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Scott A. Baldwin
Brigham Young University - Provo

Austin Baldwin

Valerie G. Loehr

Julie L. Kangas

Georita M. Frierson

Routledge
Taylor & Francis Group

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Elucidating satisfaction with physical activity: An examination of the day-to-day associations between experiences with physical activity and satisfaction during physical activity initiation

Austin S. Baldwin[a]*, Scott A. Baldwin[b], Valerie G. Loehr[a], Julie L. Kangas[a] and Georita M. Frierson[c]

[a]*Department of Psychology, Southern Methodist University, Dallas, TX, USA;* [b]*Department of Psychology, Brigham Young University, Provo, UT, USA;* [c]*Department of Psychology, Howard University, Washington, DC, USA*

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Satisfaction with physical activity is known to be an important factor in physical activity maintenance, but the factors that influence satisfaction are not well understood. The purpose of this study was to elucidate how ongoing experiences with recently initiated physical activity are associated with satisfaction. Participants ($n = 116$) included insufficiently active volunteers who initiated a self-directed physical activity regimen and completed daily diaries about their experiences for 28 days. We used multilevel models to examine the associations between experiences with physical activity and satisfaction. Significant between-person effects demonstrated that people reporting higher average levels of positive experiences and lower levels of thinking about the negative aspects of exercise were more likely to report higher levels of satisfaction ($ps < .05$). Positive experiences and perceived progress toward goals had significant within-person effects ($ps < .01$), suggesting that day-to-day fluctuations in these experiences were associated with changes in satisfaction. These findings elucidate a process through which people may determine their satisfaction with physical activity.

Keywords: physical activity initiation; health behaviour change; satisfaction; physical activity experiences; within-person changes

Regular physical activity affords many benefits including improvements in mood, sleep and cognitive functioning, as well as reduced prevalence of chronic disease, mortality rates and health care costs (US Department of Health and Human Services [USDHHS], 2008a). Yet, physical activity rates are low globally (Centers for Disease Control and Prevention [CDC], 2009; World Health Organization[WHO], 2011), and most who initiate physical activity fail to maintain it (Marcus et al., 2006; Nigg, Borrelli, Maddock, & Dishman, 2008). Thus, there is a critical need to better understand what influences continuous engagement in physical activity, particularly during the first days and weeks after initiating it.

*Corresponding author. Email: baldwin@smu.edu
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It seems intuitive that people will maintain regular physical activity if they find it satisfying. Empirical evidence across different health behaviours supports the proposition that satisfaction is an important determinant of maintenance (Baldwin et al., 2006; Dishman, Vanderberg, Motl, Wilson, & DeJoy, 2010; Finch et al., 2005; Fleig, Lippke, Pomp, & Schwarzer, 2011; Williams et al., 2008). For example, Fleig et al. (2011) demonstrated at the end of a clinic-based intervention that the greater participants' satisfaction with the results of their recently physical activity, the greater their physical activity level six weeks later. These findings are consistent with theoretical work suggesting that the decision to maintain a behaviour change is guided primarily by satisfaction with it (Rothman, 2000; Rothman, Baldwin, Hertel, & Fuglestad, 2011). How people determine their satisfaction with the results of physical activity, however, is not well understood.

According to general self-regulation theories of health behaviour, the regulation of satisfaction with health behaviour change reflects an ongoing assessment of whether experiences associated with the new behaviour are worth the effort (Leventhal, Weinman, Leventhal, & Phillips, 2008; Rothman et al., 2011). This suggests that the behavioural, psychological and physiological experiences associated with regular physical activity are important in determining satisfaction. However, the theoretical models do not specify *which* experiences are likely to be associated with satisfaction with physical activity. In considering this issue, it is important to observe that people commonly report a variety of experiences and outcomes with initiating regular physical activity such as changes in mood, health or physical appearance (Cash, Novy, & Grant, 1994; Kendzierski & DeCarlo, 1991; Marshall & Biddle, 2001). Negative experiences and outcomes such as physical pain and experiencing exercise to be a chore are also common (Kendzierski & DeCarlo, 1991; Marshall & Biddle, 2001). Because these types of experiences and outcomes are related to the expectations people commonly have for physical activity, it seems reasonable that people attend to these types of experiences when determining their satisfaction. For a person who has recently initiated regular physical activity, this suggests her satisfaction on a given day may be associated with perceived improvement in health or appearance, experiencing exercise as a chore and so on.

There is evidence that similar types of experiences with smoking cessation (e.g. frequency of cravings) and weight loss (e.g. compliments from others) systematically co-vary with satisfaction (Baldwin, Rothman, Hertel, Keenan, & Jeffery, 2009; Baldwin, Rothman, & Jeffery, 2009). However, no studies have investigated how experiences with physical activity are associated with satisfaction. Examining these associations during the first weeks after initiating regular activity is important because it is a period during which many abandon the new behaviour (Dishman, Ickes, & Morgan, 1980), and satisfaction assessed as soon as two (Fleig et al., 2011) to four weeks (Baldwin et al., 2006) after initiating a change has been shown to predict maintenance. The purpose of this research is to elucidate a process through which people regulate satisfaction with physical activity by examining how their ongoing experiences with recently initiated activity are associated with satisfaction.

Although positive experiences with physical activity (e.g. feeling better after exercise) have been shown to be associated with satisfaction (Fleig et al., 2011), this evidence is limited in three ways. First, studies in physical activity have only examined the relation between positive experiences and satisfaction, and have neglected negative

experiences (e.g. body soreness). Thus, the range of experiences that contribute to the regulation of satisfaction is unclear. Second, no studies have examined the associations between experiences and *changes* in satisfaction, which potentially inhibits the development of interventions to increase satisfaction and activity.

Third, no studies have distinguished between- and within-person variability in these associations, and this distinction has important implications for understanding specifically how experiences are associated with satisfaction and for interventions. To illustrate, a person's reported satisfaction with physical activity on a given day is likely associated with one or two different sources of variation: the person's stable traits and their dynamic states (Hamaker, Nesselroade, & Molenaar, 2007). Between-person variability refers to differences among people's stable traits or characteristics. Between-person variability in an association between experiences and satisfaction is variability due to differences in average levels of the experiences that vary between individuals. For example, individuals who tend to report high levels of positive experiences with physical activity on average may also tend to report high levels of satisfaction. This suggests that some *people* may be more prone to experience satisfaction with physical activity than others due to differences in stable characteristics (e.g. dispositional tendencies). Thus, it follows that a physical activity experience that only has a between-person association with satisfaction will likely be less amenable to interventions to increase satisfaction.

In contrast, within-person variability refers to differences among people's states at a particular time and occurs around a person's average level of the relevant variable (Hamaker et al., 2007). Within-person variability in an association is due to fluctuations in the physical activity experience that vary within-individuals, regardless of any between-person differences (e.g. dispositional tendencies). For example, a person who experiences an increase in her positive experiences with physical activity on a given day, above her own average level, may report increased satisfaction on that day. This suggests that satisfaction is associated with *changes* in physical activity experiences that occur within individuals. Identifying associations due to within-person variability is particularly important for two reasons. First, satisfaction is theorised to reflect an ongoing assessment of related experiences and outcomes rather than an assessment that occurs at a discrete point in time (Rothman et al., 2011), yet there is no evidence of this to date in the domain of physical activity. Within-person daily variability provides the clearest evidence for this proposition. Second, associations that are due to within-person fluctuations in the experiences may be most amenable to interventions to increase satisfaction because the associations occur regardless of any stable, between-person differences.

It is also important to note that decisions about physical activity occur on a daily basis (Dunton & Atienza, 2009), thus time-intensive information is well suited to elucidate associations between physical activity experiences and satisfaction. Specifically, daily assessments of experiences and satisfaction can elucidate associations that identify (1) which experiences co-vary with satisfaction on a daily basis, (2) which experiences are associated with changes in satisfaction from one day to the next and (3) the variability in the associations that is due to between-person differences and within-person changes.

Current study

Using a daily diary study in a sample of insufficiently active adults during 28 days after initiating regular physical activity, we investigated associations between physical activity experiences and satisfaction. Specifically, we examined whether average levels of people's experiences with physical activity (between-person effects) and/or daily fluctuations in the experiences that vary within individuals (within-person effects) are associated with satisfaction. In both cases, we examined associations between experiences and (1) same-day satisfaction and (2) changes in satisfaction from one day to the next. Because the amount of time people engage in physical activity and their level of physical fitness may influence their satisfaction, we examined the associations between experiences and satisfaction *beyond* any effect the amount of physical activity and differences in cardiorespiratory fitness (CRF) may have on satisfaction.

Methods

Participants

Participants ($n = 116$) were volunteers recruited from the Dallas/Fort Worth area through public advertisements who reported being insufficiently active. The sample was primarily female (75.9%), racially and ethnically diverse (32.8% Hispanic, 42.2% non-Hispanic White, 15.5% non-Hispanic Black, 5.2% Asian and 2.6% Other), had a mean age of 34.5 years (SD = 12.5, range = 18–61), and a mean body mass index (BMI) of 27.8 (SD = 5.7). The distribution of BMI categories was the following: normal weight (BMI < 25.0; 36.2%), overweight (BMI = 25.0–29.9; 29.3%) and obese (BMI $\geqslant$ 30.0; 34.5%). Most participants (91%) had some education beyond high school, and 69% reported an annual income less than $50,000.

Procedure

The study procedures reported here and some measures reported in the next section have also been described elsewhere (Loehr, Baldwin, Rosenfield, & Smits, in press).[1]

Eligibility screen

We screened interested individuals for eligibility via telephone or online questionnaire using the following criteria: (1) insufficiently active (<60 min/week of moderate -to-vigorous intensity activity across multiple days over the past month; USDHHS, 2008a), assessed using the physical activity items from the Behavioural Risk Factor Surveillance System (BRFSS; CDC, 2009); (2) a BMI < 40 and absence of cardiovascular, pulmonary or metabolic disease (American College of Sports Medicine, 2009); (3) internet access at home; (4) access to exercise equipment and/or a location to exercise; and (5) an interest in initiating regular activity. Eligible participants were scheduled for a baseline assessment.

Baseline assessment

A research assistant consented participants in to the study, provided instructions about initiating physical activity (e.g. types of activity, weekly recommendations) using an

evidence-based informational booklet (USDHHS, 2008b), and helped participants make plans for when they would exercise during the upcoming week with the goal of 150 min of moderate-intensity activity.

Daily diaries

Participants completed daily diaries for 28 days. We used a daily assessment schedule rather than more frequent assessments to reduce participant burden and increase protocol adherence (Green, Rafaeli, Bolger, Shrout, & Reis, 2006). Starting the day after the baseline session, we scheduled a daily questionnaire to be sent to participants via email with instructions to complete it that night. However, responses were considered timely if completed by 12:00 pm the following day (Gable & Poore, 2008), with timeliness verified via electronic time stamps. When participants did not complete a diary on time, we sent an email to inquire about any difficulties they might be having. There were 3248 possible daily diaries and participants completed diaries on 72.2% of the possible days (or 2345 days). This rate is similar to other studies using daily assessments in physical activity (e.g. Dunton, Atienza, Castro, & King, 2009; 76% completion rate). The mean number of days completed was 20.22 (SD = 8.30), and the range was 1–28. Participants were compensated up to $120 for participating.

We also called participants weekly to discuss physical activity plans for the upcoming week and address questions or concerns, as brief telephone contact with study staff has been shown to result in improved adherence to physical activity plans (Castro & King, 2002).

Measures

Participants' BMI, CRF and demographics (age, gender, race/ethnicity and household income) were assessed during the baseline session. In the daily assessments, participants reported their satisfaction, positive experiences, progress toward goals, perceptions of exercise as a chore, thinking about the negative aspects of exercise, body soreness, quality of sleep, positive affect and negative affect (see Appendix 1 for complete wording of items). These experiences were selected for analyses because they represented a range of behavioural, psychological and physiological experiences that are common in physical activity. We measured several constructs with multiple items. As described elsewhere (Loehr et al., in press), we conducted exploratory factor analyses, using principal axis factor analysis and oblique rotation (oblimin), on four different days (Day 1, 8, 15 and 22) to investigate whether items loaded on the same factor consistently. At each time point, the experience items were tested in a single, multi-factor model and we examined the pattern coefficients. We excluded items if they are loaded on multiple factors or had loadings less than .40. The multi-item scales include items that were consistent in their factor loadings across the four time points. The one exception was thinking about the positive aspects of exercise that had a loading of .30 on Day 1. However, because this was not an unreasonable loading and the item had a loading above .40 on the other days examined, we included it in the positive experience scale. Thus, the same items were used for each scale at each time point (see Appendix 1). We also examined four single-item variables that did not load consistently on any factor.

Satisfaction

We used a single item to assess satisfaction that asked 'As of today, how satisfied are you with what you have experienced as a result of exercising?' Consistent with previous research (Baldwin, Rothman, & Jeffery, 2009; Finch et al., 2005; Fleig et al., 2011), the measure reflected satisfaction with the consequences or results of regular exercise. Participants responded using a scale ranging from −4 (*extremely dissatisfied*) to +4 (*extremely satisfied*). This item has been shown to predict future physical activity (Fleig et al., 2011). Simulation research demonstrates that treating a single item outcome as a continuous, normally distributed variable produces biased results (Bauer & Sterba, 2011). This is especially true if the distribution of the variable does not approximate a normal curve, which daily satisfaction did not. Participants used the midpoint (0) or positive end of the scale more frequently than the negative end, and some negative values were rarely used (−4 was reported in less than 3% of responses). Thus, we decided to treat satisfaction as an ordinal variable and recoded responses into categories to stabilise results (Pastor & Beretvas, 2006). To keep the scale symmetrical, we collapsed values into the following categories: −4 and −3 into *extremely dissatisfied*; −2 and −1 into *moderately dissatisfied*; 0 as *neutral*; 1 and 2 into *moderately satisfied*; 3 and 4 into *extremely satisfied*.

The following measures have been described elsewhere (Loehr et al., in press), but were examined at the weekly level rather than daily level as examined here (see footnote one).

Positive experiences

Five items assessed positive experiences with physical activity and were based on existing scales (Cash et al., 1994; Kendzierski & DeCarlo, 1991). Participants responded using a scale ranging from 0 (*not at all*) to 8 (*a great deal*). Reliability was high at each assessment with αs ranging from .84 to .90.

Perceived progress toward goals

Five items assessed perceived progress toward goals and were based on common reasons people cite for exercise (Cash et al., 1994). Participants responded using a scale ranging from 0 (*not at all*) to 8 (*a great deal*). Reliability was high at each assessment with αs ranging from .95 to .98.

Single-item experience variables

Perceptions of exercise as a chore (0 [*not at all*] to 8 [*a great deal*]), thinking about the negative aspects of exercise (0 [*not at all*] to 8 [*a great deal*]), body soreness (0 [*not at all*] to 8 [*extremely*]) and quality of sleep (−4 [*very poor*] to +4 [*very good*]) were all assessed with single items using nine-point response scales.

Positive affect

We used the three positive affect items from the Physical Activity Affect Scale (PAAS; Lox, Jackson, Tuholski, Wasley, & Treasure, 2000) with participants using a scale

ranging from 0 (*not at all*) to 8 (*a great deal*). Reliability was high at each assessment with αs ranging from .85 to .95.

Negative affect

We used the three negative affect items from the PAAS (Lox et al., 2000) with participants using a scale ranging from 0 (*not at all*) to 8 (*a great deal*). Reliability was high at each assessment with αs ranging from .86 to .93.

Covariates

Participants reported the total duration (in minutes) of each bout of walking, moderate-intensity and vigorous-intensity activity they engaged in that day using items modified from the BRFSS (CDC, 2009) to reflect daily rather than weekly reporting. We converted minutes of moderate- and vigorous-intensity activity into metabolic equivalent task (MET) minutes (Ainsworth et al., 2000) by multiplying moderate-intensity minutes by 4.5 and vigorous-intensity minutes by 7.5 (see Morrow, Bain, Frierson, Trudelle, & Haskell, 2011). We assessed CRF at baseline and calculated it using the non-exercise model (Jurca et al., 2005). The model estimates CRF based on physical activity level, gender, age, BMI and resting heart rate. We measured resting heart rate three times for each participant using a Tanita 6102 heart rate monitor. The average of the three measurements was used to calculate CRF. BMI was calculated using participants' height and weight ($[\text{lbs} \times 703]/\text{in}^2$) that we measured using a wall-mounted height rod and a Tanita HD-351 digital scale, respectively.

Data analysis

Analyses were run with Stata Version 12 (StataCorp, 2011). As noted above, we treated satisfaction as a five-category ordinal variable. A common model for ordinal data is the ordinal logistic model. However, this model makes the restrictive proportional odds assumption in which the relationship between a predictor variable and satisfaction is assumed to be the same for all levels of satisfaction (Long & Freese, 2006). This assumption was violated in these data (likelihood-ratio test: χ^2 (69) = 360.8, $p < .001$). The stereotype logit model is an appropriate choice for these analyses because it accommodates the ordinal nature of the outcome variable and does not make the proportional odds assumption (Long & Freese, 2006). Given the longitudinal nature of the data, we used cluster robust standard errors to accommodate non-independence in the data (similar to generalised estimating equations; StataCorp, 2011).

The stereotype logit model produces two types of parameters we will interpret in these analyses (Long & Freese, 2006). First, regression coefficients (β) describe the relationship between the predictors and the outcome. Second, scaling coefficients (ϕ), which are unique to each category, allow the relationship between predictors and outcomes (i.e. the β's) to vary across the categories. This scaling is accomplished by multiplying regression coefficients by the scaling coefficients (see the note to Table 2) and is how this model avoids the proportional odds assumption. We used odds ratios to facilitate interpretation of the models. Specifically, we show how a one-unit change in a

predictor is associated with the odds of being in a higher vs. a lower category (e.g. moderately satisfied vs. neutral), again holding all other predictors constant.

We fit two sets of models. In the first set, we ran separate univariate models predicting satisfaction using the between- and within-person portions of all eight experience variables. In the second set, we ran a multivariate model using the same between- and within-person portions to determine which experiences had significant associations with satisfaction when adjusting for the effect of the experience variables. The between-person effects are interpreted as the relation between satisfaction and the mean level of each experience across the study period. The within-person effects are interpreted as the relation between satisfaction and daily fluctuations in the experience variable around a person's own average. In both the univariate and mulitvariate models, we predicted same-day satisfaction and changes in satisfaction from one day to the next. Change in satisfaction was modelled by including the previous day's satisfaction as a predictor. All models included day, daily MET-minutes and baseline CRF as covariates.

We observed time trends in some of the experience variables. This was not surprising given that participants were insufficiently active prior to the study and then changed their physical activity. When time trends are present, separating between- and within-person variability by centring an observation at a given time point around a person's overall mean leads to interpretation problems (Curran & Bauer, 2011). Thus, we used the de-trending strategy suggested by Curran and Bauer (2011) in which each experience variable is regressed on time, which is grand mean centred, to remove the time trend. This analysis is done separately for each person. The person-specific intercepts from the de-trending analysis are the between-person portion of the experience variable and the residuals are the within-person portion.

Table 1. Descriptive statistics for the between-person and within-person experience variables.

Variable type and physical activity experience	*M*	SD	Min	Max
Between-person (mean value over 28 days)				
Positive experiences	3.97	1.55	.72	7.69
Progress toward goals	3.26	1.78	.14	7.80
Positive affect	4.20	1.35	1.26	7.85
Negative affect	1.82	1.20	.11	5.09
Perceived quality of sleep	3.81	1.57	.14	7.93
Perceiving exercise as a chore	3.36	1.91	.00	7.89
Thinking about the negative aspects of exercise	1.05	1.01	.05	4.87
Body soreness	1.73	1.27	.00	6.07
Within-person (daily deviations from mean value)				
Positive experiences	–	.93	−4.43	4.94
Progress toward goals	–	.81	−3.79	5.00
Positive affect	–	1.34	−6.90	5.65
Negative affect	–	1.31	−4.00	6.58
Perceived quality of sleep	–	1.01	−7.03	5.36
Perceiving exercise as a chore	–	1.27	−7.00	6.73
Thinking about the negative aspects of exercise	–	1.11	−3.31	7.51
Body soreness	–	1.66	−4.57	7.65

Note: The mean values for the within-person variables are all zero because the variables, by definition, are mean-centred.

Table 2. Univariate and multivariate associations between satisfaction and physical activity experiences for changes in satisfaction from the previous day.

	Univariate models		Multivariate model	
	Coefficient	*p*-value	Coefficient	*p*-value
Experience variable				
Positive experiences (between)	2.28	<.0001	2.16	<.0001
Positive experiences (within)	2.14	<.0001	1.56	<.0001
Progress toward goals (between)	1.01	<.0001	−.04	.88
Progress toward goals (within)	1.72	<.0001	.89	.003
Exercise as a chore (between)	−.52	<.0001	−.16	.44
Exercise as a chore (within)	−.39	<.0001	−.24	.12
Thinking negatively (between)	−.22	.27	−.58	.05
Thinking negatively (within)	−.29	.04	−.23	.09
Quality of sleep (between)	.61	<.0001	.35	.08
Quality of sleep (within)	.37	.007	−.01	.97
Body soreness (between)	.01	.95	.25	.41
Body soreness (within)	−.08	.22	−.13	.09
Positive affect (between)	1.03	<.0001	.40	.27
Positive affect (within)	.64	<.0001	.21	.11
Negative affect (between)	−.70	<.0001	−.01	.99
Negative affect (within)	−.58	<.0001	−.15	.29
Covariates[a]				
Previous day's satisfaction	–	–	4.09	<.0001
MET-minutes	–	–	.001	.36
Cardiorespiratory fitness	–	–	.09	.50
Day (1–28)	–	–	.06	<.0001
[b]*Scaling factors*				
Φ Extremely dissatisfied	–	–	1	–
Φ Moderately dissatisfied	–	–	.79	<.0001
Φ Neither satisfied nor dissatisfied	–	–	.59	<.0001
Φ Moderately satisfied	–	–	.34	<.0001
Φ Extremely satisfied	–	–	0	–

Notes: [a]The covariates were also included in each separate univariate model, and scaling factors were computed for each model, but these values from the models were not included in the table due to space considerations. [b]The coefficients for each of the predictors and covariates are the change in log-odds of being in the extremely dissatisfied vs. the extremely satisfied category for a one-unit change in the predictor variable. Exponentiating the log-odds will produce the odds ratio for the extremely dissatisfied vs. the extremely satisfied conditions for a one-unit change in the predictor variable. To compute the odds ratio for any two categories as they relate to predictor k, one can use the following equation: $\exp\{(\phi_{\text{lower}} - \phi_{\text{higher}})\beta_k\}$ (40).

Results

Descriptive analyses

The observed distribution of responses for each satisfaction category was as follows: *extremely dissatisfied* = .06, *moderately dissatisfied* = .08, *neutral* = .33, *moderately satisfied* = .32 and *extremely satisfied* = .21. In addition, descriptive statistics for the between-person and within-person experience variables are reported in Table 1. Regarding physical activity levels, over the four weeks, participants reported a median of 427.5 MET-minutes *per week* (SD = 525.5) with a range of 397.5–442.5. Thus, the median level of activity for the sample was slightly under public health guidelines

(i.e. $\geqslant$500 MET-minutes per week). The percentage of participants who no longer met criteria for physical inactivity (i.e. were now engaging in $\geqslant$270 MET-minutes per week) ranged from 62.9% in the first week to 49.1% in the fourth week.

Finally, we did two things to describe the relation between satisfaction and physical activity. First, we examined the association between satisfaction on one day and MET-minutes the next day. The association was significant (coefficient = 9.43, $p = .03$) indicating that satisfaction on one day is positively associated with physical activity the next day. Second, we averaged daily reports of satisfaction and MET-minutes into weekly averages for the 28-day period. We then examined three prospective correlations between the week-level variables of satisfaction and MET-minutes (Week 1 satisfaction-Week 2 MET-minutes, Week 2 satisfaction-Week 3 MET-minutes and Week 3 satisfaction-Week 4 MET-minutes) using Spearman's rho. The correlations ranged from .24 to .28, and are similar in magnitude to prospective correlations between satisfaction and physical activity minutes reported elsewhere ($r = .17$; Fleig et al., 2011). These two findings are consistent with prior evidence demonstrating that satisfaction is prospectively associated with physical activity (Dishman et al., 2010; Fleig et al., 2011; Williams et al., 2008) and provide validity for participants' reports of satisfaction.

Univariate associations with satisfaction

The pattern of findings between models predicting same-day satisfaction and change in satisfaction were quite similar. Therefore, we only report and discuss findings from the change in satisfaction models. The results of the univariate models where we tested the between- and within-person associations for each of the experiences variables are reported in the first two columns of Table 2. Six of the eight experience variables had significant between-person associations and seven of the eight experiences had significant within-person associations. The previous day's satisfaction (not reported in the table) was significantly associated with next-day satisfaction in each of the models (zs > 7.24, ps < .001). The results from these models indicate that when examined separately, all of the experiences with physical activity (with the exception of body soreness) were associated with changes in satisfaction with physical activity.

Multivariate associations with satisfaction

As with the univariate models, we only report and discuss findings from the change in satisfaction models because the pattern of findings between same-day satisfaction and change in satisfaction were quite similar. The results of the multivariate model where we tested the associations adjusting for the presence of all the experience variables are reported in the last two columns of Table 2. We also include a figure to illustrate the findings from this model (Figure 1).

Between-person effects

Two experiences – positive experiences, thinking about negative aspects of exercise – had significant between-person associations with change in satisfaction (Table 2). The other experiences did not.

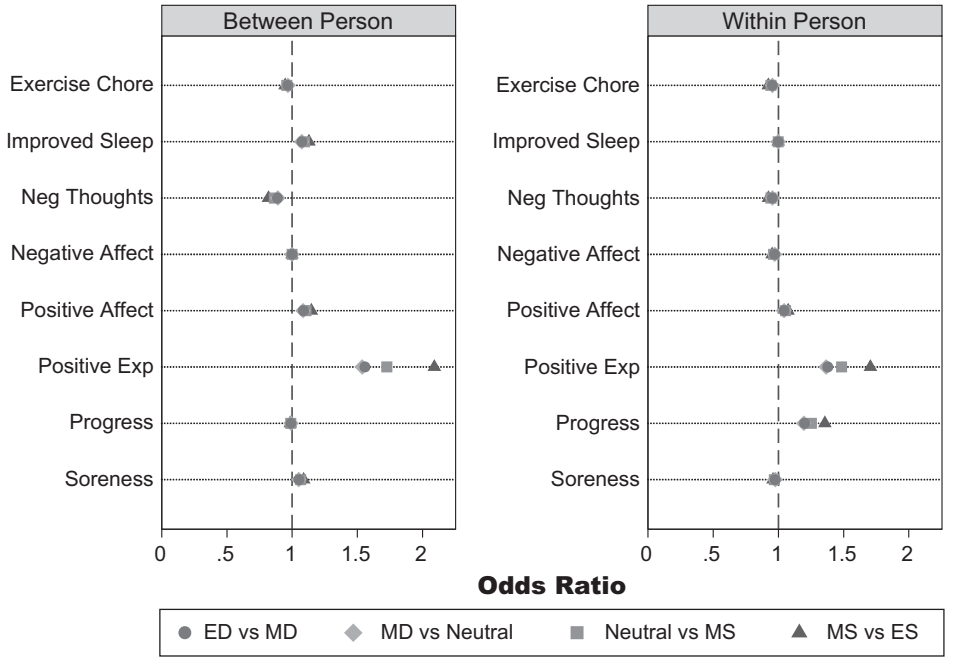

Figure 1. Odds ratios indicating the extent to which the odds of being in one satisfaction category vs. another is associated with a one-unit change in each of the eight experience variables. The abbreviations for the satisfaction categories are the following: ED = extremely dissatisfied, MD = moderately dissatisfied, neutral, MS = moderately satisfied and ES = extremely satisfied.

One way to interpret the results is to use odds ratios that indicate the extent to which the odds of being in one satisfaction category vs. another is associated with a one-unit change in the predictor variable. Figure 1 presents the odds ratios for each of the experience variables, with the between-person relations on the left panel. Because the stereotype logit model allows for relationships to vary by satisfaction category, we plotted unique odds ratios for four adjacent category comparisons (e.g. neutral vs. moderately satisfied, moderately vs. extremely satisfied; see Figure 1). For the two experience variables that had a significant between-person association (positive experiences, thinking about negative aspects of exercise), all the adjacent category comparisons were significantly different at $p < .05$. First, consider the relation between changes in satisfaction and positive experiences. A one-unit increase in positive experiences is associated with increased odds of being in a higher satisfaction category. For example, the odds ratio for neutral vs. moderately satisfied is 1.73, indicating the odds of being in the moderately satisfied category vs. neutral are 1.73 times greater given a one-unit difference in between-person positive experiences. Odds ratios less than one indicate a decrease in odds. For example, the odds ratio for thinking about the negative aspects of exercise for moderately satisfied vs. neutral category is .86, indicating that a one-unit difference in negative thinking decreases the odds of being in the moderately satisfied vs. neutral category by a factor of .86.

Within-person associations

Two of the experiences – positive experiences, perceived progress toward goals – had significant within-person associations with change in satisfaction (Table 2). The other experiences did not.

We again plotted unique odds ratios for four adjacent category comparisons with the within-person associations (e.g. neutral vs. moderately satisfied, moderately satisfied vs. extremely satisfied; see Figure 1). For the two experience variables that had a significant within-person association (positive experiences, progress toward goals), all of the adjacent category comparisons were significantly different at $p < .05$. The right-hand panel of Figure 1 shows that a one-unit increase in within-person changes in perceived progress toward goals is associated with increased odds of being in a higher satisfaction category. For example, the odds ratio for extremely vs. moderately satisfied is 1.36, indicating that the odds of being in the extremely vs. moderately satisfied category are 1.36 times greater given a one-unit difference in within-person perceived progress toward goals, even after controlling for the previous day's satisfaction. A similar pattern of odds ratios emerged for the within-person changes in positive experiences.

Discussion

The findings are the first to demonstrate how people's experiences during physical activity initiation are associated with their satisfaction. Using daily measures of physical activity experiences and satisfaction, we found that some ongoing experiences were associated with changes in satisfaction. The findings are consistent with data in other health behaviour domains (Baldwin, Rothman, Hertel, et al., 2009; Baldwin, Rothman, & Jeffery, 2009), as well as with general self-regulation theories suggestion that satisfaction is a marker of an ongoing assessment of whether the behavioural, psychological and physiological experiences associated with the new behaviour are worth the effort (Leventhal et al., 2008; Rothman et al., 2011). Although satisfaction motivates the maintenance rather than initiation of behaviour change (Baldwin et al., 2006; Rothman, 2000; Rothman et al., 2011), satisfaction assessed within as little as two weeks after initiating regular physical activity has been shown to predict maintenance (Fleig et al., 2011). The current findings elucidate a process through which people may derive satisfaction with physical activity during this critical initiation period (Dishman et al., 1980).

The findings also extend what is known about day-to-day decision-making in physical activity (Dunton & Atienza, 2009) and suggest how decisions about maintaining physical activity may unfold after initiating it. First, they build on previous research (Fleig et al., 2011) by demonstrating that both positive and negative physical activity experiences are associated with satisfaction. This suggests that when assessing their satisfaction people monitor different experiences, not just positive ones. Thus, it is important for researchers and practitioners to consider and assess a variety of experiences and satisfaction on multiple occasions.

Second, the findings indicate that associations between physical activity experiences and changes in satisfaction are due to both between- and within-person variability. Two of the experiences – positive experiences and thinking about the negative aspects of exercise – had significant between-person effects. This suggests that *people* who are

prone to report positive experiences and thinking less about the negative aspects of exercise are also more likely to report higher levels of satisfaction. Two of the experiences – perceived progress toward goals and positive experiences – had significant within-person effects suggesting that increases in these experiences that occur *within* individuals are associated with increases in satisfaction. This evidence of within-person daily variability in satisfaction provides the clearest evidence to date to support the theoretical proposition that satisfaction reflects an ongoing assessment of experiences rather than occurring at a discrete point in time (Rothman et al., 2011). In addition, the within-person effects suggest these experiences are particularly important to changes in satisfaction during the first weeks after initiating regular activity. Specifically, when people do not experience *increases* in their positive experiences or in progress toward their goals above their typical levels, they are likely to find regular physical activity less satisfying. Thus, perceived progress toward goals and positive experiences are good candidate variables for daily self-monitoring or interventions aimed at increasing satisfaction during physical activity initiation because the associations exist independent of any between-person differences. This is particularly important given that physical activity interventions, and the theoretical models that guide them (Lally & Gardner, 2011; Nigg et al., 2008; Schwarzer, 2008), assume a within-person change in the relevant constructs.

Perceived progress toward one's goals is particularly interesting in the context of initiating regular physical activity. Many outcomes that result from regular physical activity (e.g. weight loss) are distal and typically take months to accrue. However, these findings suggest that distal outcomes are not irrelevant to satisfaction during physical activity initiation; instead, they influence satisfaction through the progress people believe they are making toward them. Although satisfaction with distal outcomes cannot be determined shortly after initiating physical activity, it appears that perceiving progress toward those outcomes on a daily basis is critical.

It is possible that the experiences identified in these analyses are associated with changes in satisfaction only when people are initiating regular physical activity. Once people are exercising regularly and shift their focus to maintaining it, it is possible that influences on their satisfaction also shift (e.g. no longer actively monitor ongoing experiences; see Rothman et al., 2011; Rothman, Sheeran, & Wood, 2009). It is also possible that as people gain experience with regular physical activity, their satisfaction may become less sensitive to day-to-day fluctuations in their experiences. Additional research is needed to examine how the factors that influence satisfaction with physical activity may shift across different stages (e.g. initiation and maintenance).

Although affect has been shown to be important in physical activity (Dunton et al., 2009; Gauvin, Rejeski, & Norris, 1996), we did not observe any significant associations between affect and satisfaction in the multivariate model. When examined in univariate analyses, positive and negative affect both had significant associations that were rendered non-significant in the multivariate model. This is consistent with previous work demonstrating that positive and negative affect had significant associations with physical activity when considered separately, but not when other factors were considered simultaneously (Dunton et al., 2009). These observations raise the possibility that the influence of affect on satisfaction and physical activity occurs indirectly through its influence on other relevant factors (e.g. perceiving progress toward goals), but additional research is needed to more clearly specify these relations.

Limitations

There are a few limitations that warrant mention. First, we used a single item to assess satisfaction although this is consistent with how it has been assessed previously (Baldwin, Rothman, Hertel, et al., 2009; Baldwin, Rothman, & Jeffery, 2009; Fleig et al., 2011). However, the strong associations satisfaction had with positive experiences and perceived progress toward goals indicate that the constructs share important overlapping variance. It is possible that the discriminant validity of the measures could be improved by systematically revising the items that tap these three constructs. Future psychometric work is needed (i.e. item generation, establishing concurrent/discriminant validity and factor analytic studies) to clarify how best to assess these constructs in physical activity. This type of work would also likely inform the assessment of satisfaction in other health behaviour domains. Second, the way the items used to assess the experience variables were worded may have influenced the findings. Specifically, the experience variables that had significant associations with the satisfaction item either included the word 'exercise' in the items used to assess them or strongly implied reference to the exercise plan (i.e. perceived progress toward goals). Items that did not explicitly refer to exercise in this way (i.e. quality of sleep, body soreness, positive and negative affect) did not retain significant associations in the multivariate model. Future work should address this issue.

Another limitation is that we examined a limited set of experiences with physical activity. For example, we did not assess people's experiences during exercise bouts, yet experiences such as in-exercise affect are known to influence future physical activity (Kwan & Bryan, 2010; Williams, Dunsiger, Jennings, & Marcus, 2012). It seems reasonable that in-exercise affect would be associated with satisfaction, and satisfaction may be a mechanism through which in-exercise affect influences future activity. In addition, it is important to recognise that there are factors other than the physical activity experiences we examined that likely influence satisfaction. For example, satisfaction may depend on whether activity on a given day had sufficient duration or intensity, it was performed with other people, or it was novel. Additional research is needed to address the effect other factors may have on satisfaction. We also did not include expected outcomes from physical activity in these analyses – the attainment of which influences physical activity adherence (Wilcox, Castro, & King, 2006). We did measure weekly outcome expectations in this study, and findings from this data-set have been reported demonstrating that outcome expectations vary from week-to-week as a function of experiences with physical activity (Loehr et al., in press). But future work is needed to clarify specific questions related to how unmet (or met) expectations may influence satisfaction and other decisions regarding physical activity.

Finally, although the sample did include people of diverse ethnic/racial backgrounds and with wide range of baseline BMI, the sample is not entirely representative of the general population given that most participants were women and were well educated. Thus, conclusions that can be drawn from these data are somewhat limited.

Conclusion

Experiences during the initiation of regular physical activity are systematically associated with satisfaction – a factor critical to maintenance. Positive experiences and perceiving progress toward one's goals are particularly important during this critical

initiation phase. The findings elucidate a way in which people determine their satisfaction with physical activity, an important step in understanding how physical activity can shift from something people feel they *must* do to something they *choose* to do (Ekkekakis, Parfitt, & Petruzzello, 2011).

Note

1. Loehr et al. (in press) is a different paper based on the same data-set as this paper. The data published in the two papers overlap in the following ways: (1) Both papers report findings with physical activity experiences as predictors. (2) Both papers examine positive experiences, perceived progress toward goals, positive affect, negative affect, body soreness, quality of sleep and perceiving exercise as a chore as the specific physical activity experiences. However, in the findings reported here the experiences are examined at the daily level, whereas in Loehr et al. (in press) they are averaged and examined at the weekly level. This difference exists in order to appropriately address the different research questions posed in each paper. In addition, the two papers are substantively different in the following ways. (1) The papers address different research questions. The findings reported here address the question of how people's daily satisfaction with the results of physical activity is associated with their physical activity experiences. Loehr et al. (in press) addresses the questions of whether outcome expectations for physical activity change from week-to-week and whether experiences with physical activity influence the change. (2) The outcome variables are different. In the findings reported here, satisfaction with physical activity measured daily is the primary outcome. In Loehr et al. (in press), outcome expectations measured weekly are the outcome.

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Appendix 1

Satisfaction

As of today, how satisfied are you with what you have experienced as a result of exercising?

Positive experiences

How much of a sense of accomplishment do you feel today about the fact that you are exercising regularly?

How much of a sense of relief do you feel today about the fact that you are exercising regularly?

How much do you currently enjoy exercise?

To what extent have you been thinking today about the positive aspects of exercise?

How much effort are you putting into following your exercise plan?

Perceived progress toward goals

How much progress are you making toward improving your physical fitness (e.g. endurance and flexibility)?

How much progress are you making toward improving your physical attractiveness?

How much progress are you making toward improving your overall health?

How much progress are you making toward preventing health problems?

How much progress are you making toward your specific weight-related goal (either losing or maintaining weight)?

Positive affect

How upbeat did you feel today?

How energetic did you feel today?

How enthusiastic did you feel today?

Negative affect

How miserable did you feel today?

How discouraged did you feel today?

How crummy did you feel today?

Perceptions of exercise as a chore

How much do you currently feel like exercising is a chore?

Thinking about the negative aspects of exercise

To what extent have you been thinking today about the negative aspects of exercise?

Perceived body soreness

How sore did your body feel today?

Perceived quality of sleep

How would you rate the quality of sleep you are currently getting at night?