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Motivation, psychological distress and exercise adherence following myocardial infarction

Abstract

Fifty patients with myocardial infarction were recruited from a hospital based Cardiac Education and Assessment Program (CEAP) in Sydney, Australia. The Exercise Motivation Inventory-2 (EMI-2) and the Depression, Anxiety and Stress Scale (DASS) were administered prior to commencement in the program and re-administered by telephone interview at 5-month followup. Four exercise adherence measures were completed: attendance, exercise stress test, self-report ratings and a 7-day activity recall interview. There was a 46% adherence rate for MI patients during the hospital based CEAP. Of those individuals who completed CEAP, 91% obtained functional improvement on the exercise stress test. For the 38 patients who were followed-up by telephone interview at 5 months, 71% were exercising according to CEAP prescription. Higher levels of anxiety were associated with lower levels of self-reported exercise adherence. The 3 strongest motivations for exercise in this group of MI patients were all health related; wanting to be free from illness, maintaining good health and recovering from the effects of coronary heart disease. The discussion highlights the implications of these findings for cardiac rehabilitation programs and the need for empirically driven guidelines for measuring exercise adherence.

Keywords

motivation, following, distress, exercise, infarction, myocardial, psychological, adherence

Disciplines

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Motivation, Psychological Distress and Exercise Adherence Following Myocardial Infarction

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Fifty patients with myocardial infarction were recruited from a hospital based Cardiac Education and Assessment Program (CEAP) in Sydney, Australia. The Exercise Motivation Inventory-2 (EMI-2) and the Depression, Anxiety and Stress Scale (DASS) were administered prior to commencement in the program and re-administered by telephone interview at 5-month follow-up. Four exercise adherence measures were completed: attendance, exercise stress test, self-report ratings and a 7-day activity recall interview. There was a 46% adherence rate for MI patients during the hospital based CEAP. Of those individuals who completed CEAP, 91% obtained functional improvement on the exercise stress test. For the 38 patients who were followed-up by telephone interview at 5 months, 71% were exercising according to CEAP prescription. Higher levels of anxiety were associated with lower levels of self-reported exercise adherence. The 3 strongest motivations for exercise in this group of MI patients were all health related; wanting to be free from illness, maintaining good health and recovering from the effects of coronary heart disease. The discussion highlights the implications of these findings for cardiac rehabilitation programs and the need for empirically driven guidelines for measuring exercise adherence.

The benefits of using exercise therapy as an intervention for coronary heart disease and other chronic illnesses is well documented (Blair et al., 1996). Researchers have found decreases in mortality and morbidity, an improvement in cardio-respiratory function, reduction in CHD risk factors (e.g., blood pressure, cholesterol, body fat), decrease in anxiety, depression, enhanced well-being, and enhanced return to normal duties (Bittner & Oberman, 1993; Blair et al., 1996; Dubbert, 1992; Pate et al., 1995). However, only approximately 15% of the Australian population engage in regular vigorous exercise (Sallis & Owen, 1999).

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A review of randomised cardiac rehabilitation trials suggested the rate of dropout from such programs was between 2% and 25% at 3 months, and 40% and 50% by 6 months (Bittner & Oberman, 1993). Relapse into previous sedentary patterns is a common phenomenon for cardiac rehabilitation (CR) patients even though these patients have encountered life-threatening circumstances. One of the most commonly reported reasons for poor adherence to exercise programs is a lack of motivation (Klinger, 1984; Sluijs & Knibbe, 1991). Exercise motivation has been defined as the combination of underlying processes that initiate, direct and maintain physical activity (Frederick & Ryan, 1995).

Biddle (1995) suggests that exercise motivation appears to be influenced by the type of physical activity (e.g., sport, community fitness programs) age range, (e.g., children to older adults), gender, work status, and health (Mo-Kyung et al., 2004). Researchers have found that MI patients enter cardiac rehabilitation programs usually on their doctors' recommendation and to prevent another heart attack (Ades, Waldemann & Weaver, 1992). Other studies have found those individuals who adhered to an exercise program during the hospital segment were more likely to be adhering to the program at follow-up (Prosser, Carson, & Phillips, 1985). To date there has been an emphasis on examining the motivations of healthy individuals for exercise and very little research about the exercise motivations for clinical samples such as MI patients.

Researchers have used the concept of self-motivation to examine adherence to treatments such as CR programs. For example, Dishman and Gettman (1980) defined self-motivation as 'a generalised, nonspecific tendency to persist in a habitual behavior regardless of extrinsic reinforcement and independent of situational influence' (p. 2897). Using the Self-Motivation Inventory (SMI), they found that coronary patients who adhered to a CR program were more self-motivated than those who did not adhere to the program (Dishman & Gettman, 1980), a finding consistent with other studies (e.g., Snyder, Franklin, Foss & Rubenfire, 1982).

The onset of sudden coronary illness appears to cause sustained distress to some patients, in contrast others recover both physically and psychologically, returning to work or normal daily living. Reduction in negative affect following MI tends to occur progressively over time (Oldridge, Streiner, Hoffman & Guyatt, 1994). The aim of cardiac rehabilitation programs is to accelerate the recovery of physical and psychological functioning and to help patients to return to normal activities after a coronary event. However, Nagle (1971) estimates that 40% to 50% of coronary patients do not return to work due to psychological reasons. Blumenthal and Wei (1993) add that 'depression, low morale, and psychological distress are significant predictors of mortality among patients sustaining MI. Thus, emotional problems contribute to the increased risk of mortality as well as to psychological, social, and economic maladjustment in such patients', (p. 326).

Despite such findings there is a scarcity of research examining the links between psychological distress and adherence. One relatively recent study found that the Theory of Planned behavior explained 51% of the variance in exercise intention with intention explaining 23% of the variance in exercise adherence (Blanchard, Courneya, Rodgers, Daub & Knapik, 2002). The present study aimed to extend findings from previous research that has linked psychological distress with poor adherence to cardiac rehabilitation programs (Blumenthal, Williams, Wallace, Williams & Needles, 1982). In extreme cases some coronary patients can become 'cardiac cripples' a term that was

coined in the mid 1960's to describe when coronary patients' psychological symptoms become chronic, leading to a fear of normal physical activity, such as mowing the lawn and having sexual relations with their partner. These patients tend to experience excessive fatigue, helplessness, and over dependency on family members (Mullinax, 1995). They limit their usual activities even when it is medically acceptable to continue participating in these activities (Ewart, Barr-Taylor, Reese & Debusk, 1983).

A strong theme emerging from the review of exercise adherence research is the lack of consistency in definitions of adherence. For example, exercise adherence measures include attendance (Oldridge et al., 1983), exercise stress test (Oldridge & Streiner, 1990), performance ratings (Franklin, Gordon, & Timmins, 1992), 7-day activity recall interviews (Hellman, 1997) or a combination of measures (Gale, Eckhoff, Mogel, & Rodnick, 1984). In addition, while MI patients taking part in an outpatient rehabilitation program may report a frequency of exercise in accordance with their prescribed plan, corroborative evidence (e.g., a treadmill exercise test) shows no improvement in cardiovascular fitness. Researchers have suggested that the use of more than one objective and subjective measure should provide the most accurate picture (Dishman, 1991).

The present study aims to describe MI patients' adherence rates to the CR program in the hospital and at 5-month follow-up using multiple measures of adherence. A further aim is to explore the aspects of exercise motivation (EMI-2) that appear to motivate MI patients to exercise both at entry to the hospital program and at the later 5-month follow-up.

Method

Participants

Fifty patients who had experienced myocardial infarction and were attending a hospital based Cardiac Education and Assessment Program (CEAP) in Sydney, Australia volunteered to participate in the research. There were 42 (84%) males and eight (16%) females who completed the survey package. The mean age was 60.4 years ($SD = 11.8$) and ranged between 37 years and 82 years. The relationship status for the full sample was single (12%), married or defacto (76%) and widowed, divorced or separated (12%). The majority (48%) were retired, while of the rest, 30% were in paid employment (30%) with 10% in unpaid employment. At a descriptive level the age and gender distribution appeared typical of MI samples in Australia (National Heart Foundation, 1996). The Nurse Unit Manager and nursing staff interviewed patients at admission and informally assessed their level of English proficiency to determine their capacity to complete the research protocol. They selected those patients who met criteria for the study. Over the study period there were 100 eligible myocardial infarction (MI) admissions providing a participation rate of 50%. There were 38 of the 50 participating patients (76%) who completed the follow-up interview 5 months from completion of the hospital program. Of the 12 patients who did not complete the follow-up interview, 8 declined, 2 could not be contacted because their telephone was disconnected, and 2 participants died.

Cardiac Rehabilitation (CEAP)

CEAP is a medically supervised, phase 2 program (Hall et al., 2002), which entails monitored physical conditioning with a group education component to reduce risk

factors associated with cardiovascular disease (CVD). Patients' programs consist of prescribed exercises within the hospital, home walking and a group educational component. Patients are instructed to attend the program at least four times a week over an 8-week time frame during the hours of 7 am to 4 pm. The hospital program involves the use of prescribed exercises that are conducted on bicycles, arm ergometers, treadmills, stepper and rowing machines.

Patients concurrently complete a prescribed daily home walking program to supplement the 8-week hospital program. Patients are asked to record the date, time, type of activity, number of minutes and how they were feeling during the walking program at home. The unsupervised home walking program, commences upon completion of CEAP, and entails a minimum half hour of walking, three times a week at a moderate intensity.

Measures

Several measures of exercise adherence were used. The first two measures were based on the clinical judgment of the nursing unit manager of the hospital program (R.Z): (1) attendance (days attended) during the CR program. The nursing unit manager suggested that patients who had attended at least 10 exercise sessions at the hospital could be classed as adherers. (2) The nursing unit manager also suggested that those patients who had increased their time on the Bruce protocol exercise stress test by 2 minutes or the equivalent of 3 METs were considered to be adhering with the exercise program. METs refer to the energy expended for a given workload on the exercise stress test. The exercise stress test results were obtained from the CEAP database. (3) Exercise adherence at 5-month follow-up was measured by self-report ratings (percentage estimates; Klinger, 1984). (4) 7-day activity recall (Hellman, 1997), and (5) ratings of perceived exertion (RPE; Borg, 1970). The Borg's rating (RPE; Borg, 1970) has been found to be a reliable marker of an individual's exercise tolerance and it was significantly correlated with exercise heart rate and oxygen consumption values (Noble, Borg, Jacobs, Ceci & Kaiser, 1983). During the follow-up telephone interviews the Borg's scale was administered. While recalling their last 7-days' exercise, patients were asked to describe the exercise intensity, first in their own words and then using a rating from the Borg's scale (RPE) to estimate how hard they were working. The American College of Sport Medicine (ACSM, 1995) recommends a minimum of 30 minutes of continuous aerobic activity three times a week to achieve cardiorespiratory endurance. Thus, in the present study, adherers were classed as patients who had completed at least 90 minutes or more of either walking or any other aerobic activity over the last week at a moderate intensity.

The Exercise Motivation Scale (EMI-2; Markland & Hardy, 1997) measures broad reasons for exercising. It is a 51-item self-report questionnaire that asks participants to rate their personal motives for exercising using a 6-point Likert scale. The exercise participation motives were classed into the following subscales (number of items in brackets): Stress Management (4), Revitalisation (3), Enjoyment (4), Challenge (4), Social Recognition (4), Affiliation (4), Competition (4), Health Pressures (3), Ill-Health Avoidance (3), Positive Health (3), Weight Management (4), Appearance (4), Strength (4) and Nimbleness (3). The EMI-2 has satisfactory psychometric properties with support for the scale's internal consistency with the alpha coefficients ranging from .68 to .95 (Markland & Ingledew, 1997). The test-retest reliability coefficients ranged from .59 to .88 over a 4 to 5 week period

(Markland & Hardy, 1993). The EMI-2 was found to discriminate between men and women with respect to their exercise motives (Markland & Hardy, 1997).

Depression Anxiety Stress Scale (DASS; Lovibond & Lovibond, 1995) is a 21-item scale with three subscales and was used to assess depression, anxiety and stress. The depression subscale examines subjects' feelings of hopelessness, self-blame, lack of motivation, loss of pleasure and positive outlook on life. The anxiety subscale measures situational anxiety, autonomic arousal and bodily distress. The stress subscale assesses difficulty relaxing, agitation, irritability and impatience. The DASS was constructed to assess states rather than more stable personality traits. The DASS has excellent internal consistency with coefficients ranging from $r = .84$ to $r = .91$ for all scales (Brown, Chorpita, Korotitsch & Barlow, 1997). In the present study alpha coefficients were .91 for Anxiety and .92 for the Stress and Depression scales. Brown et al., (1997) used confirmatory factor analysis and found that the scale had a stable 3-factor structure over time.

Procedure

The study procedures were reviewed and approved by both the university and Area Health Service ethics committees. Nursing staff informed potential participants that the study was voluntary. Those who agreed to participate in the survey had the contents of the package explained to them in addition to receiving written information. The completed survey packages were sent to the researcher with the date of entry into the program. The follow-up data collection was conducted over the telephone between 3 months and 6 months (average 5 months) from completion of the program. The inventories were re-administered at follow-up as well as a structured interview that determined exercise adherence.

Results

Table 1 provides means and standard deviations for scales of the EMI-2 at entry to the hospital rehabilitation program (T1) and at 5-month follow-up. At a descriptive level health related motivations were highest at entry and 5-month follow-up. Health Pressures were the most important reasons the MI patients exercised at entry and again at follow-up. A series of paired *t*-tests were conducted to explore what changes in exercise motivation occurred from entry to follow-up. A Bonferroni adjusted alpha of $p < .004$ was used to control for Type-I error. *T* tests revealed that only stress management increased significantly from Time 1 to Time 2, $t(37) = -8.00$, $p < .001$. There were no other significant differences on any of the other EMI-2 scales but it is notable that 10 of the 14 scales showed small increases suggesting a trend toward increasing motivation. Mean scores of depression, anxiety and stress decreased from entry to follow-up but none of these differences reached significance, in part influenced by the high variability within the sample (reflected by the high *SDs*).

Rates of Exercise Adherence

There were moderate positive and significant correlations between the number of exercise sessions at CEAP and patient self-estimates of adherence at follow-up $r(38) = .33$, $p < .05$. Similarly, there was a positive and significant relationship between the number of exercise sessions at CEAP and the number of minutes of exercise at follow-up using the 7-day activity recall $r(38) = .35$, $p < .05$.

TABLE 1Pre-Post Means for the EMI-2 and DASS Scales at Entry and Follow-up ($n = 38$)

	Entry		Follow-up	
	M	SD	M	SD
EMI-2				
Ill health	4.34	1.21	4.49	1.00
Positive health	4.14	1.13	4.27	1.09
Health pressures	3.82	1.58	3.63	1.33
Strength	3.21	1.35	3.55	1.32
Nimbleness	2.82	1.58	3.36	1.71
Revitalisation	2.81	1.79	3.35	1.65
Weight management	3.20	2.04	3.07	1.90
Enjoyment	2.34	1.80	2.99	1.96
Stress management	2.54	1.60	2.97	1.76*
Challenge	1.81	1.63	2.01	1.66
Competition	1.29	1.68	1.61	1.73
Appearance	1.72	1.51	1.60	1.64
Affiliation	1.74	1.51	1.57	1.54
Social recognition	1.03	1.47	1.17	1.54
DASS				
Stress	11.55	10.90	10.68	12.76
Anxiety	8.04	9.36	7.32	9.51
Depression	7.80	10.15	7.26	10.10

Note. EMI-2 = Exercise Motivation Inventory — Version 2, DASS = Depression, Anxiety Stress Scale (21-item version).

* $p < .004$ Bonferroni correction used.

One of the main aims of the present study was to examine the varying rates of exercise adherence for MI patients attending CEAP. In order to classify the patients who adhered or did not adhere to the hospital program, attendance and performance measures were taken into account. Table 2 provides frequencies and percentages of patients who met the various definitions of adherence at entry and at follow-up. Patients who completed the pre and post exercise stress test, attended at least 10 sessions within CEAP, and improved their performance by 2 minutes or 3 METs were considered to have adhered to the CEAP hospital-based exercise program (see Table 2). Exercise adherence at 5-month follow-up was defined as the completion of at least 90 minutes of walking or other aerobic activity (see Table 2). Using attendance as the definition of adherence to the CEAP between 40% and 46% of participants adhered to the hospital based component of the exercise program. Of those who completed the pre and post program stress test (i.e., attended) between 65% and 91% showed improvements in performance measures. Table 2 suggests that those who participated in the follow-up survey also tended to be the same people who adhered to the CEAP program.

TABLE 2

Varying Measures of Adherence for the Cardiac Education Assessment Program (CEAP) at Entry and Follow-Up

Adherence Measures	Adherence Definitions	Entry		Follow-up	
Attendance	Completed pre and post program exercise stress test	23/50	46%	—	—
	≥ 10 sessions at CEAP	20/50	40%	—	—
Performance	≥ 2 minute improvement in stress test	21/23	91%	—	—
	≥ 3 MET improvement for stress test	15/23	65%	—	—
Self-report	Patient mean % estimate of adherence	—	—	—	62%
7-day activity recall	≥ 90 minutes of walking and equivalent aerobic activity* and completed CEAP	—	—	18/38	47%
	≥ 90 minutes of walking and equivalent aerobic activity	—	—	27/38	71%
	≥ 140 minutes of walking only	—	—	25/38	66%

Note: *Equivalent aerobic activity included: aerowalker, treadmill, bicycle riding, exercise bike, lawn bowls, tennis, swimming, gym and golf (Pate et al., 1995).

There were 30 participants who did not attend for 10 sessions of CEAP, of this group 9 (24%) were found to be exercising to a moderate degree. Of the 20 individuals who did attend 10 sessions of CEAP, 18 (90%) were exercising to a moderate degree at follow-up. For those individuals who completed the follow-up interviews, adherence to exercise routines was good with 71% exercising moderately at 5 months and 66% walking over 140 mins/week. Patient mean self-estimates of exercise adherence were only slightly lower on average than 7-day activity recall rates.

Relationship Between Psychological Distress and Exercise Adherence

It was expected that psychological distress and exercise motivation would be related to exercise adherence. The total DASS score and subscales were examined to assess whether they were related to various measures of exercise adherence (attendance, patient self estimates of adherence and minutes of exercise at follow-up).

There was a significant negative correlation between patient self-estimates of adherence and anxiety, $r(38) = -.34, p < .05$. In addition, the relationship between stress and self-estimates of adherence approached significance, $r(38) = -.32, p = .06$. The relationship between depression and exercise adherence also approached significance, $r(38) = -.33, p = .08$. For this sample higher levels of anxiety were associated with lower levels of exercise adherence.

Exercise Motivation and Psychological Distress as Predictors of Exercise Adherence

Two standard multiple regressions were used to predict exercise adherence with the total exercise motivation scores and psychological distress scores as independent variables. In the first regression, attendance at CEAP was used as the measure of adherence. Results indicate that psychological distress and exercise motivation at entry did not significantly predict adherence (attendance), $F(2, 38) = .21, p > .05$.

In the second regression patient self-estimates were used as the measure of adherence and again the regression was not significant, $F(2, 31) = 2.33, p > .05$, (and only accounted for 13% of the variance). Overall, exercise motivation and psychological distress at entry were not found to significantly predict attendance at CEAP or self-estimated exercise adherence at 5-month follow-up.

Discussion

One of the main aims of the present study was to examine the adherence to exercise therapy within the hospital and at follow-up. Results indicated an adherence rate between 40% and 46% within the hospital program dependent on the measure of attendance used. Ninety-one percent of those MI patients who completed the Cardiac Education and Assessment Program (CEAP), obtained functional improvement by the end of the program according to exercise test results (i.e., 2 minute improvement). These findings suggest that CEAP was effective for those MI patients who adhered to the program.

The results indicated that there was a high proportion of coronary patients who discontinued CEAP (60%). This suggests that rates of exercise nonadherence for the MI sample in the present study were relatively high compared to at least one review of randomised CR trials, where the rate of dropout was between 2% and 25% at 3 months (Bittner et al., 1993).

A secondary aim of the present study was to examine adherence rates after completing the hospital program to determine the number of MI patients who adhered to their exercise program when exercising relatively independently. Exercise adherence patterns at the 5-month follow-up were consistent with prior research with 47% exercising according to CEAP prescription and 66% of those interviewed walking every day. The findings were consistent with other reported rates of exercise nonadherence at 6-month follow-up (40%–50%, Bittner et al., 1993). When other forms of moderate exercise were included in addition to walking, the majority of the follow-up sample (71%) was conducting regular physical activity at the appropriate intensity.

In comparison to 7-day activity recall measures taken at follow-up, mean self-report percentage estimates were lower than expected. Interestingly, 24% of the sample was exercising at a moderate level at follow-up even though they had not completed the hospital program. This finding suggests that some MI patients may have incorporated exercise as part of their lifestyle and it is difficult to separate the effects of attending CEAP as other factors such as spouse support and self-efficacy may influence patients' choice to conduct regular exercise.

Results suggest that the same MI patients who attended CEAP were more likely to be adhering at 5-month follow-up. It appears that CEAP was effective for those patients who adhered to the hospital program and this may have bearing on adherence rates at follow-up. This finding also suggests that hospital programs should work hard to increase engagement in hospital based aspects of rehabilitation since these are likely to have flow-on effects for exercise and other lifestyle changes outside of the hospital setting. In particular, programs need to assess and build women's self efficacy for overcoming barriers to physical activity at an earlier stage in order to increase adherence (Blanchard, Rodgers, Corneya, Daub, & Knapik, 2002). Strategies might include assertive outreach services such as visits to patients' homes; help with transportation or

at a minimum telephone follow-up for missed appointments.

MI patients reported that their main motivations for exercising at entry to the cardiac rehabilitation program were Health Pressures, Ill Health, and Positive Health. All are consistent with the desire to recover from the effects of coronary heart disease. At 5-month follow-up the same health related reasons remained consistently high motivators (e.g., Ill Health, Positive Health, Health Pressures). There were relatively few changes in exercise motivation 5-months after entry to CEAP hospital program. Only Stress Management motivations increased significantly over time although most specific motivation domains showed small increments suggesting a tendency toward a general increase in all motivations. As expected the present results are supported by other studies, which found that MI patients are motivated to attend CR due to doctors' recommendation and wellness (Ades et al., 1992; Fluery, 1991). However, the results of the present study also suggest that it may be worth emphasising the stress management benefits of exercise once patients' complete hospital based programs since this may enhance motivation for sustained exercise at home.

While previous studies have found psychological distress is part of the normal emotional response following MI and tends to decrease over time (Blumenthal et al., 1982; Oldridge et al., 1994), in the present study these decreases were not significant. However, high variability in distress levels in this sample may have masked effects.

The hypotheses concerning the presence of a significant relationship between psychological distress and adherence during the hospital program and at 5-month follow-up was supported. The findings are consistent with those of other researchers who found that there was a relationship between psychological distress and adherence to cardiac rehabilitation (Blumenthal et al., 1982). Although no causal relationship can be determined by our data, it can be speculated that MI patients with higher anxiety may also have greater concern or worries related to conducting physical activity. If this is the case, they may limit their usual activities to prevent heart attack even when normal activity is medically acceptable. The implications for treatment may be to incorporate psychological treatment such as cognitive-behavioural therapy in addition to drug therapy and exercise regimens within CR programs. According to Blumenthal and Wei (1993) there is a need to increase the role of the psychologist in cardiac rehabilitation programs. Within Australian CR programs the role of psychologists and other rehabilitation counselors has been limited and also varies considerably within European CR programs (Briffa et al., 1993; Maes, 1992).

The main limitation of the present study was the relatively small sample size although this is a clinical sample, which presents its challenges in obtaining a large sample size. Psychological distress and exercise motivation did not predict adherence to CR but this might have been influenced by the relatively small sample size. The present study was also limited by the response rate during the pre-test, which was 50%. This response rate was lower than similar studies that reported response rates up to 82% to 84% (Gale, Eckhoff, & Rodnick, 1984; Oldridge et al., 1983). This may reflect the relatively high number of patients who attend CEAP having English as a second language. However, the response rate during the posttest follow-up (76%) was good compared to other studies that report response rates between 33% and 52% (Gale et al., 1984; Oldridge & Streiner, 1990).

Rates of exercise adherence appear to be variable and there is a lack of consistency in definitions (Robinson et al., 1994). This inconsistency is exacerbated

further by the variability in defining 'moderate' exercise, which is often part of the adherence criteria (Dubbett, 1992; Pate et al., 1995). The increased use of electronic activity monitors may increase the reliability in assessing moderate intensity physical activity in the future. Electronic activity monitors could be used to validate self-report data such as the 7-day activity recall interview method (Sallis & Owen, 1999). In addition, there are different information sources for monitoring exercise adherence such as health care professional observation versus patient self-report (Sljuis & Knibbe, 1992). There are a wide variety of exercise program settings (e.g., outpatient versus unsupervised programs at home or community based settings) (Sallis & Owen, 1999), which may also lead to variations in results between settings. Julkunen and Saarinen (1994) add that 'One problem for both research and clinical practice is the diversity of available measurement techniques for assessment of the factors ... Due to this, comparison and evaluation of results from different research centres is quite difficult' (p. 69).

The results from this study suggest a need to obtain multiple measures of adherence until such time as standardised or accepted protocols are established. Towards this end there is a need for peak bodies in Australia such as the National Heart Foundation and the Australian Cardiac Rehabilitation Association to develop policy statements on key performance indicators for cardiac rehabilitation outcomes and to provide guidelines for a national database in order to standardise adherence measures for service providers.

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