Telic-paratelic Dominance and State Effects on Responses to Resistance and Endurance Exercise

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We examined the influence of opposite states of mind (the "telic" vs. "paratelic" state) and dominances (personality characteristics that reflect a preference for one of these states) on emotion and stress responses to exercise. Telic dominant participants completing resistance exercise in the telic state condition reported decreased relaxation from pre- to post-exercise. All participants reported more pleasant emotions when performing endurance exercise in the telic state condition. In contrast, in the paratelic state condition, they reported increased anxiety. These results lend mixed support for previous research but suggest that meta-motivational state is more influential than dominance.

Keywords: metamotivational dominance, metamotivational state, paratelic, telic, emotion, stress, misfit effect, exercise, state-balance

Physical exercise can be beneficial for mental health and well-being, with positive effects reported for stress, emotion, affect, mood state, well-being, anxiety, and depression (Ekkekakis & Backhouse, 2014). However, even with the available evidence that has demonstrated the positive influence of exercise on affect and emotional well-being (e.g., Brosse, Sheets, Lett, & Blumenthal, 2002; Ensel & Lin, 2004; Reed & Ones, 2006), a consistent observation is that 50% of individuals who start a structured exercise program will dropout within 6 months (e.g., Abernethy et al., 2013). It has been proposed that one of the main reasons for this is the negative affect/emotion some individuals experience during exercise (Williams, et al., 2008) as differences in affective responses to exercise exist among individuals (Ekkekakis & Backhouse). Thus, individual emotional responses to exercise are of considerable interest to researchers and practitioners aiming to understand exercise experiences (Ekkekakis,

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Hargreaves, & Parfitt, 2013) as some individuals might have difficulty finding the right exercise or the right "match" for them. To help fully understand the factors that deter some people from exercising, research is needed that examines factors moderating the effects of exercise on affect.

Literature Review

During the last decade, the Dual Mode Model (DMM; Ekkekakis, 2003; Ekkekakis & Acevedo, 2006) has become a widely used theoretical approach for understanding the interindividual variability in affective/emotional responses to exercise. The DMM postulates that affective changes during exercise result from the interplay between the afferent signals arising from the exercise-induced metabolic stress (these signals reflect all aspects of the physiological condition of all tissues of the body and are referred to as the "interoceptive" system), and cognitive/personality factors. The relative dominance of these two systems is proposed to depend on exercise intensity: the harder one exercises, the greater the influence of the interoceptive system. When exercise intensity exceeds one's respiratory compensation point (or one's lactate threshold) this influence is thought to be overwhelmingly negative as exercise intensity precludes the maintenance of physiological steady state and threatens one's vital equilibrium. In most cases, however, cognitive/personality factors probably remain the most salient influence on affect/emotion since individuals usually self-select exercise intensities *below* the lactate or the respiratory threshold (e.g., Ekkekakis & Lind, 2006; Lind, Ekkekakis, & Vazou, 2008). Unfortunately, very little is known about the nature of these

cognitive/personality constructs as research on this topic is still in its infancy. Findings obtained so far have identified the following variables to be significant: self-efficacy (e.g., Barnett, 2013), perceived autonomy (e.g., Rose & Parfitt, 2012), knowledge of exercise duration (e.g., Rose & Parfitt, 2012), tolerance to exercise intensity (Ekkekakis, Hall, & Petruzzello, 2005), behavioral activation-inhibition (Schneider & Graham, 2009) and predisposition toward perceived evaluative threat (Focht, 2011).

A series of recent studies have also demonstrated the relevance of cognitive and personality variables deriving from Reversal Theory as moderators of the exercise-affect relationship (Legrand, Bertucci, & Thatcher, 2009; Legrand & Thatcher, 2011). Reversal theory (RT; Apter, 2001, 2007) emphasizes the dynamic nature of the individual's mental state (known as "motivational" or "metamotivational" states). Each person exhibits a tendency to spend relatively more time in one state than the other. This has been termed motivational (or metamotivational) dominance. Whilst we prefer to experience our dominant state, there can be a period of time where the individuals, regardless of dominance, tend to spend a time in a certain state due to contingencies and/or frustrations, which is referred to as a "state-balance" (Apter, 2001). State balance will change over time (Apter & Larsen, 1993), for example, a paratelic dominant individual can be in a telic state while exercising for a health purpose but, as soon as he/she finishes exercising, the state will shift to a paratelic state which is the preferred state for this individual.

Although RT has posited the existence of four pairs of motivational states (interested readers can find a detailed account of RT constructs in Apter, 2001), the "telic-paratelic" pair is the most relevant to the context of exercise and affect since telic and paratelic states are proposed to influence the relationship between arousal and affect/emotion in opposing ways (Apter, 1982, 2001). As we intended to manipulate state-balance, a method for manipulating state combinations has not yet been determined but an established method of manipulating the telic-paratelic states has been used in previous research. Thus, given that research to date indicates this is the most relevant pair for exercisers (e.g., Kerr, Wilson, Svebak, & Kirkcaldy, 2006b; Kuroda, Thatcher, & Thatcher, 2011; Thatcher, Kuroda, Legrand, & Thatcher, 2011), we focused here only on the telic-paratelic state pair.

The paratelic state is characterised by the fact that one wants to have fun and to experience what one is doing as strongly and intensely as possible (this has been referred to as an "arousal-seeking" mode). In contrast, the core value of the telic state is that of work and seriousness. Any barrier or frustration of any kind that may impede achievement of identified objectives will be likely to increase arousal that will subsequently be experienced as anxiety (the "telic" state is also known as an "arousal-avoidance" mode). Therefore, according to RT, the preferred level of exercise intensity is low in the telic state (i.e., lower levels of stimulation should be associated with pleasant affect/emotion and higher levels would be experienced as aversive). In contrast in the paratelic state, the preferred level of intensity is high (i.e., the dose-response curve exhibits the opposite pattern). Therefore, individuals who are telic dominant prefer activities that have a telic emphasis and those who are paratelic dominant prefer activities with a paratelic orientation. It is suggested that in part this is because more positive affect will result from exercise performed when state and dominance are matched than when they are mismatched. Results have consistently indicated that extremely paratelic dominant individuals prefer more explosive and spontaneous sports, such as baseball, cricket, touch football, surfing, and windsurfing, whereas extremely telic dominant individuals prefer endurance and repetitive sports, such as distance running and rowing (e.g., Cogan & Brown, 1999; Kerr, 1991; Svebak & Kerr, 1989). These established relationships between preferred activity, state and metamotivational dominance might help to explain inter-individual differences observed in emotional responses to exercise and highlight the need for an interactive approach, not one that focuses on either person-related or situational factors, or, in RT terms, on only dominance or state. Given that telic and paratelic dominant individuals prefer different types of exercise activities (e.g., Kerr et al., 2006a), their emotion and stress responses may differ when performing different types of activity and in different metamotivational states. Svebak (1990) has identified that when a mismatch occurs between activity, state and dominance (e.g., a telic dominant individual participating in an explosive activity that induces the paratelic state) the individual may experience unpleasant affect and this is termed the 'misfit effect' (Spicer & Lyons, 1997). However, studies that have involved manipulation into the telic and paratelic states among telic/paratelic dominant individuals have not consistently lent support for the misfit effect in an exercise context (Kuroda et al., 2011; Kuroda, Hudson, & Thatcher, 2015; Thatcher et al., 2011). As exercise can take place over an extended period of time, the individual can experience both telic and paratelic state emotions during this period. Thus, in an exercise context, it could be more appropriate to investigate the misfit effect in relation to dominance-state balance, as state manipulation in this context will reflect situational state-balance rather than metamotivational state per se. Therefore, the present study will examine emotion and stress responses to resistance (paratelic activity) and endurance (telic activity) exercise bouts by manipulating state-balance among telic and paratelic dominant individuals.

In sum, from a practical perspective, increased understanding of an individual's experience of exercise might help exercise professionals to engage people in appropriate, tailored exercise programmes. It is clear that increased insight could be gained by examining the interactive effect of per-

sonality and state factors in relation to different types of exercise, and RT offers a framework via the misfit effect to do so. Only limited research has explored the interactive influence of metamotivational state and dominance within exercise contexts and none has yet examined this influence on emotional responses to endurance (continuous) *and* explosive exercise. The endurance (continuous) exercise consisted of 100 repetitions of isokinetic leg extension, with variable resistance to a constant leg movement; thus, this was identified as the telic activity. The explosive exercise consisted of three maximum isometric leg extensions, where explosive muscular power was used; thus, this was identified as the paratelic activity. Metamotivational state-balance was manipulated in both studies to ensure that participants exercised predominantly in both the telic and paratelic states, and, their emotional and stress responses were assessed prior to, during and following two different exercise sessions. To examine dominance-state-balance misfit, the hypotheses for the studies were:

1. in Study 1, during explosive resistance (anaerobic) exercise in predominantly the paratelic state, paratelic dominant participants will experience less stress and report more positive emotion than telic dominant participants, and vice versa for telic dominant participants;

2. in Study 2, during endurance (aerobic) exercise in predominantly the telic state, telic dominant participants will experience less stress and report more positive emotion than paratelic dominant participants, and vice versa for paratelic dominant participants.

Method

Participant Recruitment

Participants for both studies were recruited via email and verbal approach to individuals enrolled as students at a UK University ($N = 157; M_{age} = 21.0, SD = 5.7$ years; range $18 - 65$ years). All participants provided written informed consent to participate in the initial sampling phase. They completed the Paratelic Dominance Scale (PDS; Cook & Gerkovich, 1993; see Measures section for details), scores on which range between $0 - 30$, with higher scores indicating paratelic dominance (PD) and lower scores indicating telic dominance (TD). Mean PDS score was $16.05 (SD = 5.71)$; participants who scored higher than one standard deviation above the mean (21.76) were classified into the PD group and below (10.34) were classified into the TD group (Gerkovich, Cook, Hoffman, & O'Connell, 1998). Study participants were then purposely sampled from this pool based on their PDS score. Age, sex, and frequency of exercise per week were recorded for each participant and participants in both studies provided written informed consent prior to their participation. Both studies received University ethics approval.

Participants

Study 1: Resistance exercise. Participants were 14 TD (PDS $M = 6.14, SD = 2.32$) and 13 PD (PDS $M = 24.00, SD = 0.84$) individuals. The TD group included 7 males and 7 females ($M_{age} = 25.7, SD = 9.0$ years; range $18 - 53$ years), with a mean exercise frequency of 3.9 times per week ($SD = 1.7$). The PD group comprised 7 males and 6 females ($M_{age} = 21.2, SD = 5.7$ years; range $18 - 38$ years), with a mean exercise frequency of 3.0 times per week ($SD = 1.8$).

Study 2: Endurance exercise. Participants were 14 TD (PDS $M = 6.29, SD = 2.49$) and 12 PD (PDS $M = 24.04, SD = 0.86$) individuals. There were 7 males and 7 females in the TD group ($M_{age} = 23.0, SD = 4.2$ years; range $18 - 30$ years), with a mean exercise frequency of 4.0 times per week ($SD = 1.9$). The PD group comprised 7 males and 5 females ($M_{age} = 21.2, SD = 6.0$ years; range $18 - 38$ years), with a mean exercise frequency of 3.1 times per week ($SD = 1.8$).

Measures

Paratelic Dominance Scale (PDS; Cook & Gerkovich, 1993). The PDS includes 30 items representing three theoretically based subscales: playfulness, spontaneous and arousal seeking. Each subscale has 10 items with a true/false answer format. Responses are scored with 0 = telic option and 1 = paratelic option, resulting in a scoring range of $0 - 30$ (0 being extremely telic dominant and 30 being extremely paratelic dominant). The PDS is used frequently to measure individuals' metamotivational dominance (Bindarwish & Tenenbaum, 2006; Kuroda et al., 2011; Thatcher et al., 2011). The alpha coefficient for odd-numbered items in the study by Cook and Gerkovich (1993) was 0.87 and for even-numbered items was 0.86. No sex differences have been identified in previous samples and population data demonstrate a normal distribution, as indicated by acceptable skewness and kurtosis.

Telic State Measure (TSM; Svebak & Murgatroyd, 1985). The TSM includes 5 items to determine if an individual is currently in the telic or paratelic state and their associated arousal and effort. The first item was used in this study to assess serious-playful mood as in previous research (Perkins, Wilson, & Kerr, 2001; Thatcher et al., 2011). This item includes a six-point rating scale anchored by the adjectives, *serious* and *playful*. Low scores ($1 - 3$) indicate the telic state and high scores ($4 - 6$) indicate the paratelic state.

Tension and Effort Stress Inventory (TESI; Svebak, 1993). There are 20 items in the TESI to measure tension stress (2 items), effort stress (2 items), pleasant emotions (8 items), and unpleasant emotions (8 items), using a rating scale ranging from 1 (*not at all*) to 7 (*very much*). This study used the first four items that ask respondents to report their levels of internal and external tension and effort

stress. Of the remaining 16 items assessing emotions, only the first four were used here (relaxation, anxiety, excitement and boredom; Apter, 1982) as these are the most relevant to the telic and paratelic states. Previous research has similarly used selected items from the TESI (Perkins et al., 2001) and has supported its validity and reliability with Cronbach's alphas of 0.88 and 0.75 for pleasant and unpleasant emotion items, respectively (e.g., Males & Kerr, 1996; Svebak, 1993).

Design

In each study participants attended three sessions at the same time of day, separated by at least 48 hours, within a two-week period. The first session was a familiarisation session; this was followed by two experimental conditions that involved state manipulation into the telic or paratelic state. These were presented in a cross-over design with half of the participants completing the telic state (TS) condition first, and the other half completing the paratelic state (PS) condition first.

Familiarisation session. Participant stature (wall-mounted Stadiometer, Holtain Ltd, Crymych, UK) and body mass (Seca 645, Seca GmbH & Co, Hamburg, Germany) were recorded prior to being seated in an isokinetic dynamometer (Biodex Isokinetic System III, IPRS Mediquipe, Little Blakenham, UK), which is a machine that is used to measure various angles and speeds of joints (and in this study, knee joint to examine leg movements were measured. The hip angle was fixed to 110° between the alignment of the spine and the femur. Pelvic and femoral straps were applied to restrict movement to the lower leg. All settings were recorded and used during subsequent visits. Participants then performed active extension and allowed gravity assisted passive flexion until comfortable with the action. All exercise was performed with the right leg and all participants were right leg dominant. They then completed a performance trial that replicated the movement involved in the exercise protocol for that study.

Experimental trials. Participants' metamotivational state-balance was manipulated via video stimuli, projected onto a 1.3 m x1.5 m screen, for 10 minutes immediately prior to the commencement of exercise and for the duration of the exercise protocol. A comedy motion picture was used to induce the paratelic state, and a documentary video was used to induce the telic state. Mood manipulation via video has worked successfully in previous studies (Kuroda et al., 2011; Thatcher et al., 2011). Immediately prior to (baseline) and following (pre-exercise) state manipulation participants completed the TSM and TESI items. They then performed the exercise protocol for that study, whilst continuing to watch the video, after which they completed the TSM and TESI items (post-exercise).

In Study 1 (i.e., resistance exercise), participants completed 3 maximum voluntary isometric contractions (MVC)

for 5 s at a hip angle of 110°, with 60 s between each effort and in Study 2 (i.e., endurance exercise), they performed 100 self-paced repetitions of isokinetic leg extension exercise at a rate of $90°\,s^{-1}$. The rationale for selecting these exercises is presented in the Introduction.

Data analysis

Both studies employed a mixed design with three independent variables (with meta-motivational dominance as a between-subject variable and state condition and time of TESI completion as within-subject variables). Dependent variables were the TESI scores (relaxation, anxiety, excitement, boredom, internal tension stress, internal effort stress, external tension stress, and external effort stress). Eight 2 (Dominance) x 2 (State conditions) x 2 (Time points) mixed-design ANOVAs were performed in each study, with alpha set at .05. Significant effects were examined using t-tests with Bonferroni correction. Effect sizes were computed using Cohen's $d = (Mi - Mj)/SD_{pooled}$, corrected for dependence among means in within-subject comparisons by taking the correlation between the two means into account.

Results

Manipulation Check

TSM item responses indicated that the state-balance manipulation was effective. For Study 1, the state main effect was significant with a large effect size, $F(1, 12) = 36.43, p < 0.001$, partial $\eta^2 = 0.75$. Playfulness was rated significantly higher in the paratelic state than in the telic state condition, $t(38) = -6.86, p < 0.001$. The state main effect was also significant for Study 2, with a large effect size ($F(1, 11) = 16.33, p < 0.002$, partial $\eta^2 = 0.60$). Again, participants were significantly more playful in the paratelic state than in the telic state condition ($t(35) = -4.72, p < 0.001$).

Study 1 (resistance exercise)

Table 1 includes descriptive statistics for the TESI items in each experimental condition (telic/paratelic state) and dominance group (telic/paratelic dominant).

ANOVA analysis revealed a significant three-way interaction for relaxation, $F(1, 25) = 6.16, p = .020$, partial $\eta^2 = .20$. Follow-up tests indicated that for telic dominant participants in the telic condition, relaxation significantly decreased pre- to post-exercise ($M_{pre} = 4.4, SD = 1.7, M_{post} = 3.5, SD = 1.5$, Cohen's $d = -0.70$).

Of statistical, but not theoretical, significance, all stress responses increased pre- to post-exercise. This increase was observed in both conditions and dominance groups, except for paratelic dominants' external tension stress in the paratelic condition and internal tension stress in the telic condition, which did not change. Effect sizes were moderate to large (Cohen's ds ranged from 0.45 to 1.41).

Table 1

Pre- and post-exercise TESI scores as a function of motivational dominance and motivational state-balance in Study 1 (resistance exercise).

	Telic dominant participants (n = 14)				Paratelic dominant participants (n = 13)				ANOVA F			
	pre-test		post-test		pre-test		post-test		T	T × D	T × C	T × D × C
	M	SD	M	SD	M	SD	M	SD				
RELAXATION									4.01	<1	<1	6.16*
telic condition	4.4	1.7	3.5	1.5	4.2	1.7	4.2	1.5				
paratelic condition	4.4	1.5	4.1	1.3	4.8	1.9	4.2	1.6				
ANXIETY									3.49	1.69	<1	3.45
telic condition	1.7	0.7	2.4	1.3	2.1	1.0	1.9	1.0				
paratelic condition	1.8	1.1	2.0	1.0	1.7	0.9	2.0	1.2				
EXCITEMENT									<1	<1	1.08	1.74
telic condition	2.7	1.3	2.9	1.4	3.5	1.3	3.1	1.6				
paratelic condition	2.0	1.1	1.8	0.8	3.3	1.1	3.1	1.4				
BOREDOM									<1	<1	<1	<1
telic condition	2.6	1.8	2.2	1.6	3.2	1.6	3.2	2.0				
paratelic condition	1.3	0.6	1.3	0.8	2.0	1.1	1.8	0.9				
EXTERNAL TENSION STRESS									12.87**	2.64	<1	<1
telic condition	2.8	1.5	3.5	1.4	2.5	1.1	2.5	1.3				
paratelic condition	2.6	1.6	3.3	1.5	1.7	0.5	2.2	0.8				
INTERNAL TENSION STRESS									11.32**	2.82	1.83	1.21
telic condition	2.5	1.2	3.5	1.3	2.2	1.0	2.2	1.0				
paratelic condition	2.6	1.4	3.6	1.9	1.7	0.6	2.4	1.0				
EXTERNAL EFFORT STRESS									17.00**	1.92	<1	<1
telic condition	2.4	1.4	3.2	1.6	2.1	1.1	2.5	1.3				
paratelic condition	2.7	1.5	3.7	1.5	1.7	0.6	2.2	1.1				
INTERNAL EFFORT STRESS									13.04**	<1	<1	2.48
telic condition	2.1	1.2	3.4	1.8	2.1	1.1	2.7	1.4				
paratelic condition	2.9	1.6	3.9	1.8	1.8	0.7	2.6	1.3				

Note. T = Time; D = Dominance; C = Condition

*p < .05 **p < .01

Study 2 (endurance exercise)

Table 2 is identical to Table 1, except that it reports scores for our endurance exercise study (Study 2) rather than our resistance exercise study (Study 1).

The time x condition interactions for boredom ($F(1, 24) = 16.56, p < .001$, partial $\eta^2 = .41$), excitement ($F(1, 24) = 5.28, p = .031$, partial $\eta^2 = .18$), and anxiety ($F(1, 24) = 5.46, p = .028$, partial $\eta^2 = .19$) were significant. More specifically, for both dominance groups, exercise had a positive impact on boredom ($M_{pre} = 3.3, SD = 2.0, M_{post} = 2.2, SD = 1.4$, Cohen's $d = -1.09$) and excitement ($M_{pre} = 2.0, SD = 0.9, M_{post} = 2.8, SD = 1.0$, Cohen's $d = 0.97$); but only when exercise was performed in the telic condition. By contrast, exercise increased anxiety when in the paratelic condition ($M_{pre} = 1.5, SD = 0.6, M_{post} = 2.2, SD = 1.3$, Cohen's $d = 1.35$), but not in the telic condition.

As in Study 1, stress responses significantly increased pre- to post-exercise for both groups of participants in both ex-perimental conditions, with even larger effect sizes (Cohen's ds from 0.80 to 1.93). Similarly, relaxation significantly decreased pre- to post-exercise for both groups in both conditions (Cohen's ds from −0.86 to −1.37).

Discussion

The purpose of the two studies reported here was to examine person by situation interaction effects on emotion and stress responses to acute exercise. Using RT, we observed responses in relation to telic and paratelic meta-motivational dominance and manipulated meta-motivational state balance. Neither study offered support for the dominance-state-balance misfit (a mismatch between meta-motivational dominance and state). Indeed in Study 1 (resistance exercise) results contradicted the dominance-state-balance misfit effect with a decrease in relaxation reported by telic dominant individuals in the telic state. This does lend support to the decreased pleasant emotion observed in telic but not paratelic

Table 2

Pre- and post-exercise TESI scores as a function of motivational dominance and motivational state-balance in Study 2 (endurance exercise).

	Telic dominant participants (n = 14)				Paratelic dominant participants (n = 12)				ANOVA F			
	pre-test		post-test		pre-test		post-test		T	T × D	T × C	T × D × C
	M	SD	M	SD	M	SD	M	SD				
RELAXATION									22.19**	3.76	<1	<1
telic condition	4.1	1.4	2.7	1.6	4.8	1.5	4.2	1.4				
paratelic condition	4.5	1.8	2.9	1.2	5.4	1.8	4.8	1.3				
ANXIETY									5.68*	5.68*	5.46*	<1
telic condition	1.8	1.1	2.4	1.6	1.8	1.3	1.5	0.9				
paratelic condition	1.5	0.8	2.5	1.4	1.4	0.5	1.7	1.0				
EXCITEMENT									4.17	1.35	5.28*	<1
telic condition	1.9	0.9	2.9	1.0	2.2	1.0	2.6	1.1				
paratelic condition	3.2	1.2	3.4	1.4	3.3	1.1	3.3	1.7				
BOREDOM									6.07*	<1	16.56**	<1
telic condition	3.0	2.2	2.1	1.3	3.7	1.8	2.3	1.6				
paratelic condition	1.4	0.6	1.6	0.8	1.3	0.7	1.6	1.0				
EXTERNAL TENSION STRESS									18.84**	<1	<1	3.20
telic condition	2.9	1.7	3.9	1.1	2.2	0.8	2.6	1.2				
paratelic condition	2.4	1.3	3.3	1.2	1.6	0.8	2.4	1.2				
INTERNAL TENSION STRESS									27.86**	<1	<1	<1
telic condition	2.6	1.4	3.9	1.1	1.9	0.9	2.9	1.2				
paratelic condition	2.6	1.3	3.8	1.1	1.4	0.7	2.3	1.2				
EXTERNAL EFFORT STRESS									16.89**	<1	<1	1.94
telic condition	2.5	1.5	3.6	1.3	2.0	1.2	2.5	1.6				
paratelic condition	2.7	1.3	3.4	1.3	1.5	0.7	2.3	1.3				
INTERNAL EFFORT STRESS									16.80**	<1	<1	<1
telic condition	2.6	1.6	3.7	1.4	1.8	0.9	2.8	1.4				
paratelic condition	2.7	1.5	4.2	1.4	1.4	0.5	2.3	1.5				

Note. T = Time; D = Dominance; C = Condition

*p < .05 **p < .01

dominant individuals in response to 10 minutes of heavy-intensity exercise (Legrand et al., 2009). Moreover, for telic dominant individuals, resistance exercise is not suited for them as the exercise mode does not fit with their dominance (Svebak & Kerr, 1989), especially when in a telic goal-oriented state, which is how coaches/trainers encourage a lot of people to be when trying to encourage them to exercise. However, we cannot be certain if this reflects a dominance effect or is confounded by exercise mode, as telic dominant individuals prefer endurance exercise (Svebak, 1990). The lack of dominance effects in Study 2 strengthens this latter explanation.

Study 2 revealed an interaction between dominance and state but not in line with the dominance-state-balance misfit effect. The increase in pleasant emotion (excitement) and decrease in unpleasant emotion (boredom) observed in the telic state condition and increased anxiety in the paratelic state condition, in both dominance groups, supports previous findings that state is more influential than dominance (e.g., Legrand & Thatcher, 2011). More positive responses have been identified previously when exercise was performed in the paratelic state, but our results contradicted this. For some individuals, the exercise intensity for this study was low and this may have caused them to positively perceive that the telic state (i.e., being goal oriented) helped, as it gave them a focus during a longer exercise bout regardless of their dominance. In contrast, not having a goal in the paratelic condition created anxiety as they were exercising without a clear goal for longer.

Across both studies, apart from two responses in paratelic dominant individuals, stress responses did not vary in relation to dominance or state, but instead as a result of exercise. This does not reflect the interactive effects observed previously (Thatcher et al., 2011) but does reflect exercise-induced stress resulting from the psychological and physical demands of exercise (Kerr & Svebak, 1994). As did the

present study, Kuroda et al. (2015) examined the state misfit effect during maximal aerobic exercise, but results showed no interactions between metamotivational dominance and state. These results may be in line with the propositions of DDM (Ekkekakis, 2003) where exercise intensity is influencing the interoceptive system. As was also evident in Kuroda et al., the exercise in Study 1 required all-out effort to exert maximal power, and, in Study 2, although the exercise was self-paced, some participants might well have exercised over their anaerobic threshold by the end of the 100 repetitions (while for others the exercise did not exceeded their anaerobic threshold). Thus, changes in emotions and stress were observed regardless of dominance or state. Similarly, a study by Thatcher, Kuroda, Thatcher, & Legrand (2010) found higher RPE when individuals exercised in the telic state during 30 minutes of treadmill running. Therefore, as proposed in the DDM, high intensity exercises cause unpleasant emotion, and this may be associated with a telic state, which is a goal oriented motivation and not a state-balance between telic and paratelic states.

The main limitation of our studies is the focus only on the telic-paratelic motivational pair. Whilst this is a salient pair within an exercise context, complete understanding of the individual's psychological state requires a focus on all eight meta-motivational states. Further, meta-motivational states represent our subjective phenomenology and therefore we might better understand the complex interaction of state, dominance and exercise with studies that incorporate qualitative methods. Similarly, instead of manipulating meta-motivational state or state-balance, we might benefit first from more fully understanding naturally occurring meta-motivational states and associated emotions during exercise, as observed by Thatcher et al. (2010).

Conclusion

From a practical perspective, increased understanding of how individuals experience exercise emotionally might help exercise professionals to engage people in appropriate, tailored exercise programs. Our studies sought to understand why emotional responses to exercise are not always positive, to contribute to the debate surrounding factors responsible for lack of exercise participation. Not surprisingly, given the pervasiveness of this problem, our studies did not reveal definitive answers. Tentatively, we suggest a need to enhance understanding of psychological state influences on emotional responses to exercise. Personality factors (at least those examined here) appear to exert less influence, but exercise mode cannot be ignored in future studies, as we observed greater variation during endurance than resistance exercise.

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