Exercise reduces the intensity and prevalence of low back pain in 12–13 year old children: a randomised trial

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Question: Does an eight-week exercise program reduce the intensity and prevalence of low back pain in 12–13 year old children? Does it decrease the childhood physical risk factors for low back pain and promote a sense of well-being? **Design**: Randomised trial with concealed allocation and assessor blinding. **Participants**: Seventy-two 12–13 year old children, who had complained of low back pain in the past three months. **Intervention**: The experimental group completed eight exercise classes of 40–45 minutes duration over eight weeks conducted by a physiotherapist, whilst the control group received no intervention. **Outcome measures**: The primary outcome was pain intensity measured on a 10-cm visual analogue scale. Secondary outcomes included 3-month prevalence of pain, childhood physical risk factors for low back pain, and sense of well-being. Measures were taken at baseline (Month 0), post-intervention (Month 3), and three months later (Month 6). **Results**: Pain intensity over the past month had decreased by 2.2 cm (95% CI 1.0 to 3.5) more for the experimental group than the control group at Month 3 and was still 2.0 cm (95% CI 0.5 to 3.5) less than the control group at Month 6. The absolute risk reduction for 3-month prevalence in low back pain in the experimental group was 24% (95% CI 4 to 41) compared with the control group at Month 3, and 40% (95% CI 18 to 57) at Month 6. There were also statistically-significant between-group differences in neural mobility. **Conclusion**: Exercise is effective in reducing the intensity and prevalence of low back pain in children. **Trial registration**: Clinical trials NCT00786864. **[Fanucchi GL, Stewart A, Jordaan R, Becker P (2009) Exercise reduces the intensity and prevalence of low back pain in 12–13 year old children: a randomised trial. *Australian Journal of Physiotherapy* 55: 97–104]**

Key words: Randomised controlled trial, Low back pain, Exercise, Children, School, Prevalence, Rehabilitation, Physiotherapy

Introduction

The high prevalence of low back pain during childhood and adolescence has been well documented (Burton et al 2004). A large epidemiological study in the Northern Gauteng district of South Africa, established a lifetime (cumulative) prevalence of 53%, one-year prevalence of 50%, and point prevalence of 15% in South African adolescents (Jordaan et al 2005). These findings are similar to those of studies carried out in other countries (eg, Watson et al 2002).

The severity of low back pain, as well as associated activity limitations, medical costs, and work loss, increases with age (Hestbaek et al 2006b, Wasiak et al 2006). In addition, low back pain at an early age is a strong predictor of low back pain in later life, independent of age and gender (Harreby et al 1995, Hestbaek et al 2006a). Although the prevention of low back pain has been investigated extensively in the adult population, the prevalence of low back pain remains very high. Therefore, it appears counterproductive to postpone prevention and intervention until the problem becomes severe, chronic, and more difficult to treat (Hestbaek et al 2005b). Hence, numerous authors have proposed that prevention needs to target a younger population, ideally before the first onset or at the first onset of low back pain (Burton et al 2004, Cardon and Balagué 2004). However, there is very little information available about the prevention of low back pain in children. As a result, there is insufficient evidence available to formulate evidence-based guidelines for the prevention of low back pain during childhood and adolescence (Cardon and Balagué 2004, Steele et al 2006).

In contrast, prevention of low back pain in adults has been investigated extensively. There is strong evidence to indicate that programs which incorporate information, advice, and education alone, are not successful in preventing low back pain in adults (Burton et al 2004). In contrast, there is strong evidence to indicate that exercise is successful in preventing low back pain (Ferreira et al 2006, Hayden et al 2005), in particular, exercise which focuses on improving spinal and pelvic stability (Ferreira et al 2006).

Only one study has investigated the efficacy of exercise in preventing low back pain in children. Jones et al (2007) conducted a randomised trial to evaluate the efficacy of an 8-week exercise program in reducing the recurrence of low back pain in adolescents. This study found that involvement in an exercise program appears to provide benefits, namely the reduction of pain intensity and childhood physical risk factors for low back pain (Jones et al 2007). During periods of rapid growth, the body is very susceptible to stresses placed on it (Grimmer and Williams 2000). Considering that the peak onset of low back pain is between 12 and 14 years, it appears that the onset of low back pain is related to the growth spurt in children, when the rapidly growing spine is sensitive to excessive loads (Grimmer and Williams 2000, Jordaan et al 2005). It can thus be hypothesised that, during the adolescent growth spurt, specific stabilising exercises and stretches could place positive 'stresses' on the body, and so promote better development of the deep muscular stabilising mechanism and correct alignment of the spine. Furthermore, it can be hypothesised that a well-functioning stabilising system in children could protect the body against the repetitive loads placed on it during normal physical activity and activities of daily living.

Despite years of research directed at the prevention of low back pain in adults, the incidence remains high and the need for early intervention has been identified. However, there is limited evidence about the efficacy of exercise as prevention for low back pain during childhood. Therefore the research questions for this study were:

1. Does an eight-week exercise program reduce the intensity and prevalence of low back pain in 12–13 year old children?
2. Does it decrease the childhood physical risk factors for low back pain and promote a sense of well-being?

Method

Design

A randomised trial was conducted. In January 2007, all of the children in Grade 6 and Grade 7 from two government primary schools in the Ekhuruleni West District of Gauteng, South Africa, were invited to participate. Children who complained of back pain in the previous three months were assigned to an experimental or a control group by concealed random allocation, using computer generated randomisation numbers. The random number lists were given to the class teacher who then allocated children. The experimental group received an 8-week exercise program while the control group received no intervention. Measurements were taken at baseline (Month 0), post-intervention (Month 3), and three months later (Month 6). One author (GF) took all of the measurements. She was blinded to group allocation, as well as to previous measurements at each follow-up.

Participants

Children were included if they were: aged 12–13 years, in Grade 6 or Grade 7, and had complained of low back pain in the past three months. They were excluded if they: had serious spinal pathologies or deformities (eg, severe scoliosis, spinal tumours); had neurological conditions which alter motor tone; physical disabilities (eg, spinal cord injuries) which prevented them from being able to stand up on their own without an orthotic device or brace, or from taking part in normal physical education classes; had any other serious co-morbidities (eg, cancer, severe lung pathology), were provincial sports participants, were currently following a specific training program with a biokineticist or physiotherapist, were undergoing current orthopaedic procedures or had fractures of the spine, pelvis, lower or upper limbs.

Intervention

The experimental group participated in an 8-week exercise program during school hours (see Appendix 1 on the eAddenda for detailed information of the intervention). The exercise program consisted of eight classes of 40–45 minutes duration. The program was initiated with a 10–15 minute educational session. A physiotherapist discussed the importance of the exercises which the children would be doing and how the exercises related to their low back pain. A simplified explanation of the core musculature, correct posture, and spinal alignment was also included. These principles were reinforced throughout the program. The exercise program was based on exercises which have been shown to be effective in the prevention of low back pain in adults (Akuthota and Nadler 2004, Arokoski et al 2004, Koumantakis et al 2005a, Urquhart et al 2005). The classes were structured to limit disturbances and time delays, which would be caused by the children changing positions frequently and moving around excessively. The exercises were progressed steadily over the eight weeks. The experimental group also received a weekly home exercise program which included exercises that had been taught in the class.

The control group received no intervention, ie, they did not attend the exercise classes nor did they take part in the home exercise program. Both groups continued with their normal physical education classes, sports, and physical activity.

Outcome measures

The primary outcome was pain measured with a 10-cm visual analogue scale. The visual analogue scale has been shown to be a valid and reliable measure in this age group. The standard 10-cm line was used. A smiling face, together with the numeral '0' and the wording 'no pain at all' and 'no discomfort' were placed at the beginning of the line. A sad face, with the numeral '10' and the wording 'worst pain you can imagine' and 'very uncomfortable' were placed at the end of the line (Sherman et al 2006).

Secondary outcomes were prevalence of low back pain, physical risk factors for low back pain, and sense of well-being. Three month prevalence of low back pain was determined by asking standardised questions about the presence of pain or discomfort in the lower part of the back (Jordaan et al 2005; Watson et al 2002). (See Appendix 1 on the eAddenda for detailed information on the outcome measures.)

Physical risk factors for low back pain consisted of insufficient lumbar stability, decreased neural mobility, decreased muscle length and impaired lumbosacral proprioception (Burton et al 2004). Lumbar stability was measured using the active straight leg raise test as described by Jull et al (1993) to assess the integrity of the lumbar stabilising muscles in transferring loads to the lumbar spine. Neural mobility was measured using the passive straight leg raise test as described by Butler (1991). Length of the hamstrings, iliopsoas and rectus femoris muscles was measured using standard muscle length tests as described by Kendall et al (1993) and Bandy and Irion (1994). Lumbosacral proprioception was measured as described by Brumagne et al (2000). Standard equipment was used for the physical measurements[(a)].

Sense of well-being was measured using the Mental Health Inventory-5 (Rumpf et al 2001). Scores can range between 5 and 30, with scores greater than 24 indicating psychosocial well-being and an absence of psychological distress. Two face scales were also included, to determine how the child felt about school and life in general (Jordaan et al 2005). Scores could range between 1 and 6, with scores of greater than 5 indicating happiness, and scores of less than 3 indicating sadness.

All of the outcome measures have been shown to be both valid and reliable in children in this age group (Bandy and Irion 1994, Brumagne et al 2000, Butler 1991, Jordaan et al 2005, Jull et al 1993, Kendall et al 1993, Rumpf et al 2001, Sherman et al 2006, Watson et al 2002). Groups of questions from various questionnaires, which have been shown to be valid and reliable in this age group, were combined to meet the study's requirements (Jordaan et al 2005, Rumpf et al

Table 1. Baseline characteristics of participants and schools.

Characteristic	Participants			
	Randomised (n = 72)		Lost to follow-up (n = 2)	
	Exp (n = 39)	Con (n = 33)	Exp (n = 1)	Con (n = 1)
Participants				
Age *(yr)*, mean (SD)	12 (0.7)	12 (0.7)	12	13
Gender, n males (%)	24 (62)	15 (45)	1 (3)	0 (0)
Schools, participants treated (%)				
1	22 (58)	16 (42)	1 (3)	0 (0)
2	17 (50)	17 (50)	0 (0)	1 (3)

Exp = experimental group, Con = control group

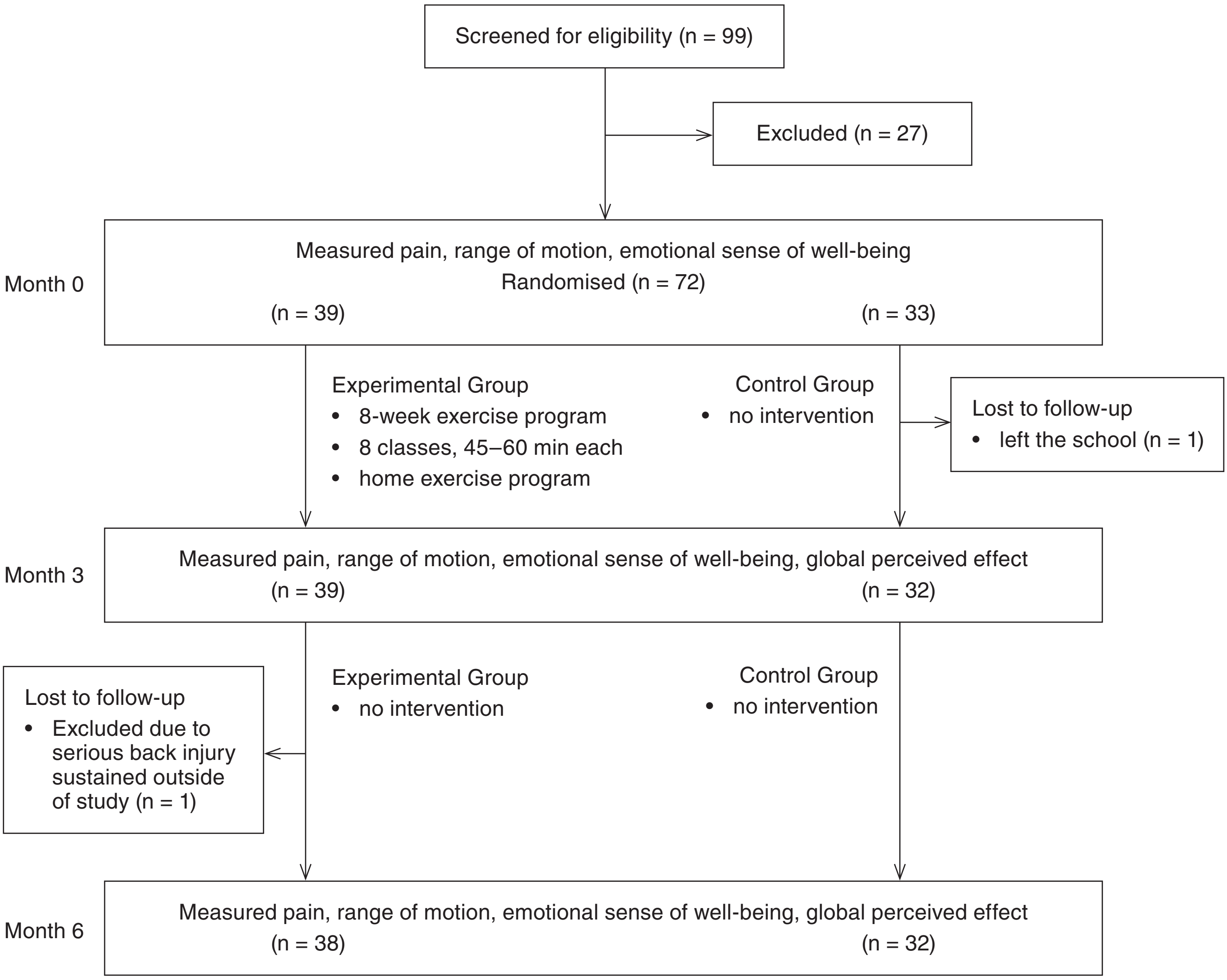

Figure 1. Design and flow of participants through the trial.

2001, Sherman et al 2006, Watson et al 2002).

Data analysis

Powell et al (2001) determined that the minimum clinically-significant difference in visual analogue scale for children aged 8–15 years is 1 cm. For the purpose of the sample size calculation for this study, a change of 2 cm was used to determine an adequate sample size. A sample of 62 children would give 90% power to determine a difference of 2 cm in pain intensity as measured on the visual analogue scale between groups.

Groups were compared with respect to change, from baseline (Month 0) to post-intervention (Month 3) and from

Table 2. Mean (SD) of each group, mean (SD) difference within groups, and mean (95% CI) difference between groups for pain intensity and physical risk factors.

Outcome	Groups						Difference within groups				Difference between groups	
	Month 0		Month 3		Month 6		Month 3 minus Month 0		Month 6 minus Month 0		Month 3 minus Month 0	Month 6 minus Month 0
	Exp (n = 39)	Con (n = 33)	Exp (n = 39)	Con (n = 32)	Exp (n = 38)	Con (n = 32)	Exp	Con	Exp	Con	Exp minus con	Exp minus con
Pain *(0 to 10 cm VAS)*												
Past month	5.0 (2.8)	4.0 (2.9)	2.3 (2.6)	3.3 (2.7)	1.7 (2.8)	2.6 (2.4)	–2.7 (2.4)	–0.5 (2.9)	–3.2 (3.6)	–1.2 (2.7)	–2.2 (–3.5 to –1.0)	–2.0 (–3.5 to –0.5)
Current	2.4 (3.0)	2.6 (3.2)	1.1 (2.1)	2.6 (2.9)	1.5 (2.7)	1.5 (2.2)	–1.2 (–3.0)	0.0 (2.9)	–0.8 (3.1)	–1.1 (3.6)	–1.2 (–2.6 to 0.2)	0.3 (–1.3 to 1.9)
Muscle length *(deg)*												
Hamstrings-R	56 (11)	50 (15)	64 (12)	49 (10)	62 (13)	51 (12)	8 (8)	0 (11)	7 (11)	2 (15)	8 (4 to 13)	5 (–1 to 11)
Hamstrings-L	51 (12)	48 (10)	57 (12)	42 (12)	54 (12)	46 (10)	6 (10)	–7 (8)	3 (9)	–3 (9)	15 (11 to 19)	6 (2 to 10)
Iliopsoas-R	6 (11)	6 (10)	10 (6)	4 (12)	11 (8)	7 (10)	4 (8)	–2 (11)	5 (8)	2 (9)	6 (2 to 11)	3 (–1 to 7)
Iliopsoas-L	11 (12)	9 (11)	17 (7)	4 (12)	16 (11)	8 (9)	6 (10)	–4 (13)	6 (13)	0 (11)	10 (5 to 15)	6 (0 to 12)
Rectus femoris-R	70 (11)	69 (18)	68 (8)	65 (16)	71 (9)	69 (13)	–2 (10)	–4 (22)	1 (11)	0 (18)	2 (–6 to 10)	1 (–6 to 8)
Rectus femoris-L	79 (9)	76 (15)	78 (8)	75 (11)	80 (8)	77 (13)	0 (9)	–1 (18)	1 (10)	1 (13)	1 (–6 to 8)	0 (–5 to 5)
Lumbar stability *(deg)*												
ASLR-R	55 (5)	57 (7)	56 (6)	56 (6)	58 (6)	59 (6)	0 (6)	–1 (5)	3 (6)	2 (6)	1 (–2 to 4)	1 (–2 to 4)
ASLR-L	58 (6)	58 (8)	57 (6)	58 (7)	57 (7)	57 (6)	–2 (7)	–1 (6)	–2 (8)	–2 (7)	–1 (–4 to 2)	0 (–4 to 4)
Neural mobility *(deg)*												
PSLR-R	58 (17)	51 (15)	66 (17)	44 (14)	64 (17)	44 (17)	8 (13)	–8 (14)	6 (13)	–7 (18)	16 (10 to 20)	13 (6 to 10)
PSLR-L	49 (18)	43 (16)	56 (19)	35 (14)	56 (18)	40 (18)	6 (17)	–8 (16)	6 (13)	–4 (12)	14 (6 to 22)	10 (4 to 16)
Proprioception *(deg)*	2.5 (1.0)	2.9 (1.4)	1.8 (1.0)	2.5 (1.2)	1.8 (0.8)	2.2 (1.2)	–0.7 (1.3)	–0.3 (1.9)	–0.7 (1.3)	–0.6 (1.6)	–0.4 (–1.2 to 0.4)	–0.1 (–0.8 to 0.6)

Shaded row = primary outcome. Exp = experimental group, con = control group, VAS = visual analogue scale, R = right, L = left, deg = degrees, ASLR = active straight leg raise, PSLR = passive straight leg raise

Table 3. Number of participants (%) in each group and difference in absolute risk reduction (95% CI) between groups for 3-month prevalence of low back pain.

Prevalence	Groups				Absolute risk reduction between groups	
	Month 3		Month 6		Month 3	Month 6
	Exp (n = 39)	Con (n = 32)	Exp (n = 38)	Con (n = 32)	Exp relative to Con	Exp relative to Con
Pain in last 3 months	26 (67)	29 (91)	16 (42)	26 (81)	0.24 (0.04 to 0.41)	0.40 (0.18 to 0.57)

Exp = experimental group, Con = control group

baseline to 3 months after the intervention ceased (Month 6) and presented as mean differences (95% CI) for interval data and absolute risk (95% CI) for dichotomous data.

Results

Flow of participants, therapists and schools through the trial

In January 2007, 99 children returned signed consent and assent forms. Seventy-two children, 33 (46%) boys and 39 (54%) girls, with a mean age 12.3 years (SD 0.7) met the inclusion criteria. We randomised 39 to the experimental group and 33 to the control group. The groups were similar at baseline in terms of age, pain, sense of well-being, and physical risk factors. Table 1 presents the baseline characteristics of the participants and Figure 1 details their progress through the trial. One child from the control group was lost to the study as she changed schools, and one child in the experimental group was excluded from the analysis as he sustained a serious back injury one week prior to the Month 6 measurement. Therefore, the follow-up rate was 97%.

A qualified, registered physiotherapist with five years' experience in exercise rehabilitation, supervised all three exercise classes each week. In addition, the therapist received further training in the specific exercise program for this study. Due to space limitations, the experimental children were divided into three groups. The same research assistant ensured that all of the groups did the same exercises, as well as the same number of repetitions, each week.

Two government primary schools in the Ekhuruleni West District of Gauteng, South Africa took part in this study. Across Grade 6 and Grade 7, there were 280 students; 72 (26%) students participated in the study.

Compliance with trial method

The majority of the children in the experimental group attended all of the eight exercise classes. Only 5 (13%) of the children missed more than one class. One-third of the children reported that they did the home exercise program regularly (three or more times a week), whilst 20% of the children reported minimal adherence to the program (less than twice a week). Only one child did not do any of the home exercises. The majority of children indicated that they enjoyed the exercise class (85%), felt that the exercises helped to make them feel better (97%) and to make their backs stronger (81%).

Effect of intervention

Group data for all outcomes at Baseline (Month 0), post-intervention (Month 3) and 3 months later (Month 6) for experimental and control groups are presented in Tables

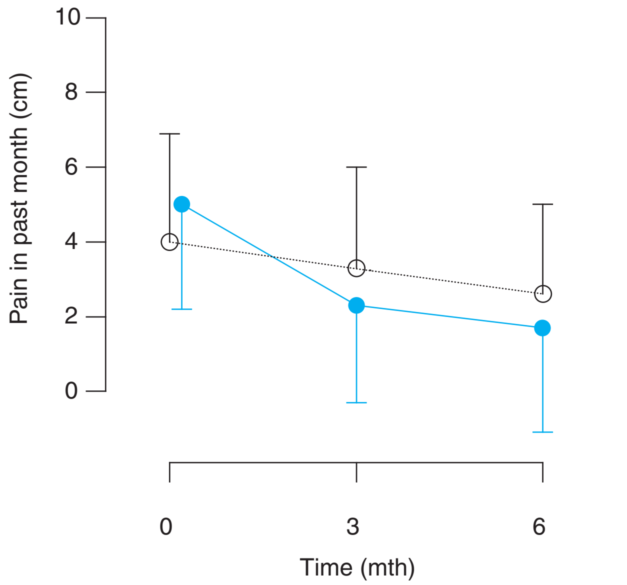

Figure 2. Mean (SD) intensity of pain in the past month for the experimental group (closed circles) and the control group (open circles) at 0, 3 and 6 months.

2–4 while individual data are presented in Table 5 (see eAddenda for Table 5). Pain intensity over the past month for the experimental group had decreased by 2.2 cm (95% CI 1.0 to 3.5) more than the control group at post-intervention (Month 3). Pain intensity over the past month for the experimental group was still 2.0 cm (95% CI 0.5 to 3.5) less than the control group 3 months later (Month 6). There was no statistically-significant difference in current pain intensity between the groups at Month 3 or at Month 6 (Table 2).

The absolute risk reduction for 3-month prevalence in low back pain in the experimental group was 24% (95% CI 4 to 41) compared with the control group post-intervention (Month 3) and 40% (95% CI 18 to 57) 3 months later (Month 6). Whilst the number of children complaining of low back pain decreased in the experimental group, a high percentage of children in the control group still complained of low back pain at both Month 3 and 6 (Table 3).

In terms of physical risk factors, there were between-group differences in favour of the experimental group in hamstring and iliopsoas muscle length and neural mobility and these were largely maintained 3 months later whereas there were no statistically significant between-group differences in rectus femoris length, lumbar stability or proprioception (Table 2). Hamstring length was 8 deg (95% CI 4 to 13) more in the experimental group than the control group in the right leg at post-intervention (Month 3) and 15 deg (95% CI 11 to 19) more in the left leg. Iliopsoas length was 6 deg (95% CI 2 to 11) more in the experimental group than the

Table 4. Mean (SD) of each group, mean (SD) difference within groups, and mean (95% CI) difference between groups for sense of well-being.

Sense of well-being	Groups						Difference within groups				Difference between groups	
	Month 0		Month 3		Month 6		Month 3 minus Month 0		Month 6 minus Month 0		Month 3 minus Month 0	Month 6 minus Month 0
	Exp (n = 39)	Con (n = 33)	Exp (n = 39)	Con (n = 32)	Exp (n = 37)	Con (n = 32)	Exp	Con	Exp	Con	Exp minus con	Exp minus con
MHI-5 *(5 to 30)*	22 (4)	21 (4)	23 (4)	23 (3)	24 (5)	22 (4)	1 (4)	2 (4)	2 (4)	1 (4)	–1 (–3 to 1)	1 (–1 to 3)
School *(1 to 6)*	5.1 (1.0)	4.8 (1.1)	4.9 (1.1)	4.9 (1.1)	5.1 (1.0)	4.7 (1.2)	–0.2 (1.0)	0.1 (0.7)	0.0 (0.9)	–0.1 (1.3)	–0.3 (–0.7 to 0.1)	0.1 (–0.4 to 0.6)
General *(1 to 6)*	5.1 (0.9)	4.9 (1.2)	5.0 (1.2)	5.1 (0.9)	5.0 (1.2)	5.0 (1.1)	–0.1 (1.1)	0.2 (1.0)	–0.1 (1.0)	0.1 (1.6)	–0.3 (–0.8 to 0.2)	–0.2 (–0.8 to 0.4)

Exp = experimental group, Con = control group, MHI-5 = Mental Health Inventory-5

control group in the right leg at post-intervention (Month 3) and 10 deg (95% CI 5 to 15) more in the left leg. Passive straight leg raise was 16 deg (95% CI 10 to 20) more in the experimental group than the control group in the right leg at post-intervention (Month 3) and 14 deg (95% CI 6 to 22) more in the left leg.

There were no statistically-significant between-group differences in sense of well-being post-intervention or 3 months later. The children consistently reported a moderate sense of well-being and indifference with regard to school and life in general, irrespective of which group they were in (Table 4).

Discussion

The results of this study show that undertaking an eight-week exercise program decreased the intensity of low back pain as well as the three-month prevalence in 12–13 year old children. In addition, these improvements were maintained three months later. Taking into account the minimum clinically-significant difference in visual analogue pain scores, these improvements can also be considered to be clinically significant in this age group. Exercise in the adult population has shown similar improvements in low back pain intensity and prevalence, with the improvements in pain intensity being maintained up to three years later (Hayden et al 2005, Koumantakis et al 2005a). The only available study on exercise in children also reported a significant improvement in low back pain intensity after participation in an eight-week exercise program (Jones et al 2007). However, no follow-up measurements were taken, so it is unknown whether this improvement was maintained. In addition, Jones et al (2007) only reported the low back pain intensity over the past week and did not measure the prevalence of low back pain. However, considering the current lack of evidence to support the prevention of low back pain in childhood, the improvements which were observed in the present study and the study by Jones et al (2007) are promising. Therefore, ideally, future school-based studies should include exercise as a component of their low back pain prevention programs.

Prior to commencing the study, the probability of a spontaneous resolution of low back pain in this age group was identified as a possible limiting factor. However, only a few children in the control group demonstrated a 'spontaneous' resolution of low back pain. Presumably, a similar small percentage of children in the experimental group also had a 'spontaneous' resolution of their low back pain. Mikkelsson et al (2006) proposed that exercise during childhood and adolescence may modify the sensory perception of peripheral pain at the level of the central nervous system, which will result in fewer pain syndromes in adolescence and adulthood. Although this study followed the children over only six months, a progressively greater reduction in the prevalence of low back pain was observed in the experimental group as time went on. Therefore, the Mikkelsson et al (2006) theory may well be applicable for this age group.

Improvements were also observed in neural mobility and muscle length (hamstrings and iliopsoas). Although the experimental intervention resulted in improvements in some of the physical risk factors compared with the control group, this does not necessarily imply that modification of physical risk factors will lower the recurrence of low back pain. Studies in the adult population have shown that low back pain can improve without significant changes in muscle function (Koumantakis et al 2005b), and simply modifying risk factors in children has not prevented low back pain either (Cardon and Balagué 2004).

The baseline measurements in this study indicated that imbalance between left and right sides for muscle length and neutral mobility was already present in this group of 12–13 year old children with low back pain. This is consistent with findings in previous studies that have identified musculoskeletal imbalances, which occur during the growth spurt, as one of the primary underlying causes of low back pain in childhood (Balagué et al 1999, Burton et al 2004). Inappropriate physical activity or sudden increases in physical activity during the growth spurt have also been identified as risk factors for low back pain (Cardon and Balagué 2004). During periods of rapid growth, the spinal structures are prone to structural damage, as they are less able to withstand the stresses and loads which are placed on them, making them more susceptible to injury, sprains, and strains (Grimmer and Williams 2000). Therefore, considering that changes were observed after only eight weeks of exercise in the present study, it would appear that regular involvement in specific exercise programs during childhood could promote optimal spinal alignment and tissue loading during the growth spurt. If abnormal movement, musculoskeletal imbalance, and associated abnormal spinal loading are addressed during childhood, it may be possible to prevent the onset of chronic and recurrent low back pain.

A strong link has been identified between psychosocial risk factors and low back pain in children (Watson et al 2003). Currently, there is no evidence to indicate that modification of psychosocial factors or sense of well-being has an impact on low back pain in children (Burton et al 2004). The results from the present study indicate that, although there was a significant reduction in intensity and prevalence of low back pain with exercise, there was no change in sense of well-being. Watson et al (2003) have suggested that psychosocial factors may contribute more significantly to low back pain in children than mechanical factors. However, the children who were included in this study were in the transition phase between childhood and puberty. This is a difficult time for children as they go through hormonal, physical, and emotional changes, and the 8-week exercise program did not have much impact on the sense of well-being of the children in the present study.

The children participated enthusiastically in the exercise program. Therefore, it would appear that children of 12–13 years of age are an ideal, receptive target population for interventions consisting of exercise. Mikkelsson et al (2006) indicated that appropriate exercise during the growth spurt could help to promote optimal spinal alignment, dynamics and loading, as well as enhance back function and minimise injury. In addition, it can help children to learn to be responsible for their health, as well as developing healthy exercise habits, which can help to prevent low back pain (Méndez and Gómez-Conesa 2001).

The following limitations of the present study need to be taken into account. Only two schools, in a similar geographic and socioeconomic area were included, and therefore the results may not necessarily generalise to a larger population. Due to the nature of the intervention, neither the therapist nor the participants could be blinded to group allocation. The participants were followed up for only three months after the cessation of intervention, so the long-term effect of the intervention on their low back pain is unknown.

Nevertheless, this study has shown that exercise is effective in reducing the intensity and three-month prevalence of low back pain in 12–13 year old children. Therefore, future studies investigating the prevention of low back pain should focus on exercise as an intervention. Studies with long follow-up are needed to determine the long-term effect of exercise on adolescent low back pain. ■

Footnotes: [(a)]A digital inclinometer (The Saunders Group Inc, 4250 Norex Drive, Chaska MN 55318 - 3047, USA), and two Stabilizer™ Pressure Biofeedback Units (Chattanooga Group, 4717 Adams Rd, Hixson, TN 37343, USA)

eAddenda: Appendix 1, Table 5 available at AJP.physiotherapy.asn.au

Ethics: The University of the Witwatersrand's Human Research Ethics Committee approved this study (Reference number M060334). Permission was obtained from the Gauteng Department of Education and from the schools' principals and governing bodies. Only children who signed assent and whose parents signed informed consent were included in the study.

Support: Financial assistance from the MREF (Medical Research Endowment Fund).

Acknowledgements: We are grateful to Libby Fox for her assistance in conducting all of the exercise classes.

Competing interests: None declared.

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