An Exercise and Education Program Improves Well-Being of New Mothers: A Randomized Controlled Trial

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Objective. The purpose of this study was to evaluate the effect of a physical therapy exercise and health care education program on the psychological well-being of new mothers.

Design. This was a randomized controlled trial.

Participants. Primiparous and multiparous English-speaking women ready for discharge from The Angliss Hospital postnatal ward were eligible for this study. Women who were receiving psychiatric care were excluded. One hundred sixty-one women were randomized into the trial.

Intervention. The experimental group (n=62) received an 8-week “Mother and Baby” (M&B) program, including specialized exercise provided by a women’s health physical therapist combined with parenting education. The other group (education only [EO], n=73) received only the same educational material as the experimental group.

Main Outcome Measures. Psychological well-being (Positive Affect Balance Scale), depressive symptoms (Edinburgh Postnatal Depression Scale), and physical activity levels were assessed at baseline, after 8 weeks (post-program), and then 4 weeks later.

Results. There was significant improvement in well-being scores and depressive symptoms of the M&B group compared with the EO group over the study period. More specifically, there was a significant positive effect on well-being scores and depressive symptoms at 8 weeks, and this effect was maintained 4 weeks after completion of the program. The number of women identified as “at risk” for postnatal depression pre-intervention was reduced by 50% by the end of the intervention.

Limitations. Although this study provides promising short-term (4-week) outcomes, further work is needed to explore whether the intervention effects are maintained as sustained psychological and behavioral benefits at 6 months.

Conclusions. A physical therapy exercise and health education program is effective in improving postnatal well-being. Routine use of this program may reduce longer-term problems such as postnatal depression.
Giving birth involves many changes in a woman’s physical, emotional, and social health. Increased levels of sex hormones cause laxity of ligaments and muscles to prepare a woman’s body for the growing baby and birth process. This laxity makes certain movements and physical tasks difficult and uncomfortable. Major changes of both hormonal and social origin occur with pregnancy and continue into the postnatal period. Decisions regarding career and when to finish work, as well as factors such as relationships, sleep deprivation, and the availability of support from family and friends can affect a woman’s self-esteem and perception of herself as a new mother and influence her parenting ability.¹

Postnatal depression (PND) is a major health issue affecting up to 13% of all new mothers throughout the world, with most cases commencing in the first 3 months of the postnatal period.² Postnatal depression is thought to evolve from neuroendocrine changes, such as pregnancy stress, and personality predisposition, as well as a combination of many other factors.³ Yet its duration is thought to be determined more by sociocultural factors such as self-esteem of the mother, the childbirth experience, and the availability of support and local services.¹

It has been suggested that a multidisciplinary treatment approach should be taken to manage and reduce the risk for PND.¹ Group physical therapy exercise programs may assist in the management of this condition through a mixture of social support and the effects of exercise. The literature also suggests that future trials must determine which approaches will be most successful, cost-effective, and feasible to implement in the wider community.⁴ However, to date there have been no randomized controlled trials (RCTs) evaluating the benefits of group physical therapy exercise approaches to improve psychological health outcomes of women postnatally.

The Mother and Baby (M&B) Program was developed in the Physiotherapy Department of The Angliss Hospital and has been delivered regularly for the past 7 years. The program was developed in response to a Women’s Health Strategy developed by the Victorian Government’s Department of Human Services over the period 2001 to 2004, which identified a large number of isolated new mothers in Melbourne’s Outer East. It comprises an 8-week program of 1 hour of group physical therapy exercise with mothers and their babies and a 30-minute education session delivered by health care professionals.

In this article, we report on an RCT evaluating the benefits of the M&B Program on the psychological health outcomes of postnatal women. We hypothesized that women participating in the M&B Program would have higher well-being scores and lower risk for postnatal depression compared with women who were not participating in the program. Such a program is feasible to deliver and, if shown to be effective in reducing the risk for PND, it would make a significant contribution to the health of new mothers.

**Method**

Ethics approval for this study was obtained from the institutional review boards at The Angliss Hospital and the University of Melbourne, and all participants gave informed consent.

**Design Overview**

This study was an RCT investigating the effect of the M&B Program, commencing at 6 to 10 weeks postpartum, on the psychological well-being of new mothers.

**Setting and Participants**

Recruitment for the study was conducted between June 2005 and June 2006. All primiparous and multiparous women ready for discharge from The Angliss Hospital postnatal ward and who spoke and read English independently were invited to participate, regardless of the type of delivery. Women were excluded if they had a diagnosis of a psychiatric disorder medicated and managed by a general practitioner or a psychiatrist or if they needed hospitalization. The CONSORT flowchart (Figure) shows the details of the study.

**Randomization and Interventions**

Women were assigned randomly to either the M&B group or the EO group using a computer-generated random numbers list. Allocation was managed by one of the researchers (M.P.G.) and stratified according to parity (primiparous or multiparous) in blocks of 16 participants. Group allocation was concealed in consecutively numbered, sealed, opaque envelopes that were opened by the physical therapist conducting the M&B Program. Due to the nature of the intervention, blinding of participants was not possible.

The EO group received written educational material mailed to them every week over 8 weeks. Education topics covered baby massage, nutrition for mothers, introducing solids,
adjusting to a new lifestyle, communicating with the baby, sun care for the baby, and play development. Contact details of health care personnel also were included in this written information.

The M&B Program was conducted once per week for 8 weeks at The Angliss Hospital. Each week, women undertook 1 hour of group exercise with their babies, facilitated by a physical therapist, which involved cardiovascular and strength components. Each of the 8 exercise sessions was adapted for each woman depending on the type of delivery and her recovery. Participants also had a 30-minute education session delivered by health care professionals, including physical therapists, dietitians, speech pathologists, health psychologists, and midwives. In addition, the M&B group received the same written educational material as the EO group. In the last week of the program, all the speakers and the women and their babies gathered together for afternoon tea. Both groups received a booklet containing diagrams of all the exercises provided over the course of the program, as well as a list of local gyms and community resources to assist them in continuing their exercise at home.

Outcome Measures and Follow-up
All participants completed questionnaires at 6 to 10 weeks postpartum (baseline), at the end of the intervention (8 weeks from baseline), and then 4 weeks following the intervention (12 weeks from baseline). The questionnaire booklet contained a well-being scale (the Positive Affect Balance Scale [PABS]), a depression scale (Edinburgh Postnatal Depression Scale [EPNDS]), and questions regarding the amount of physical activity (minutes per week) undertaken.

The primary outcome measure was the PABS. This 10-question scale indicates psychological reactions (positive and negative) of people in the general population to events in their daily lives. The scale is described as an indicator of an individual's ability to cope with the stresses of everyday living, and the “positive affect” questions in particular have demonstrated a relationship with social participation, satisfaction with social life, and engagement in activities. Responses to the questions, which are
made according to a 3-point scale of “never,” “sometimes,” or “often,” reflect experiences in the previous week. A positive affect score, a negative affect score, and a total affect balance score can be calculated. This study used the positive affect score (ranging from 5 to 15), with 15 being the maximum (most positive) score. The components of this total positive score include feeling “excited or interested,” “proud,” “pleased to accomplish,” “on top of the world,” and “things were going your way.” This scale is a reliable measure of psychological well-being.6

The secondary outcome measures were the EPND$^{7}$ and amount of physical activity. The EPND$^{7}$ is specifically used for the screening of postnatal depression risk factors.7 It consists of 10 questions, with responses on a 4-point scale. Women are asked to circle the response that most closely represents how they have felt over the previous 7 days. A score of 13 or more generally is used internationally as a cutoff for depressive symptoms and the need for further investigation regarding PND.5,7 This scale is not a diagnostic tool; rather, it identifies risk factors for postnatal depression. It was selected for the study because it is the only outcome measure available to screen women in the postnatal period. It was not used as a primary outcome measure because the main purpose of the study was to measure women’s psychological well-being in the postnatal period, not postnatal depression. However, improving women’s psychological well-being, in turn, might reduce the risk for postnatal depression (ie, lead to lower scores on the EPND$^{7}$).

Three questions were asked of the women regarding type, duration, and frequency of physical activity they undertook at baseline, 8 weeks, and 12 weeks of the study period. These questions were based on the American College of Sports Medicine and American Heart Foundation’s most recent exercise guidelines, which recommend that the average adult who is healthy should participate in 30 minutes of moderate-intensity aerobic exercise 5 times weekly and 8 to 10 strength training exercises with 8 to 12 repetitions of each exercise twice weekly.8 The total duration of formal physical activity per week was determined (minutes per week) and compared between the 2 groups across the 3 time periods. The questionnaire booklet was identified by a code number for each participant to conceal group allocation from the researcher (E.N.) who undertook the scoring.

Data Analysis
A sample size calculation based on a pilot study of the M&B Program indicated that a total of 134 participants would be sufficient to detect a clinically important difference of 1.3 units on the PABS with 80% power and an alpha level of .05. All data were analyzed using SPSS software, version 11.5.* Data were examined for deviation from normal distribution. Analysis was by intention-to-treat. The PABS and EPND$^{7}$ scores and amount of exercise for both groups were compared over the 3 time periods using a mixed-model analysis of covariance, with group as a between-subjects factor, time as a within-subjects factor and baseline score, and parity and age as covariates. Linear regression was used to examine the factors predicting PABS and EPND$^{7}$ scores. Nonparametric tests were used for other analyses. Imputation of missing data at follow-up was by last observation carried forward.

Role of the Funding Source
The Angliss Hospital and the University of Melbourne provided financial support for the provision of the M&B Program and statistical advice.

Results
Recruitment for the study was conducted between June 2005 and June 2006. One hundred sixty-one women were randomly assigned to either the M&B group or the EO group (Figure). The demographics of the cohort are shown in Table 1. Eighteen women assigned to the M&B group and 8 women assigned to the EO group did not receive the allocated intervention for the reasons outlined in Table 2. These participants were not included in the analysis. The remaining participants who commenced the intervention (M&B group, n = 62; EO group, n = 73) were all included in the analysis, including those who dropped out at 8 weeks (n = 3) and 12 weeks (n = 2) (Figure). There were no adverse events. The overall dropout rate for those commencing the study was 3.7%.

There was a significant between-group difference in PABS scores over time. Post-hoc t tests showed a significant difference between baseline and 8 weeks, but not between 8 and 12 weeks, indicating that PABS scores remained relatively stable for both groups over this time period (Tab. 3).

Comparison of the EPND$^{7}$ scores over the time periods revealed a significant main effect, with the women in the M&B group showing a reduced risk for PND over time. There was no significant change in EPND$^{7}$ scores between 8 and 12 weeks (Tab. 3).

At baseline, the proportion of women who were at risk for depression, as indicated by a score of 13 or more on the EPND$^{7}$, was 22% in the
M&B group and 16% of the EO group. After the 8-week program, the proportion of women in the M&B group with an increased risk for depression was reduced by 50% to 11%, whereas in the percentage in the EO group remained unchanged.

There was no significant difference in the amount of formal exercise undertaken by the 2 groups at baseline, and this did not change over time (Tab. 3). For all outcome measures, there were no significant effects of age or parity.

The PABS scores at baseline, the amount of exercise performed at 8 and 12 weeks, and group membership all independently contributed to the prediction of the PABS scores at 8 weeks and 12 weeks. A greater amount of exercise at 8 weeks and 12 weeks, higher baseline PABS scores, and membership in the exercise group were all significantly associated with higher PABS scores, and accounted for 47% (46% adjusted) and 54% (53% adjusted) of the variance in PABS scores.

The EPNDS scores at baseline and group membership, but not the amount of exercise performed at 8 weeks or 12 weeks, independently contributed to the prediction of the EPNDS scores at 8 and 12 weeks. Higher baseline EPNDS scores and membership of the M&B group were significantly associated with greater EPNDS scores, and accounted for 55% (54% adjusted) and 52% (50% adjusted) of the variance in EPNDS scores.

Discussion
This study is the first RCT to investigate the effects of group physical therapy exercise and health care education on new mothers’ well-being

Table 1.
Demographics of “Mother and Baby” (M&B) Program Group (n=62) and Education Only (EO) Group (n=73) at Baseline

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>M&amp;B Group</th>
<th></th>
<th>EO Group</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean (SD)</td>
<td>Range</td>
<td>Mean (SD)</td>
<td>Range</td>
</tr>
<tr>
<td>Mother’s age (y)</td>
<td>29.3 (4.0)</td>
<td>20–41</td>
<td>30.1 (3.3)</td>
<td>17–39</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>73.4 (14.8)</td>
<td>50–125</td>
<td>71.0 (13.2)</td>
<td>52–110</td>
</tr>
<tr>
<td>Baby’s age (wk)</td>
<td>7.3 (1.3)</td>
<td>6–10</td>
<td>8.0 (1.5)</td>
<td>6–10</td>
</tr>
<tr>
<td>Age of oldest child (y)</td>
<td>1.2 (2.7)</td>
<td>0–15</td>
<td>1.7 (3.1)</td>
<td>0–14</td>
</tr>
<tr>
<td>Primiparous</td>
<td>42 (68)</td>
<td></td>
<td>46 (63)</td>
<td></td>
</tr>
<tr>
<td>Cesarian birth</td>
<td>34 (55)</td>
<td></td>
<td>27 (37)</td>
<td></td>
</tr>
<tr>
<td>Vaginal birth</td>
<td>28 (45)</td>
<td></td>
<td>46 (63)</td>
<td></td>
</tr>
<tr>
<td>Homemaker</td>
<td>14 (22)</td>
<td></td>
<td>19 (26)</td>
<td></td>
</tr>
<tr>
<td>Student</td>
<td>0 (0)</td>
<td></td>
<td>2 (3)</td>
<td></td>
</tr>
<tr>
<td>White collar</td>
<td>24 (39)</td>
<td></td>
<td>21 (29)</td>
<td></td>
</tr>
<tr>
<td>Blue collar</td>
<td>24 (39)</td>
<td></td>
<td>31 (42)</td>
<td></td>
</tr>
<tr>
<td>Full-time</td>
<td>1 (2)</td>
<td></td>
<td>1 (1)</td>
<td></td>
</tr>
<tr>
<td>Part-time–casual</td>
<td>4 (6)</td>
<td></td>
<td>6 (8)</td>
<td></td>
</tr>
<tr>
<td>Maternity leave</td>
<td>36 (58)</td>
<td></td>
<td>34 (47)</td>
<td></td>
</tr>
<tr>
<td>Unemployed</td>
<td>21 (34)</td>
<td></td>
<td>32 (44)</td>
<td></td>
</tr>
</tbody>
</table>

*Significant at P<.05.

Table 2.
Reasons for Not Commencing the Allocated Intervention

<table>
<thead>
<tr>
<th>Never Commencing Intervention</th>
<th>M&amp;B Group (n=18)</th>
<th>EO Group (n=8)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baby unwell</td>
<td>n=2</td>
<td>n=1</td>
</tr>
<tr>
<td>Unable to be contacted</td>
<td>n=5</td>
<td>n=7</td>
</tr>
<tr>
<td>Moving or going overseas</td>
<td>n=5</td>
<td></td>
</tr>
<tr>
<td>Too busy with other children</td>
<td>n=6</td>
<td></td>
</tr>
</tbody>
</table>

*M&B=“Mother and Baby” Program, EO=education only.
and their risk for PND. Previous studies have shown that general exercise improves mood states in younger\(^9\) and older women,\(^10\) improves well-being,\(^11\) and leads to a reduction in depressive symptoms in mothers diagnosed with PND.\(^12\) No clinical trials to date have been conducted postnatally in women who are healthy, nor has the effect of a physical therapy exercise program been investigated.

This RCT has shown that the M&B Program, comprising education plus exercise, resulted in a greater improvement in mothers’ well-being than an education-only intervention. A significant reduction in maternal symptoms of depression and, therefore, a decreased number of women at risk for PND also were observed. The proportion of women who were at risk for depression, as measured by the EPNDS (22% of the M&B group; 16% of the EO group) is similar to the prevalence rate of PND internationally (10%–20%).\(^3\) Neither

<table>
<thead>
<tr>
<th>Time</th>
<th>M&amp;B Group (n=62)</th>
<th>EO Group (n=73)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(\bar{X} (SD), 95% CI)</td>
<td>(\bar{X} (SD), 95% CI)</td>
<td></td>
</tr>
<tr>
<td>Positive Affect Balance Scale</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline</td>
<td>10.72 (2.19), 10.10–11.24</td>
<td>10.67 (2.17), 10.16–11.21</td>
<td>.007*</td>
</tr>
<tr>
<td>8 weeks</td>
<td>11.82 (2.08), 11.24–12.37</td>
<td>10.47 (2.26), 9.96–11.01</td>
<td>.580*</td>
</tr>
<tr>
<td>12 weeks</td>
<td>11.93 (2.31), 11.38–12.45</td>
<td>10.49 (1.91), 10.01–11.01</td>
<td></td>
</tr>
<tr>
<td>Edinburgh Postnatal Depression Scale</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline</td>
<td>8.00 (6.16), 6.54–9.57</td>
<td>6.75 (5.44), 5.32–8.08</td>
<td>.0001*</td>
</tr>
<tr>
<td>8 weeks</td>
<td>5.47 (5.11), 4.19–6.92</td>
<td>6.75 (5.51), 5.42–7.95</td>
<td>.0001*</td>
</tr>
<tr>
<td>12 weeks</td>
<td>4.73 (5.27), 3.49–6.23</td>
<td>6.54 (5.61), 5.03–7.59</td>
<td>.194*</td>
</tr>
<tr>
<td>Physical activity (minutes per week)</td>
<td></td>
<td></td>
<td>.87</td>
</tr>
<tr>
<td>Baseline</td>
<td>165 (168), 121–209</td>
<td>141 (148), 106–176</td>
<td></td>
</tr>
<tr>
<td>8 weeks</td>
<td>188 (126), 156–221</td>
<td>154 (153), 118–191</td>
<td></td>
</tr>
<tr>
<td>12 weeks</td>
<td>176 (110), 147–205</td>
<td>155 (173), 114–196</td>
<td></td>
</tr>
</tbody>
</table>

\(*\) CI = confidence interval.

\(^*\) Analysis of covariance (ANCOVA) adjusted for baseline score, age, and parity: significant main effect \((F_{1,134} = 18.065, P = .001); *\)significant between-group effect \((\text{post hoc } t \text{ test: baseline vs 8 weeks}); ^*\)nonsignificant between-group effect \((\text{post hoc } t \text{ test: 8 weeks vs 12 weeks}).

\(^*\) ANCOVA adjusted for baseline score, age, and parity: significant main effect \((F_{1,134} = 12.688, P = .0001); *\)significant between-group effect \((\text{post hoc } t \text{ test: baseline vs 8 weeks}); ^*\)nonsignificant between-group effect \((\text{post hoc } t \text{ test: 8 weeks vs 12 weeks}).

\(^*\) ANCOVA adjusted for baseline score, age, and parity: nonsignificant main effect \((F_{1,134} = 0.14, P = .87). \)

The mothers’ age nor the number of children affected the findings. Surprisingly, there was no significant difference in the amount of exercise performed by the 2 groups. Importantly, the analyses suggest that a higher level of physical activity at 8 weeks was associated with increased psychological well-being, irrespective of the group to which the women were allocated. However, being part of the intervention group was predictive of increased well-being and reduced depression scores, regardless of the amount of physical activity.

Sampselle et al\(^13\) reviewed the benefits of physical activity on the psychological well-being of women postnatally. Although they did not conduct a clinical trial, their interviews suggested that women who were more active reported more satisfaction with motherhood and with their partners. These observations are supported by reports that a single session of exercise can result in both an increase in positive mood states (eg, feeling positive, more energetic, happy and more refreshed) and a decrease in negative mood states (eg, tension, anxiety, confusion).\(^11,14\) These results are consistent with the findings of our study.

In the general population, aerobic exercises (eg, walking, running, cycling, swimming) have a stronger effect on mood than anaerobic activities (eg, weight training).\(^11,14\) Specific guidelines on how exercise can affect well-being in different populations, including in women postnatally, have been lacking. In our study, the physical therapy exercise component of the M&B Program included both modified aerobic and anaerobic components every week during the program. The women in the M&B Program reported that the physical activity they undertook separately from the intervention was aerobic in nature, such as walking, cycling, and swimming.
Offering all women specific physical therapy exercises and advice has been recommended to assist them with recovery from giving birth.\textsuperscript{13} Although all women participating in the study were taught pelvic-floor exercises as part of routine postnatal care, the M&B Program provided an opportunity for participants to have individualized instruction on pelvic-floor exercises if they requested it. The program also included information on good bladder and bowel habits, assessment of and appropriate exercise for abdominal muscles, and upper- and lower-body strengthening exercises to assist mothers with picking up other children and performing household tasks. All of these components may contribute to the effectiveness of, and adherence to, such a program.\textsuperscript{15}

The M&B Program is consistent with recommendations given to general practitioners to prescribe exercise to patients with depression. Nicoloff and Schwenk\textsuperscript{16} suggested that supervision, positive reinforcement, and feedback were important, especially early in the exercise program. The excellent program adherence (more than 85%) and the very low dropout rate from the M&B Program demonstrate that it was feasible for the mothers to attend. Moreover, many participants wrote thank-you notes indicating that they enjoyed the sessions and were still continuing to meet with other participants in their group on a social basis. Although parity was not a factor in the effectiveness of the program, the provision of child care would make it easier for women with more than one child to attend. The physical therapist emphasized the importance of exercise every week and the mothers had the opportunity to develop social networks with other new mothers while exercising. Although these factors are most likely to be important elements of this effective intervention, it was not possible to determine which component of the M&B Program had an effect on well-being. Other studies involving exercise such as pram (stroller) walking have found the social interaction in such groups to be effective for new mothers.\textsuperscript{17–19} However, pram walking exercise programs have been shown to improve fitness levels and reduce depression symptoms in women with PND significantly more than social support alone.\textsuperscript{12} In our study, the proportion of women in the M&B group with an increased risk for depression (22%) was reduced by 50% after 8 weeks to 11%. The size of this effect is similar to that found by Hiscock and Wake,\textsuperscript{20} who used a behavioral infant sleep intervention to improve infant sleep and maternal mood.

In this study, the M&B group had 18% more cesarean deliveries than the EO group yet still showed a significantly greater increase in well-being. Despite earlier reports that cesarean delivery was associated with increased risk of postnatal depression, a recent study by Patel et al\textsuperscript{21} showed that this was not the case.

Reducing the risk of depressive symptoms in new mothers is important, considering that only approximately 25% of PND cases are reported and 63% may be treated as late as 1 year postpartum.\textsuperscript{3} All of the mothers in this study had had their babies 6 to 10 weeks prior to participating in the study, which is the most common time for symptoms of mild PND to occur.\textsuperscript{3} Thus, the program was conducted at the most relevant period for these women, when they were most vulnerable to developing PND.

The M&B intervention provided by health care professionals offers a potentially cost-effective way of improving the well-being of new mothers and of assisting those with depressive symptoms by providing an opportunity for these mothers to develop social networks. This intervention could be implemented immediately by appropriate professionals in an outpatient setting or community health center at very little cost.

The M&B Program could help to manage the stigma associated with PND and perhaps prevent PND in those women who may be at risk.\textsuperscript{22} Armstrong and Edwards\textsuperscript{12} found that participants with PND symptoms in their pram walking programs preferred to be with women who were going through similar difficulties, as the group understood their situation. Future studies measuring depressive symptoms at baseline and establishing the effectiveness of exercise interventions similar to the M&B Program on women with depressive symptoms and over a longer period of time would complement these findings.

**Conclusions**

This rigorous RCT has shown that in a cohort of postnatal women attending a maternity service, the combination of exercise, supervised by a physical therapist, and face-to-face health care education can improve the well-being of new mothers and reduce the risk for PND. The findings of this study can be generalized to similar groups of women who are healthy and attending a typical maternity service.

Ms Norman, Dr Osborne, and Dr Galea provided concept/idea/research design, writing, and data analysis. Ms Norman provided data collection, participants, and facilities/equipment. Ms Norman and Dr Galea provided project management. Dr Galea provided fund procurement and clerical support. Ms Norman, Dr Sherburn, and Dr Galea provided institutional liaisons. All authors provided consultation (including review of manuscript before submission).

Ethics approval for this study was obtained from the institutional review boards at The
Angliss Hospital and the University of Melbourne.

This work was presented at the National Conference of the Australian Physiotherapy Association; October 4–11, 2007; Cairns, Queensland, Australia.

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Trial registry: National Institutes of Health.
Trial register number: NCT00361478.

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