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Personality and participation in aerobics, circuit training, and Tai Chi

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The purpose of the present study was to compare the personality characteristics of 93 participants engaged in aerobics, circuit training, or Tai Chi for a period of six months or more using the Motivational Style Profile (MSP: Apter, Mallows, & Williams, 1998). Stepwise discriminant function analysis with Wilks' Lambda statistical criterion was employed in separate statistical analyses with the ten MSP subscales as predictors of membership of three exercise groups. Motivational Style Profile dominance scores produced non-significant discriminant functions. However, the MSP subscales produced significant discrimination between the three exercise groups. The most accurate prediction of correct group membership was 66.7% for aerobics, with 64.7% accuracy for circuit training, and 51.7% of correct classifications for Tai Chi. Discriminant function 1 separated the Tai Chi group from the other two exercise groups and discriminant function 2 differentiated the circuit training group from both Tai Chi and aerobics groups. The Tai Chi group had high levels of *alloic-mastery* and low levels of both *autic-mastery* and *arousal-seeking*. The circuit training group had high levels of *negativism* and *arousal-seeking*. The aerobics group had low *alloic-mastery*, and high *autic-mastery* in comparison to the Tai Chi group and lower levels of *negativism* and *arousal-seeking* than the circuit training group. The findings are important because they identified differences between the three activity groups rather than between exercise activity and non-activity groups. Also, MSP subscale scores were more sensitive discriminators of exercise group differences than their derived dominance values.

Keywords: personality, exercise activities, aerobics, circuit training, Tai Chi, reversal theory

Introduction

The importance of regular physical activity for the prevention and treatment of a range of medical conditions and general health has been recognized for some time. Reports and reviews emanating from countries like Britain, the US, Canada, and Germany have all underlined the health benefits of regular exercise (Allied Dunbar National Fitness Survey, 1992; Department of Health, 1996; Institute of Medicine, 2004; Reiner, Niermann, Jakauc, & Woll, 2013; USDHHS, 1996; Warburton, Nicol, & Bredin, 2006). Furthermore, although causality cannot be presumed, there is research evidence that personality may play a role in regular exercise participation and choice of exercise activity (Courneya & Hellsten, 1998; Kirkcaldy & Furnham, 1991; Rhodes, Courneya, & Jones, 2004).

Rhodes and Smith (2006), for example, examined personality correlates and physical exercise behavior in a review and a meta-analysis of 33 studies, undertaken between 1969 and 2006, containing 35 independent samples. Personality traits from the three-factor model (*neuroticism, extraversion, psychoticism*; Eysenck, 1970), the five-factor model (*neuroticism, extraversion*, *openness to experience/intellect, agreeableness* and *conscientiousness*; Costa & McCrae, 1992), and Cattell's 16 primary personality factors (Cattell, 1947) were examined. Studies that involved adults (≥ 18 years) and a general measure of physical activity behavior were included in the meta-analysis, but studies measuring physical activity in athletes were not. The results indicated that neuroticism ($r = -0.11$), extraversion ($r = 0.23$), and conscientiousness ($r = 0.20$), were correlates of physical activity. In contrast, psychoticism, openness to experience/intellect and agreeableness were not associated with physical activity. Studies examining personality and different types of physical activity did show some differences in extraversion scores. For example, among middle-aged men, high scorers on extraversion were more likely to participate in swimming, aerobic conditioning, dancing, and tennis (Howard, Cunningham, & Rechnitzer, 1987).

Personality research, based on reversal theory (Apter, 1982) also found links between personality and participation in sport, exercise, and leisure activities (e.g., Braathen & Svebak, 1992; Chirivella & Martinez, 1994; Cogan & Brown 1998; Kerr, 1987; Kerr, 1991; Kerr & Svebak, 1989, 1994; Svebak & Kerr, 1989). In reversal theory, personality consists of a number of relatively fixed motivational

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style dimensions that are based on the theory's structure of metamotivational state pairs. These dimensions are associated with the "balance" between four pairs of mental or *metamotivational states.* This balance is the relative amount of time a person spends in one or other of each pair of states over time and is known as *metamotivational dominance* (Apter, 1982). The metamotivational states in reversal theory are the *telic-paratelic*, *negativistic-conformist*, *mastery-sympathy* and *autic-alloic* pairs of states. A person's metamotivational dominances can be measured using the Motivational Style Profile (MSP; Apter, Mallows, & Williams, 1998). The MSP has ten personality subscales that allow metamotivational dominance for the four metamotivational state pairs to be computed. The MSP has additional arousal-avoiding/arousal-seeking personality subscales that have been differentiated from the original telic-paratelic construct (e.g., Apter, 1982) and are measured separately in the MSP. The MSP also has personality subscales that measure *optimism, pessimism, arousability* and *effortfulness*.

Previous reversal-theory-based personality research findings have, for example, shown that adults high in telic dominance (serious, planning-oriented, preference for low arousal) tend to prefer and perform endurance sports, characterized by repetitive and enduring activity (e.g., long distance running, cycling, rowing). It has also been shown that people who score high on paratelic dominance (playful, spontaneous, preference for high arousal) prefer and perform explosive sports, characterized by impulsive or explosive action (Svebak & Kerr, 1989). In addition, when sport and exercise participation was examined in high school students, significant differences in dominances were found between very active, active, and inactive students. For example, the active groups were found to be more arousal-seeking dominant than the inactive respondents and, in most cases, the very active groups were more arousal seeking than the active participants (Kerr, Au, & Lindner, 2005). Personality differences between participants in different types of exercise activities have been shown to exist but, as Rhodes and Smith (2006) have pointed out, more research needs to be carried out before definitive conclusions can be made.

The current study is the second part of a psychological investigation into adult physical exercise behavior. Part one focused on the immediate subjective experiences of exercisers pre- and post-exercise (Frith, Kerr, & Wilson, 2011). The purpose of part two was to examine the reversal theory personality characteristics of adult participants in three contrasting exercise activities. Based on interpretations from reversal theory and the characteristics of aerobics (often moderate to high intensity, rhythmic physical movements), circuit training (very intense use of exercise equipment on specific muscle groups), and Tai Chi (controlled slow and continuously flowing dance-like body movements) it was hypothesized that: (1) the circuit training group would score significantly higher on telic dominance (and have higher telic and/or lower paratelic subscale scores) than the Tai Chi and aerobics groups; (2) the Tai Chi and circuit training groups would score higher than the aerobics group on conformist dominance (and have higher conformity and/or lower negativism subscale scores); (3) the aerobics and circuit training groups would score significantly higher on arousal-seeking dominance than the Tai Chi group (and have lower arousal-avoiding and/or higher arousal-seeking subscale scores), and; (4) as all three activities are group activities, no significant differences were expected in autic-mastery and alloic-mastery dominance or the autic-mastery, autic-sympathy, alloic-mastery, or alloic-sympathy personality subscales.

Methods

Participants and procedure

Volunteer participants were recruited from the University of Tasmania sport and recreation centers and private gymnasiums in a study approved by the University of Tasmania's Human Ethics Committee. Individuals who agreed to participate were asked to read a detailed information sheet and sign a statement of informed consent. The participants included 51 females and 42 males who had participated for a period of six months or more in aerobics (n = 30, mean age = 29.90 years, SD = 13.58), circuit training (n = 34, mean age = 28.71years, SD = 10.79) or Tai Chi (n = 29, mean age = 37.21 years, SD = 15.20). A 3 Group x Gender Chi square test revealed no gender differences between or within groups. However, there was a significant age difference between the circuit training and Tai Chi groups ($t(61) = 2.0519$, $p = .012$). After completing post-exercise measures in the earlier study (Frith, Kerr, & Wilson, 2011), participants were given a copy of the MSP to complete at home and return. Those participants who failed to return the MSP within two weeks were sent e-mail reminders or contacted by phone.

Measures

The MSP is comprised of 70 items (e.g., "Have intense feelings", "Have fun", "Behave impulsively") that are rated on six-point Likert scales (1 = never, 2 = seldom, 3 = sometimes, 4 = often, 5 = very often, 6 = always). Participants respond to each item based on how they experience things in general rather than how they feel at the moment. Ten reversal theory MSP personality subscales are obtained: *telic, paratelic; negativism, conformity*; *autic-mastery* (self-oriented mastery), *autic-sympathy* (self-oriented sympathy); *alloic-mastery* (other-oriented mastery), *alloic-sympathy* (other-oriented sympathy)*;* and *arousal-avoidance, arousal-seeking*. The MSP dominance score for each pair is obtained by subtracting the second subscale in each pair from the first. The scores for the four additional

Table 1
Motivational Style Profile (MSP) Personality Subscale Scores for the Three Exercise Groups

	Circuit Group		Aerobics Group		Tai Chi Group	
	(n = 28)		(n = 30)		(n = 26)	
MSP subscale score	*Mean*	*SD*	*Mean*	*SD*	*Mean*	*SD*
Telic	20.75	3.94	21.83	4.02	21.15	3.34
Paratelic	19.93	4.18	18.17	3.54	18.89	2.37
Negativism	14.54	3.94	12.13	3.84	12.15	3.33
Conformity	19.25	3.22	19.93	3.25	20.81	3.85
Autic-mastery	18.96	2.87	19.40	3.84	18.01	2.80
Autic-sympathy	20.21	3.18	19.10	4.84	18.35	3.65
Alloic-mastery	21.25	4.01	19.97	4.85	23.01	4.40
Alloic-sympathy	22.96	3.29	22.20	3.89	24.11	3.92
Arousal-avoidance	18.11	3.75	19.77	3.24	20.27	3.23
Arousal-seeking	19.25	3.43	17.87	3.69	16.61	3.61

MSP personality subscales (optimism-pessimism, arousability and effortfulness) were not analyzed as they are not part of reversal theory's metamotivational structure.

The MSP has demonstrated good test-retest reliability for personality subscales (correlations all significant at $p < .001$) and satisfactory concurrent validity data (Apter et al., 1998). For example, comparison between the MSP and the Eysenck Personality Questionnaire (EPQ; Eysenck & Eysenck, 1975) showed that the paratelic and arousal-seeking subscales were significantly correlated with EPQ *extraversion* (for both $p < .01$), and negatively correlated with EPQ *neuroticism* (paratelic $p < .01$; arousal-seeking $p < .05$). These relationships and lack of relationships (non-significant correlations) between subscales from the two measures are what would have been predicted by reversal theory.

Data Analysis

Discriminant function analyses were performed to identify which of the ten MSP subscale scores and five MSP dominance scores differentiated between participants practising aerobics, circuit training, or Tai Chi. Two sets of data were used to determine which type of data provided better discrimination between exercise groups. The first analysis used data from the ten MSP subscale scores (i.e., telic, paratelic, negativism-conformity, autic-mastery, autic-sympathy, alloic-mastery, alloic-sympathy, arousal-avoidance, arousal-seeking) as the predictor variables with groups being the three exercise types. The MSP subscale scores measure the *absolute strength* of each personality dimension. The second analysis used the five MSP dominance scores which measure *relative differences* in the strengths between each opposing pair of metamotivational states. Stepwise discriminant function analysis was used with Wilks' Lambda statistical criterion to test for significant differences between the groups on the individual predictor variables ($p = .05$ for entry; $p = .10$ to remove). This procedure is indicated when there are no *a priori* grounds for specifying order of entry of predictor variables, and when a reduced set of predictor variables is appropriate (Tabachnick & Fidell, 1996). SPSS for Windows version 12.0.1. was used in the statistical analysis.

Results

The MSP personality subscale means and standard deviations for the three exercise groups are shown in Table 1. Stepwise discriminant function analysis was performed using the ten MSP personality subscales as predictors of membership of the three exercise groups. These measures are summarized in Table 2. Data from nine of the original 93 participants were dropped from analysis because of missing data for one or more of the discriminating variables. Two discriminant functions were revealed with a combined χ^2 (8) = 32.61, $p < .001$. After removal of the first function there was still a significant association between groups and predictors with χ^2 (3) = 9.72, $p = .021$. The two discriminant functions accounted for 72% and 28% respectively, of the between-group variability, and correctly predicted exercise group membership in 61.3% of cases.

In contrast, the MSP dominance scores produced no significant discrimination functions between any of the exercise groups. The MSP dominance data were not analysed further.

The discrimination function procedure is summarized in Table 2 and shows that only four of the ten MSP personality subscale measures contributed significantly to the two discriminant function solutions. The discriminant functions are shown in Figure 1 and it can be seen that function 1 separates the Tai Chi group from the other two exercise groups and function 2 differentiates the circuit training group from both Tai Chi and aerobics groups. Table 2 shows that membership of the Tai Chi group (which is differentiated by function 1) is determined by high levels of alloic-mastery and low levels of both autic-mastery and arousal-seeking. Similarly, the circuit training group (differentiated by function 2) is determined by high levels of negativism and arousal-seeking. The aerobics group falls between the Tai Chi and circuit training groups on both discriminant functions and is defined by exclusion from the other two groups with respect to both functions – that is, low alloic-mastery, and high autic-mastery in comparison to the Tai Chi group and lower levels of negativism and arousal-seeking than the circuit training group. The most accurate prediction of correct group membership, 66.7% was for aerobics, with 64.7% accuracy for circuit training, and 51.7% of correct classifications for Tai Chi.

Pooled within-group correlations between the four predictors are shown in the right-hand columns of Table 2. Of the six correlations, four would be statistically significant at

Table 2
Summary of Discriminant Function Analysis of Motivational Style Profile (MSP) Subscale Scores for the Three Exercise Groups

Predictor variable	Correlation of predictor variables with discriminant functions		Pooled within-group correlations among predictor variables (df=83)		
	Function 1	*Function 2*	*Autic-Mastery*	*Negativism*	*Arousal-Seeking*
Alloic-mastery	.498	.113	.483**	-.045	.375**
Autic-mastery	-.297	-.022		.254*	.421**
Negativism	-.103	.839			.375**
Arousal-seeking	-.337	.636			
Canonical R	.5	.339			
Eigenvalue	0.334	0.13			

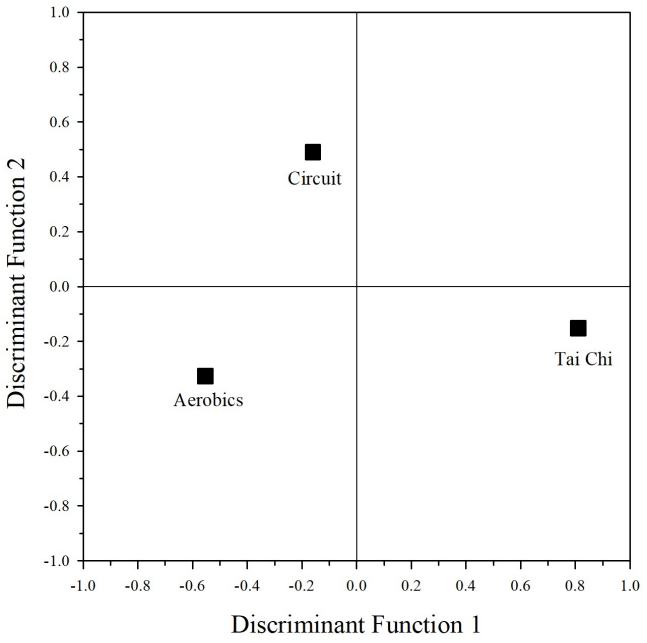

Figure 1. Discriminant Functions for Aerobics, Circuit Training and Tai Chi

α = .01 if tested individually. There is a significant positive relationship for the pooled data between alloic-mastery and autic-mastery, showing that the two mastery states are closely related in the present study exercise participants. Also, arousal-seeking is significantly and positively correlated with all three of the other predictor variables. These correlations with arousal-seeking indicate that the individuals who seek out excitement and arousal are also competitive and self controlling (autic-mastery), are team players, taking pleasure from the achievements of others (alloic-mastery), and are non-conformist, challenging expectations and limits (negativism).

Discussion

Personality may be one factor which affects participants' choice of exercise activity (Kerr, Wilson, Svebak, & Kirkcaldy, 2006; Kirkcaldy & Furnham, 1991; Rhodes, Courneya, & Jones, 2004; Rhodes & Smith, 2006). The results of the present study indicated that none of the five MSP dominance measures discriminated between any of these groups. This is in contrast to the results of other recent reversal theory-based studies where metamotivational dominance was found to be important in association with exercise behavior. For example, Segatto and Lafreniere (2013) studied body image in high- and low-frequency student exercisers. They found that high-frequency exercisers scored higher on paratelic dominance than low-frequency exercisers. For high-frequency exercisers positive body esteem was associated with paratelic dominance and negativism dominance. For low-frequency exercisers, positive body esteem was significantly correlated with autic mastery dominance. Rahman, Hudson, and Flint (2018), using an online survey, found that different metamotivational dominances could discriminate between females and males who had been exercising for different lengths of time, with different levels of exercise consistency and different types of main exercise. Among their results, for example, males who had been exercising for over 10 years were found to be more likely to have higher levels of mastery dominance than other exercising groups. Finally, adopting a cross-cultural approach, Kuroda, Geisler, Morel, and Hapeta (2017) used the reversal theory framework to examine metamotivational dominance as well as changes in metamotivational state, arousal, stress, and emotions among members of traditional Japanese and New Zealand dance groups. The metamotivational dominance results distinguished between the two dance groups, with the New Zealand dancers significantly more paratelic dominant and arousal-seeking dominant than the Japanese dancers.

Interestingly, four of the 10 MSP personality subscales measured by the MSP did significantly discriminate between the aerobics, circuit training, and Tai Chi exercise groups in the present study. This demonstrates that in the present study the relative differences in strength between opposing pairs of metamotivational states (i.e., measured by MSP dominance scores) is less salient for aerobics, circuit training, and Tai Chi exercisers than the absolute strength of the metamotivational subscales (i.e., measured by MSP subscale scores). The Tai Chi group showed positive loading on discriminant function 1, which was characterized by positive correlation with alloic-mastery and negative correlations with autic-mastery and arousal-seeking. The Tai Chi group was comprised of calm and relaxed, non-competitive, group-oriented participants. The circuit training group was positively differentiated by discriminant function 2, which was defined by positive correlations with both arousal-seeking and negativism. The circuit training group can be characterized as containing arousal-seeking and rebellious individuals. The aerobics group is intermediate to the other two groups. It is characterized by individuals who score low on negativism, low on alloic-mastery, high on autic-mastery, and moderate on *arousal-seeking*.

Hypothesis 1 was not supported, as neither MSP telic dominance, nor the MSP telic and paratelic subscale scores contributed to the discrimination between the three groups. Hypothesis 2 was partially supported, as the MSP negativism subscale score was significant in discriminant function 2. However, the circuit training group had the highest MSP negativism subscale scores and not the aerobics group as predicted. Hypothesis 3 was also partially supported. The circuit training and aerobics groups scored significantly higher on the MSP arousal-seeking subscale than the Tai Chi group. Hypothesis 4 was not supported because of the significant role of MSP autic-mastery and alloic-mastery subscale scores in discriminant function 1.

It is understandable that an activity like aerobics attracts individuals who score higher than the other two groups on autic-mastery and arousal-seeking MSP personality subscales. These individuals are motivated to master their own bodies by pushing them in physical workouts, aimed at enhancing their cardiovascular fitness, endurance, and strength in a "high-energy", heightened-arousal environment. However, alloic-mastery and negativism were unexpected in the discrimination between the activity groups. While negativism can be accommodated easily within the reversal theory framework as the need to challenge and break boundaries and expectations of self and others, it is not clear how alloic-mastery is manifest in different exercise activities. However, a possible explanation of the importance of alloic-mastery in Tai Chi is that individual participants' feelings of satisfaction came mainly from the group's successful performance in completing the required tasks and precise movements as "one" in a synchronized and skilful manner in a similar way to successful performance when singing in a choir. Previous research has shown the importance of alloic (taking part with friends) and mastery (to become good at sports or skills) motives for recreational sport participation (Lindner & Kerr, 2000). However, the role of alloic-mastery dominance in exercise activities remains an issue which needs to be addressed in future research. The personality or motivational style findings from the present study are particularly important as they identify differences between the three activity groups rather than differences between exercise activity and non-activity groups. The study also has important implications for reversal theory itself as it shows that, in this case, the MSP personality subscale scores are more sensitive discriminators of group differences than their derived dominance values. Thus, the absolute value or strength of MSP personality subscales may be more useful than the relative differences in the strengths between each pair of metamotivational states (provided by MSP dominance scores) in showing group differences.

Of course, based on the results of the present study, it cannot be assumed that personality determines participation in exercise activities. It could be that participating in exercise activities over time develops the differences in personality identified between aerobics, circuit training, and Tai Chi groups. However, if the former relationship between personality and participation is correct, one implication from these findings is that those responsible for providing exercise activities in sport and health facilities should provide a range of different activities which can accommodate exercisers' different personality types. For example, some exercisers who score high on the MSP autic-mastery personality subscale may need an activity to challenge their own personal boundaries, self-expectations, and expectations of others. For other exercisers, who score high on the MSP alloic mastery personality subscale, it may be important to find an activity in which they can exercise with friends and enjoy the shared success of the other individuals in the group. As Segatto and Lafreniere (2013, pp. 33-34) pointed out:

> An awareness of the reasons for an individual's initiation and adherence to exercise is fundamental when promoting healthy active living in a large population. Instead of focusing on a rigid exercise regimen as the only method, people should be presented with a variety of options. Since individuals have diverse personalities, the same style of exercise will not appeal to everyone.

If a range of activities is made available, then individual exercisers can choose the activity best suited to their personality or motivational style and thus increase the possibility of their continuing exercise behavior over the long term. Thera-

pists have long recognized that identical procedures do not work equally well for all clients and methods of tailoring techniques to individual needs are required. Individually-tailored exercise interventions based on differences in motivational style have been developed and found to be effective in producing consistent exercisers (Keele-Smith & Leon, 2003).

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