

Running head: INFLUENCES ON EXERCISE ADOPTION IN WOMEN

Influences on the Stages and Processes of Exercise Adoption in Women

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Abstract

The present study investigated the transtheoretical model of behaviour change in relation to exercise adoption and maintenance in a sample of 140 women. The aim was to examine the relationship between the stages of exercise change, and the constructs of processes of change, costs and benefits of exercising, self-efficacy, and self-rated health. Analyses revealed that the processes, pros, cons, self-efficacy, and self-rated health were significantly associated with stage of exercise adoption. Specifically, the processes fluctuated, pros and self-efficacy increased, and cons decreased across the stages from precontemplation to maintenance. A stage exercise adoption perspective may be particularly useful for understanding how women adopt and sustain exercise regimes.

Introduction

A wealth of research over the past 4 decades attests to the long-term physical and mental health benefits of regular physical activity (see Warburton, Nicol, & Bredin, 2006; World Health Organisation, 2002; World Health Organization, 2004). However, a considerable number of individuals report that they still engage in virtually no regular exercise (Hasse, Steptoe, Sallis, & Wardle, 2004; Joint Health Surveys Unit, 2004), and those people who do exercise are often not exercising at sufficient levels to acquire health benefits. For example, although exercise levels vary from country to country, approximately 41% of people globally are thought to exercise below the threshold for beneficial health returns (World Health Organization, 2002).

Recent research shows a gender gap in physical activity levels globally. Hasse, Steptoe, Sallis, and Wardle (2004) report that, across all the 23 countries sampled in the International Health and Behaviour Study, men consistently exercised more than women, and women had greater levels of inactivity in all but one of these countries. In support of this trend, the *2002/2003 New Zealand Health Survey* (Ministry of Health, 2004) indicated that 57% of New Zealand men participated in some type of vigorous physical activity in any given week compared to only 49% of New Zealand women. Lower levels of physical activity mean that women are now at greater risk of non-communicable diseases associated with such inactivity (e.g., cardiovascular disease) than men, and, as the traditional mortality gap that favoured women over men is fast disappearing (U.S. Department of Health & Human Services, 2003), women are increasingly viewed as a priority group for exercise interventions. Studies have investigated exercise adoption on many different subgroups of the female population, such as ethnic minority groups (e.g., Heesch, Brown, & Blanton, 2000;

Kingi, Towers, Seebeck, & Flett, 2005), older women (e.g., Hardcastle, & Taylor, 2001; Litt, Kleppinger, & Judge, 2002), and obese women (e.g., Dallow, & Anderson, 2003), but little if any research examines the general pattern of exercise in the broader female population. Therefore, a strategic focus should be placed on understanding the underlying inactivity patterns of the broader female population.

Mass media campaigns to motivate individuals to adopt physical activity have been successful in increasing short-term knowledge about exercise-related health benefits, but have provided little to no success in increasing physical activity in the population (Bauman, Bellew, Owen, & Vita, 2001; Bauman et al., 2003; Hillsdon, Cavill, Nanchahal, Diamond, & White, 2001; Ogilvie, Egan, Hamilton, & Petticrew, 2004). A case in point is Sport and Recreation New Zealand's 'Push Play' campaign, a national campaign designed both to increase public awareness of the benefits of physical activity and motivate exercise uptake. Since the campaign's inception in 1999 awareness of the benefits of activity and intention to exercise increased across the 4-year monitoring period, but levels of weekly physical activity remained relatively unchanged (Bauman et al., 2003). This public inertia indicates that little change in exercise behaviour is probable, even in the presence of motivational campaigns, if we do not first understand and target the processes underlying people's intentional exercise behaviour change.

Researchers are increasingly focussing on the issue of motivational readiness for change in order to better understand the processes involved in adopting positive health behaviour, (Marcus, Rakowski, & Rossi, 1992). Research on exercise adherence shows that intentional behaviour change is dependent on a person's readiness for change to occur (Dishman, 1991; Prochaska & Marcus, 1994). The transtheoretical model of behaviour change (Prochaska & DiClemente, 1983) which

highlights the stages undertaken to initiate and maintain behaviour change, has previously been employed as a 'stage of exercise adoption' model (Marcus, Banspack, et al., 1992; Marcus, Eaton, Rossi, & Harlow, 1994; Marcus & Owen, 1992; Marcus, Rakowski, & Rossi, 1992) and provides an integrative framework for examining intentional exercise behaviour change. The stage of exercise adoption model emphasises the importance of readiness to change as integral to the adoption of new exercise behaviours. People adopting exercise move through a sequence of five stages of intentional behaviour change, from the initial stage of Precontemplation (not intending to exercise) through to the last stage of Maintenance (sustaining the exercise behaviours over time).

Movement through the stages of exercise adoption is dependent on attitudes towards the pros (i.e., perceived benefits) and cons (i.e., perceived costs) of exercise, the summation of which provides a measure of 'decisional balance'. Negative decisional balance scores indicate that individuals are focused on the costs of exercise, therefore hindering exercise adoption, while positive decisional balance scores indicate that individuals are focused on the benefits of exercise, therefore motivating exercise adoption. Stage progression also relies on the use of 'processes of change', described by Marcus & Simkin (1994) as "covert or overt activities that individuals use to modify their experiences and/or environments, in order to modify their behaviour" (p.1400). The processes encompass both cognitive (e.g., thoughts, beliefs) and behavioural (e.g., stimulus control, reinforcement management) strategies associated with behaviour change, and as such they are contained within two higher order factors: experiential and behavioural respectively (Prochaska, Velicer, DiClemente, & Fava, 1988). Different patterns are observed for the two constructs. During the early stages of the behaviour change model, the experiential processes

appear to be more important for understanding and predicting progress, while the behavioural processes seem to be more relevant for predicting movement through the later stages (DiClemente et al., 1991).

The current study sought to understand how women's stage of exercise adoption was related to the processes of change and decisional balance concepts. In addition, this study also explored how exercise self-efficacy was related to women's stage of exercise adoption, as Marcus, Eaton et al. (1994) showed that self-efficacy for exercise increased peoples readiness to exercise. Furthermore, the influence of self-rated health on exercise adoption was also explored as previous research indicates that poor self-rated health may actually act as a barrier to exercise adoption and should therefore be associated with both decisional balance concepts and stage of exercise adoption (Towers, Flett, & Seebeck, 2005). Based on previous research, it was hypothesised that endorsement of the pros and cons of exercise should increase and decrease respectively with an ascent through the 5 stages, and as such decisional balance is predicted to move from negative to positive with stage progression. Secondly, as exercise self-efficacy is associated with readiness to change, levels of exercise self-efficacy were predicted to be positively associated with the pros, and negatively associated with the cons, of exercise and should increase with increases in stage of exercise adoption. Thirdly, poor self-rated health hinders exercise adoption, so it was predicted that self-rated health would be negatively associated with the cons of exercise, and should therefore be positively associated with stag of exercise adoption. Lastly, it was hypothesised that use of the processes of change would be asymmetrically linked with stage of exercise adoption. However, it was predicted that increased use of the experiential processes would only be evident in the early stages of exercise adoption (from Precontemplation to Preparation) whereas differences in

the use of the behavioural processes would be evident in the later stages (from Preparation to Maintenance).

Method

Participants

A total of 140 women took part in the study. The mean age of participants was 35 years (SD = 1.09; range = 20–62 yrs). Participants were a non-probability sample recruited through institutional and acquaintanceship networks. The majority of participants were New Zealanders of European decent (80%), were married (64%), and 43% reported having a tertiary education. The majority of women were either in full-time (38%) or part-time (22%) paid employment.

Measures

Stages of exercise adoption. Stage of exercise adoption was assessed on a 9-point scale in the shape of a ladder to identify the respondent's current level of exercise adoption. Five statements served as thematic anchor points along the ladder, each anchor corresponded to one of the 5 stages of exercise adoption. Exercise was defined as activities which increase the heart rate (e.g., brisk walking, swimming), and in line with the American College of Sports Medicine (1990) regular exercise was defined as exercising three or more times a week for at least 20 minutes each time. For analysis, responses were collapsed to place respondents into one of the five stages. Participants were placed into a stage according to the rating they selected: 0 – 1 (Precontemplation), 2 – 3 (Contemplation), 4 – 5 (Preparation), 6 – 7 (Action), and 8 (Maintenance). Marcus, Rossi et al. (1992) report reliability of .78 over a two-week period for an 11-point version of this measure, and concurrent validity for the measure

has been supported by its significant association with the Seven-Day Recall Physical Activity Questionnaire (Marcus & Simkin, 1993).

Processes of Change. The processes of change were measured by the Processes of Change Questionnaire (PCQ; Marcus, Rossi, Selby, Niaura, & Abrams, 1992). The PCQ is made up of 39 statements that form 10 sub-scales reflecting 10 specific processes of behaviour change. Each of the ten processes reflect either an experiential focus (i.e., they are a cognitive coping strategy) or a behavioural focus (i.e., they are a behavioural coping strategy). The 5 experiential processes are: consciousness raising, dramatic relief, environmental re-evaluation, and self-re-evaluation. The 5 behavioural processes are: social liberation, counter-conditioning, helping relationships, reinforcement management, self-liberation, and stimulus control. Respondents were asked to think back over the last month and to rate the frequency of occurrence of each item on a 5-point scale ranging from never (1) to always (5). For example, an item on the counter-conditioning sub-scale states “Instead of remaining inactive, I engage in some physical activity”. Marcus, Rossi et al. (1992) report internal consistency (alpha) coefficients that range from .62 to .89 across the 10 subscales. Cronbachs alpha for the sub-scales in the current study ranged from .56 to .85, with the self-reevaluation sub-scale (.56) the only sub-scale to fail to reach an alpha of .70.

Decisional Balance. An 18-item decisional balance measure was used, composed of a 10-item pros (benefits) scale and a six-item cons (costs) scale taken from the Marcus, Rakowski et al. (1992) study with two additional items included. A pros item (I would feel more comfortable exercising with other family members or relatives) and a cons item (I would feel shy/embarrassed exercising in front of others) were added to the measure in order to assess the attitude of individuals toward

exercising with others. Participants were asked to rate, on a five-point scale ranging from not at all important (1) to extremely important (5), how important each statement was with respect to their decision to exercise or not. The items were scored on two sub-scales (pros and cons) were converted to a T score, and a decisional balance index was obtained by subtracting the mean total (T-score) of the cons scale from the mean total (T-score) of the pros scale. Cronbachs alpha for the pros and cons scales in the current study were .90 and .72 respectively.

Self-efficacy. An eight-item exercise specific self-efficacy measure was used in the study to assess the degree of confidence participants had in their ability to engage in regular exercise. The measure was originally developed as part of a questionnaire used in the Stanford Adolescent Heart Health Programme (Killen et al., 1988; cited in Reynolds et al., 1990), a multiple risk factor intervention programme for youth. Participants were asked how confident they were that they would exercise in challenging conditions, such as when they were tired, feeling down, busy, or feeling stressed. Participants rated each self-efficacy item on a five-point scale ranging from not at all confident (1) to very confident (5). Items in the scale correspond to two key factors found to be important in exercise self-efficacy: resisting relapse and making time for exercise (Sallis, Pinski, Grossman, Patterson, & Nader, 1988). Cronbachs alpha for the scale in the current study was .94.

Self-rated health. Self-rated health was measured on a single-item indicator. Participants were asked the following question: *Compared to a person in excellent health, how would you rate your health at the present time?* Scores ranged from terrible (1) to excellent (7).

Procedure

Participants were recruited from local schools (parents and teachers), sports clubs, educational institutions, and acquaintance networks by the lead author. They were provided with a coversheet explaining the purpose of the study and their rights as participants, and their rights to anonymity and confidentiality of their results were also explained. The questionnaire was also provided, and completion took approximately 12 minutes on average.

Results

Participants were classified into one of the five groups representing the stages of exercise adoption: Precontemplation (N=18, 12.9%), Contemplation (N=19, 13.6%), Preparation (N=38, 27.1%), Action (N=24, 17.1%), and Maintenance (N=41, 29.3%). There were no significant differences among women across the stages in relation to education, employment, satisfaction with standard of living, or satisfaction with income.

----- Place Table 1 about here -----

Pros, Cons, and Decisional Balance

As predicted, pros and cons were significantly related to stage of exercise adoption, with the pros significantly increasing and cons significantly decreasing with stage progression (see Table 1). Scheffe's post-hoc analyses (see Table 2) revealed that scores on the Pros scale were significantly lower for women in the Precontemplation stage than women in all other stages, and scores on the Cons scale were significantly higher for women in the Precontemplation and Contemplation stages as compared with women in the Preparation and Maintenance stages. Finally,

the mean differences on the Decisional Balance scale by stage of exercise adoption were highly significant. Specifically, post-hoc analyses revealed that decisional balance scores were significantly higher for respondents in the Preparation, Action, and Maintenance stages as compared to respondents in the Precontemplation stage.

Self-efficacy

Table 2 shows that the level of self-efficacy significantly increased from the Precontemplation through to the Maintenance stage, indicating a strong link between exercise participation and exercise confidence. There was a significant positive correlation between self-efficacy and scores on the pros scale, $r(140) = .38, p < .001$, indicating a tendency for those who felt confident in their ability to exercise regularly to rate the benefits of exercising highly. In addition, there was a significant negative correlation between self-efficacy and scores on the cons scale, $r(140) = -.46, p < .001$. Thus, women who lack confidence in their ability to exercise regularly were also more likely to rate the costs of exercising highly. Finally, self-efficacy was also correlated with the overall decisional balance index, $r(140) = .56, p < .001$. Women with high exercise-related self-efficacy were more likely to have a decisional balance score favouring the benefits of exercising than women who did not have high exercise-related self-efficacy.

Self-rated health

Only 7% of the sample rated their health as poor, 20% rated their health fair, 24% rated their health as good, and 14% considered themselves to be in excellent health. Self-rated health scores were significantly higher for women in the Maintenance stage as compared with those in the lower stages. There was no significant correlation between the costs (cons) of exercise adoption and self-rated

health, but there was a significant positive correlation between self-rated health and self-efficacy, $r(139) = .31, p < .001$.

----- Place Table 2 about here -----

The processes of change

One-way analyses of variance (ANOVA) were computed to examine mean differences in process use across the stages of exercise adoption (see Table 3), and the results indicate that there were significant differences in the use of each of the processes of change. Except in the cases of Environmental Re-evaluation and Stimulus Control, use of both the experiential and behavioural processes is characterised by a significant increase as individuals ascend the stages of exercise adoption.

----- Place Table 3 about here -----

Scheffe's post-hoc analyses were conducted on the differences in process use across stage in order to determine at which stage the use of each process significantly increased. As the results in Table 4 suggest, for all of the experiential processes the significant increase in process use occurred at the early stages of exercise adoption, generally distinguishing those in Precontemplation from individuals in the Preparation stage and above. The same trend was observed for the behavioural processes of change, with significant increase in process use occurring in the earlier rather than later stages of exercise adoption.

----- Place Table 4 about here -----

Discussion

The current study sought to determine how women's stage of exercise adoption was related to decisional balance, self-efficacy, self-rated health and the processes of change. The hypothesis that decisional balance would swing from negative to positive with stage progression was supported by the current results, with endorsement of the pros of exercise steadily increasing and endorsement of the cons steadily decreasing the higher the stage of exercise adoption. Secondly, the current results supported the hypothesis that self-efficacy would be positively associated with the pros of exercise, negatively associated with the cons of exercise, and would increase with stage progression. Our hypothesis concerning self-rated health was only slightly supported, as the hypothesised relationship between self-rated health and the cons of exercise was not found, but self-rated health did increase with an ascent through the stage of exercise adoption. Lastly, use of both the experiential and behavioural processes of change showed the predicted asymmetric relationship with the stage of exercise adoption, but the point at which individuals would rely on the different processes did not conform to our hypotheses. While experiential processes were used significantly more in the earlier stages of exercise adoption as was predicted, the same pattern occurred for the behavioural processes where it had been predicted that differences in the use of these processes would occur in the latter half of the stages model.

Decisional Balance

Concurrent with the findings of Marcus and Owen (1992) and Marcus, Rakowski et al. (1992), the costs (cons) and benefits (pros) of exercising were significantly related to stage exercise adoption in the present study, with the pros increasing and the cons decreasing with stage progression. These findings suggest that women who exercise regularly are more likely to perceive greater benefits in exercising than women that are not currently exercising who, conversely, are likely to perceive the costs as outweighing the benefits. Thus, those women endorsing the benefits may show greater readiness to change their exercise behaviour for the better, while concern over the costs of exercise reduces women's readiness for change.

The greatest positive shift in women's decisional balance occurred between the Precontemplation and Contemplation stages, and the point at which decisional balance changed from negative to positive (i.e., people's positive evaluations about the benefits of exercise outweighed their focus on the costs) occurred between the Contemplation and Preparation stage. These results are consistent with earlier research on exercise adoption (Marcus Rakowski et al., 1992; Marshall & Biddell, 2002), and suggest that women's exercise adoption is dependent on recognition of the benefits of exercise and emphasises the fact that endorsement of the benefits is a critical component in the behaviour change process.

The association between high levels of self-efficacy and greater endorsement of the benefits of exercise help explain the finding that more exercise efficacious individuals persist longer in exercise activities (e.g., McAuley & Jacobson, 1991). Belief in both the benefits of regular exercise and ones own ability to undertake such an exercise schedule should provide motivation to uptake exercise and self-belief to maintain the regular routine.

Self-efficacy

Women in the later stages of exercise adoption had higher exercise self-efficacy, a result replicated in previous studies (e.g., Kingi et al, 2005; Marcus & Owen, 1992). However, meta-analysis of the differences in exercise self-efficacy by stage has shown that moderate differences were evident between the lower stages, whereas larger differences in self-efficacy were evident from Action to Maintenance stages (Marshall & Biddell, 2002). This surge in self-efficacy shown in previous research may take place in the later stages of exercise adoption as people slowly become more familiar with exercise routines and confirm their ability to undertake such exercise. In contrast with this surge of self-efficacy in later stages, the differences in self-efficacy across stages in the current study were relatively even, suggesting either women's exercise uptake in the early stages either does not inspire such a surge of self-efficacy, or, self-efficacy is not a tool that women use to propel themselves through the stages of exercise adoption as others do. While it is unclear from this study whether self-efficacy change is a cause or effect of stage progression, this finding still indicates that exercise self-efficacy may not play as decisive an exercise-motivating factor for women as it may do for other sub-groups of the population.

Women's levels of exercise self-efficacy was also closely related to levels of self-rated health, a finding that mimics that of Towers et al (2005), suggests that women with poor self-rated health also have less belief in their own ability to undertake exercise. This supports the idea by Towers et al (2005) that lower self-rated health may actually act as a barrier to exercise rather than as a motivation to exercise. The worse a woman's self-perceived level of health, the less likely she is to think that her body can withstand the rigour associated with regular exercise, and the more

likely she is to think that exercise actually poses serious risks to her health (e.g., heart attack, muscle strain, falls).

Self-rated health

In the current study women in the Maintenance stage had much better self-rated health than women in lower stages of exercise adoption. This suggests that women who consistently exercise perceive themselves to be much healthier than women either not considering or just beginning regular exercise. This conforms to the finding that the physical health benefits known to be related to regular exercise (see Warburton, Nicol, & Bredin, 2006; World Health Organisation, 2002; World Health Organization, 2004) should be experienced primarily by women who have engaged in regular exercise for a reasonable length of time.

While there was a trend for women's self-rated health to be negatively associated with the costs of exercising, no significant relationship actually existed. This result is contrary to those of Towers et al (2005) who found a very close relationship between the cons of exercise and self-rated health in a sample of middle-aged men. Our lack of significant relationship could be explained as a genuine gender difference, such that men in poor health place more emphasis on the costs of exercise as potentially injurious to their health than women in a similar state, but little or no research exists to confirm or dispute such a claim. Gender differences in the endorsement of the pros and cons of exercise have been found (e.g., Fallon, Hausenblas, & Nigg, 2005) but no research to date has investigated gender differences in the pro and con endorsement as a factor of health status.

Stages and processes of change

The current study found that there was significant asymmetric pattern to the use of both experiential and behavioural processes of change in relation with stage of

exercise adoption, and that change in use generally occurred in the earlier stages. Women in the Precontemplation stage of exercise adoption utilised both the experiential and behavioural processes of change substantially less than participants in later stages. This result is consistent with the findings of Marcus, Rakowski et al. (1992) and Gorely and Gordon (1995) and suggests that women not thinking about exercise are not concerned about the consequences of their physical inactivity, and therefore are not ready to undertake behaviour change. Furthermore, differences in process use only occurred between Precontemplation or Contemplation and higher stages, indicating that it requires a concerted focus on the positive beliefs associated with exercise change and active use of behavioural strategies to motivate women to actually engage in exercise rather than merely contemplate it.

Interestingly, after motivation to change is activated (i.e., women have entered the contemplation stage) use of the processes of change becomes constant across the later stages, a pattern which does not conform to some previous research on process use. For example, Lippke and Plotnikoff (2006) found that use of experiential and behavioural processes often increased in line with stage advancement, including later stages such as Preparation and Action. The discrepancy between those results and our findings suggest that, rather than following patterns of increased process use with stage advancement, cognitive and behavioural strategy use may be *stable* across the later stages of exercise adoption for women.

Limitations

While the current findings pose a number of questions regarding the pattern of exercise adoption in women, a number of potential limitations of this study mean caution should be applied in interpreting these findings. First, although attempts were made to recruit a demographically varied sample of women, the current participants

were a non-probability sample, self-selecting from acquaintance networks of the primary author. While no demographic differences were evident across stage of exercise adoption groups, the sample as a whole were still predominantly middle-class, white, and well educated, indicating that application of these results to New Zealand women of differing ethnic or socioeconomic levels may be difficult. Second, it is possible that those women who had exercise-related interests were more inclined to self-select, and compared to other studies (e.g., Lippke & Plotnikoff, 2006) the current study does have a higher proportion of participants in the preparation and maintenance stages of exercise adoption. This might explain the lack of variation in the use of processes of change in the later stages of exercise adoption, as these women are already motivated to adopt exercise and may be less likely to require motivational strategies or behavioural conditioning to change behaviours.

Conclusion

Like populations in previous studies, an emphasis on the health benefits of exercise coincides with increased adoption of exercise in women. However, exercise self-efficacy may not provide the same level of motivation for women to adopt exercise as it may for other populations. Although poor self-rated health was not associated with a focus on the costs of exercise, its association with exercise self-efficacy suggests that it may hinder exercise adoption in women rather than act as a motivating factor. Lastly, women likely use both the experiential and behavioural processes of change as factors motivating them to at least contemplate exercise adoption, but their use of the processes in later stages suggests that they are not relied upon to bolster further exercise adoption.

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Table 1

Means and standard deviations for self-report data provided by respondents in each stage of exercise adoption.

Measure	Precontemplation (n = 18)	Contemplation (n = 19)	Preparation (n = 38)	Action (n = 24)	Maintenance (n = 41)	Univariate <i>F</i> ^a
Pros scale (T-score)	38.03 ± 6.49	48.99 ± 8.24	50.58 ± 9.24	53.70 ± 7.13	53.02 ± 10.39	10.56**
Cons scale (T-score)	58.32 ± 10.50	57.28 ± 8.01	48.70 ± 8.89	50.04 ± 8.62	44.15 ± 7.93	12.35**
Decisional Balance	-20.29 ± 13.17	-8.30 ± 12.45	1.88 ± 10.64	3.66 ± 11.19	8.87 ± 11.85	22.73**
Self-efficacy	1.32 ± 0.48	1.82 ± 0.83	2.36 ± 0.82	3.08 ± 0.69	3.69 ± 0.66	46.90**
Self-rated health	5.12 ± 1.36	5.16 ± 1.01	5.00 ± 1.12	5.04 ± 0.86	6.07 ± 0.85	7.17**

Note. ^a degrees of freedom (4, 135); * $p < 0.01$; ** $p < 0.001$. All p values two-tailed.

Table 2

Post-hoc between-groups comparisons (Ranges Tests) on Pros, Cons, Decisional Balance, Self-Efficacy and Self-rated health.

Measure	Comparison of stage exercise adoption groups
Pros scale	PRECON < CONTEM, PREP, ACTION, MAINT
Cons scale	PRECON > PREP, MAINT CONTEM > PREP, MAINT
Decisional Balance	PRECON < PREP, ACTION, MAINT CONTEM < ACTION, MAINT
Self-efficacy	PRECON < PREP, ACTION, MAINT; CONTEM < ACTION, MAINT PREP < ACTION, MAINT ACTION < MAINT
Self-rated health	MAINT > PRECON, CONTEM, PREP, ACTION

Note. PRECON = Precontemplation stage; CONTEM = Contemplation stage; PREP = Preparation stage; ACTION = Action stage; MAINT = Maintenance stage;

< = Difference between stages is $p < .05$ using Scheffe's post-hoc analyses.

Table 3

Process of Change means, standard deviations, and ANOVA results across the five Stages exercise adoption.

Process of Change	Stage exercise adoption						Univariate <i>F</i>
	Precontemplation (n = 18)	Contemplation (n = 19)	Preparation (n = 38)	Action (n = 24)	Maintenance (n = 41)		
Experiential processes	Consciousness raising	6.56 ± 1.95	8.68 ± 2.67	10.89 ± 2.78	10.58 ± 2.65	11.40 ± 4.24	9.04**
	Dramatic relief	4.22 ± 1.35	6.58 ± 2.99	7.03 ± 2.31	7.17 ± 2.38	7.68 ± 3.12	5.93**
	Environmental reevaluation	7.28 ± 1.93	10.11 ± 3.14	10.50 ± 3.67	10.58 ± 3.28	9.44 ± 3.36	3.62*
	Self reevaluation	7.44 ± 2.89	11.68 ± 3.74	13.87 ± 4.25	14.25 ± 2.59	14.80 ± 3.67	16.57*
	Social liberation	8.00 ± 2.35	10.42 ± 3.70	10.84 ± 2.90	10.52 ± 1.90	11.88 ± 3.07	5.73**
	Counter-conditioning	6.61 ± 1.65	9.26 ± 3.21	11.45 ± 3.48	13.71 ± 3.09	15.70 ± 2.70	36.59*
	Helping relationships	5.56 ± 1.46	7.74 ± 3.54	8.53 ± 2.93	8.33 ± 3.03	10.13 ± 3.92	6.58**
Behavioural processes	Reinforcement management	7.11 ± 2.37	10.06 ± 3.10	11.16 ± 2.73	12.13 ± 3.34	12.61 ± 3.23	11.78*
	Self liberation	7.89 ± 1.97	10.68 ± 2.87	13.18 ± 3.01	13.96 ± 3.34	12.61 ± 3.33	22.30*
	Stimulus control	5.06 ± 1.00	7.32 ± 2.65	8.32 ± 2.62	9.48 ± 3.17	8.51 ± 2.51	8.04**

Note. * $p < 0.01$; ** $p < 0.001$. All p values two-tailed.

Table 4

Post-hoc between-groups comparisons (Ranges Tests) on each of the processes of change

Process of Change	Comparison of Stage exercise adoption Groups
Consciousness raising	PRECON < PREP, ACTION, MAINT
Dramatic relief	PRECON < PREP, ACTION, MAINT
Environmental reevaluation	PRECON < PREP, ACTION
Self reevaluation	PRECON < CONTEM, PREP, ACTION, MAINT; CONTEM < MAINT
Social liberation	PRECON < PREP, MAINT
Counter-conditioning	PRECON < PREP, ACTION, MAINT; CONTEM < ACTION, MAINT; PREP < MAINT
Helping relationships	PRECON < PREP, MAINT
Reinforcement management	PRECON < PREP, ACTION, MAINT
Self liberation	PRECON < PREP, ACTION, MAINT; CONTEM < ACTION, MAINT
Stimulus control	PRECON < PREP, ACTION, MAINT

Note. PRECON = Precontemplation stage; CONTEM = Contemplation stage; PREP = Preparation stage; ACTION = Action stage; MAINT = Maintenance stage;

< = Difference between stages is $p < .05$ using Scheffe's post-hoc analyses.

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