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Exercise Benefits and Exercise Adherence

Joan Maycock & Tony Cassidy*

School of Psychology, University of Ulster, Coleraine, UK

***Corresponding Author:** Tony Cassidy, School of Psychology, University of Ulster, Coleraine, UK,
E-mail: t.cassidy@ulster.ac.uk

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Abstract

Objectives: This study examined the relationship between regular aerobic exercise and the psychological health and well-being of healthy adults.

Design: A longitudinal, mixed(between and within group) research design was conducted with a total of (n=73) participants; males (n=37) females (n=36) between the ages of 18-65,over a period of six weeks.

Methods: A self-report questionnaire covering self-compassion, exercise motivation, self-efficacy, resilience, self-rated health, positive and negative mood, life satisfaction and illness symptoms was completed at three time points.

Results: A between-within subjects repeated measures ANOVA showed significant increases over time for, resilience, self-efficacy and life satisfaction and decreases for negative mood, physical symptoms and psychological distress. There were also significant group interactions and increases over time for self-compassion, intrinsic motivation and positive mood. A logistic regression found self-compassion was the best predictor of exercise adherence.

Conclusion: These results clearly show improvements in psychological health and well-being of healthy adults over a six week period of regular aerobic exercise. In addition the identification of self-compassion as a predictor of adherence points to the utility of mindfulness interventions in the area.

Keywords: Aerobic exercise; Psychological well-being; Self-compassion; Motivation; Self-efficacy; Adherence.

Introduction

There is substantial empirical evidence on the positive effects of regular aerobic exercise on our physical health and well-being [1]. Caspersen, Powell and Christensen [2] differentiate between physical activity and exercise. "*Both are bodily movements which are produced by skeletal muscles and which expand energy* (p. 128)", however exercise has the added objective of improving and maintaining physical fitness because it is planned, structured and repetitive. Currently the exercise guidelines for 18-64 year olds are *"30 minutes a day or 150 minutes of moderate-intensity aerobic exercise on five days a week, or at least 75 minutes of vigorous-intensity aerobic exercise a week, or an equivalent combination of moderate-and vigorous-intensity exercise. Aerobic exercise is defined as brisk walking, running, bicycling, housework, rowing, skipping, swimming and gardening,"*[3].

According to Mc Donnaldand Hodgdon[4] exercise increases brain derived neurotropthic factor (BDNF) which improves mood, the survival of brain cells and produces the stimulant Phenyl ethylamine, which is associated with the release of endorphins and dopamine and acts as a natural antidepressant.

In contrast to the above message on the effects of regular aerobic exercise on our physical well-being, the evidence from studies on emotional and psychological health is controversial and ambiguous. A vast amount of evidence comes from studies conducted on clinical populations examining the impact of exercise interventions on anxiety, depression and positive and negative mood. Although there is general consensus that regular aerobic exercise improves our psychological health and well-being [5, 6].The results on the dose-response relationship are mixed and ambiguous with some studies reporting changes in mood after 20-30 and 60 minutes of exercise [7 - 10], and others reporting no effects on depression, anxiety and negative mood [11, 12].

Biddle and Mutrie [6] defined 'Affect' as *"more than emotion including changes in mood states and traits"* (p. 166). Mood is interpreted as an all-inclusive set of *"affective states experienced on a daily basis and classified in terms of depressed mood state or enthusiastic mood state"* (p. 166). Emmons [13] suggested that positive affect correlates with past goal achievements and negative affect correlates with doubts of future goal achievements. Smith [14] proposed that negative emotions (negative affectivity) impact negatively on health, reduce longevity and increase serious illness, while resilience; associated with optimism and positive emotions has been linked to increased longevity and good health [15, 16]. Cassidy [17] linked optimism to psychological health through "positive relationships between optimism, coping and general health". Ekman [18] proposed that emotions are survival mechanisms which elicit automatic cognitive appraisals of positive or negative events which impact on our psychological well-being, however because regular exercise does not threaten us in any way cognitive appraisal is not elicited, thus studies examining the effects of regular exercise on emotions and well-being generally measure changes in affective states or test the interactions between specific psychological constructs during or after exercise, which can have lasting effects on our psychological health and well-being.

It is generally accepted that control is central to health and well-being; this is acknowledged in the concept of motivation when control is perceived over outcome expectations [13, 17, 19]. Cassidy [17] underlines the concept of achievement motivation, "that goal achievement within the social environment is intrinsic to psychological well-being and that psychological health exists in the striving rather than in the achievement". Several studies have used the Self-Determination Theory [20] as a basis to assessing the psychological determinants of exercise behaviour[21 - 23]. This theory proposes that people are intrinsically motivated to partake in an activity when they enjoy it and get satisfaction from it and are extrinsically motivated when they partake in an activity with ulterior motives for ulterior goals, accessible through the activity. Embedded within extrinsic motivation are different levels of behavioural regulations consisting of; external regulation (behaviour is externally controlled); introjected regulation (behaviour is internally controlled); identified regulation (behaviour is valued) and integrated regulation (behaviour matches other values). Thus, motivation can be internally controlled (intrinsic, identified and integrated) or externally controlled (external and introjected), these different levels of motivation are of vital importance when investigating exercise participation behaviour. It is theorised that motivation is less controlled by external circumstances as the individual moves from external regulation towards integrated regulation [24, 25].

Self-efficacy [26], as defined by Bandura's Social Cognitive Theory has been described as a state and trait like psychological construct and is generally defined as the individual's optimistic belief in their own ability to perform any necessary actions which affects their lives and are based on past experiences of goal achievements; implying underlining positive coping abilities and motivation to achieve desired outcomes. Motivation incentives drive these actions, the feelings and cognitions of the behaviour and the valued outcomes. Self-efficacy plays a vital role in the motivation and maintenance of exercise; it enhances resilience and mastery and reinforces interest in and commitment to regular exercise [27]. Haggar et al. [28] examined the relationship between behaviour, intentions, attitudes, subjective norms, perceived behavioural control self-efficacy and past behaviour, and found that self-efficacy influenced the intentions to and the performance off exercise.

There is growing evidence that resilience contributes to positive health and is strongly linked to control [15]. Resilience refers to the ability and speed at which an individual recovers from stressful events. Tugade, Fredrickson and Barrett [16] examined this concept in relation to positive emotions which facilitate adaptive coping.

It is argued that self-efficacy and resilience are likely to mediate the impact of exercise on positive health and wellbeing [29]. Another construct shown to have an impact on exercise motivation and maintenance is self-compassion. Self-compassion [30, 31] involves being "caring, understanding, non-judgemental and kind to oneself in instances of failure and pain and recognising that one's experience is part of the human experience", Neff [32]. Although the evidence linking self-compassion to regular aerobic exercise is lacking, self-compassion has been linked to a range of psychological health outcomes such as less depression, anxiety, and self-consciousness and more positive affect; life satisfaction, happiness, optimism and mastery [30, 33]. Magnus et al. [34] explored self-compassion in the context of women's motives to exercise and exercise related outcomes and found that self-compassion positively correlated to "intrinsic motivations and negatively correlated to extrinsic and introjected motivation", while Berry et al. [33] found that 'body self-compassion' required the "motivation, attitudes and actions" to ensure good health, indicating that self-compassion positively correlated to regular aerobic exercise.

It stands to reason that exercise motivation and maintenance will play a mediating role in the perception of physical and psychological health and well-being so this study also included a self-rated health measure to assess subjective and objective self-rated health. High levels of aerobic exercise have been found to correlate positively to high level of good self-rated health while high levels of psychosomatic symptoms and poor self-rated health correlate positively to low levels of aerobic exercise[35].

While the evidence on the effect of regular aerobic exercise on physical health cannot be disputed, the evidence on the effect of regular aerobic exercise on our psychological well-being is ambiguous and confusing. This study will attempt to address this deficit. This study will contribute to the existing literature by examining the impact of regular aerobic exercise on the psychological health and well-being of healthy adults. The aim is to investigate the relationship between regular aerobic exercise and self-compassion, exercise motivation, self-efficacy, resilience, self-rated health, positive and negative mood, life satisfaction and illness symptoms and to test which of these variables predicts exercise adherence.

Method

Design

This was a longitudinal, mixed method (between and within group) study with assessments at 3 time points over a 6 week period, see Table 1. It used a multiple item self-reporting questionnaire covering; self-compassion, exercise motivation, self-efficacy, resilience, self-rated health, positive and negative mood, life satisfaction and illness symptoms.

Sample and Procedure

Power Analysis for Repeated Measures Manova with 3 groups and 6 measures indicated that a sample of 45 would have a power of 0.95 and an effect size of .25. A sample of 90 was targeted to make allowances for drop outs. Targeted sampling was used to collect data at several sports centres / health and fitness clubs. An achieved sample of 73 participants were divided into 3 groups, dependent on exercising period, see Table 1.

Table 1: Exercise groups and time points

Time 1 (week 1)	Time 2 (2-3 weeks)	Time 3 (4-6 weeks)
Just starting exercise (n=15)	Exercising 2-3 weeks (n=13)	Exercising 4-6 weeks (n=12)
Exercising for 0-3 weeks (n=23)	Exercising 4-6 weeks (n=19)	Exercising 7-9 weeks (n=17)
Exercising for 6 weeks (n=35)	Exercising 7-9 weeks (n=26)	Exercising 10-12 weeks (n=19)

Inclusion Criteria

Inclusion criteria required all participants to achieve a minimum of 150 minutes of moderate-intensity aerobic exercise a week, have access to a computer, have a current email address, read the information sheet and sign the consent form.

Participants

Participants were 73adults(male =37 and females =36) between 18-64 years old. The group were heterogeneous in terms of type and duration of aerobic exercise; 2.5 to 10 hours a week; running, brisk walking, rowing, treadmill walking, cycling, cardiovascular exercise and participation in exercise classes.

Measures

Quantitative data collection was done using a self-report questionnaire completed at 3 time point. Demographic information; age, gender; height, weight, exercise hours per week and training period was collected. The following measures were used.

The Self-Compassion Scale:

A short self-report 12- item scale was used to measure levels of self-compassion [32, 36].Participants rated how often they behaved in the manner indicated by each of the items. Example item ‘‘I try to be loving towards myself when I’m feeling emotional pain’’. This scale consists of six subscales: Self-Kindness (two items), Self-Judgment (two items), Common Humanity (two items), Isolation (two items), Mindfulness (two items) and Over-Identified (two items). All items are rated on a 5-point Likert-type scale, from 1 (almost never) to 5 (almost always). The total score of the scale was used in the analysis with a higher score indicating a higher level of self-compassion. The coefficient alpha of the scale was .92 [32] among college students.

The Behavioural Regulation in Exercise Questionnaire 2:

The BREQ-2 [37, 38] measures the Deci& Ryan[39] concepts of extrinsic and intrinsic motivation. It has good validity and is widely used to measure exercise motivation with 19 items scored on a five-point scale ranging from 0 (not true for me) to 4 (very true for me). Cronbach’s alpha reliability coefficients for the BREQ-2 subscales ranged from .80 to .95.

The Brief Resilience Scale (BRS):

A6 item self- report instrument [40] measuring the ability to bounce back from stress on a Likert scale from 1= (Strongly Disagree) to 5= (Strongly Agree). The scale is scored so that a higher score indicates more resilience. It has demonstrated good internal consistency and test-retest reliability.

The Health Status Single Item Verbal Rating Scale:

A single item scale [41], used to give a global self-rating of current subject and objective health.

The Satisfaction with Life Scale:

A5 item measure of general satisfaction with life scale [42] measures satisfaction with life on a Likert scale from 1= (Strongly Disagree) to 5= (Strongly Agree) and has a Cronbach’s Alpha of .87.

The Generalized Self-Efficacy Scale (GSES):

Schwarzer & Jerusalem [43], based on Bandura’s [26] concept of self-efficacy this has a 10 item scale which reflects an optimistic self-belief in assorted functioning domains. Each item refers to successful coping and is measured on a 4 point scale from 1 (not at all true) to 4 (exactly true). Cronbach Alpha in this study was .87.

The Positive and Negative Affect Schedule:

This 20 item version of the PANAs [44] measures positive and negative mood states and has a Cronbach’s Alpha of .63 -.89. The 5 point scale from 0 (not at all) to 4 (extremely) measures different positive and negative feelings and emotions.

The Rotterdam Symptom Checklist (RSCL):

This 25 item scale [45] measures health over the past week in terms of a range of psychological and physical symptoms. With Cronbach’s alphas from .72 to .94 it measures symptoms on a Likert-type scale of 1 (not at all) to 4 (very much).

Overall Quality of Life Scale:

The quality of life scale is part of the Rotterdam Symptom Checklist and measures perceived quality of life using only 1item which asked participants how they would rate their overall quality of life over the past week on a scale of 6 (excellent) to 1(poor).

Procedure

After ethical approval from the University Research Ethics Committee, managers of the fitness centres were approached and permission was sought to access clientele. The questionnaire, information sheet and consent forms were translated into Dutch. After permission was granted participants were approached and introduced to the study, they were given information in English and Dutch regarding the details of the inclusion criteria, including being required to complete a questionnaire at 3 time points, of which the 2nd and 3rd would be sent by e-mail and their e-mail address would be deleted after completion of the 3rd.

After reading all information and signing the consent form they were assigned to an exercise group and asked to complete the first questionnaire. Some participants signed the consent form on site and requested the questionnaire by email. On site completed questionanires were handed to the author with a current e-mail address and dates for the 2ndand 3rd questionnaires, generally the interval period was two weeks. Because of the nature of this study group logs (G1, G2 and G3) were kept to register participants according to a specific group and to track all questionnaires and communications. All emails were logged along with deadline dates and reminder dates. After the receipt of the 3rd questionnaire participants were sent a ‘thank you e-mail’ in which they were informed their e-mail address would be destroyed. As data was being collected an SPSS data file was set up in SPSS statistics package (version 21) and the received data was entered.

Data Analysis

The data from 73 participants was entered into IBM SPSS Statistics 21, coded, and total scale scores were calculated. A mixed between-within subjects repeated measure ANOVA was conducted to test for main effects and interactions.

Results

Descriptive statistics of mean and standard deviations for constructs by time and group and for the completers and non-completers can be found in Table 2, and 3.

Table 2: Means and standard deviation of study constructs by time point and exercise group

	Exercise groups			
Variable /Time Point	New	1-3weeks	6 weeks +	Total
	Mean (Sd)	Mean (Sd)	Mean (Sd)	Mean (Sd)
Selfcompassion1	3.36 (0.49)	2.95 (0.40)	3.44 (0.44)	3.25 (0.49)
Selfcompassion2	3.38 (0.45)	3.67 (0.41)	3.56 (0.37)	3.56 (0.41)
Selfcompassion3	3.81 (0.16)	3.89 (0.33)	3.56 (0.32)	3.74 (0.33)
Relativeautonomy1	3.50 (0.90)	2.64 (0.49)	3.52 (0.77)	3.21 (0.82)
Relativeautonomy2	2.75 (0.75)	3.88 (0.99)	3.89 (0.93)	3.60 (1.03)
Relativeautonomy3	4.25 (0.45)	3.82 (0.63)	3.78 (0.53)	3.92 (0.58)
Resilience1	3.00 (0.85)	2.35 (1.45)	2.94 (1.02)	2.75 (1.18)
Resilience2	3.75 (0.86)	3.70 (1.21)	3.63 (0.68)	3.69 (0.93)
Resilience3	3.83 (0.83)	3.70 (1.21)	3.63 (0.68)	3.69 (0.93)
Positivemood1	2.25 (0.62)	2.58 (0.61)	2.42 (0.69)	2.44 (0.65)
Positivemood2	3.50 (0.52)	2.64 (0.70)	3.47 (0.51)	3.19 (0.70)
Positivemood3	3.58 (0.51)	3.29 (0.58)	3.31 (0.88)	3.37 (0.70)
Negativemood1	2.16 (1.02)	2.35 (1.69)	2.47 (1.50)	2.35 (1.45)
Negativemood2	1.91 (1.08)	1.29 (0.68)	1.16 (0.37)	1.40 (0.76)
Negativemood3	1.33 (0.65)	1.35 (0.70)	1.47 (0.84)	1.40 (0.74)
Lifesatisfaction1	1.58 (1.08)	3.11 (1.11)	2.68 (1.05)	2.81 (1.08)
Lifesatisfaction2	3.58 (0.66)	3.88 (0.99)	3.58 (0.96)	3.69 (0.90)
Lifesatisfaction3	3.75 (0.45)	4.23 (0.66)	3.63 (0.95)	3.88 (0.79)
Selfefficacy1	2.50 (1.24)	2.76 (0.75)	2.58 (0.61)	2.63 (0.84)
Selfefficacy2	3.41 (0.51)	3.23 (0.43)	2.58 (0.61)	2.62 (0.84)
Selfefficacy3	3.50 (0.52)	3.29 (0.46)	3.21 (0.54)	3.28 (0.49)
Physicalsymptoms1	2.91 (0.99)	3.00 (0.93)	2.63 (0.68)	2.83 (0.86)
Physicalsymptoms2	2.83 (0.38)	2.17 (0.72)	2.10 (0.74)	2.31 (0.72)
Physicalsymptoms3	2.25 (0.45)	2.23 (0.83)	2.10 (0.81)	2.19 (0.73)
Psychologicaldistress1	1.83 (0.71)	2.35 (0.60)	1.89 (0.74)	2.04 (0.71)
Psychologicaldistress2	1.33 (0.49)	1.35 (0.70)	1.63 (0.50)	1.46 (0.58)
Psychologicaldistress3	1.33 (0.49)	1.35 (0.49)	1.53 (0.51)	1.42 (0.50)

A mixed repeated measure ANOVA tested for main effects of regular aerobic exercise on the 9 variables at 3 time points. Mauchly's Test of Sphericity was significant for resilience, life satisfaction, self-efficacy; negative mood and psychological distress, indicating that sphericity could not be assumed. For these variables the Greenhouse-Geisser correction was used when judging effect significance. There were significant main effects over time for self-compassion ($F(1,45) = 45.95$, $p<.001$; $\eta_p^2 = .51$); intrinsic motivation ($F(1,45) = 13.00$, $p<.001$; $\eta_p^2 = .22$); resilience ($F(1,45) = 26.27$, $p<.001$; $\eta_p^2 = .37$), positive mood ($F(1,45) = 51,22$, $p<.001$; $\eta_p^2 = .53$); self- efficacy ($F(1,45) = 22.47$, $p<.001$; $\eta_p^2 = .33$); physical symptoms ($F(1,45) = 8.66$, $p<.001$; $\eta_p^2 = .16$), psychological distress ($F(1,45) = 18.20$, $p<.001$; $\eta_p^2 = .28$), negative mood $F(1,45) = 10.63$, $p<.001$; $\eta_p^2 = .19$) and life satisfaction; ($F(1,45) = 24.87$, $p<.001$; $\eta_p^2 = .35$).

There were also significant interactions for time by group for self-compassion ($F(2,45) = 15.72$, $p<.001$; $\eta_p^2 = .41$); intrinsic motivation ($F(2,45) = 10.02$, $p<.001$; $\eta_p^2 = .31$); positive mood ($F(2,45) = 7.45$, $p<.001$; $\eta_p^2 = .25$). However, there were no significant interactions by time x group for resilience; self- efficacy, physical symptoms, psychological distress, negative mood or life satisfaction.

Table 3: Means and standard deviation of completers and non-completers

	Not completed	Completed	Total
	Mean (Sd)	Mean (Sd)	Mean (Sd)
Selfcompassion1	2.62 (0.42)	3.25 (0.49)	3.04 (0.55)
Selfcompassion2	2.95 (0.42)	3.56 (0.41)	3.45 (0.47)
Selfcompassion3		3.74 (0.33)	3.74 (0.33)
Relativeautonomy1	3.08 (0.91)	3.21 (0.82)	3.16 (0.85)
Relativeautonomy2	3.40 (0.52)	3.860 (1.03)	3.57 (0.96)
Relativeautonomy3		3.92 (0.58)	3.92 (0.58)
Resilience1	2.48 (1.04)	2.75 (1.18)	2.66 (1.13)
Resilience2	3.60 (0.84)	3.69 (0.93)	3.67 (0.90)
Resilience3		3.79 (0.92)	3.79 (0.92)
Positivemood1	2.48 (0.65)	2.44 (0.65)	2.45 (0.65)
Positivemood2	3.20 (0.52)	3.19 (0.70)	3.19 (0.66)
Positivemood3		3.37 (0.70)	3.37 (0.70)
Negativemood1	3.20 (1.63)	2.35 (1.45)	2.64 (1.56)
Negativemood2	3.30 (1.42)	1.39 (0.76)	1.72 (1.15)
Negativemood3		1.40 (0.74)	1.40 (0.74)
Lifesatisfaction1	2.40 (1.04)	2.82 (1.08)	2.67 (1.08)
Lifesatisfaction2	3.00 (0.67)	3.67 (0.90)	3.57 (0.90)
Lifesatisfaction3		3.87 (0.79)	3.87 (0.79)
Selfefficacy1	2.60 (0.76)	2.63 (0.84)	2.62 (0.81)
Selfefficacy2	2.50 (0.53)	3.27 (0.49)	3.14 (0.57)
Selfefficacy3		3.31 (0.51)	3.31 (0.51)
Physicalsymptoms1	3.32 (0.94)	2.83 (0.86)	3.00 (0.91)
Physicalsymptoms2	2.40 (0.70)	2.31 (0.72)	2.33 (0.71)
Physicalsymptoms3		2.19 (0.73)	2.19 (0.73)
Psychologicaldistress1	2.92 (1.15)	2.04 (0.71)	2.34 (0.97)
Psychologicaldistress2	2.55 (0.85)	1.45 (0.58)	1.63 (0.74)
Psychologicaldistress3		1.42 (0.50)	1.42 (0.50)

Of the 73 who started, 48 were still exercising after 6 weeks. A logistic regression was used to identify the best predictor variables between self-compassion, intrinsic motivation, positive mood, negative mood, physical symptoms, psychological distress, life satisfaction, resilience and self-efficacy of completers versus non-completers at Time 3, see Table 3.

A test of the full model against a constant only model was statistically significant indicating that the predictors as a set reliably distinguish between completers and non-completers ($\chi^2(9)=41.16$, $p<.001$). Nagelkerke's $R^2=.60$ indicating a moderately strong relationship between prediction and grouping. Prediction success overall was 82.2% (93.8 for completers and 60% for non-completers). The Wald statistic demonstrated that self-compassion at time 1 (Wald=11.16, $p<.001$), and psychological distress at time 1 (Wald=3.86, $p<.05$) were the only significant contributors to prediction. Increased levels of self-compassion corresponded to over 30 time more likelihood of completing (EXP(B)=30.46) and increases in psychological distress reduced the likelihood of completing by one fifth (EXP(B)=0.15). While not significant, increases in intrinsic motivation (EXP(B)=1.58), positive mood (EXP(B)=1.19) and life satisfaction (EXP(B)=1.70) at time 1 also increased the likelihood of completing.

A second logistic regression was used with the separate dimensions of self-compassion, self-kindness, self-judgement, common humanity, isolation, mindfulness, and over identified all as measured at time 1 as predictors of completers versus non-completers.

A test of the full model against a constant only model was statistically significant indicating that the predictors as a set reliably distinguish between completers and non-completers ($\chi^2(6)=41.56$, $p<.001$)

Nagelkerke's R^2=.60 indicating a moderately strong relationship between prediction and grouping. Prediction success overall was 83.6% (85.4 for completers and 80% for non-completers). The Wald statistic demonstrated that self-kindness at time 1 (Wald=4.48, p<.05), mindfulness at time 1 (Wald=11.21, p<.001), and common humanity at time 1 (Wald=6.41, p<.01) were the only significant contributors to prediction. Increased levels of self-kindness corresponded to more than twice the likelihood of completing (EXP(B)=2.39), increased levels of mindfulness corresponded to more than nine times the likelihood of completing (EXP(B)=9.10)and increases in common humanity increased the likelihood of completing by almost four times (EXP(B)=3.80).

Table 4: Predictors of completers versus non-completers from logistic regression analysis

		95% CI for Odds Ratio		
Variable (Time 1)	**B(SE)**	**Lower**	**Odds Ratio**	**Upper**
Logistic Regression 1				
Constant	-6.66***(4.12)			
Self-compassion	3.42***(1.02)	4.10	30.46	226.10
Resilience	-0.22(0.36)	0.40	0.81	1.65
Intrinsic motivation	0.46(0.45)	0.66	1.58	3.78
Self-efficacy	-0.26(0.53)	0.28	0.78	2.19
Positive mood	0.18(0.63)	0.35	1.19	4.08
Negative mood	-0.48(0.26)	0.37	0.62	1.02
Life satisfaction	0.53(0.32)	0.91	1.70	3.18
Psychological distress	-0.96* (0.49)	0.15	0.38	1.00
Physical symptoms	-0.35(0.40)	0.33	0.71	1.54
Logistic Regression 2				
Constant	-12.61***(3.35)			
Isolation	-0.16(0.57)	0.28	0.86	2.60
Self-judgement	0.50(0.62)	0.49	1.66	5.54
Over-identified	0.16(0.46)	0.47	1.17	2.89
Self-kindness	0.87*(0.41)	1.07	2.40	5.36
Mindfulness	2.21***(0.66)	2.50	9.10	33.18
Common humanity	1.34**(0.53)	1.35	3.80	10.71

* p<.05 ** p<.01 ***p<.001

Discussion and Limitations

The aim of this study was to investigate the relationship between regular aerobic exercise and self-compassion, exercise motivation, self-efficacy, resilience, self-rated health, positive and negative mood, life satisfaction and illness symptoms and to test which of these variables predicts exercise adherence. The results clearly show significant increases for the total sample in levels of self-compassion, intrinsic motivation, positive mood, and life satisfaction, resilience, self-efficacy, and life satisfaction, and significant decreases in negative mood, psychological distress and physical symptoms from pre to post exercise. These results support previous studies demonstrating the positive psychological benefits of exercise[9, 28, 29, 33, 34, 46 - 49]. All of the groups benefitted from exercise and the few interaction effects observed suggested that those new to exercise benefited most in terms of increased self-compassion, intrinsic motivation, and positive mood.

In terms of predicting who would adhere to the exercise programme the findings show that self-compassion has the biggest impact. When self-compassion is broken down into its constituent dimensions, mindfulness, self-kindness and common humanity plays the significant role. The observed increase in self-compassion may be seen as a logical progression in that the longer one exercises the more self-compassionate one becomes.However it may also indicate a reciprocal relationship as indicated by Magnus et al. [34] suggesting that self-compassion was associated with intrinsic motivation and Berry et al. [33] who refers to 'a body self-compassion stance' which demands the "motivation, attitudes and actions" to ensure participation in regular exercise for good health.

The main limitations of the current study were the lack of a control group, the variation in amount of exercise undertaken, and the sample size. However the size of effects demonstrated to some extent compensate for the sample size. It is extremely difficult to establish a viable control group in this area without bringing other variables into play which may then confound findings. Again it is difficult to regulate the amount of exercise taken and it seems reasonable to use a baseline as a way of partially compensating for this effect.

In terms of implications the impact of mindfulness in predicting adherence perhaps suggests a potential for using a mindfulness-based intervention in the area.

Conclusion

This longitudinal study while small can make a reasonable contribution to the available literature as it shows a strong relationship between regular aerobic exercise and self-compassion, intrinsic motivation, resilience, positive mood, negative mood, self-efficacy, life satisfaction, physical symptoms and psychological distress over time. In addition, in identifying self-compassion as a useful predictor of adherence, in particular the dimension of mindfulness, it points to the possibility of increasing the efficacy of exercise interventions by combining them with a mindfulness programme.

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