



# Encouraging healthy spine habits to prevent low back pain in children: an observational study of adherence to exercise

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## Abstract

**Background** Low back pain (LBP) in adolescence is a predictor of adult LBP. Strategies to educate children and encourage healthy spine habits may prevent LBP. Poor adherence to health programmes can be a barrier to their success. This study addresses the potential for habitualisation of a short daily exercise programme that draws attention to factors thought to keep the spine healthy.

**Objectives** To describe adherence to a 9-month exercise programme, and analyse factors that may influence adherence.

**Design** Observational cohort study.

**Setting** Four primary schools in New Zealand.

**Outcome measures** Outcomes included self-evaluation of adherence to exercise, and self-reported incidence and severity of LBP.

**Participants** Children ( $n=469$ ) aged 8 to 11 years.

**Methods** Participants were taught four simple spine movements for daily practice as part of a health programme that emphasised ‘back awareness’ and self-care of the spine. Strategies to encourage adherence were implemented. Data on self-reported adherence and episodes of LBP during the previous week were collected through an online survey completed on trial days 7, 21, 49, 105, 161 and 270 over a 9-month period.

**Results** Daily exercise adherence was 34% on day 7 and dropped to 9% by day 270. Exercise adherence of at least once per week was 84% on day 7 and 47% by day 270. Frequency of exercise was not associated with episodes of LBP [odds ratio (OR) 1.16, 95% confidence interval (CI) 0.92 to 1.47,  $P=0.21$ ], previous history of LBP (OR 0.97, 95% CI 0.77 to 1.23,  $P=0.77$ ), lifetime first episode of LBP (defined as the first episode of LBP in the study period for participants with no previous history of LBP) (OR 0.39, 95% CI 0.15 to 1.34,  $P=0.14$ ) or severity of LBP (OR 1.59, 95% CI 0.99 to 2.52,  $P=0.05$ ).

**Conclusion** This study applied a comprehensive set of strategies considered to be important in encouraging adherence, but was not successful in sustaining the interest of more than half of the cohort. Innovative strategies are needed to develop new exercise habits in children.

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**Keywords:** Adherence; Low back pain; Children; Exercise; Habit; Prevention

## Introduction

The prevalence of low back pain (LBP) increases with age, starting as young as 9 years of age and reaching similar

prevalence as reported for adults by 15 years of age [1,2]. LBP affects most people during their lifetime with an estimated point prevalence of 12% and 1-month prevalence of 23% [3]. LBP in adolescence predicts LBP in adulthood [4,5], signalling a role for primary prevention of the lifetime first episode of LBP [2,6]. The only risk factor for LBP that has been validated in independent studies in adults is a history of previous LBP [2,7–11]. Exercise appears to be helpful in reducing the recurrence of LBP in adults [12], and may influence future spine health of young people with a history of LBP

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[13,14]. Reviews of interventions to improve spinal knowledge, change movement behaviour and reduce the prevalence of LBP in children showed potential benefits, but evidence to support their effects is weak [15,16].

This prospective multicentre cluster randomised controlled trial (RCT) compared education and regular specific back movement with education alone on the incidence of LBP in children aged 8 to 11 years. The data [17] indicate that regular specific back exercises combined with education may reduce episodes of LBP and lifetime first episodes of LBP compared with education alone.

Previous studies have considered the effect of adherence to exercise programmes [12,18–20], but not focused specifically on whether or not children can be encouraged to make lifestyle changes related to daily exercise routines. This study considered the effect of habituation of good health behaviours in childhood (such as dental hygiene), and whether establishing commitment to programmes that support spine health in childhood could be established and maintained into adulthood. However, poor adherence to exercise programmes is a recognised barrier to their success [21,22], with over one-half of participants who commence an exercise programme giving up within 2 to 6 months [23]. This precludes the development of new habits that require repetition of desired behaviour [24]. Studies investigating habit formation are sparse, use small sample sizes [24,25], and rarely focus on strategies required to maintain change [26]. Limited guidance for helping people to maintain behaviour change may, in part, explain poor long-term adherence to programmes [12,18,19,21,25–31].

Adherence to new exercise behaviour usually requires lifestyle changes to optimise success. The construct of adherence is complex; it appears to be influenced by many factors, and there is no gold standard approach to its measurement [18,32]. It is not easy to predict design features of an exercise programme that would optimise adherence. Studies of adherence in healthy populations generally focus on physical activity and sport [33,34]. To the authors' knowledge, no studies have investigated a process for introducing habituated spine exercise for children as a daily routine.

Exploring factors associated with adherence would be a sensible prerequisite to the development of exercise programmes. Embedding desirable behaviour into everyday routines in tandem with reminders may facilitate adherence [24,25]. Other recommended strategies include exercise supervision and follow-up [18,35], education, behavioural techniques such as positive reinforcement and goal setting [18,36], establishment of a routine, minimising interruption to daily life, family involvement [36,37], interactive exercise demonstration, diagrams and written instructions [18,38], self-monitoring (exercise diary), an exercise contract, and an adherence certificate [18].

It is not clear what proportion of children aged 8 to 11 years could master an exercise programme introduced at school, habituate practice over a period of time, and incorporate it into a daily routine. With implementation of recommended

Table 1

Inclusion and exclusion criteria for schools and participants.

	School	Children
Inclusion	In public or private sector Within 30 minutes of travel or 10 km from the primary researcher Decile <sup>a</sup> rating of 9 or 10	Aged 8 to 11 years Able to follow simple instructions and complete a child-friendly survey Child and parental consent
Exclusion	Children not able to do the exercises due to spine pathologies and/or neurological disorders, injuries or physical disabilities for which movement was a contraindication or prevented standing on one leg safely and independently	

<sup>a</sup> Decile ratings are determined by the Ministry of Education. Schools are ranked by socio-economic status, divided into 10 equal-sized units rated 1 to 10. A rating of 1 indicates a poor area; a rating of 10 indicates a high level of affluence. Invited schools had a decile rating of 9 or 10.

adherence strategies, children may habituate an exercise routine in the same way that they habituate other routines such as dental hygiene.

The primary target of this research was to examine how children adhered to a simple back exercise programme (MySpine programme), and if they could habituate a regimen of exercises as a daily routine. The secondary aim was to examine factors that may influence adherence.

## Methods

This was an observational study of adherence to exercise. It was embedded in a prospective multicentre cluster RCT comparing education and daily exercise with education alone on LBP in children (aged 8 to 11 years) in primary schools in New Zealand between April and December 2011. The method adhered to the guidelines in the Consolidated Standards of Reporting trials (CONSORT) [39] with consideration of the recommendations for conducting and reporting cluster RCTs [40]. This observational study adhered to the Strobe guidelines [41].

This study was approved by the Northern Y Ethics Committee (Project No. NTY/10/11/093, 16 February 2011), and subsequently by the Monash University Human Research Ethics Committee (Project No. 2011000216, 2 March 2011). Subjects gave consent to participate.

## Participants

Table 1 shows the inclusion and exclusion criteria for schools and participants.

For the primary trial, random allocation of schools with concealment was undertaken by a remote allocation officer to the exercise/education intervention group or a control group (education alone). Only those in the intervention group were included in this adherence study. The primary researcher sent explanatory statements to school principals, and met

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