Low Back Pain in Elite Adolescent Footballers: Change in Self-Reported Disability Following Four Weeks of Multimodal Chiropractic Care

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ABSTRACT

Objectives: Low back pain (LBP) is common in the pediatric population and is a frequent complaint among elite youth football players. Spinal manipulation and other chiropractic methods have evidence of benefit for LBP in adults, but published data in elite pediatric footballers are scarce. This study examined whether four weekly visits of multimodal chiropractic care were associated with change in self-reported disability in male academy players aged 12—18 years. **Methods:** A pragmatic prospective cohort study was conducted in a private clinic in England. Sixty-two male players with LBP, all of whom played at full-time elite football academies, were recruited by convenience sampling. Each player completed the Modified Oswestry Disability Questionnaire before care and after four 30-minute visits over four consecutive weeks. Care comprised spinal manipulation, mobilization, soft-tissue therapy and active release, delivered by a registered chiropractor. A paired-samples t-test compared pre- and post-care scores. Reporting follows the STROBE statement for cohort studies. **Results:** All 62 players completed both questionnaires. Mean Modified Oswestry score fell from 11.81 before care to 4.92 after four visits ($t = -10.48$, $df = 61$, $p < 0.001$). Fifty-nine players (95%) improved and three were unchanged. Thirty-eight players (62%) moved to a more favorable disability category; 24 (38%) remained in the same category. Of 248 treatment encounters, four were followed by short-lived post-treatment soreness that settled with ice. No serious adverse events were recorded. **Conclusions:** A four-week course of chiropractic care was associated with a statistically significant reduction in self-reported LBP-related disability in elite male pediatric footballers and appeared well tolerated. The observational design precludes causal inference. Larger studies with longer follow-up, a comparison arm and pediatric-specific outcome measures are warranted.

Key words: chiropractic; multimodal care; low back pain; pediatric; adolescent; football; soccer; elite athlete; Modified Oswestry Disability Questionnaire; prospective cohort.

Introduction

Low back pain is among the most common musculoskeletal conditions worldwide in both adults and children.[1] It is defined as pain and discomfort below the costal margin and above the inferior gluteal folds, with or without referred leg pain.[1] Pediatric LBP becomes more prevalent through adolescence and with competitive sport,[2] and adolescent LBP is a recognized risk factor for LBP in adult life.[3]

In adolescent athletes the incidence of LBP has been estimated at 11%, with a three-month prevalence of 42%. Risk factors include sport participation, training volume and intensity, concurrent lower-limb pain, body-mass index above 25, increasing age, female sex and a family history of LBP.[4] Young elite athletes have been reported to experience LBP three to five times more often than the general pediatric population.[5] In youth football, LBP sits alongside hamstring, quadriceps and groin strains as a leading complaint.[6] Injury audits in high-level male academy players have identified 14—16 years as a particularly vulnerable window, coinciding with rapid skeletal growth.[7]

Earlier suggestions that hyperlordosis was the principal cause of LBP in young athletes have not been sustained.[8] Current mechanistic accounts emphasize repetitive lumbar extension, restricted hip motion with compensatory lumbar extension,[9] hamstring tightness[6] and reduced trunk-muscle capacity.[10] Spondylolysis is the diagnosis most often cited in pediatric footballers with LBP[6,11-15] and is more frequent in young athletes who specialize in a single sport.[12] Across pediatric athletes more broadly, non-specific LBP remains the most common presentation (34%), followed by spondylolysis (28%), disc herniation (8%), sacroiliac pain (7%), lumbar facet pain (6%) and other diagnoses (17%).[16]

Usual care for LBP in youth footballers typically comprises

analgesia, activity restriction and exercise.[6] For lumbar spondylolysis, a three-month break from football has been recommended if a symptom-free return is the goal.[11] In the elite academy setting such a layoff is rarely acceptable: most players hold short contracts, and prolonged absence can jeopardize progression. Alternative approaches that allow earlier, safer return to training are therefore of practical importance.

Chiropractic care for LBP in pediatric athletes has received little published attention. Interdisciplinary pediatric LBP guidance emphasizes physical activity and, where needed, psychologically informed programs; a mixed-studies review has suggested that combining manual therapy with physical activity may be useful in the clinic.[17,18] No consensus guideline exists specifically for LBP in pediatric athletes.[16]

The question addressed here was: in elite male footballers aged 12—18 years with LBP, is a course of four weekly chiropractic visits associated with change in self-reported disability? The working hypothesis was that Modified Oswestry scores would be lower after four weeks of care.

Methods

Study design

This was a pragmatic prospective cohort study. That design was used because the research question asked whether self-reported disability changed after a defined course of care in a niche group already identified by their clinical presentation, and because prospective data collection allowed the findings to be applied in the same setting. Convenience sampling was used because the investigator already worked within full-time elite football academies. The study is reported in accordance with the STROBE statement for observational studies.[19]

Setting and usual care

Care was delivered in a private clinic, not at the academies. Participants were players at full-time elite football academies in England who attended the clinic for treatment. Data collection took place during the competitive academy season. Players remained full-time at their clubs throughout the four-week course. They were withheld from match play and on-pitch football training because of ongoing LBP that had not settled with first-line club physiotherapy, but they continued other gym-based conditioning sessions. To keep the process consistent, every participant followed the same pathway. After parental or guardian consent, the Modified Oswestry Disability Questionnaire was completed. The first visit comprised a case history, neurological and orthopedic examination, explanation of findings and, once consent for treatment was given, a 30-minute treatment. Treatment combined mobilizations, soft-tissue therapy, active release and spinal manipulation, provided by a registered chiropractor. Each player was then seen weekly for four consecutive weeks and completed the same questionnaire after the fourth visit.

Participants

Inclusion criteria were male sex; age 12—18 years; LBP defined as pain from the twelfth rib to the gluteal folds;[1] playing at full-time elite football academies in England; and the ability to attend weekly care for four consecutive weeks. Exclusion criteria were concurrent participation in another organized sport; pain confined to the cervical or thoracic spine; concurrent treatment of LBP by another practitioner; contraindications to manual care (hypermobility, osteoporosis, acute fracture, acute infection, malignancy, fever); and a pre-existing spinal diagnosis of malignancy, recent fracture or whiplash.

Convenience sampling was used because the investigator treated this group in private clinic practice. The target population was male footballers aged 12—18 years who played at full-time elite academies in England and were experiencing low back pain. Restricting the sample to that level was intended to capture players at the elite end of the sport in the country, where published chiropractic data are scarce. A sample of 30—60 was planned so that the size would be comparable with previous football and adolescent-athlete LBP series (34—58 participants).[11,20,21]

Outcome measure

The primary outcome was change in the Modified Oswestry Disability Questionnaire, a widely used LBP disability scale that has been applied in pediatric athletes and has acceptable reliability and responsiveness.[21-24] Each of the 10 sections is scored from 0 to 5, giving a raw total of 0—50; a higher score indicates greater disability. Disability groups followed Fairbank and Pynsent.[25] No disability: the patient can cope with most living activities and usually no treatment is indicated apart from advice on lifting, sitting and exercise. Mild disability: the patient experiences more pain and difficulty with sitting, lifting and standing; travel and social life are more difficult, and the patient can usually be managed by conservative means. Moderate disability: pain remains the main problem and activities of daily living are affected. Severe disability: pain impacts all aspects of the patient's life and intervention is required. A total score of 20 or more indicated moderate disability or worse. Secondary descriptive variables collected from the new-patient record were age, pain quality, 0—10 visual analogue scale (VAS) intensity, and mode of onset (training, match, or insidious morning pain). Adverse events were taken from contemporaneous treatment notes.

Data collection

After a briefing and written parental consent with player assent, the baseline questionnaire was completed before the

first treatment and stored with the clinical file in a locked cabinet. The same questionnaire was completed after the fourth visit. The investigator left the room during the second completion to reduce demand characteristics. Each player was assigned a random study number. Identifiable records were retained in line with General Chiropractic Council guidance, then scanned to password-protected storage. No identifiable information is presented.

Statistical analysis

Pre- and post-care scores were compared with a paired-samples t-test in Microsoft Excel, with a two-sided significance level of 0.05. The null hypothesis was that mean scores before and after care were equal. Pearson's correlation, variance and degrees of freedom were calculated. Category shifts on the Modified Oswestry scale, pain quality, VAS, onset context and adverse events were summarized descriptively. No imputation was required; there were no missing questionnaires.

Ethics

The study was approved by the AECC University College Research Ethics Committee (United Kingdom: E152/07/2021). Written informed consent was obtained from a parent or guardian and assent from each player. Both were reminded of the right to withdraw at any time, with immediate disposal of their data. A parent or guardian was present at visits. Consent for treatment was reconfirmed at each encounter. Data handling followed UK GDPR. Infection-control measures current at the time of the COVID-19 pandemic (disinfection of paperwork and surfaces, personal protective equipment, and club testing protocols) were observed.

Results

Participants

Sixty-two players met the criteria, completed four visits and returned both questionnaires. There were no drop-outs and no incomplete forms. The most frequent ages were 15 and 17 years; 14 years was the least represented age. No single age band dominated the sample.

Category	n	%
No (minimal) disability	12	19
Mild disability	26	42
Moderate disability	22	35
Severe disability	2	3
Total	62	100

No disability: most daily activities possible; advice on lifting, sitting and exercise usually sufficient. Mild: more pain and difficulty with sitting, lifting and standing; travel and social life harder; usually manageable conservatively. Moderate: pain remains the main problem and daily activities are affected. Severe: pain affects all aspects of life and intervention is required.

Table 1. Modified Oswestry disability category at baseline (n = 62). Categories follow Fairbank and Pynsent (2000).

Baseline clinical features

Before care, 12 players (19%) were classified as no disability, 26 (42%) as mild, 22 (35%) as moderate and two (3%) as severe (Table 1). Twelve players therefore scored in the "no disability" band despite symptoms sufficient to trigger academy medical referral and to affect football performance, which suggests that the instrument may under-capture sport-specific limitation in this group.

Pain was described as a dull ache in 54 players (87%) and as sharp in eight (13%) (Table 2). Six of the eight players with sharp pain scored 20 or more and therefore fell in the moderate or severe bands. VAS intensity ranged from 2/10 to 10/10 (median 3/10); the most frequent scores were 3/10, 4/10 and 7/10, and only two players rated pain at 2/10 (Table 3). Onset was during a match in 33 players (53%), during training in 27 (44%) and on waking in two (3%) (Table 4).

Character		n	%
Dull ache	54	87	
Sharp		8	13

Table 2. Character of pain at presentation (n = 62).

VAS score	n	%
2/10	2	3
3/10	10	16
4/10	12	19
5/10	7	11
6/10	7	11
7/10	12	19
8/10	5	8
9/10	5	8
10/10	2	3

Table 3. Baseline visual analogue scale intensity (n = 62).

Onset	n	%
During a match	33	53
During training	27	44
Insidious, on waking	2	3

Statistical summary (not a separate numbered table in the original dissertation output, reproduced here for completeness). Paired two-sample t-test of Modified Oswestry scores: mean after care 4.92; mean before care 11.81; Pearson correlation 0.75; hypothesized mean difference 0; df 61; t statistic -10.48; P(T≤t) one-tail 1.45 × 10-15; t critical one-tail 1.67.

Table 4. Mode of onset (n = 62).

Primary outcome
Mean Modified Oswestry score was 11.81 before care and 4.92 after four visits (variance 54.29 and 51.78 respectively; Pearson r = 0.75; t = -10.48; df = 61; one-tailed p = 1.45 × 10-15). The reduction was statistically significant at the pre-specified 0.05 level, and the one-tailed result was consistent with a lower mean after care. Fifty-nine players (95%) improved; three (5%) were unchanged.

Thirty-eight players (62%) moved to a more favorable Modified Oswestry category and 24 (38%) remained in the same category. The most common shift was mild to no disability (37% of the cohort). A further 10% moved from moderate to no disability, 13% from moderate to mild, and 2% from severe to moderate. Thus, most players improved numerically, but more than one third did not change category, so a four-visit course did not produce a categorical change in quality-of-life band for every participant.
Adverse events

Across 248 encounters the only reported adverse effect was post-treatment soreness lasting up to two days in four players, each after the first visit only. Ice was advised and was sufficient in all four. No further soreness and no serious adverse events were recorded.

Discussion
Four weekly chiropractic visits were associated with a statistically significant reduction in Modified Oswestry scores in this cohort of elite male footballers aged 12—18 years playing at full-time academies in England. Ninety-five percent of players improved, 62% changed disability category, and the adverse-event profile was limited to brief, first-visit soreness. Because this was an uncontrolled observational study, these changes cannot be attributed to chiropractic care alone. Before chiropractic care, the players had already been seen by the club physiotherapist, which is the first port of call in this setting, and had not responded adequately to that care.

Age was not clearly related to the presence of LBP in this sample, in contrast to Hall and colleagues, who reported peak academy injury between 14 and 16 years in a much larger multi-country audit,[7] and to a ten-season study at Clairefontaine that similarly found higher injury rates at 14 years of age.[31] It also contrasts with some athletic LBP series in which middle adolescence predominated.[16] The present findings are closer to those of Brito et al. in sub-elite youth football, where LBP did not rise steadily with age.[26] A longer, larger surveillance study would be needed before age could be used to target pre-emptive chiropractic input.
The direction of change differs from Fritz and Clifford, who reported a poorer disability prognosis in adolescent athletes than in non-athletes treated with physical therapy.[21] Direct comparison is limited: their sample mixed sports, the content of therapy was not fully specified, and the present cohort received a standardized chiropractic package after failed first-line care. The results are more in keeping with Manansala and colleagues, who found clinically important improvement in adolescent spinal pain with chiropractic care,[27] and with Piper and DeGraauw, who described resolution of adolescent athletic LBP within a month of conservative care, albeit without lumbar manipulation in every case and with later recurrence on return to play.[28] El Rassi et al. recommended three months away from football for spondylolysis;[11] the present players continued inside the academy program while receiving care. Diagnostic homogeneity cannot be assumed here, and the study was not designed to test spondylolysis protocols.

Match play accounted for slightly more onsets than training (53% versus 44%), which is consistent with other youth-football injury work,[29] although the difference was modest. The largest categorical gains were in players who started in the mild-disability band, 37% of the whole cohort moving from mild to no disability. That observation may be useful for academy triage: players with LBP and a mild Modified Oswestry band appear particularly likely to change category after four visits. Players who remained in the same band (38%) may need a longer course; Evans et al. found additional benefit with extended conservative schedules,[30] and Piper and DeGraauw required further visits after early recurrence.[28]

Safety is a frequent concern when manual care is discussed for adolescents. Four mild, self-limited events in 248 visits, and no serious events, provide limited but practically relevant reassurance in this tightly defined group. The figure should not be generalized to all pediatric manual-therapy contexts.

Limitations
Several limitations follow from the design. There was no comparison group, so the observed change cannot be attributed to chiropractic care. The design cannot determine how much of the change was due to the multimodal chiropractic package, natural recovery, regression to the mean, concurrent academy rehabilitation, or expectation and placebo effects. The investigator was also the treating clinician, and players knew a study was underway; they may therefore have answered as they thought was expected. The investigator left the room while the second questionnaire was completed in order to reduce that bias, but it cannot be excluded. Convenience sampling from full-time elite academies in England limits how far the findings can be applied to female players, non-elite settings and other sports. Female academy players were not included, so the findings cannot be applied to that group.

The Modified Oswestry Disability Questionnaire was not

developed for elite adolescent footballers and is not fully validated in children and adolescents. Some domains (sitting, lifting, traveling) may not capture sport-specific functional restrictions in academy football, which likely explains why 12 symptomatic players scored as "no disability" at baseline. Players were seen during the competitive season. They remained full-time at their clubs, were not participating in matches or on-pitch football training during the four treatment weeks, and continued gym-based conditioning. Concurrent gym work and time away from play are therefore alternative explanations for part of the observed change; the improvement cannot be attributed to the chiropractic package alone. Calendar timing within the season (for example pre-season versus mid-season) was not recorded; previous work has found clustering of injuries at the start of the season and after the winter break[32]. There was no follow-up after the four-week course, so it is not known whether the change lasted. If the study were repeated, a review at two months and a longer course (for example eight weekly visits with questionnaires at weeks 0, 4, 6 and 8) would address those gaps. Treatment was a multimodal package; the contribution of manipulation versus soft-tissue care cannot be separated.

Implications

Within these constraints, the findings support considering chiropractic care as one option in the academy pathway for male players aged 12—18 years whose LBP has not settled with first-line physiotherapy, particularly those in the mild-disability band. The treatment mix used here – manipulation, mobilization, soft-tissue therapy and active release – was deliverable in a 30-minute private-clinic visit and was not associated with serious harm in this series. Future work should include a comparison arm, female academies, eight- to twelve-week dose—response follow-up, a pediatric or sport-specific disability scale, and blinding of outcome assessment.

Conclusion

In 62 elite male pediatric footballers, four weekly chiropractic visits were associated with a significant reduction in Modified Oswestry disability scores, improvement in 95% of players, and only minor, transient soreness. The greatest categorical change occurred in players with mild baseline disability. These observational data do not prove effectiveness, but they provide a foundation for controlled studies and a practical starting point for academy medical teams considering manual care for this under-described group.

Acknowledgements

This work formed part of the author's Master of Science in Musculoskeletal Paediatric Health (Paeds MSc) at AECC University College (now Health Sciences University). Players and parents gave their time during a demanding season.

Funding and conflicts of interest

This work received no external funding. The author was the treating clinician in the private clinic during data collection and is the sole author. No other financial or competing interests are declared.

Informed consent and ethics

Parental written consent and player assent were obtained for all participants. The protocol was approved by AECC University College Research Ethics Committee (E152/07/2021).

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