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The Dynamics of Success and Failure: How Post-Behaviour Evaluations Relate to Subsequent Exercise Intentions and Behaviour

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Abstract

Objective: Exercise behaviour change involves multiple experiences with success and failure. The Model of Action Phases (MAP) offers a dynamic account of how success and failure influence both immediate evaluations and future decisions and actions. However, predictions from the MAP have not been formally tested.

Design: A longitudinal daily diary study was used to examine how post-behaviour evaluations of exercise success and failure influence subsequent exercise intentions and behaviour. Participants ($N = 104$) set exercise goals, and then kept a daily online exercise diary for four weeks.

Main Outcome Measures: Participants self-reported exercise behaviour, affective response to exercise, self-evaluations after success or failure at following through on intentions to exercise, and intentions to exercise in the next week.

Results: Multilevel modelling revealed significant within- and between-participant relationships among post-behaviour evaluations, intentions, and subsequent behaviour. Findings supported MAP-derived predictions about how success and failure at exercise are associated with feelings about exercise and the self, and inform subsequent exercise intentions and behaviour.

Conclusion: Positive post-behaviour evaluations of success or failure may stabilize positive intentions and aid maintenance of exercise behaviour. Implications of these MAP-based findings for intervention design are discussed.

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Keywords

model of action phases; affective response; exercise; self-conscious emotion; post-behaviour evaluations

Health behaviour change is difficult and fraught with failure. Most New Year's resolutions involve health behaviours but 30% of resolutions are abandoned within 2 weeks, and more than 50% are abandoned by six months (Norcross, Mrykalo, & Blagys, 2002). About 50–65% of health and fitness mobile apps are used for less than 30 days (Klotzbach, 2016). Experimental evidence shows a weak relationship between physical activity intentions and behaviour (Rhodes & Dickau, 2012). Failure is thus an inevitable part of the process of exercise behaviour change, and how people respond to such failure may have an important influence on their long-term success (Luszczynska, Mazurkiewicz, Ziegelmann, & Schwarzer, 2007; Schwarzer, 2008). However, prominent models of physical activity and exercise (e.g., the theory of planned behaviour, health action process approach [HAPA], self-determination theory) offer little explicit analysis of how repeated experiences of success and failure dynamically influence subsequent decisions and actions, within person over time. Improved understanding of daily experiences of success and failure during attempts to change behaviour is important from both theoretical and applied perspectives. Theoretically, research in this area may illuminate the critical mechanisms by which health behaviour goals are successfully achieved and maintained while also offering practical insights into the design of interventions, such as those with goal monitoring and behaviour tracking elements.

The Model of Action Phases (MAP) (Achtziger & Gollwitzer, 2010; Gollwitzer, 2012; Heckhausen & Gollwitzer, 1987) offers a framework for understanding the mechanisms of health behaviour change that pertain to the daily monitoring of success and failure. In particular, the MAP proposes that post-behaviour evaluations (e.g., how exercise felt, and how the person feels about themselves in the wake of performance or non-performance) constitute a crucial link between ongoing experiences of success and failure and subsequent exercise intentions and behaviour. The present research offers a first test of these predictions from the MAP.

The MAP is a dynamic model that considers not only the motivational phase of behaviour change addressed in many theories (i.e., the factors that influence goal setting or intention formation), but also the *volitional* phase of behaviour change (i.e., the factors that influence the translation of intentions into action)(Rothman, Baldwin, Hertel, & Fuglestad, 2004). The MAP has already informed innovations around *implementation intentions*, a now well-established tool for promoting behaviour change including physical activity (Bélanger-Gravel, Godin, & Amireault, 2013; Gollwitzer & Sheeran, 2006). Although research based on other phase models that include elements of action control (e.g., HAPA (Sniehotta, Nagy, Scholz, & Schwarzer, 2006), HAPAHHai-Change (de Vries, Eggers, & Bolman, 2013)) address processes related to planning, plan enactment, and coping with barriers, little or no research has addressed predictions unique to the MAP concerning the self-reflective processes that are instigated when people succeed or fail at performing their intended behaviour – that is, in a phase that comes *after* behavior.

The MAP describes four phases in which goals are selected, planned, enacted, and reflected upon (see Figure 1). The *predecisional phase* involves consideration of the desirability (will the outcomes be positive?) and feasibility (do I have the necessary ability and opportunity?) of pursuing a particular goal. The predecisional phase culminates in the formation of a goal intention or decision to act (e.g., "I intend to run 10 miles a week in the next month!"). The *preactional phase* involves consideration of the different pathways to goal attainment, and ends with the formation of implementation intentions (plans that have an "if-then" format) that specify good opportunities to act or how obstacles will be handled (e.g., "If it is a weekday, then I will go to the gym after work and run 2 miles on the treadmill!"). The *actional phase* involves detecting the situation specified in the implementation intention, initiating action, and engaging in focused, persistent effort in pursuit of the goal (e.g., "It is after work on a weekday, then I run two miles on the treadmill."). The actional phase culminates in the performance (or non-performance) of the intended action. Finally, the *post-actional phase* involves post-behaviour evaluations of the outcomes and experience of goal pursuit and a determination of whether further effort is necessary (e.g., Did I meet my goal to run 2 miles today? Was running 2 miles on the treadmill after work pleasant? How do I feel about myself now?), and culminates in intentions being renewed, revised, or abandoned in line with the relevant evaluations.

Thus, according to the MAP, evaluations of outcomes following the performance of a behaviour (i.e., post-behaviour evaluations; [PBEs]) influence intentions to continue engaging in the behaviour. Parallel evidence concerning the temporal stability of intentions (how the strength of behavioural intentions fluctuates over time), shows that intentions are better translated into behaviour when they are more stable (Abraham & Sheeran, 2003; Conner & Godin, 2007; Kwan & Bryan, 2010a; Sheeran, Orbell, & Trafimow, 1999). Testing the MAP-derived predictions about PBEs may thus enhance understanding of the processes by which intentions remain strong and positive over time, and how maintenance of exercise behaviour can be achieved.

The MAP does not specify precisely how PBEs should be operationalized. However, given that PBEs correspond to evaluations of the extent to which outcome expectancies for a behavior were realized, the outcomes evaluated could be affective, self-evaluative, or cognitive (Bandura, 1998; Trafimow & Sheeran, 1998). In the context of people's most recent bout of exercise, affective response to the experience of the behaviour refers to whether exercise behaviour itself felt good or bad (Ekkekakis, 2003) whereas self-evaluation refers broadly to how good or bad did following through on one's intention (i.e., succeeding at, or failing to, exercise) make the person feel about him/herself. Evidence shows that exercise intentions and behaviour are associated with affective responses to an exercise bout and self-conscious emotions such as pride and regret (Bryan, Hutchison, Seals, & Allen, 2007; Kwan & Bryan, 2010b; Sandberg & Conner, 2008; Williams, Dunsiger, Jennings, & Marcus, 2012). Negative self-conscious emotions following goal failure have been shown to weaken motivation (Crocker & Park, 2004), and success (i.e., intending to exercise and subsequently exercising) leads to stronger internal attributions than spontaneous behaviour (i.e., exercising despite not having the prior intention to do so; see (Abramson, Seligman, & Teasdale, 1978)), Thus, these psychological consequences of behaviour — affective responses to the experience of exercise and self-evaluations in response to success or failure

in exercise intentions — are appropriate to test the MAP prediction that PBEs in response to repeated attempts at behaviour influence exercise intentions and behaviour over time.

Figure 2 outlines the conceptual framework guiding the present research; the paths in Figure 2 correspond to MAP-derived hypotheses to be tested as follows:

Hypothesis I.

Compared to exercise failure days (failure to exercise as planned), exercise days (either intended or spontaneous) will be associated with more positive self-evaluations (i.e., participants feel better about themselves due to both exercise behaviour itself and to fulfilling their intentions) (Path 1).

Hypothesis II.

Compared to spontaneous exercise days (external attributions for behaviour),intended exercise days (internal attributions for behaviour) will be associated with more positive affective responses and more positive self-evaluations (Path 2).

Hypothesis III.

More positive PBEs (both affective responses to exercise and self-evaluations) will be associated with stronger intentions to exercise in the coming week (paths 3 and 4).

Hypothesis IV.

More positive PBEs will also be associated with greater exercise behaviour in the coming week, either directly (paths 5 and 6) or via the intention-behaviour relationship (path 7).

Method

Design

This study used an observational, longitudinal daily diary study design. To create a study context consistent with the actional and post-actional phases of the MAP, participants formulated exercise goals and implementations intentions for the coming month. Participants then completed a brief online exercise diary entry each day for 28 days. Exercise behaviour, the affective response to a bout of exercise behaviour (if undertaken), self-evaluations (if exercise was planned), and intentions to exercise in the next week were assessed on a daily basis in this diary. Participants completed self-report surveys of exercise-related constructs at baseline and 1-month post-baseline (within one week of completing the 28-day diary period). The planned sample size was 100 participants with at least 20 data points over the course of 28 days. As the relationships tested in this analysis are focused on within-person (level 1) relationships, the sample size is the total number of observations (diary entries * participants – a maximum of 2800 over a 28-day study period). Actual number of observations was approximately 1700 for any given analysis (see denominator degrees of freedom for model statistics). Guidance on conducting power and sample size

simulations for longitudinal diary studies is available (Bolger, Stadler, & Laurenceau, 2012; Iida, Shrout, Laurenceau, & Bolger, 2012).

A longitudinal diary study design is ideal for studying within-person variability in goal striving and PBEs as it permits not only daily assessment of exercise success and failure and reactions to such success or failure but also measurement of how those reactions influence subsequent intentions and behaviour.

Participants

The sample consisted of 104 first-semester college freshmen. The goal was to study a population intending to maintain or increase exercise behaviour in a new context in which behavioural regulation may be challenging. Participants were recruited with flyers posted around campus, student email bulletins, and a booth at a freshman orientation event. Eligible participants were at least 18 years old, not pregnant, were not professional athletes or members of high-level college sports teams, reported positive intentions to exercise in the next month (a value of four or higher on a scale from 1 to 7), and had been exercising on average 1 to 5 days per week in the last 3 months. There were 155 completed eligibility screens, of whom 110 were eligible, and 104 consented.

Measures and materials

Participants completed self-report surveys on a variety of exercise-related constructs (e.g., self-efficacy, motivations to exercise); those relevant to the current analysis are described here. At baseline, participants set exercise goals for the next month, specifying the frequency (number of days per week), intensity, duration, type, location, and time of day at which they would exercise. Participants then completed an online diary every day for 28 days, in which they recorded each day's exercise behaviour, affective response to exercise (if undertaken), and self-evaluation (if exercise was planned), as well as their exercise intentions for the next 7 days. As we were particularly interested in success and failure at realizing intentions to exercise, affective responses to exercise and self-evaluations were not assessed on days participants neither intended to exercise nor engaged in spontaneous, unintended exercise. However, because exercise behaviour itself is linked to a generally positive affective response (Ekkekakis, 2009), affective response to the behaviour was assessed every day that exercise occurred (whether it was intended or spontaneous) in order to test whether positive PBEs were the result of exercise itself, were unique to feelings associated with accomplishing an intended goal, or both. The daily diary measures were as follows:

Exercise behaviour—In each daily diary entry, participants recorded that day's exercise behaviour (if undertaken), including self-reported types, intensity, and duration of exercise. For clarity of presentation of results, analyses shown here are based on whether or not any exercise was undertaken on a given day (dichotomous yes/no), rather than a composite of intensity and duration. Note, analyses using a composite measure based on duration and intensity of activity relative to a participant's own goal produced comparable but more complex results.

Exercise success and failure—To assess success or failure, exercise behaviour was evaluated relative to participants' reports of having intended to exercise that day. Exercise behaviour each day was categorized as "success" if the participant intended to exercise, and did exercise (also referred to as "intended exercise") and "failure" if they intended to exercise, but did not. On days participants exercised in the absence of an intention, behaviour was categorized "spontaneous exercise"; this is not considered "success" per se, given the absence of an intention. Finally, days that participants neither intended to exercise nor exercised spontaneously were categorized "non-failure". The primary comparisons of interest for hypothesis testing include differences in self-evaluations on success versus failure days, as well as affective response to exercise on success days (intended exercise) versus spontaneous exercise days.

Self-evaluation—Self-evaluation was assessed on success days, failure days, and spontaneous exercise days. Participants indicated, "As a result of either exercising as planned or not exercising as planned today, how good or bad do you feel about yourself?", on a scale from 1 (very bad about myself) to 7 (very good about myself). Self-evaluation was not assessed on non-failure days, because one cannot report on how exercising/not exercising *as planned* made them feel when no plan or intention existed.

Affective response to exercise.—Affective response to exercise was assessed in the daily diary on exercise days (both intended and spontaneous), using the Feeling Scale (Hardy & Rejeski, 1989), following measurement standards in research on affect and exercise (Ekkekakis, 2013). The Feeling Scale is a single-item 11-point scale that assesses basic affect during exercise, consistent with the valence dimension of affect (good/bad, pleasure/displeasure), as theorized by Russell's circumplex model (1980). On exercise days (both intended and spontaneous), participants reported "While you were exercising today, how good or bad did you feel?" on a scale from −5 (very bad) to +5 (very good).

Intentions to exercise in the next week—The final item in the exercise diary asked participants to indicate the number of days (0 to 7 days) that they intended to exercise in the next week. Daily intentions were centred at each participant's baseline goal for exercise frequency per week; interpretations of estimates thus reflect differences relative to the person's own baseline goal. Intentions to exercise in the next week, rather than the next day, were used in this analysis to be aligned with the wording of baseline goal intentions, which were stated in terms of number of days per week.

Exercise behaviour in the next week—For each day, we computed the actual number of days of exercise that were undertaken in the upcoming seven days. Note this calculation could only be done for the first three weeks of the study, as behavioural data were not available beyond the fourth week (the end of the study).

Procedure

This study was approved by the university Institutional Review Board and was conducted in accordance with universal ethical principles. Informed consent was obtained from all individual participants included in the study. At a baseline session in the lab, participants

completed a survey in which they read about the benefits of regular exercise and the then-current recommendations(Thompson, Gordon, Pescatello, & Medicine, 2010), and were asked to form intentions to exercise regularly at a level consistent with these recommendations (i.e., to form a goal intention, the culmination of the first MAP motivational phase). They were asked to set specific goals for desired outcomes (e.g., running a 5k in less than 30 minutes), and to make specific plans for exercise in the next month by indicating the types of exercise, frequency (in number of days per week), duration, locations and times of day for exercise (i.e., they formed implementation intentions, the culmination of the MAP preactional phase). The survey was administered via MediaLab (Empirisoft Corp., New York, NY).

Research assistants trained participants in the use of the online diary, and gave them a password to access the survey and a personal identification code to ensure confidentiality. Participants received $10 for completing this initial session. The daily online survey was administered via surveymonkey.com. Participants were asked to complete a diary entry every day during the next month, even if they did not exercise. For diary entries to count towards their accumulated compensation, diaries had to be completed no more than one day late (according to the timestamp). For each week participants completed at least 5 diary entries, they received $5, and if participants completed a total of at least 20 diary entries, they received a bonus of $10. Participants then completed an online follow-up survey (also on surveymonkey.com), assessing intentions to continue exercising, for which they received an additional $10, for a total of up to $50.

Overview of Analysis

Descriptive statistics were used to characterize the sample. Multilevel modeling via random coefficient regression (PROC MIXED or PROC GLIMMIX in SAS Version 9.4) was used to test between and within-participant relationships in the longitudinal data (Cohen, Cohen, West, & Aiken, 2003). Conditional models were specified with random and fixed effects of PBE variables predicting intentions and behaviour, separately. To account for repeated measures over time, an autoregressive covariance structure was used for all models, unless stated otherwise. Models for counts of exercise days were estimated using PROC GLIMMIX, with Poisson distributions.

Following the recommendations of Wang and Maxwell (2015), between- and within-participant effects were disaggregated by person mean-centring the PBE variables (subtracting the average affective response to exercise and self-evaluation ratings for that individual), and included time (in days since baseline) as a covariate to detrend the outcome variables (intentions and behaviour), which showed significant negative linear trends over the course of the study. The test of the fixed effect of the person mean-centered affective response to exercise and self-evaluation variables indicates whether on average there is a significant within-participant relationship between these constructs and intentions or behaviour. The test of the fixed effect of the person-mean PBE (each individual's own average affective response or self-evaluation) indicates whether there is a between-participant effect of PBEs on exercise goal intentions and behaviour. This would mean that

participants who report more positive PBEs on average continued to hold positive goal intentions and maintained exercise behaviour at a level consistent with their baseline goal.

Results

Characteristics of the Sample

Out of all 104 participants, a median of 22 of 28 possible diary entries were completed (range 1 to 28); one participant completed only a single diary entry and was excluded from further analyses. The following analyses are based on 103 participants with complete baseline data and at least two daily diary entries. According to these diary entries, participants exercised on average 11.2 days during the study period ($SD = 5.6$), or about 2.8 days per week, for an average of 38.05 minutes per exercise day ($SD = 24.15$). All variables were examined for violations of assumptions of normality and homoskedasticity and any outliers; no substantial violations were detected. Average age was 18.23 years ($SD = 0.49$). The sample was 57.7% female and 91.3% white, and had exercised 3.32 days per week on average ($SD = 1.25$) in the past 3 months at baseline. Participants on average intended to increase exercise to 4.76 days per week ($SD = 0.97$) in the next month. Mean daily goal intentions from the exercise diary was 4.00 days/week (SD = 1.16). Mean daily Feeling Scale responses were 2.78 ($SD = 1.21$) on a scale from −5 to +5, and mean self-evaluations were 5.25 ($SD = 0.82$) on a scale from 1 to 7.

Relationships between Exercise Success/Failure and Post-Behaviour Evaluations

Table 1 shows the results of tests of hypotheses 1 and 2, the relationship between exercise success and failure and PBEs. As predicted in Hypothesis I (Path 1 in Figure 2), compared to failure days (when exercise was intended but not completed), exercise days (either intended or spontaneous) were associated with significantly more positive self-evaluation that day, relative to a participant's own mean ($est = 1.96$, $SE = 0.10$, $F(1,1331) = 333.79$, $p < .001$). As predicted in Hypothesis II (Path 2 in Figure 2), intended exercise was associated with more positive self-evaluation than spontaneous exercise. Success was associated with significantly more positive self-evaluation than average ($est = 0.49$, $SE = 0.04$, $F(1,103) = 146.65$, $p < .001$), whereas spontaneous exercise was not associated with better-than-average self-evaluation ($est = -0.04$, $SE = 0.08$, $F(1,103) = 0.35$, $p = .56$). Affective response to exercise was significantly more positive on intended exercise days than on spontaneous exercise days ($est = 0.64$, $SE = 0.13$, $F(1,1057) = 25.60$, $p < .001$).

Relationships among Behaviour, Post-Behaviour Evaluations, and Intentions to Exercise in the Next Week

As predicted in Hypothesis III (Path 3 in Figure 2), daily intentions to exercise in the next week were greater on success days than on failure days ($est = 0.29$, $SE = 0.10$, $F(1,254) = 9.36$, $p = .002$), non-failure days ($est = 0.45$, $SE = 0.07$, $F(1,254) = 39.44$, $p < .001$), and spontaneous exercise days ($est = 0.28$, $SE = 0.11$, $F(1,254) = 6.55$, $p = .01$). There were no significant differences in daily intentions amongst non-failure, failure, and spontaneous exercise days. Table 2 shows results from a series of models of PBEs and success/failure predicting daily goal intentions. As predicted in Path 3 of Figure 2, on average, there were significant between and within-participant effects of daily affective responses to exercise on

daily intentions to exercise in the next week. Specifically, participants who reported experiencing more positive affect during exercise intended to exercise more often in the next week. The within-participant analysis also indicated that participants intended to exercise more often in the next week following exercise days on which affective responses were more positive. There was no difference between intended exercise and spontaneous exercise with respect to the affective response-intention relationship (Path 3*, Table 2).

As predicted in Path 4 in Figure 2, there were significant between and within-participant effects of self-evaluations on intentions to exercise in the next week. Feeling better about oneself both on average and on any given day was associated with intentions to exercise more often. There were significant differences between today's exercise and failure to accomplish exercise intentions on intentions to exercise in the next week. Relative to exercise failure days, both success and spontaneous exercise days were associated with intentions to exercise more often in the next week, and this relationship was larger for success days than spontaneous exercise days (*est* =.31 and .15, respectively).

To test the separate relationships between self-evaluations and intentions on success days vs. failure days, an interaction term (exercise behaviour × self-evaluation) was included in the model predicting daily intentions, and simple effects of self-evaluation on intentions were examined separately given failure, spontaneous exercise, or success as reference categories for behaviour. As shown in Table 2, there was a significant interaction between self-evaluation and spontaneous exercise vs. failure, and a marginal interaction between self-evaluation and success vs. failure.

On success days, self-evaluations were positive, and ranged between −1 and +3. There was a significant positive relationship between self-evaluations and intentions to exercise in the next week (*est* = 0.06, p =.04) such that the better participants felt about themselves in the wake of successfully exercising, the more often they intended to exercise in the coming week. On exercise failure days, self-evaluations were much lower, and ranged between about −3 and 0. Interestingly, there was also a significant positive relationship between self-evaluation and intentions to exercise in the next week (*est* = 0.16, p <.001) on exercise failure days.

Relationships among Behaviour, Post-Behaviour Evaluations, Intentions, and Future Exercise

As predicted by Hypothesis IV, there was a significant relationship between success vs. failure and exercise in the next week. As shown in Table 1, participants exercised significantly more often in the next week on failure days as compared to success (*est* = 0.38, *SE* = 0.11, $F(2,103) = 12.53$, p <.001), spontaneous exercise (*est* = 0.37, *SE* = 0.15, $F(1,203) = 6.35$, p =.01), and non-failure days (*est* = 0.32, *SE* = 0.12, $F(1,203) = 6.92$, p = .009). As shown in Table 3, there were between-participant effects of affective response to exercise, self-evaluation, and daily intentions on future exercise behaviour. Participants who, on average, reported positive affective response to exercise, positive self-evaluation, and higher intentions exercised more often in the next week compared to their counterparts. Notably, person-mean self-evaluation (average rating for any given individual) was associated with subsequent behaviour over and above person-mean intentions (Table 3, Paths 6/7). However,

there were no direct within-participant effects of PBEs on exercise days in the next week, suggesting that PBEs predominantly influence behaviour indirectly via intention formation and that it is these intentions, in turn, that guide subsequent exercise behaviour.

Discussion

This study offered a first test of key hypotheses derived from the Model of Action Phases (MAP), in relation to the maintenance of exercise behaviour. Whereas previous research predominantly concerned the motivational (e.g., intentions) and volitional (e.g., if-then planning) phases of exercise behaviour change, here we focused on the MAP's post-actional phase – the dynamics of people's daily efforts to exercise and the implications of those efforts for future exercise decisions and performance. According to the MAP, success and failure at undertaking exercise should influence post-behaviour evaluations that in turn feed intentions to continue engaging in exercise and maintain exercise behaviour over time. Our data supported these predictions, in that succeeding in exercising was associated with more positive self-evaluation whereas failing to exercise was associated with people feeling worse about themselves (Hypothesis I). Furthermore, affective response to one's most recent bout of exercise (how good or bad people felt while exercising) was more positive on intended exercise days than on spontaneous exercise days (Hypothesis II). These post-behaviour evaluations (how people reacted to success and failure, attributions to success, and affective reactions to exercise behaviour) related to exercise intentions for the next week (Hypothesis III). That is, feeling good during exercise and feeling good about oneself in relation to one's exercise performance were associated with setting higher exercise goals for the coming week. Finally, weekly goal intentions in turn were associated with participants' subsequent levels of exercise behaviour (Hypothesis IV).

While other behavior change models (e.g., HAPA (Sniehotta et al 2006); i-CHANGE (deVries et al 2013)) incorporate action plans and both trial and maintenance phases of behavior, the dynamic, within-person reactions to success and failure are not explicitly reflected in their mechanisms of change. Furthermore, although goal setting and self-regulation theories discuss tracking behavior and evaluating progress towards achieving a goal (Harkin et al., 2016), reflecting upon the *experience* of behavioral attempts, success, and failure is not addressed. Thus, the concept of post-behavioral evaluations and the dynamic process of feedback to the pre-decisional phase of behavior change appears unique to the MAP, and builds upon existing understanding of the broad domain of action control.

As well as offering empirical support for key paths proposed by the MAP's post-actional phase, the present research generated three novel findings that merit discussion. First, we observed that engaging in exercise means different things depending on whether participants intended to exercise that day or did not intend to exercise but exercised anyway. Successfully following through with intended exercise was more strongly related to PBEs compared to spontaneous exercise. That is, participants felt better during exercise and felt better about themselves after exercise when they intended to exercise and did so, than if they exercised without having a prior intention to do so. Thus, it appears that people obtain greater (affective and self-evaluative) benefit from following through on their intentions to exercise than they do from merely engaging in exercise *per se*. This finding is consistent with

Correspondent Inference Theory's (CIT) analysis of the crucial role of intentionality is drawing inferences about personal dispositions (Jones & Davis, 1965), as well as attribution theory evidence that perceived locus of causality influences emotions such as pride experienced following goal attainment (Weiner, 1986). According to CIT, credit could confidently be assigned to the self for exercising if and only if exercise behavior was intended. It is also known that more autonomous forms of exercise motivation to exercise are associated with more positive intentions (Teixeira, Carraça, Markland, Silva, & Ryan, 2012), affective response to exercise (Kwan, Hooper, Magnan, & Bryan, 2011; Schneider & Kwan, 2013), and self-conscious emotion (Sabiston et al., 2010). These findings show that the effect of intentionality on affect applies to post-behaviour evaluations of affective response and operates not only across people, but within individuals, and on a day-to-day basis.

Second, we obtained new information concerning the importance of self-evaluations. Whereas previous studies have focused on *outcome expectancies* pertaining to self-evaluation (i.e., how good or bad participants expected that engaging in exercise would make them feel; see, e.g., anticipated regret (McAuley, Motl, White, & Wójcicki, 2010)), the present study operationalized self-evaluations as an experiential variable and measured how participants actually felt about themselves in the wake of exercising or not. Findings showed that daily exercise success and failure had predicted associations with self-evaluations. More intriguing, however, was the relationship of self-evaluations to exercise, over and above intentions – even relative to affective responses, which are an established predictor of exercise behaviour (Rhodes & Kates, 2015). The implication of these findings is that the prediction of exercise intentions and behaviour will be enhanced when researchers not only consider *how exercise feels* but also take account of how exercise makes people feel *about themselves.* These findings extend upon existing evidence on the effects of self-conscious emotions such as pride and regret on motivation and regulation of exercise (Bryan et al., 2007; Kwan & Bryan, 2010b; Sandberg & Conner, 2008; Williams et al., 2012), in that self-evaluations represent basic affect underlying self-conscious emotion. For instance, Sabiston et al (2010) showed body-related guilt and shame were related to more extrinsic forms of exercise motivational regulations (external and introjected regulations) and less exercise while body-related pride was related to more intrinsic regulation and more exercise. It may be important to differentiate methodologically, and in intervention design, between the core affective response to the exercise stimulus itself, and self-evaluations related to regulatory success or failure, and the relationship between these two concepts.

The third novel finding concerned how self-evaluations relate to intentions and behaviour on success vs. failure days. According to control theory, positive affect accrues from good progress with one's goals and is "a sign that you can attend to something else" (Carver, 2003) p. 241. Negative affect, on the other hand, signals a discrepancy between goals and performance and leads to setting higher goals and expending greater effort to reduce the discrepancy. Thus, feeling good should lead to weaker intentions to exercise and less exercise behaviour whereas feeling bad should lead to stronger intentions to exercise and more exercise behaviour. The present findings were consistent with control theory's broad prediction that, compared to success days, failing to exercise leads to more negative self-evaluations and more frequent exercise behaviour in the next week. However, our findings were not consistent with the prediction from control theory that negative self-evaluation

strengthens intentions to exercise and promotes exercise behaviour. We observed that both on success and failure days, more positive self-evaluations were associated with *increased* intentions and behaviour, adding to recent findings that feeling bad about stalled progress does not increase intentions to change (Reynolds, Webb, Benn, Chang, & Sheeran, 2017).

The present findings are consistent with basic research indicating that positive affect is crucial for the development of motivation (Custers & Aarts, 2005) and with research concerning the role of pride in motivating achievement (Damian & Robins, 2013). Most important, however, these findings have valuable implications for efforts to galvanize people's motivation when they encounter lapses in following their intended exercise regimen. Feeling good about oneself following failure to exercise appears to be crucial for promoting continued intentions to exercise and maintenance of exercise performance (i.e., for action control). The findings from this investigation can build upon any theory addressing action planning (e.g., i-Change (de Vries et al., 2013), the HAPA model (Sniehotta et al., 2006)), in that these findings inform the types of additional planning that may be needed during action planning steps to help cope with failure, such as using emotion regulation strategies to mitigate negative self-evaluation in the wake of failure. The implication is that interventions need to target the link between the inevitable lapses that people encounter when trying to increase their exercise behaviour and their self-evaluations pertaining to exercise (e.g., by encouraging participants to discount the evaluative implications of any lapse, by focusing attention on recent successes in realizing one's exercise intentions). Future research using experimental designs to test intervention strategies leveraging PBEs – such as tailoring feedback in response to idiosyncratic reactions to success and failure - is needed.

Our results have practical implications too, especially in relation to interventions wherein participants monitor their exercise behaviour on a daily basis. An estimated 58% of U.S. smartphone users have a health app on their device, 52% use these apps to track physical activity and 48% use them to track food intake (Krebs & Duncan, 2015). In 2015, 20% of U.S. adults who are online used wearable devices (e.g., fitness trackers, pedometers, smartwatches), and sales were expected to increase dramatically through 2016 and beyond (Fleming, 2015). However, these tools have thus far demonstrated limited effectiveness for long-term behaviour change (Bort-Roig, Gilson, Puig-Ribera, Contreras, & Trost, 2014). Evaluations of physical activity apps indicate that the techniques designed to improve behaviour change are currently limited to goal setting, monitoring, and social support (Conroy, Yang, & Maher, 2014; Michie et al., 2013; Yang, Maher, & Conroy, 2015). The present findings suggest that daily assessments of success and failure and post-behaviour evaluations of such success or failure (affective response to exercise, self-evaluations such as shame, regret and pride), combined with directed reflection on those PBEs could serve to improve the future success rate. Further study is needed to evaluate the effects of such daily assessments in physical activity apps.

Limitations

The present study has limitations that should be acknowledged. The design was correlational and cannot rule out third-variable explanations or permit causal inferences. At the same

time, the correspondence observed for between- and within-participant effects and the longitudinal design provide strong support for the conclusion that post-behavioural evaluations (both for unique and cumulative behavioural attempts) influence future motivation and behaviour. Participants were university freshmen who had positive intentions to exercise, which limits external validity. These participants offered a valuable sample with which to explore the theory-derived predictions tested here, but tests with more representative samples should follow. Finally, to reduce respondent burden in this intensive daily diary study, single-item measures of key constructs were used. While the validity of such measures may be considered a limitation, a strength of this design is that minimizing respondent burden may have contributed to high rates of adherence to the daily diary protocol.

Conclusions

Limitations notwithstanding, the present research offers several useful advances for research on exercise behaviour as well as direct implications for intervention design. The current study offers the first test of MAP predictions concerning the impact of success or failure at exercising on subsequent exercise decisions and actions. We could trace the influence of perceived success and failure on subsequent intentions and behaviour through two key, potentially modifiable, variables – affective responses to exercise and self-evaluations. Self-evaluations proved as influential as the affective responses tested in previous research, such that much like positive affective response to exercise increases future exercise, feeling good about oneself even in the face of failure (resilient self-evaluation) proved valuable in promoting high-level goals and maintenance of exercise behaviour. These findings would seem to warrant further research to discover effective techniques for enhancing post-behaviour evaluations of exercise.

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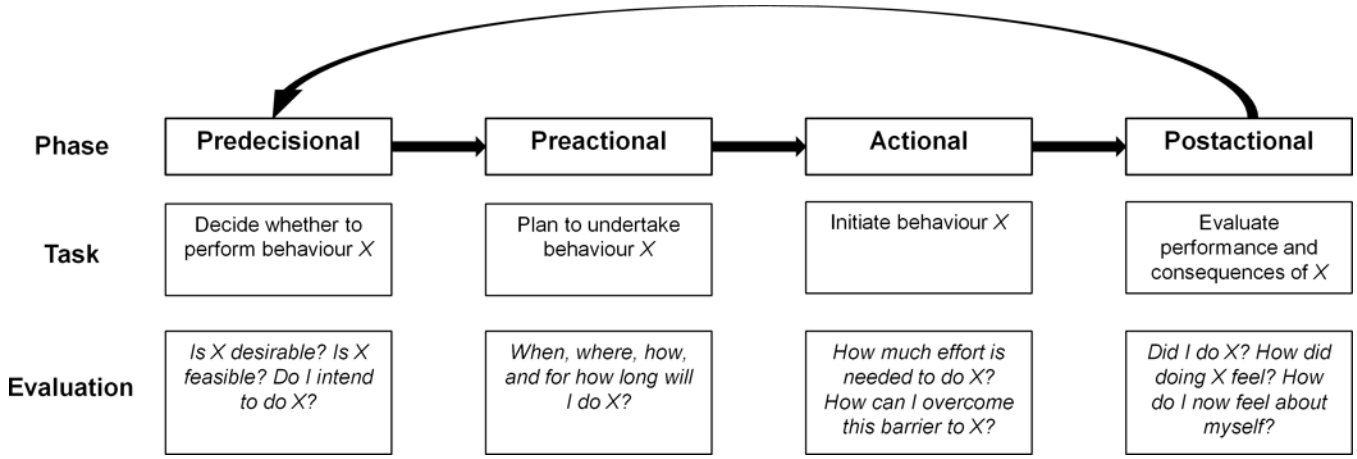

Figure 1.
The model of action phases

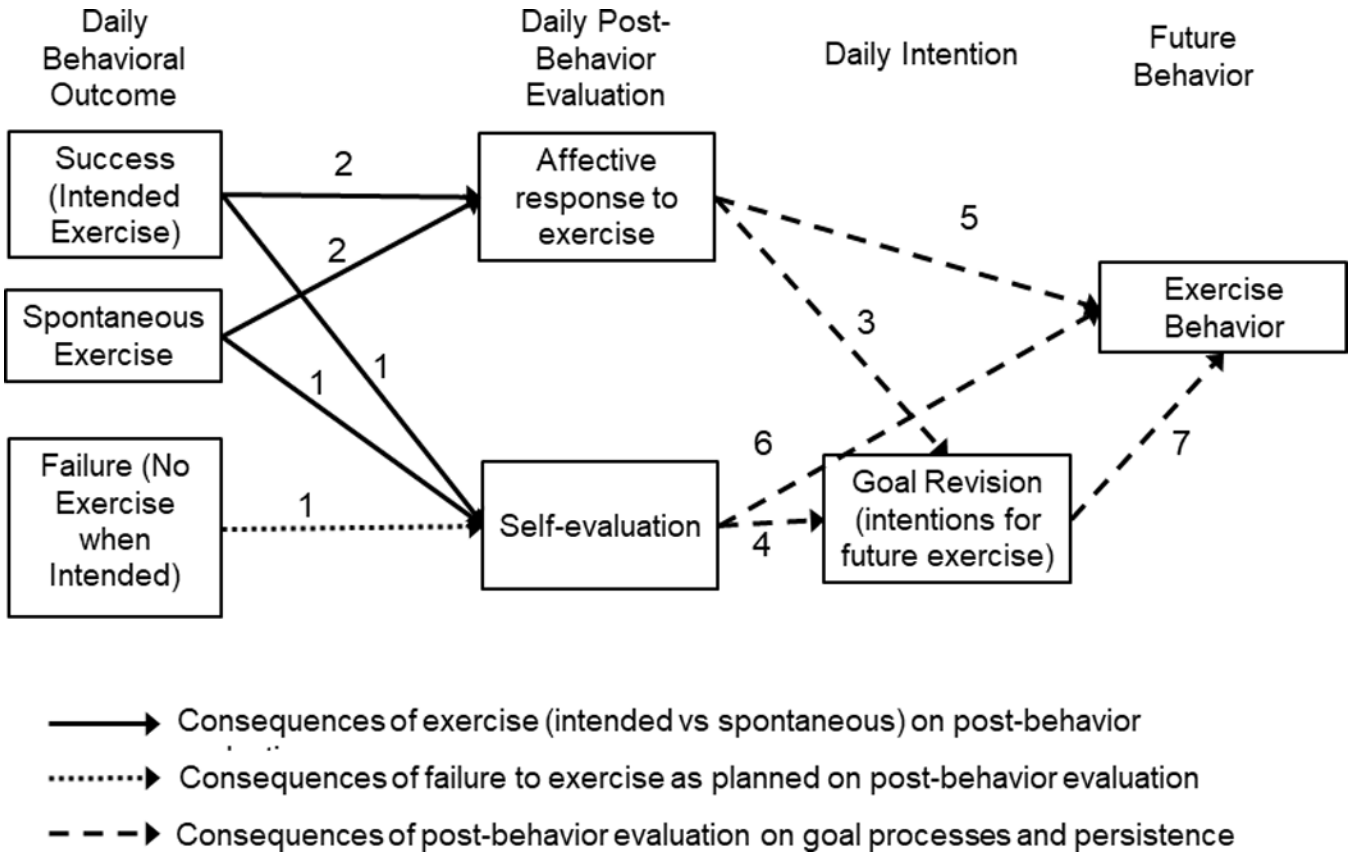

Figure 2.
Hypothesized paths derived from the model of action phases for the relationship among post-behaviour evaluations, exercise intentions, and future behaviour.

Table 1.

Post-Behaviour Evaluations, Daily Intention, and Future Exercise by Exercise Success and Failure

	Affective Response to Exercise (Path 1)	Person Mean-Centred Self-Evaluation (Paths 2 & 3)	Goal-Centred Daily Intention	Goal-Centred Exercise in Next Week
	M(SD)*	***M (SD)****	***M (SD)****	***M (SD)****
Exercise Success vs Failure				
Success	2.92 (1.25)	0.56 (0.76)	0.51 (0.48)	−1.67 (0.97)
Spontaneous Exercise	2.34 (1.35)	−0.04 (0.64)	0.21 (0.46)	−1.85 (0.99)
Failure	N/A	−1.69 (0.65)	0.16 (0.52)	−1.25 (0.80)
Non-Failure	N/A	N/A	0.09 (0.60)	−1.98 (0.86)

Note.

*Mean of within-participant means and standard deviations

Table 2.

Fixed Effects Estimates for Random Coefficient Regression Models of the Predictors of Daily Intentions (Goal-Centred)

	Variable	*Est*	*SE*	*F*	*df*	*P*
Path 3	Intercept	0.51	0.09	30.03	100	<.001
	Time	−0.02	0.01	15.84	1047	<.001
	Person Mean AR (between)	0.1	0.03	10.18	100	0.002
	Person Mean Centred Daily AR (within)	0.05	0.02	9.06	1047	0.003
Path 3*	Intercept	0.41	0.10	15.37	100	<.001
	Time	−.025	0.01	13.76	1045	<.001
	Person Mean AR (between)	0.09	0.03	9.06	100	.003
	Person Mean Centred Daily AR (within)	0.04	0.03	1.35	1045	.25
	Exercise Behaviour (Intended vs Spontaneous)	0.13	0.05	5.90	70	.02
	Daily AR * Behaviour	0.00	0.04	0.01	1045	.92
Path 4	Intercept	0.07	0.24	0.10	101	0.76
	Time	−0.03	0.01	13.69	1319	<.001
	Person Mean Self-Evaluation	0.12	0.04	7.56	101	0.007
	Person Mean Centred Daily Self-Evaluation	0.11	0.02	37.09	1319	<.001
Path 4*	Intercept	0.26	0.25	1.04	101	0.31
	Time	−0.03	0.01	10.18	1300	0.001
	Person Mean Self-Evaluation	0.1	0.05	4.37	101	0.04
	Person Mean Centred Daily Self-Evaluation	0.16	0.05	11.49	1300	<.001
	Exercise Behaviour (Failure)	REF				
	Exercise Behaviour (Spontaneous Exercise)	−0.13	0.1	1.74	157	0.19
	Exercise Behaviour (Success)	−0.01	0.09	0.02	157	0.89
	Daily Self-Evaluation * Behaviour (Failure)	REF				
	Daily Self-Evaluation * Behaviour (Spontaneous Exercise)	−0.17	0.07	5.90	1300	0.02
	Daily Self-Evaluation * Behaviour (Success)	−0.1	0.05	3.28	1300	0.07

Note. AR = Affective response. Outcome modelled is goal-centred daily intentions. Positive values indicate number of days more than goal the participant intends to exercise in the next week. df are denominator degrees of freedom. Time measured in days since baseline.

* Path 4 examined separately for exercise success vs failure days.

Table 3.

Fixed Effects Estimates for Random Coefficient Regression Models of the Predictors of Future Exercise Behaviour

	Variable	*Est*	*SE*	*F*	*df*	*P*
Path 5	Intercept	1.06	0.08	194.88	92	<.001
	Time (fixed effects only)	−0.01	0.003	9.12	647	0.003
	Person Mean AR (between)	0.08	0.02	12.46	92	<.001
	Person Mean Centered AR (within)	0	0.02	0.00	647	0.98
Path 6	Intercept	0.61	0.19	10.30	94	0.002
	Time (fixed effects only)	−0.005	0.002	7.51	815	0.006
	Person Mean Self-Evaluation	0.12	0.04	11.42	94	0.001
	Person Mean Centered Self-Evaluation	−0.02	0.03	0.69	815	0.41
Path 6	Intercept	1.06	0.04	695.90	95	<.001
	Time (fixed effects only)	−0.006	0.002	12.39	1155	<.001
	Person Mean Daily Intention (goal centered)	0.25	0.04	45.97	95	<.001
	Person Mean Centered Daily Intention	0.08	0.04	3.50	1155	0.06
Paths 6/7	Intercept	0.8	0.17	22.28	92	<.001
	Time (fixed effects only)	−0.004	0.002	5.20	809	0.02
	Person Mean Self-Evaluation	0.07	0.03	4.58	92	0.035
	Person Mean Centered Self-Evaluation	−0.02	0.02	0.79	809	0.38
	Person Mean Daily Intention (goal centered)	0.2	0.03	45.97	92	<.001
	Person Mean Centered Daily Intention	0.03	0.04	0.67	809	0.41

Note. AR = Affective response. Outcome modelled is days of exercise in the next week.