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**Understanding Exercise Behavior and Drop-out Through Meta-Motivational
Dominance, Exercise Identity and Motives.**

Abstract

Despite literature exploring interventions and strategies to encourage exercise adoption and maintenance, the drop-out rate of irregular exercisers, particularly within the first 6 months of adoption, continues to reduce the effectiveness of such interventions. Whilst a body of literature exists exploring the drop-out profile of clinical patients, less is known about the psychological and theoretical differences that discriminate exercise behavior and which could be indicative of susceptibility to drop-out in the general population.

The current study examines whether the meta-motivational constructs of reversal theory (Apter, 1989), exercise motives and exercise identity can discriminate between males' and females' exercise behavior, defined in relation to length of exercise participation, and consistency (frequency of previous drop-out). 973 participants responded to an online survey. MANOVA was used to determine whether exercise length and consistency resulted in significant differences in levels of outcome variables. Where significant effects were identified, discriminant function analysis was employed to determine whether and how the dependent variables were able to discriminate between groupings.

Results indicated that differing profiles of exercise identity, meta-motivational dominance and motives for exercise could discriminate between females and males who had been exercising for different lengths of time and with different levels of exercise consistency. These findings indicate that specific groupings may highlight individuals who are vulnerable to drop-out so that strategies can be tailored more effectively for these individuals.

Keywords:

Exercise Identity; Exercise Motives; Reversal Theory; Exercise; Drop-out

Understanding Exercise Behavior and Drop-out Through Meta-Motivational Dominance, Exercise Identity and Motives.

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The relationship between physical activity and positive health and wellbeing is well established (Barnes, 2010; Ekelund et al., 2016). The past decade has seen a dramatic rise in chronic illness associated with an inactive lifestyle in western societies (Ding et al., 2016; World Health Organisation, 2015) and as such, the need to encourage exercise adoption and maintain physical activity remains. However, despite a range of literature exploring interventions and strategies to encourage exercise adoption and maintenance, the drop-out rate of irregular exercisers, particularly within the first 6 months of adoption, continues to reduce the effectiveness of such interventions for sustained improvements to health (James et al., 2008).

Whilst focusing on physically inactive individuals and seeking ways to encourage exercise adoption is beneficial, a significant amount could be learnt from exploring the factors that determine drop-out versus long-term exercise participation to allow more targeted strategies to support those most at risk of dropping out. A number of studies have explored the determinants of drop-out, attendance and/or adherence to clinical or structured interventions such as cardiac rehabilitation (Yohannes, Yalfani, Doherty, & Bundy, 2010), programmes for patients with cancer (Shang, Wenzel, Krumm, Griffith, & Stewart, 2013) or for specific groups such as older adults (Hawley-Hague, Horne, Campbell, Demack, Skelton, & Todd, 2013) and individuals who are overweight or obese (Hadžiabdić, Mucalo, Matić, Rahelić, & Božicov 2015). This research has tended to examine the influence of demographic variables such as education level, age and gender, as well as the role of specific health perceptions. This focus on clinical populations is beneficial for understanding determinants in specific populations and for accounting for individual differences to enhance the effectiveness of structured interventions such as exercise referral or rehabilitation that are used to encourage exercise adoption. However, limited interventions exist to support the general, otherwise healthy, public to adopt and maintain physical activity. Although numerous public health campaigns exist aimed at encouraging physical activity in the general population, these focus on a one size fits all approach which is counterintuitive given the importance of individual differences in exercise and other health behaviors (e.g., Rose & Parfitt, 2007). Thus, whilst profiling individuals in relation to their demographic characteristics, as has research, can be useful, more consideration needs to be given to the psychological differences that discriminate varying engagement with exercise.

Though research has examined numerous predictors of, and barriers to, exercise adoption (e.g., Herring, Sailors, & Bray, 2014; Withall, Jago, & Fox, 2011), limited research has explored the influential factors that might determine exercise drop-out in the general public. This is important to understand because intervening with this population to support exercise adherence at an early stage of adoption, could prevent high levels of drop-out and thus, the continuous rise in chronic disease diagnoses related to physical inactivity. In addition, support at an earlier stage of exercise adoption may mean that individuals who are later required to attend a clinical rehabilitation programme are already more prepared to adhere to a programme of exercise, having potentially developed a new identity as an exerciser prior to referral.

There is extensive research linking exercise identity with exercise behavior, demonstrating relationships between exercise identity and exercise amount, and adherence to

exercise in groups of people with chronic illness (e.g., Anderson & Cychosz, 1995; MacPherson et al., 2016; Pentecost & Taket, 2011; Reifsteck, Gill, & Labban, 2016). Research highlighting the importance of exercise identity for exercise adherence has also demonstrated gender differences, where males expressed a desire to maintain a sporty or active identity, and women's exercise identity was more related to health or wellbeing (Pentecost & Taket, 2011).

Motivation has also been consistently highlighted as important for exercise engagement; specifically, intrinsic exercise motivation is considered to be beneficial for exercise participation and adherence and is associated with greater effort, persistence and performance (Vansteenkiste et al., 2004). However, it is also known that extrinsic motives are more often associated with exercise-related behaviors (e.g., Kilpatrick et al., 2005). Similar to exercise identities, gender differences in motives to exercise have also been reported with research suggesting that females cite more extrinsic factors such as weight management or health and males more intrinsic motives such as competition and challenge (Egli, Bland, Melton, & Chzech, 2011; Morris, Clayton, Power, & Han, 1995). More recently, Molanorouzi, Khoo, and Morris (2015) considered how motives for participation in physical activity could discriminate individuals based on age and gender. Individuals could be classified based on their motives with a relatively high percentage of accuracy for gender (82%), and age group (83%). Notably, motives discriminating between males and females included competition, appearance, physical condition, and mastery.

Researchers have also explored the role of personality in predicting the uptake of exercise behavior and as a potential explanation for the discrepancy in intention to act and subsequent behavior evident when most behavior change models are employed (MacCann, Todd, Mullan, & Roberts, 2015). These authors identified that lower emotionality significantly predicted intention, and lower honesty-humility significantly predicted actual behavior. However, a small effect size was reported for both of these relationships. Similarly, Ingledew and Markland (2008) identified positive relationships between neuroticism and external regulation, and, openness to experience and health and fitness motives, and, negative relationships between conscientiousness, and appearance and weight motives, and external and introjected regulation (form, of extrinsic regulation where the individual is regulated to avoid feelings of guilt or shame). This clearly demonstrates that individual differences in personality can account for differing motives to participate in a specific behavior as well as the behavioral regulation underpinning this participation. However, a large amount of the variance in motives and behavioral regulation remained unexplained in the model. This suggests that personality only accounts for a small amount of the variance or that the previous theories of personality utilised do not provide a sufficiently comprehensive framework in this context.

There are a number of models that have been tested in relation to exercise motivation, including reversal theory (Apter, 1989), which provides a theoretical framework that aims to account for the complexity and multidimensionality of personality. The theory proposes that an individual's personality can be described by their frequency or *tendency* to experience their motivation in a particular way, known as meta-motivational dominance. Four dominance dimensions exist Telic-Paratelic; Negativist-Conformist; Mastery-Sympathy, and, Autic-Alloic. The preferred behaviors reported by individuals who are Telic dominant are serious and goal-orientated while Paratelic dominant individuals prefer playful, sensation orientated and impulsive behaviors. Conformists prefer to adhere to rules, expectations and norms, whilst Negativist dominant individuals tend to rebel against these rules, expectations and norms. Mastery dominant individuals prefer to feel in control, strong and tough, whereas

Sympathy dominance is associated with a preference for co-operation, nurturing and tenderness. Finally, Autic dominance is characterised by a focus on oneself and meeting one's own needs, and, Alloic dominance by focusing on, and giving to, others. Combinations of dominances from different pairs are possible (e.g., Telic-Autic-Conformist-Mastery). As a result, reversal theory provides a better approach than other personality theories because it offers a parsimonious, contextual and flexible explanation for exploring the complexity of personality.

Lindner and Kerr (2000) examined exercise motivation in relation to the meta-motivational constructs of reversal theory and reported that the principal reasons for sport participation included fitness and fun which are Telic and Paratelic motives, respectively. They also identified that individuals who regularly participated in exercise were most likely to report Telic and Alloic meta-motivational orientations whilst non-exercisers were most likely to report Paratelic, Telic, Mastery and Autic orientations. Similarly, Sit, Kerr, and Wong (2008) reported that participants' motivation towards sport and exercise was comprised of Telic, Conformist, Alloic and Sympathy styles. These studies illustrate the relevance of Reversal Theory for understanding exercise behavior but remain limited as they have adopted a dichotomous approach to participation, describing motivational orientations in relation to participation or non-participation. However, we do not manage complex behaviors such as exercise, in this simplistic way. This is recognised not only in reversal theory but also in behavior change models such as the transtheoretical model (Prochaska & DiClemente, 1984) where behavior is proposed to progress and regress through stages, representing different degrees of consistency of behavior and psychological states. Thus, when examining exercise behavior, we need to adopt a more differentiated and dynamic approach to defining participation to account for behavioral consistency and inconsistency, which is the aim of the present study. Given the importance of exercise identity for determining exercise behavior, we also examine its role alongside motivational variables, in predicting exercise behavior.

The current study therefore examines whether the meta-motivational constructs of Reversal Theory (Apter, 1989), exercise motives and exercise identity can discriminate between males' and females' exercise behavior, defined in relation to length and consistency (frequency of drop-out) of exercise participation. In line with previous research, it was hypothesised that:

1. Longer and more consistent exercise participation will be characterised by a stronger exercise identity, more intrinsic motives for participation, and Telic, Conformist Alloic and Sympathy dominances.
2. Profiles of shorter, less consistent exercise participation (and thus more vulnerable to drop-out) will be characterised by weaker exercise identity, more extrinsic motives and Paratelic, Mastery and Autic dominances.

Method

Participants

Participants were 973 individuals (65.4% female) aged 16 to 74 years with a mean age of 33.7 ± 13.9 years all residing in the UK. They responded to an email invitation to participate in an online study. Of the responses, 33% were students, 21% worked within the education sector, 14% in administration, 11% in science, 9% in management and business, 7% were unemployed, 3% worked in healthcare, and 3% in sales, providing a cross section of the UK population. Table 1 shows the frequency of individuals represented in each category

of the grouping variables for exercise length and consistency. The majority of individuals were long-term exercisers having been exercising for over 10 years. Other categories were well represented except for those exercising for less than one month, which is to be expected given the potential for sampling bias of those more engaged in exercise. Consideration was given to collapsing certain groups; however, given the relevance of the groupings of short duration to the likelihood of drop-out, the decision was made to retain these durations in the analysis to determine if these resulted in specific patterns of motives, identity and or meta-motivational dominance. In terms of exercise consistency, all groups were relatively evenly represented (See Table 1).

Table 1:

Frequency of participants representing each category of the grouping variables (exercise length and consistency).

Variable	Grouping	Frequency (%)
Exercise Length	>10 years	437 (44.9)
	5-10 years	199 (20.5)
	1-5 years	223 (22.9)
	6months-1 year	45 (4.7)
	1-6 months	50 (5.1)
	<1 months	19 (2.0)
Exercise consistency	Never	349 (25.9)
	DO once	294 (30.2)
	DO more than once	218 (22.4)
	DO numerous	112 (11.5)

DO numerous= "I have dropped out for longer than 4 weeks on numerous occasions"; DO more than once = "I have dropped out for longer than 4 weeks on more than one occasion"; DO once "I have not dropped out for longer than 4 weeks on more than one occasion", Never="I have not dropped out for longer than 4 weeks".

Measures

Personality was measured via meta-motivational dominance as described in Reversal Theory and using the Motivational Style Profile in relation to sport and exercise (MSP; Apter, Mallows, & Williams, 1998; modified by Kerr, Au, & Lindner, 2004; MSP-SE). This is a 40 item scale using a Likert type response scale which measures the degree to which an individual is dominant in the four meta-motivational dominances: Telic; Negativist; Autic, and, Mastery. Apter et al. (1998) have demonstrated that the MSP has acceptable validity, test-retest reliability and internal consistency, for instance, Cronbach's alpha coefficients ranged from 0.68 to 0.89 and test-retest correlations from 0.71 to 0.92.

Exercise motives were assessed via the Exercise Motivation Inventory-2 (EMI-2; Markland & Ingledew, 1997). The EMI-2 includes 51 items that comprise 14 subscales assessing motives for Stress Management, Revitalisation, Enjoyment, Challenge (Psychological Motives), Competition, Social Recognition, Affiliation, Health Pressures, Ill Health Avoidance, Positive Health, Weight Management, Appearance, Strength and Endurance, and, Nimbleness. Responses are provided on a 6 point Likert type scale, anchored

by 0 (not at all true for me) and 5 (very true for me). The EMI-2 has shown good reliability with Cronbach's alpha coefficients ranging from 0.66 to 0.86 (Markland & Ingledew, 1997).

Exercise Identity was measured using the Exercise Identity Scale (Anderson & Cychosz, 1994). The nine item scale measures the extent to which exercise forms part of an individual's self-concept, responded to on a likert scale ranging from 1 "strongly disagree" to 7 "strongly agree". Anderson and Cychosz (1994) have demonstrated good test-retest reliability of the scale ($\alpha=0.93$) and internal consistency with factor loadings between 0.62-0.91.

Exercise behavior was assessed by questioning participants on whether or not they were currently engaged in exercise with a categorical response of yes or no.

Exercise length was measured by asking how long participants had been engaged in their main exercise. These were later categorised into those who had exercised for greater than 10 years, 5-10 years, 1-5 years, 6 months -1 year, 1-6 months and less than 1 month. The final two categories were included due to theoretical proposals that these time points are critical for early adoption and potential vulnerability to drop-out (1 month) and likelihood to maintain behavior (maintenance stage post 6 months of Stages of change; Prochaska & DiClemente, 1982).

Exercise consistency was measured by asking participants how consistent they considered their exercise behavior to have been in the past year (excluding reasons out of their control such as illness or injury). The monthly interval proposed by the Stages of Change (Prochaska & DiClemente, 1982) between the Preparation / Action phases were used to indicate this as an appropriate timeframe that individuals might drop-out but with the potential to re-engage rather than defining drop-out on a more permanent basis. Thus, four categorical responses were available including, "I have dropped out for longer than 4 weeks on numerous occasions", "I have dropped out for longer than 4 weeks on more than one occasion", "I have not dropped out for longer than 4 weeks on more than one occasion", and, "I have not dropped out for longer than 4 weeks".

Procedure

Ethical approval for the study was granted by the institutional ethics committee in accordance with British Psychological Society ethical guidelines. Participants were contacted via an email campaign and asked whether they would be interested in completing an online survey about exercise motives and behavior. Interested parties were asked to follow a link to the online questionnaire where all study information was provided. Informed consent was assumed by completion and submission of the questionnaire, as explained in the study information.

Data analysis

Data were screened for parametric assumptions and due to uneven sample sizes in the grouping conditions, homogeneity of variance was violated in a number of the male and female variables. Multivariate ANOVA of male and female data (using the Wilk's Lambda test statistic due to its ability to be robust against violations of homogeneity) was initially used to determine whether the grouping variables of exercise length and exercise consistency resulted in significant differences in levels of meta-motivational dominance, exercise motives and exercise identity. Where significant effects were identified, discriminant function analysis was employed to determine whether and how the dependent variables were able to discriminate between the groupings. This was used as opposed to the usual post hoc tests,

given that Discriminant Analysis can explore relationships beyond the linear combinations of MANOVA.

Results

Descriptive statistics

Tables 2 and 3 show the descriptive statistics of the variables included in the analyses for males and females, respectively. Coefficients of reliability for all variables were over .68 indicating good internal consistency except for the motive of health pressures with an alpha reliability of .66.

Table 2:
Male means and standard deviations for exercise length and consistency.

	Exercise length; Mean (SD)						Exercise Consistency; Mean (SD)			
	<1m	1m-6m	6m-1yr	1-5yrs	5-10 yrs	>10 yrs	Never	DO Once	DO more than once	DO numerous
Exercise identity	27.00 (10.42)	31.63 (13.77)	38.86 (14.83)	43.52 (13.18)	43.68 (13.39)	43.88 (1.00)	44.74 (13.42)	45.42 (11.66)	40.81 (13.80)	29.04 (13.36)
Telic	-1.25 (3.30)	2.88 (6.58)	1.29 (6.37)	0.51 (5.38)	1.71 (5.49)	1.50 (5.02)	2.10 (5.19)	0.82 (5.31)	1.09 (4.85)	0.74 (5.83)
Negativistic	-3.25 (4.92)	-8.50 (9.17)	-5.21 (7.06)	-6.07 (6.39)	-6.55 (5.67)	-5.19 (6.33)	-6.01 (5.53)	-5.75 (6.53)	-5.85 (6.55)	-3.15 (8.31)
Autic	-2.38 (4.48)	-4.63 (10.98)	-2.57 (3.51)	-1.80 (3.62)	-2.65 (3.63)	-3.07 (4.00)	-2.84 (3.81)	-2.78 (4.10)	-2.98 (3.59)	-1.87 (3.25)
Mastery	0.38 (2.53)	-0.50 (3.06)	-0.29 (3.56)	-0.42 (3.66)	-0.50 (2.69)	0.68 (2.83)	0.31 (2.89)	0.08 (3.43)	-0.17 (3.02)	0.61 (1.93)
Stress management	2.38 (1.38)	1.63 (1.00)	2.89 (1.55)	2.79 (1.47)	2.76 (1.52)	3.04 (1.29)	2.88 (1.33)	2.98 (1.43)	3.05 (1.41)	2.26 (1.33)
Revitalisation	3.00 (1.28)	2.13 (1.13)	3.02 (1.29)	3.45 (0.92)	3.36 (1.14)	3.55 (1.10)	3.57 (1.03)	3.50 (1.01)	3.31 (1.18)	2.67 (1.43)
Enjoyment	2.63 (1.16)	1.97 (1.51)	3.13 (1.42)	3.49 (1.27)	3.42 (1.24)	3.52 (1.29)	3.60 (1.23)	3.45 (1.27)	3.42 (1.25)	2.46 (1.52)
Challenge	2.50 (1.29)	1.53 (1.39)	2.23 (1.59)	2.85 (1.42)	2.82 (1.25)	2.68 (1.36)	2.74 (1.39)	2.83 (1.29)	2.62 (1.40)	1.96 (1.35)
Social Recognition	2.88 (0.48)	0.94 (0.99)	1.66 (1.59)	2.39 (1.56)	2.30 (1.43)	1.96 (1.40)	1.95 (1.46)	2.12 (1.45)	2.19 (1.36)	1.65 (1.42)
Affiliation	3.44 (0.90)	1.31 (1.73)	1.18 (1.50)	1.97 (1.60)	2.22 (1.60)	2.24 (1.56)	2.17 (1.57)	2.11 (1.64)	2.38 (1.59)	1.55 (1.31)
Competition	3.36 (0.83)	1.66 (1.55)	1.10 (1.12)	2.49 (1.75)	2.49 (1.62)	2.66 (1.70)	2.61 (1.63)	2.46 (1.74)	2.75 (1.72)	1.73 (1.54)
Health Pressures	1.00 (0.27)	1.96 (2.01)	0.71 (0.94)	0.85 (0.92)	1.03 (1.1)	1.10 (1.06)	1.02 (1.10)	0.99 (0.99)	1.14 (1.11)	1.16 (1.19)
Ill-health Avoidance	3.33 (1.05)	3.50 (1.79)	2.98 (1.44)	2.90 (1.36)	3.33 (1.32)	3.36 (1.29)	3.19 (1.38)	3.47 (1.15)	3.09 (1.46)	3.09 (1.40)
Positive health	3.58 (1.07)	3.75 (1.02)	3.71 (1.66)	3.98 (0.96)	4.04 (0.96)	4.02 (0.95)	4.03 (0.99)	4.11 (0.86)	3.87 (1.01)	3.52 (1.28)
Weight management	2.63 (1.44)	3.75 (1.30)	3.31 (1.83)	3.09 (1.51)	2.76 (1.57)	2.62 (1.48)	2.67 (1.50)	3.06 (1.54)	2.44 (1.57)	2.85 (1.41)
Appearance	2.94 (1.30)	2.59 (1.66)	2.79 (1.51)	3.25 (1.05)	3.10 (1.17)	2.66 (1.33)	2.78 (1.31)	3.05 (1.24)	2.81 (1.23)	2.59 (1.32)
Strength and Endurance	3.25 (0.84)	3.53 (0.81)	3.77 (1.56)	3.96 (0.94)	3.87 (0.89)	3.50 (1.19)	3.56 (1.19)	3.85 (1.03)	3.70 (0.93)	3.39 (1.25)
Nimbleness	2.25 (0.69)	2.17 (1.26)	2.67 (1.22)	3.19 (1.29)	3.34 (1.26)	3.19 (1.22)	3.26 (1.16)	3.21 (1.23)	3.07 (1.38)	2.57 (1.40)

DO numerous= "I have dropped out for longer than 4 weeks on numerous occasions"; DO more than once = "I have dropped out for longer than 4 weeks on more than one occasion"; DO once "I have not dropped out for longer than 4 weeks on more than one occasion", Never="I have not dropped out for longer than 4 weeks".

Table 3:
Female means and standard deviations according to exercise length and consistency.

	Exercise length; Mean (SD)						Exercise Consistency; Mean (SD)			
	<1m	1m-6m	6m-1yr	1-5yrs	5-10 yrs	>10 yrs	Never	DO Once	DO more than once	DO numerous
Exercise identity	19.80 (8.30)	27.98 (11.64)	32.61 (12.79)	38.58 (14.33)	41.88 (14.40)	39.27 (15.41)	44.15 (14.89)	38.99 (13.16)	34.41 (13.64)	28.80 (13.64)
Telic	0.13 (4.72)	1.36 (5.00)	2.74 (5.22)	2.17 (4.71)	2.32 (4.44)	2.14 (4.68)	2.60 (4.79)	2.22 (4.62)	1.91 (4.46)	1.13 (4.90)
Negativistic	-7.53 (4.02)	-6.95 (5.84)	-9.03 (4.81)	-6.83 (5.91)	-7.77 (6.00)	-6.97 (6.08)	-7.64 (6.04)	-7.36 (5.85)	-6.95 (6.01)	-6.38 (5.54)
Autic	-2.33 (4.17)	-2.83 (3.74)	-2.77 (4.00)	-3.59 (3.74)	-3.95 (3.81)	-4.04 (3.87)	-4.18 (3.93)	-3.35 (3.52)	-3.29 (3.85)	-4.28 (4.12)
Mastery	-1.80 (2.79)	-2.38 (2.99)	-2.34 (3.50)	-1.83 (3.23)	-1.14 (3.25)	-0.74 (2.95)	-0.57 (3.12)	-1.78 (2.92)	-1.45 (3.05)	-1.87 (3.65)
Stress management	2.32 (1.28)	2.57 (1.35)	2.60 (1.46)	3.25 (1.33)	3.45 (1.18)	3.29 (1.31)	3.50 (1.21)	3.23 (1.31)	3.09 (1.33)	2.70 (1.45)
Revitalisation	2.33 (1.30)	2.67 (1.30)	2.71 (1.24)	3.37 (1.15)	3.56 (1.20)	3.53 (1.29)	3.82 (1.13)	3.33 (1.23)	3.15 (1.19)	2.78 (1.37)
Enjoyment	1.93 (1.42)	2.33 (1.46)	2.40 (1.33)	3.14 (1.40)	3.37 (1.42)	3.24 (1.50)	3.63 (1.35)	3.09 (1.47)	2.89 (1.42)	2.31 (1.47)
Challenge	1.97 (1.37)	2.05 (1.28)	1.68 (1.11)	2.50 (1.32)	2.23 (1.38)	2.21 (1.41)	2.59 (1.36)	2.21 (1.35)	2.07 (1.33)	1.90 (1.37)
Social Recognition	1.40 (1.08)	1.34 (1.36)	1.19 (1.24)	1.59 (1.25)	1.52 (1.31)	1.40 (1.31)	1.66 (1.35)	1.45 (1.29)	1.31 (1.20)	1.28 (1.26)
Affiliation	2.22 (1.39)	2.03 (1.70)	1.33 (1.35)	1.92 (1.56)	2.20 (1.66)	1.89 (1.51)	2.22 (1.59)	2.03 (1.60)	1.73 (1.50)	1.57 (1.46)
Competition	1.10 (0.87)	1.20 (1.51)	0.84 (1.12)	1.55 (1.51)	1.75 (1.62)	1.55 (1.66)	1.90 (1.76)	1.48 (1.53)	1.29 (1.38)	1.16 (1.40)
Health Pressures	1.09 (1.13)	1.33 (1.34)	1.37 (1.67)	1.19 (1.26)	1.04 (1.13)	1.12 (1.19)	1.12 (1.23)	1.03 (1.08)	1.35 (1.37)	1.07 (1.24)
Ill health	3.40 (1.89)	3.13 (1.27)	3.41 (1.17)	3.42 (1.14)	3.50 (1.22)	3.50 (1.20)	3.55 (1.18)	3.54 (1.12)	3.39 (1.21)	3.15 (1.30)
Positive health	4.02 (0.87)	3.75 (1.21)	4.04 (0.89)	4.14 (0.90)	4.20 (0.88)	4.09 (1.02)	4.25 (0.89)	4.19 (0.83)	4.00 (0.98)	3.75 (1.26)
Weight management	3.68 (1.67)	3.79 (1.34)	4.11 (1.10)	3.89 (1.29)	3.72 (1.23)	3.52 (1.37)	3.52 (1.45)	3.84 (1.15)	3.66 (1.35)	3.95 (1.30)
Appearance	3.38 (1.19)	3.23 (1.22)	3.35 (1.19)	3.32 (1.15)	3.12 (1.23)	3.04 (1.31)	3.04 (1.32)	3.33 (1.17)	3.11 (1.17)	3.21 (1.34)
Strength and Endurance	2.98 (1.38)	2.97 (1.16)	3.03 (1.25)	3.35 (1.06)	3.26 (1.25)	3.29 (1.28)	3.48 (1.25)	3.22 (1.16)	3.16 (1.17)	2.97 (1.26)
Nimbleness	3.51 (1.08)	3.05 (1.33)	3.22 (1.24)	3.44 (1.12)	3.18 (1.37)	3.45 (1.29)	3.50 (1.29)	3.40 (1.11)	3.23 (1.32)	3.14 (1.38)

DO numerous= "I have dropped out for longer than 4 weeks on numerous occasions"; DO more than once = "I have dropped out for longer than 4 weeks on more than one occasion"; DO once "I have not dropped out for longer than 4 weeks on more than one occasion", Never="I have not dropped out for longer than 4 weeks".

MANOVA exploring the effect of exercise length and consistency on meta-motivational dominance, exercise identity and exercise motives.

For males, the MANOVA indicated a significant effect of exercise length ($F(95, 1449) = 1.382, p=0.01$) and exercise consistency ($F(57, 897) = 1.358, p=0.04$). Interactions between the grouping variables did not reach statistical significance. Discriminant analysis was explored for both exercise length and consistency in male participants.

For females, there was a significant main effect for exercise consistency ($F(57, 1171) = 1.730, p=.001$) and exercise length ($F(95, 2895) = 1.817, p=0.001$). As with the male group, there was no significant interaction. As such, both grouping variables were included in the discriminant analysis for females.

Discriminant analysis of Exercise Length

For males, two discriminant functions were identified as significant ($p < 0.05$; see Table 4). Function I accounted for 41.8% of the variance and Function II, for 24.3%. Table 5 identifies the variables most strongly correlated with these two functions. Function 1 included Mastery dominance, with motives for weight management negatively and ill-health avoidance positively. Function 2 included Autic dominance (negatively), along with motives for enjoyment, revitalisation, and stress management negatively and health prevention positively.

Overall, 42% of group membership was correctly classified with correct classifications per group as follows: >10years (44.3%); 5-10 years (30.3%); 1-5 years (37.7%); 6 months – 1 year: (57.1%); 1-6 months (62.5%), and, <1month (100%). Group centroids for Function I indicated that the variables particularly discriminated between those who had been exercising for >10 years (.385) and other durations (<1 month: .147; 1-6 months: -.819; 6 months – 1 year: -.989; 1-5 years: -.628; 5-10 years: -.186). Variable means indicated that males who had been exercising for over 10 years were more likely to have high levels of Mastery Dominance (albeit remaining at a low level), lower levels of weight management motives and higher levels of ill-health avoidance motives than the other groups.

Group centroids for Function 2 primarily differentiated those who had been exercising for between 1-6 months (2.006) and all other groups (<1 month: .873; 6 months-1 year: -.293; 1-5 years: -.290; 5-10 years: .091; >10 years: -.020). Variable means indicated that the 1-6 month group were characterised by higher levels of Alloic Dominance and motives to exercise due to health pressures with lower motives for enjoyment, revitalisation and stress management.

Only one discriminant function was significant in the female group ($p < 0.05$; see Table 4) and accounted for 61.2% of the variance. Autic dominance was included in this function (negatively) as well as exercise identity, and, positively, motives of revitalisation, enjoyment, and stress management (see Table 5). Overall, 32.4% of group membership was correctly classified with correct classifications per group as follows: >10years (28.9%); 5-10 years (33.8%); 1-5 years (29.0%); 6 months–1 year (48.4%); 1-6 months (35.7%), and, <1month (73.3%). Group centroids indicated that this function particularly differentiated between those who had been exercising for a longer period of time (5-10 years: .352; >10 years: .233) and those who were relatively new to exercise (6 months-1 year: -.589; 1-6 months: -.932; <1month: -1.704) with the centroid for 1-5 years sitting relatively centrally (-.140). Using variable means it is evident that members of each group were more likely to be Alloic dominant; however, the function analysis suggests that those classified as less Alloic

dominant with weaker exercise identity, lower motives for revitalisation, enjoyment and stress management, were more likely to have been exercising for under one year.

Discriminant analysis of Exercise Consistency

For males, only one discriminant function was significant ($p < 0.05$; see Table 4) and accounted for 54.5% of the variance. Negativist dominance and the motive of health pressures loaded negatively onto this function whilst exercise identity, enjoyment, revitalisation, challenge, positive health and nimbleness all loaded positively (Table 5). Overall, 45.8% of group membership was correctly classified with correct classifications per group as follows: not dropped out (43.1%); dropped out once (45.0%); dropped out more than once (42.6%), and, dropped out numerous times (70.4%). Group centroids differentiated linearly between the different groupings (not dropped out: .264; dropped out once: .104; dropped out more than once: -.242; dropped out numerous times: -1.355) but with a notable difference between the 'dropped out more than once and dropped out numerous times' groups and the other groupings indicative of consistent participation. Variable means indicated that those who had dropped out numerous times had weaker exercise identity, and lower levels of the identified motives than other groups. This group displayed marginally higher motives for health pressures, and, whilst all group means suggested Conformist dominance, participants were less conformist in the 'dropped-out numerous times' group than the others.

For females, only one discriminant function was significant ($p < 0.05$; see Table 4) and accounted for 72.2% of the variance. Like the males, Negativist dominance was included in this discriminant function (negatively), with the addition of Telic dominance. Exercise identity also loaded positively onto this function, along with motives for enjoyment, revitalisation, stress management, challenge, competition, positive health, affiliation, strength, social recognition and nimbleness (Table 5). Overall, 43.1% of group membership was correctly classified with correct classifications per group as follows: not dropped out (55.1%); dropped out once (35.7%); dropped out more than once (29.9%), and, dropped out numerous times (55.3%). The group centroids and mean scores indicated that the function discriminated between the different groups but notably between those who had not dropped out and those who had dropped out numerous times (not dropped out: .554; dropped out once: .008; dropped out more than once: -.271; dropped out numerous times: -.831) such that those who were less Telic and Conformist, with a weaker exercise identity and lower levels of influencing motives were more likely to have dropped out on numerous occasions.

Table 4: Discriminant Function Analyses Results

	Eigenvalue	Canonical Correlation	Wilk's Lambda	Chi square	df
Exercise Length					
Males					
I	.220	.425	.611	158.669	95
II	.128	.337	.746	94.566	72
Females					
I	.197	.406	.739	188.287	95
Exercise Consistency					
Males					
I	.193	.402	.719	106.877	57
Females					
I	.211	.418	.762	169.190	57

Table 5: Structure Matrix by exercise behaviour and gender

Exercise Length				
Variable	Males		Variable	Females
	Function 1	Function 2		Function I
Mastery dominance	.356		Exercise identity	.668
Weight management	-.313		Revitalisation	.549
Ill health avoidance	.230		Enjoyment	.514
Enjoyment		-.486	Stress management	.456
Revitalisation		-.478	Autic dominance	-.253
Health prevention		.422	Exercise identity	.668
Stress management		-.372		
Autic dominance		-.277		
Exercise Consistency				
Variable	Males		Variable	Females
	Function I			Function I
Exercise identity	.766		Exercise identity	.797
Enjoyment	.520		Enjoyment	.661
Revitalisation	.516		Revitalisation	.629
Challenge	.357		Stress management	.423
Positive health	.347		Challenge	.397
Nimbleness	.343		Competition	.379
Negativist	-.258		Positive health	.365
Health pressures	-.101		Affiliation	.327
			Strength	.310
			Social recognition	.244
			Nimbleness	.222
			Telic	.214
			Negativist	-.152

Discussion

The current study examined whether the meta-motivational constructs of Reversal Theory (Apter, 1989), exercise identity and exercise motives could discriminate between length and consistency of exercise behavior, and, if so, whether or not this differed in males and females. On average males and females with weaker exercise identity had been exercising for shorter lengths of time, and were more inclined to have dropped out on numerous occasions. On average females, regardless of length or consistency of exercise behavior, reported being Telic, Conformist, Alloic and Sympathy dominant. However, males who had been exercising for less than one month reported being more Paratelic and Sympathy dominant in comparison to males who had been exercising for longer who were more Telic and Mastery orientated. Motives tended to increase with exercise length and consistency for both genders with some variation in the patterns seen for different motives across behavior categories and genders

Exercise length

For males, two functions discriminated between exercise length groups. Males who had been exercising for over 10 years were more likely to have high levels of mastery dominance (albeit remaining at a low level), lower levels of weight management motives and higher levels of ill-health avoidance motives than the other groups. This lends partial support for hypothesis 1 that those who have been exercising for longer durations will demonstrate higher levels of intrinsic motives and lower levels of extrinsic motives. However, the finding that mastery dominance is higher in males who have been exercising for longer contradicts previous findings by Sit et al. (2008) who associated exercise with more sympathy dominance. It should be noted however, that although the finding indicated slightly higher levels of mastery dominance, these remained at a low level, suggesting no strong preference for this dominance profile.

In the second function, males who had been exercising for between 1-6 months were characterised by higher levels of Alloic Dominance and motives to exercise due to health pressures but lower motives for enjoyment, revitalisation and stress management than individuals in other groups. This supports this time frame as a vulnerable stage for drop-out when males don't appear to be experiencing the positive attributes often associated with exercise. In contrast to findings by Lindner and Kerr (2000) who associate Alloic dominance with regular exercisers, the findings suggest that the role of others may be key to male engagement during this early stage. It may be that males are drawing comparisons with other exercisers which motivate their engagement through competition, or perhaps, the support of others during this less enjoyable phase is critical to their continued engagement.

A significant main effect of exercise length was also identified for females with one significant discriminant function. In contrast to the male group, this suggested that females who had been exercising for under one year were Alloic dominant but at a lower level than other groups (less other focused; but not Autic dominant), had weaker exercise identity and weaker motives to exercise for revitalisation, enjoyment and stress management than groups who had been exercising for over 5 years. This lends partial support for hypothesis 1 which stated that longer-term exercise participation is likely to be associated with stronger exercise identity development; echoing findings by Pentecost and Taket (2011) and Reifsteck et al. (2016). Identifying strategies to support exercise identity development in those who have been exercising for shorter periods of time and are thus, more at risk of drop-out, may be an important consideration.

The role of Alloic dominance for females is in line with the hypotheses and the meta-motivational profiles that Lindner and Kerr (2000) associated with regular exercisers; however,

the other meta-motivational dominances appear to be less relevant for discriminating between groups. Given that Alloic dominance indicates an individual's preference to seek a connection to others, it may be that Alloic dominant individuals are attracted to a behavior such as exercise to fulfil their motives of enjoyment, stress management and recreation given its potential for socialising with others. Fulfilment of this need through exercise may therefore explain why these individuals are likely to have engaged in exercise behaviors over longer periods of time than other groupings.

The pattern of higher levels of intrinsic motives associated with the longer duration groupings are also interesting because they are relatively self-determined motives which do not rely on comparisons with others and as such are not likely to detract from or compete with the need to seek a connection with others in the exercise environment. It is also interesting that individuals who are 'other focused' and thus, likely to put others first, are motivated to engage in exercise for more self-focused motives. This might suggest that exercise participation is an opportunity to nurture the self in an otherwise 'other focused' individual. Additionally, perhaps it is unsurprising that these motives are associated with longer-term exercisers, given that revitalisation and stress management are benefits commonly associated with exercise. However, for those relatively new to exercise, these positive outcomes may not yet have been experienced and as such are less likely to be motivators to continue to participate. Therefore, it may be that using these as a means of encouraging exercise adoption in males and females will lead to disappointment and disillusionment when these are not immediately experienced and could lead to those in the early stages of exercise being more inclined to drop-out. It is also likely that individuals new to exercise will experience some discomfort during and after exercise, such as delayed onset of muscle soreness, that they would, over time, become accustomed to, leading to an overall more positive experience (i.e., feeling more revitalized; Baird, Graham, Baker, & Bickerstaff, 2012; Suni, Miilunpalo, Asikainen, & Laukkanen, 1998). Thus, focusing on the opportunities to connect to others could be a more suitable approach for males and females during exercise adoption and encouraging individuals to appreciate the additional benefits associated with exercise after a longer period of participation.

Exercise consistency

For males, a difference was identified between the 'dropped out numerous times' group and the other groupings. Variable means indicated that those who had dropped out numerous times had lower exercise identity, and lower motives for revitalization, enjoyment, challenge, positive health and nimbleness, than all other groups. This group displayed marginally higher motives for health pressures and whilst all group means suggested Conformist dominance, those in the 'dropped-out numerous times' group were less Conformist than in other groups. Thus, overall these findings lend support to the hypotheses that exercise identity and intrinsic motives would be associated with more consistent exercise behaviour, whilst a weaker exercise identity and external motives would associate with more inconsistent participation.

Adhering to exercise is a socially desirable behavior and as such it is understandable that those most inclined to persevere with the behavior are those who are most Conformist dominant, whilst those who are regularly dropping out are likely to be less Conformist dominant, especially when exercising due to health pressures. Similarly, it is logical that those with a higher exercise identity are less inclined to drop-out given that the behavior is consistent with their own identity. In terms of motives, it may be that individuals who are primarily motivated to exercise because of health pressures are more likely to be under pressure from

others (extrinsic) or need to exercise as a result of prior inactivity, consequently leading to health concerns. Regardless, this highlights the vulnerability of individuals exercising for this reason and also lends support to previous literature that has identified the challenge of encouraging individuals to adhere to programmes of exercise in clinical contexts (e.g., Yohannes et al., 2010; Shang 2013). Similar to the variable 'exercise length', the motives associated with greater exercise consistency reflected exercise benefits or experiences of mastery associated with exercise that take time to develop. Thus, it is understandable that individuals who are less inclined to drop-out are motivated by the positive benefits that they experience from this exercise behavior. It appears therefore that for males, ensuring strategies that help them to identify their own motivations to exercise as opposed to externalised pressures, and ensuring that engagement is achievable and not overly challenging, allowing individuals to develop a sense of accomplishment relative to their performance, is of importance to supporting those most at risk of dropping out.

For females, those who were less Telic and less Conformist dominant with a weaker exercise identity and lower levels of influencing motives were more likely to have dropped out on numerous occasions. As with the male participants, Conformity dominance is not unexpected in this function to explain more consistent exercise behavior, as is the observation that those who are more goal orientated (Telic) are also more inclined to be consistent in their behavior, with individuals who are more Paratelic (spontaneous) in the groups who reported dropping-out. Again, this supports the profiles of regular exercisers identified by Lindner and Kerr (2000). However, considering exercise behavior in a more dynamic fashion has teased out the differential role of meta-motivational dominances, distinguishing exercise length versus consistency. Notably, exercise identity was again the factor loading most highly to the function thus accounting for most of the discrimination between groups and indicating the importance of this variable for exercise persistence and consistency. It is also noteworthy that whilst a number of motives were associated with this function, all of the motives were higher in those with the most consistency in their exercise behavior and lower in those who had dropped-out numerous times. Thus, rather than there being motives that are more salient to those at the stage of exercise adoption and others for those who have been exercising for longer, it appears, generally speaking, that those who are dropping out numerous times have low levels of motives for exercise across all reported motives and as such this suggests that one of the key reasons for individuals dropping out of exercise is that they see little relevance in exercising for any reason. This may indicate the importance of encouraging individuals to reflect on why they are starting a programme of exercise, in order to develop stronger motives that can then be applied when seeking the motivation to continue to exercise. Person centred strategies such as Motivational Interviewing (Miller & Rollnick, 2012) which acknowledge and incorporate individual motives have demonstrated positive outcomes in many areas of behavior change (e.g., Rubak, Sandbæk, Lauritzen, Borch-Johnsen, & Christensen, 2009), and these results may demonstrate why this strategy is likely to be more effective than more prescribed methods.

Despite these promising results some limitations of the current research should be noted. Whilst the research attracted a relatively large sample size, and completion from a broad demographic, the sample was predominantly made up of regular exercisers with lower numbers representing shorter exercise durations. As such, more research is needed to continue to explore the relevance of the identified variables to these groups to ensure generalisability of these findings. Similarly, the cross-sectional nature of this research also means that whilst trends can be identified this research cannot determine whether manipulation of these variables will result in increased length or consistency of participation for these individuals. Future research would benefit from implementing the principles of this research by trialling tailored interventions

matched to the profiles of individuals in the vulnerable to drop-out groups in order to explore these relationships further.

Conclusion

In conclusion, this research has used discriminant function analysis to consider the complexity of a combination of factors that may help to distinguish groups vulnerable to drop-out, by considering the role of exercise identity, meta-motivational dominance and exercise motives to distinguish exercise length and consistency. Exercise identity loaded consistently as one of the stronger factors associated with exercise length and consistency in both males and females. Weak identity is therefore likely to be a critical component of vulnerability to drop-out and as such how to foster a sense of exercise identity should be an important consideration in interventions to engage individuals in exercise and to support maintenance of exercise behavior in active populations.

Interestingly, three of the four meta-motivational dominances contributed to distinguishing groups in slightly different ways. In females, weaker Alloic dominance was more indicative of shorter exercise participation whilst the opposite was true for Males. Weaker Conformist and Telic dominance distinguished more inconsistent exercisers with a history of multiple drop-outs. The present study suggests that better consideration of the individual's own reasons for engaging in exercise behavior, encouraging spontaneous enjoyment and socialisation with others as well as less rigid rule orientated activities would be more in line with the meta-motivational dominances of early adoption exercisers. However, mechanisms then need to be established to help individuals to develop a stronger exercise identity which will feed into more goal orientated and directed approaches to exercise behavior as they become adopted into the routine habit of participation. In males, health pressures also appeared to be a slightly higher motive in males who were more inclined to drop-out. This raises questions regarding the approaches currently used to encourage exercise adoption though highlighting health risks of physical inactivity. Thus, as observed in research examining other health behaviors such as nutritional intake (e.g., Leikas, Lindeman, Roininen, & Lähteenmäki, 2007) using approach rather than avoidance based messages may be more beneficial in reducing exercise drop-out. In addition, as suggested for females, using self-focused approaches such as motivational interviewing may support males to develop a more internalised motivation to engage in exercise activity with longer-term success.

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