or affective states at the time they are making the decisions; however up to this point, such studies have focused on intentional strength. For example, Abraham and Sheeran (2004) showed that people who feel anticipated regret about not exercising when making exercise intentions make stronger intentions than those who do not experience anticipating regret. Magaraggia, Dimmock, and Jackson (2014) showed that motivational priming can influence the intended duration of exercise-related goal-setting, which suggests plans for how long a person decides to exercise is impacted by states at the time of decision-making.

Another cognitive state which may impact exercise decisional intentions is ego depletion. Self-regulation is needed to implement intentions if doing so requires overcoming opposing temptations or impulses (Hall & Fong, 2007, 2010). The strength model of self-control proposes that the ability to self-regulate is a finite resource that can be drained by exerting self-control (Baumeister & Vohs, 2016; Baumeister et al., 1998). Thus, if individuals exert self-control throughout a day, such as by undertaking onerous tasks that require effort to override temptations to quit, they will experience diminished self-control capacities late in the day (Baumeister, 2002). Under conditions of ego depletion, future efforts to engage in self-regulation are compromised, and even imagining effortful experiences can be taxing (Graham, Sonne, & Bray, 2014; Neil et al., 2014). In a direct test of the relationship between ego depletion and goal-setting, Martin Ginis and Bray (2010) found that individuals induced to experience self-regulatory depletion planned to exert less effort in an upcoming exercise session relative to those who did not experience the depletion manipulation. In the present study, we sought to investigate the relationship between ego depletion and another aspect of exercise planning – that of the decisional intention of exercise duration. Given that this effect is anticipated to be the result of the deleterious effects of ego depletion on planning an effortful activity, we also investigated the relationship between ego depletion and planning for time spent sitting in leisure, doing paid work, sleeping, studying, doing housework, and amount of alcohol consumed. If it is the anticipated effort that underlies the effect, ego depletion should reduce the time people intend to exercise but not the time they intend to do the other daily behaviors.

A further consideration for the present study is the extent to which decisional intentions created under different levels of ego depletion vary in how effectively they are implemented into behavior. On the one hand, it is possible that individuals align their behavior to reach intentions irrespective of the circumstances under which the intentions were set. Evidence for this possibility has been provided by Magaraggia et al. (2014), who found that exercise goals were predictive of exercise behavior over one week regardless of individuals' prime-induced states at the time of goal-setting. On the other hand, decisional intentions might vary in their prediction of behavior to the extent that circumstances at the time of intention-setting influence the self-concordance of those intentions and/or engagement with the post-intention processes. In alignment with this general notion, a vast body of research on the elaboration likelihood model has shown that attitudes of similar valence and extremity can be more or less predictive of behavior depending on the amount of elaboration that was used in the formation of the attitude (Petty & Briñol, 2012). In addition, it has previously been shown that exercise intentions are more likely to predict exercise behavior when the intentions are modest (Rhodes, Courneya, & Jones, 2003), which means that the potential undermining effect of ego depletion on decisional intentions could actually make it *more* likely that people will successfully follow through with those intentions. People are more likely to try to reach attainable goals than ones that seem out of reach (Locke & Latham, 2002). Additionally, by the very nature of modest goals, they are easier to accomplish than less ambitious ones. For example, if in the evening a woman makes the decision to intend to get up early and go for a 90 min walk around the neighborhood, she may not even try to accomplish that intention when she wakes up and still feels exhausted. Comparatively, if the intention was simply to walk instead of drive her children to school in the morning, she likely will be more willing to consider it and more likely to accomplish it.

Most studies investigating ego depletion are conducted in laboratory settings, in which ego depletion is induced through effortful, self-control tasks (Cunningham & Baumeister, 2016; Hagger et al., 2010). These studies provide valuable insight into the behavioral after-effects of self-control exertion but not necessarily the psychological states that underpin these effects. Investigations of subjective states of ego depletion are likely more relevant for investigating the psychological processes behind behavior change. Past research has been conducted on ego depletion and health behaviors by monitoring fluctuations in daily self-control and behaviors. For example, a study was conducted in which alcohol intake intentions and behavior were logged as well as the occurrences of daily self-control demands which likely lead to ego depletion (e.g., mood regulation, controlling their thoughts, stress management, and feeling overwhelmed; Muraven, Collins, Shiffman, & Paty, 2005). The study found that people's intentions to drink were not impacted by daily self-control demands; however, people were more likely to drink beyond their self-imposed drinking limits on days when they experienced more self-control demands than usual (and therefore were likely ego depleted).

In an ecological momentary assessment study of a sample of university students who all had strong intentions to exercise, Schöndube, Bertrams, Sudeck, and Fuchs (2017) found that people tended to exercise more on days when they had greater self-control (were not ego depleted). Englert and Rummel (2016) conducted a daily diary of inactive university students and found that daily ego depletion (but not trait ego depletion) partially explained why people were less likely to exercise on days when they were highly stressed. Importantly, daily intentions were not monitored in either of these studies, so the daily interplay between self-control, exercise intentions, and exercise behavior remains untested. Given that both exercise intentions (Rebar, Elavsky, Maher, Doerksen, & Conroy, 2014) and ego depletion (Muraven et al., 2005; Schöndube et al., 2017) have shown to be variable across days, research on the interplay between these factors and their influence on exercise should be conducted using within-person, repeated assessment studies.

The aim of this study was to test two sets of hypotheses. First, it was hypothesized that if people were more ego depleted, they would make intentions to do less exercise the next day but that ego depletion at the time of intention-setting would have no impact on intended time spent sitting in leisure, doing paid work, sleeping, studying, doing housework, or the amount of alcohol consumed. Second, it was hypothesized that being ego depleted at the time of setting intentions would make it more likely that people would successfully enact their daily exercise intentions but have no impact on the likelihood of acting in line with

their intentions for leisure sitting, doing paid work, sleeping, studying, doing housework, or drinking alcohol.

2. Method

Participants were undergraduate Australian university students (N = 103, 52% female) with the M age of 21.57 years (SD = 2.97). Prior to participating in the study, participants provided informed consent. All study procedures were approved by the university's human research ethics committee. For seven consecutive days, participants were sent daily reminders at 1700hr to complete online surveys. The surveys included questions about state self-control, how much time participants spent that day doing paid work/job, sleep, exercise, studying, attending class, sitting in leisure (e.g., sitting and watching TV), doing housework, and drinking alcohol, and for how much time people intended to do these activities the following day. The aim of the study was to conduct end of day assessments, so only surveys completed between 1900hr and 0300hr were used in the analyses (omitted: 64 days from 28 participants). Total data included 610 days of data (i.e., 90.5% valid entries) from 103 participants. Most (56%) participants provided 7 days of valid data, and 85% of participants provided valid data for 5 or more days. The data and detailed descriptions of the models are available on the lead authors open science framework site (osf.io/MASKED).

Behavior was assessed as participants' responses to the daily questions about how many minutes or hours of that behavior they engaged in that day ("today"). They were provided with a definition of exercise as: "of at least moderate intensity – which means it would be tiring and make you breathe heavily (Caspersen, Powell, & Christenson, 1985)," and provided an example for leisure sitting behavior "(e.g., sitting and watching TV)" with open-ended response options. For the alcohol consumption question, they were provided descriptions of a standard unit of alcohol ("please total up your 'drinks', where 1 drink = a bottle of beer, a glass of wine, or a shot of liquor; e.g., 2 beers + 2 glasses of wine = 4 drinks").

Three items from the state self-control capacity scale were used to measure daily ego depletion (Ciarocco, Twenge, Muraven, & Tice, 2007). Participants were asked to answer the questions about how they were feeling right then on response scales ranging from 1 (*Not at all true)* to 7 (*Very true*). The items were: "I feel sharp and focused," "I feel drained," and "I feel like my willpower is gone." The ego depletion score was calculated as a mean of the three items, preceded by reverse-coding of the first item. The items were selected to capture the specific characterizations of ego depletion, as per the strength model of self-control (Baumeister, Vohs, & Tice, 2007) and showed strong inter-item reliability (M α = 0.77, SD = 0.02 across 7 days). Decisional intentions were assessed as participants' responses to the daily question about how many minutes of the behavior they planned to do the next day ("tomorrow"). They were provided with the same definition of exercise and example of leisure sitting as with the behavior questions and provided open-ended response options.

Data were analyzed using multilevel modeling (Kenny, Kashy, & Bolger, 1998) specified in the *lme4* function in *R* version 31.1.3 using restricted maximum likelihood computations (Bates, 2014; R Core Team, 2015). Ninety-five percent confidence intervals were estimated from 100 posterior simulations using the *arm* package (Gelman & Su, 2015). There were no significant outliers or significant deviant residuals. To test the first hypothesis, that ego depletion would inversely predict exercise intentions but have no impact on the other daily behaviors, intentions were regressed onto study day (to control for potential time effects) and same day ego depletion.

To test the second hypothesis, that people would be more likely to successfully enact their daily intentions when they were more ego depleted when making their intentions, intention-behavior classification variables were calculated by dividing the daily intention-behavior relationships into four categories: *non-intended non-action* (i.e., did not intend to do the behavior and did not do any), *non-intended action* (i.e., did not intend to do the behavior but did some), *successfully intended* (e.g., did intend to do the behavior and met or exceeded those intentions), and *unsuccessfully intended* (i.e., did intend to do the behavior and did not meet those intentions). If the person did some of the behavior, but not enough to meet their intended decision for that day, the day was categorized as *unsuccessfully intended*. This approach for analysis of intention-behavior discordance is less biased than linear moderation approaches, given the extreme asymmetry typical of intention-behavior relationships (Rhodes, Fiala, & Nasuti, 2012).

The variability of behavior and intention variables for time spent attending class were highly skewed and unequally distributed within-to between-person (ICCs < 0.00) so was omitted from analyses. Intentions and behavior variables for time spent doing paid work, housework, and amount of alcohol consumed were also highly skewed, but had balance of variability at the between- and within-levels, so were retained as dichotomous variables (0 = less than 1 h/1 drink, 1 = 1 h/1 drink or more). For these variables, logistic mixed effect regression models with adaptive Gauss-Hermite Quadrature were applied and odds ratios were exponentiated (Bates, 2014).

Typically, there are few occurrences of non-intended action (Rhodes et al., 2012; Sheeran, 2002; de Bruijn & Rhodes, 2011) and this was also the case in our study. Only on 4% of days did people engage in non-intended exercise and only on 5% of days did people engage in non-intended leisure sitting. On no days, did people report non-intended sleeping and only on 2% of days did people report non-intended studying. Non-intended housework and drinking alcohol was slightly more prevalent at 8% of days. For analyses, as per previous research, the non-intended categories were combined, resulting in three categories: *non-intended, successfully intended, and unsuccessfully intended.* The model regressed ego depletion of the previous day onto study day, behavior and the intention-behavior classification variable. Although having previous day ego depletion as the outcome seems counter-intuitive conceptually, multilevel regression is statistically a test of non-causal associations, so the estimates can be interpreted as associations between ego depletion and the intention-behavior classifications, accounting for the covariates. Tukey contrasts with adjusted p-values were used to simultaneously estimate multiple comparisons of means across the intention-behavior classifications (Hothorn, Bretz, & Westfall, 2008). Because this analysis required data from two consecutive days, it was conducted using 474 valid days of data from 96 individuals.

3. Results

Table 1 depicts the descriptive statistics and intention-behavior classification percentages for the behaviors. People reported exercising for 49 min per day, on average. In contrast, people reported intending to exercise for nearly an hour the next day. On average, people's end-of-day ego depletion was moderate on the 1–7 scale (M = 3.56, SD = 1.26). People were most likely to set but not follow-through with their intentions for the behaviors of studying and exercising. Rarely, did people not achieve their intentions for paid work, housework, or drinking alcohol. People were most likely to enact their intentions for leisure sitting and sleeping. People oftentimes had no daily intentions for drinking alcohol, housework, or paid work.

About one-third of variability in exercise (ICC = 31%), studying (ICC = 30%), paid work (ICC = 20%), housework (ICC = 36%), and ego depletion (ICC = 39%) was present at the between-person level, indicating that these variables fluctuated mostly at the day-to-day level. Leisure sitting behavior was comparatively more stable across time, with more than half of the variability attributable to between-person level differences (ICC = 58%). Drinking alcohol (ICC = 8%), and sleeping (ICC = 10%) mostly varied day-to-day, rather than between-person.

In support of our hypothesis, if people were highly ego depleted at

Table 1
Descriptive Statistics for Behavior and Intentions and Intention-Behavior Classifications for Exercise, Leisure Sitting, Paid Work, Sleeping, Studying, doing Housework, and Drinking Alcohol.

	Behavior		Intention		Unsuccesfully intended	Succesfully intended	Non-intended, non-acted	Non-intended, acted
	M	*SD*	*M*	*SD*	*n*, %	*n*, %	*n*, %	*n*, %
Exercise (min)	49.03	51.21	59.81	50.50	187, 39%	184, 39%	84, 18%	20, 4%
Leisure Sitting (min)	169.69	131.76	144.01	119.51	115, 24%	325, 68%	13, 3%	22, 5%
Paid Work (hr)	1.58	2.60	1.63	2.57	14, 3%	161, 34%	320, 67%	40, 8%
Sleeping (hr)	7.79	1.47	7.85	1.25	184, 39%	289, 61%	0, 0%	1, 0%
Studying (min)	96.79	100.40	127.07	92.10	260, 55%	153, 32%	53, 11%	8, 2%
Housework (min)	34.36	46.97	31.45	36.80	41, 9%	74, 16%	320, 67%	40, 8%
Drinking Alcohol (unit)	0.66	1.96	0.57	1.84	18, 4%	57, 12%	362, 76%	37, 8%

Note. Data nested across days from 96 individuals.

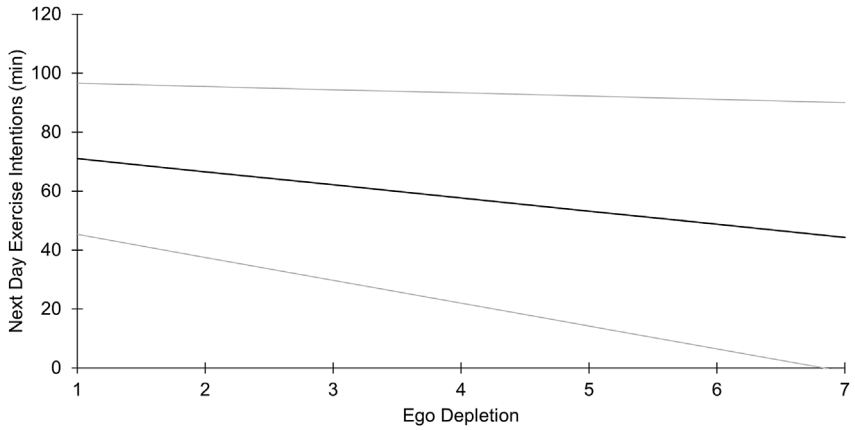

Fig. 1. The within-person association between ego depletion and next day exercise intentions (black line) with 95% confidence intervals (grey lines).

the time of making decisional intentions, they intended to exercise for significantly less time the next day than on days if they were less ego depleted ($\gamma = -4.46$, 95% CI: −7.77 to −1.11; see Fig. 1). There was also a significant time effect, such that exercise decisional intentions decreased by approximately 3 min each day the study week progressed ($\gamma = -3.29$, 95% CI: −4.98 to −1.41). There were no significant associations between ego depletion and the amount of time people intended to sit in leisure ($\gamma = 3.46$, 95% CI: −2.09 to 8.44), do paid work (OR = 0.92, 95% CI: 0.77 to 1.09), sleep ($\gamma = 0.06$, 95% CI: −0.03 to 0.16), study ($\gamma = 2.54$, 95% CI: −2.71 to 7.96), do housework (OR = 0.87, 95% CI: 0.66 to 1.16), or the amount of alcohol they consumed (OR = 1.00, 95% CI: 0.80 to 1.26). Nor was there a time effect for intended leisure sitting ($\gamma = 0.63$, 95% CI: −1.78 to 2.87), paid working (OR = −0.07, 95% CI: −0.17 to 0.03), sleeping ($\gamma = 0.03$, 95% CI: −0.021 to 0.07), studying ($\gamma = -2.88$, 95% CI: −5.80 to 0.28), or housework (OR = 0.04, 95% CI: 1.04 to 0.77); however the amount of alcohol people intended to consume increased slightly as the study progressed (OR = 1.22, 95% CI: 1.02 to 1.46).

If people were highly ego depleted the night before (when they made their intentions), they were more likely to have successfully reached their exercise intentions ($\gamma = 0.39$, $SE = 0.13$, $p = .01$; see Table 2 & Fig. 2). There were no significant time effect. There was no significant association between ego depletion at the time of making next day's exercise intentions and next day's exercise behavior ($\gamma = -0.00$, 95% CI: −0.00 to 0.00). There were no significant time effect.

There were no significant effects of ego depletion on people's intention-behavior profiles for time spent in leisure sitting (γ's = −0.22 & −0.12), paid work (γ's = 0.50 & 0.68), sleeping (γ's = 0.08 & 0.24), studying (γ's = −0.03 & 0.07), doing housework (γ's = −0.54 & −0.11), or amount of alcohol consumed (γ's = −0.06 & −0.15). Nor was there any significant effects of ego depletion on paid work ($\gamma = -0.40$), sleeping ($\gamma = 0.03$), studying ($\gamma = 0.00$), housework ($\gamma = 0.05$), or drinking alcohol ($\gamma = -0.07$) behavior. There was, however, a significant effect of ego depletion on time spent sitting in leisure, such that on the day after people were highly ego depleted, they tended to sit in leisure for slightly longer than if there were less ego depleted the day before ($\gamma = 0.00$, 95% CI: 0.000 to 0.002).

3.1. Ancillary analyses

As a post hoc exploratory investigation, we conducted a series of models testing whether the effects on exercise behavior existed at the between- and/or within-person levels as per Schwartz and Stone (1998). The between-person level variables were calculated as the person's mean ego depletion and exercise behavior scores across the seven days (one 'overall' variable per person). The within-person level variables were calculated as the deviation of the ego depletion and exercise behavior scores of that day from that person's mean 'overall' score, where a '0' represents mean level (one variable per day for each person).

In the model testing the first hypothesis (whether intentions were impacted by ego depletion), the results showed that the effects only were statistically significant at the within-person level. That is, a person's overall ego depletion was not significantly related to their exercise decisional intentions ($\gamma = -3.82$, 95% CI: −10.36 to 2.87); however their ego depletion specific to that day was significantly inversely associated to their next day exercise decisional intentions ($\gamma = -4.87$, 95% CI: −8.94 to −1.39).

In the model testing the second hypothesis (whether being ego depleted at the time of setting intentions would make it more likely that people would successfully enact their daily intentions), neither the person's overall exercise behavior ($\gamma = -0.00$, 95% CI: −0.01 to 0.00) nor their daily deviations in exercise behavior ($\gamma = -0.00$, 95% CI: −0.00 to 0.00) were significantly associated with the previous day's ego depletion. Additionally, the significant effects of the previous day's

Table 2
Results of multilevel model testing whether end of day ego depletion at time of reporting intentions influenced People's exercise intention-behavior classification.

	Fixed Effect Estimate	95% CI
Intercept	3.64	3.28 to 3.97
Study Day	−0.04	−0.09 to 0.01
Exercise Behavior (min)	−0.00	−0.00 to 0.00

Simultaneous Mean Comparisons	Estimate	*SE*	*Adj. p*
Successful Intenders vs Unsuccessful Intenders	0.39*	0.13	0.01
Non-Intenders vs Unsuccessful Intenders	0.24	0.15	0.23
Non-Intenders vs Successful Intenders	−0.14	0.17	0.68

Note. $N = 474$ days from 96 individuals; CI = confidence intervals; Residual = 1541.46, $SD = 39.26$, $^*p < .05$.

ego depletion remained even after accounting for overall and daily deviations in exercise behavior ($\gamma = 0.37$, $SE = 0.13$, $p < .01$).

4. Discussion

The findings from this study indicate that ego depletion at the time of reporting next-day exercise intentions is associated with more modest decisional intentions for exercise (measured as intended minutes). It was also found that when ego depleted at the time of creating next-day exercise intentions, individuals were more likely to succeed at behaving in accordance with those intentions. As a result of these processes, the net effect of ego depletion at the time of intention formation on next-day exercise behavior was unsurprisingly non-significant. Ego depletion had no significant impact on next day intentions of behavior for time spent in leisure sitting, doing paid work, sleeping, studying, doing housework, or amount of alcohol consumed. It may be that ego depletion leads to the creation of more modest and achievable decisional intentions only for physically effortful activities (Locke & Latham, 2002); however future research is needed to test replicability of these findings. Our ancillary findings showed that the effect of ego depletion on intentions occurred at the within-person, daily level, but not at a between-person level. These findings are important insights into the nature (and, in some cases, predictors) of the real life, day-to-day fluctuations in ego depletion, behavior, and decisional intentions.

The intention-behavior gap has been a topic of significant interest for social and health psychology researchers. Although social-cognitive factors often predict a substantial portion of variability in exercise intention, the prediction of exercise behavior from intention is typically weak (Conner & Armitage, 1998; Rhodes & Dickau, 2012). Most studies focus on how intention strength (i.e., how committed a person is to doing the behavior), our study focused on decisional intentions (i.e., how much of the behavior the person intends to do). Whereas, theoretically more intention strength should lead to a smaller intention-behavior gap; higher decisional intentions should lead to larger intention-behavior gaps because the aim is harder to reach (Rhodes & Rebar, 2017). The present findings support this claim, by demonstrating that ego depletion can lead to a smaller intention-behavior gap through attenuating people's intentional decisions. These findings highlight how essential it is for intention-behavior researchers to concretely define and measure the concept of intention which is most applicable to their research aims. Numerous strategies have been forwarded to reduce the intention-behavior gap; however, it remains clear that many individuals still fail to align their exercise behavior with their intentions, and this is especially likely in situations in which individuals hold high decisional intentions (Rhodes et al., 2003). It is plausible that this issue (i.e., greater intention-behavior gap with higher decisional intentions) offsets the relative benefits of experiencing vitality (i.e., opposite of ego depletion) at the time of intention formation. Indeed, evidence is gathering to show that changing exercise intentions does not necessarily change exercise behavior (Rhodes & Dickau, 2012). Exercise intentions should not be considered as an outcome with assumed translation to behavior, because the regulatory processes driving the intentions may shift or be reprioritized when it comes time to follow through with them.

These findings add to a building body of evidence demonstrating that people's decisional intentions and behavior varies day-to-day, as does the concordance between intentions and behavior (Conroy, Elavsky, Hyde, & Doerksen, 2011; Conroy, Maher, Elavsky, Hyde, & Doerksen, 2013; Rebar et al., 2014). This is the first study examining intention-behavior classifications via daily intentions and the results

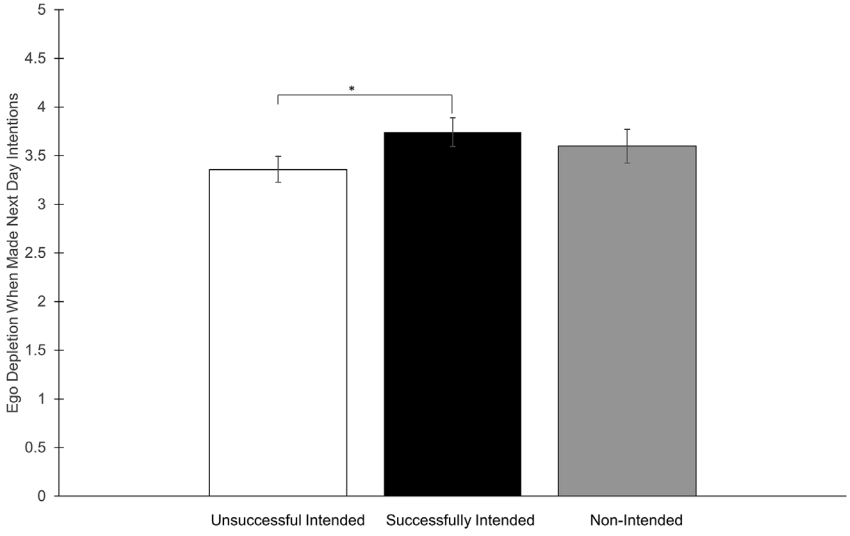

Fig. 2. The effects of ego depletion at the time of making intentions on whether people achieved their next day exercise intentions. On days when people were more ego depleted, they were more likely to have exercised as much or more than they had intended (*successfully intended)* then to have exercised less than they had intended (*unsuccessfully intended)*.

complement previous between-person approaches (Rhodes et al., 2012; Sheeran, 2002; de Bruijn & Rhodes, 2011), by showing that on approximately 50% of study days did people translate their exercise intentions into behavior. It is interesting to note that only on 18% of the study days did people not hold exercise intentions and only on a mere four percent of the study days did people not have intentions but exercised. Not surprisingly given the comparative lack of physical exertion required to engage in the activities, people were more likely to engage in at least their intended amount of time spent in leisure sitting and sleeping (68%, and 61% of days people translated intentions into behavior, respectively).

The finding that the intention-behavior gap being mostly driven by those who are not meeting their intended time spent in exercise supports a move to research on action control as it suggests – similar to prior research - that people are more likely to be struggling with translating their intentions into effortful behavior than forming intentions. Intention is necessary, but not sufficient, to engender exercise behavior for a very large proportion of people. The finding is not well-accounted by more traditional socio-cognitive approaches where intention is supposed to be the proximal predictor of behavior but rather suggests that action control theories may be better matched for exercise promotion (Kuhl, 1984; Rhodes & Yao, 2015; Sniehotta, Scholz, & Schwarzer, 2005).

This evidence from the present study indicates that health practitioners should not be too concerned about clients' ego depletion at the time of their intention formation for exercise, inasmuch as the downstream consequences of this state on next-day exercise behavior was non-significant. An alternative interpretation of these findings is that health practitioners *should be* concerned about ego depletion at the time of clients' intention formation for exercise, because practitioners may be able to employ strategies to reduce the intention-behavior gap. In general, people tend to overestimate the likelihood that they will engage in desirable behaviors (Dunning, Heath, & Suls, 2004); it may be that ego depletion simply leads people to be more realistic about how much exercise they will do the next day. In contrast, vitality at the time of intention formation might inflate decisional intentions, and then action control strategies such as the development of implementation intentions (specific plans of when, where, why, and how to implement exercise intentions) become imperative for the alignment of behavior with intention. Future replication observational studies and behavior change interventions are needed before the conclusions of this study should be translated into practical application.

This study provides innovative insight into the within-person process of ego depletion, decisional intentions, and behavior; however, it has limitations that need to be addressed in future research. People's intentions (and their likelihood of successful implementation) will greatly differ depending on whether they are making intentions for the next week, day or even hour. For example, someone could have a long-term intention to exercise three times per week, which means he/she could have intentions to not exercise at all on four days a week and still be successfully achieving their long-term exercise intentions. More research into how short-term intention fluctuations link to long-term intentions and long-term behavioral outcomes will be very useful. Additionally, in this study, intentions were made at the end of the evening for next-day behavior. Given the diurnal rhythm of ego depletion and the refreshing effect that sleep may have on ego depletion (Baumeister & Vohs, 2016; Hagger et al., 2010), further investigation with different timing of assessments (e.g., same day morning assessments of ego depletion and intention with end of day behavior measures) is needed to obtain more comprehensive insight into our understanding of these processes. Additionally, the study was reliant on the accuracy of participants' self-reported measures of behavior and ego depletion. There is controversy regarding the validity of subjective experiences of ego depletion given the typically low association seen between objective and self-reported measures of ego depletion (Hoyle & Davisson, 2018). Future research with objective measures may provide more insight into these processes with less risk of response bias. Finally, the study was conducted on a convenience sample of university students, so further research needs to be conducted investigated on other population groups before the findings should be generalized beyond the targeted population. Future research stemming from the findings of this study will help identify how interventions can account for the dynamic nature of – and relationships between – ego depletion, intentions, and behavior.

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