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FEASIBILITY AND PRELIMINARY EFFECTIVENESS OF A 12-WEEK CORRECTIVE EXERCISE PROGRAMME ON LUMBAR LORDOSIS AMONG UNIVERSITY BASKETBALL PLAYERS: A PILOT STUDY

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ABSTRACT

Background: Altered lumbar lordosis is a common postural deviation among basketball players due to repetitive jumping, landing, rapid directional changes, and prolonged sport-specific loading, which may adversely affect spinopelvic alignment, movement efficiency, and musculoskeletal health. Corrective exercise programmes have been recommended to address these biomechanical alterations; however, preliminary evidence in university basketball players remains limited.

Objective: To evaluate the feasibility and preliminary effectiveness of a 12-week corrective exercise programme on lumbar lordosis among university basketball players.

Methods: A pilot controlled experimental study was conducted involving 24 university basketball players (18–25 years), allocated to an experimental group (n = 12) and a control group (n = 12). Lumbar lordosis angle was assessed using radiographic (X-ray) evaluation before and after a 12-week intervention. The experimental group participated in a supervised corrective exercise programme comprising pelvic tilts, glute bridges, bird-dog exercises, hip flexor stretches, hamstring stretches, wall sits, and cat–cow stretches, while the control group continued their routine activities. Data were analysed using descriptive statistics, Shapiro–Wilk test, independent and paired samples t-tests, and Welch's t-test. Effect sizes were estimated using Cohen's d and Hedges' g.

Results: Baseline lumbar lordosis angles did not differ significantly between the experimental and control groups ($p = 0.065$). Following the intervention, the experimental group demonstrated a significant reduction in lumbar lordosis angle (50.67 ± 1.87° to 45.25 ±

1.36°; mean improvement = 5.42°; $t(11) = 14.309$, $p < 0.001$), whereas no significant change was observed in the control group ($p = 1.000$). Improvement scores were significantly greater in the experimental group than in the control group (Welch's $t(15.45) = 13.00$, $p < 0.001$). The intervention produced a very large treatment effect (Cohen's $d = 5.31$; Hedges' $g = 5.12$).

Conclusion: The findings indicate that the 12-week corrective exercise programme is feasible to implement and demonstrates promising preliminary effectiveness in improving lumbar lordosis among university basketball players. Larger randomized controlled trials with more diverse athletic populations are warranted to confirm these findings and establish long-term clinical effectiveness.

KEYWORDS: *basketball players; corrective exercise; lumbar lordosis; pilot study; posture; spinopelvic alignment; rehabilitation.*

1. INTRODUCTION

Basketball and Postural Demands

Basketball places repeated and multidirectional demands on the neuromusculoskeletal system because players must sprint, decelerate, jump, land, pivot, and rotate the trunk under time pressure and fatigue. These demands make postural control and lumbopelvic stability important not only for performance but also for injury prevention. In young basketball players, low back pain has been reported as a common complaint, and epidemiological evidence suggests that spinal symptoms may occur alongside lower-limb pain and other overuse problems (Yabe et al., 2020; Pasanen et al., 2016). A systematic review of basketball players also concluded that musculoskeletal complaints, including back pain, are frequent in this population and may reflect cumulative sport-related loading rather than isolated injury events (Borges et al., 2023).

Basketball training may also influence postural organization over time. Guedes and João (2014) found that adolescent federation basketball players showed measurable postural adaptations in the trunk and pelvis compared with non-players, indicating that regular training exposure can shape sagittal-plane alignment. Although basketball is often discussed in terms of lower-limb injuries, the trunk and pelvis are central to force transfer during sport actions, and repeated loading in these regions can contribute to adaptive or maladaptive postural changes. For that reason, lumbar posture deserves attention as a potential marker of how the body responds to basketball-specific mechanical demands (Guedes & João, 2014; Borges et al., 2023).

Spinopelvic Alignment

Spinopelvic alignment refers to the coordinated relationship among the lumbar spine, pelvis, and hip complex in maintaining sagittal balance and efficient movement. The lumbar curvature is influenced by pelvic tilt, hip mobility, trunk muscle function, and lower-limb mechanics, so alteration in one component may affect the others (Been et al., 2014; Dimitrijević et al., 2022). From a biomechanical perspective, the pelvis acts as a key intermediary between the spine and the lower extremities, meaning that changes in anterior pelvic tilt or hip flexor tightness may alter lumbar lordotic posture.

This relationship is particularly relevant in athletes because sport loading repeatedly challenges the lumbopelvic system. Basketball players frequently move between flexion, extension, rotation, and single-leg support, which requires coordinated control of the trunk and pelvis. When that control is insufficient, compensatory posture patterns may emerge and persist across training cycles. Reviews of corrective exercise and postural alignment suggest that exercise-based interventions can influence spinal posture, especially when programs combine strengthening and stretching components targeted to the region involved (Bayattork et al., 2020; V. Dimitrijević et al., 2022). This makes spinopelvic alignment a meaningful construct when examining lumbar lordosis in basketball players.

Lumbar Lordosis in Basketball Players

Lumbar lordosis is the inward curvature of the lumbar spine, and its magnitude varies according to individual anatomy, posture, and mechanical loading. In basketball players, this curvature may be altered through repetitive jumping and landing, repeated trunk extension demands, and prolonged sport-specific asymmetrical movement patterns. In a study of adolescent federation basketball players, postural measures indicated differences in sagittal alignment compared with controls, suggesting that basketball participation may be associated with structural or functional postural adaptation (Guedes & João, 2014).

Your pilot data are consistent with the need to examine this issue in university basketball players. The baseline lumbar lordosis values in both groups showed a measurable but not statistically significant between-group difference, which suggests that the sample started with comparable spinal alignment. This is important because it provides a reasonable basis for evaluating whether a corrective exercise programme can change lumbar lordosis over time. Direct radiographic measurement also strengthens the relevance of the present study because X-ray assessment provides a more objective estimate of lordotic angle than visual posture screening or indirect field-based methods (Been et al., 2014).

Consequences of Altered Lumbar Lordosis

Altered lumbar lordosis may affect spinal loading, movement efficiency, and symptom development. Excessive lordosis is often linked with anterior pelvic tilt and increased posterior element stress, whereas reduced lordosis may reflect different compensatory strategies that affect segmental motion and load distribution. In either direction, deviation from an appropriate sagittal posture may reduce mechanical efficiency and increase tissue stress during repeated athletic activity (Been et al., 2014; V. Dimitrijević et al., 2022). These effects are clinically relevant in basketball because the sport requires repeated absorption and redirection of force through the trunk and pelvis.

The health implications of lumbar malalignment are also supported by injury data in youth sport. Low back pain is common in young basketball players, with studies reporting substantial prevalence during competitive seasons and links with lower-extremity pain and other risk factors (Yabe et al., 2020; Pasanen et al., 2016). A broader systematic review and meta-analysis of adolescent athletes likewise reported that low back pain is common and associated with higher sport volume, older age, and concurrent musculoskeletal pain (Harris-Hayes et al., 2022). Although posture is not the only cause of pain, altered lumbar lordosis may contribute to the mechanical environment in which symptoms develop or persist.

Corrective Exercise Programmes

Corrective exercise programmes are commonly used to address postural deviations through mobility, strengthening, and motor-control strategies. In the context of lumbar lordosis, exercises such as pelvic tilts, glute bridges, bird-dog, hip flexor stretching, hamstring stretching, wall sits, and cat-cow patterns are intended to improve lumbopelvic control, reduce excessive anterior tilt, and enhance trunk stability. The logic is that improving the balance between tight or overactive muscle groups and weak or under-recruited stabilizers may support better sagittal alignment and movement control (Bayattork et al., 2020; Proskura et al., 2023).

The broader evidence base supports this approach, although the strength of evidence varies by population and protocol. A systematic review of randomized controlled trials found that exercise interventions can improve postural malalignments in the head, neck, and trunk, but also emphasized that many studies have methodological limitations and that better-designed trials are needed (Bayattork et al., 2020). A separate meta-analysis on corrective exercises and lumbar lordotic angle concluded that exercise-based approaches can positively affect lordosis, although the effect depends on the intervention design and participant characteristics (V.

Dimitrijević et al., 2022). Individual trial evidence also suggests that targeted and individualized exercise may improve lordotic alignment in people with hyperlordosis or related postural problems (Proskura et al., 2023).

Research Gap

Despite growing interest in corrective exercise, there remains limited evidence in basketball-specific populations. Most available studies have involved sedentary adults, clinical samples, or mixed-age groups rather than university basketball players, and many have focused on posture correction without using radiographic outcomes (Bayattork et al., 2020; Proskura et al., 2023). In addition, the literature on basketball has focused more heavily on lower-limb injuries and low back pain prevalence than on direct correction of lumbar lordosis through structured exercise programmes (Borges et al., 2023; Yabe et al., 2020).

There is also a gap in pilot-level evidence evaluating feasibility and preliminary effectiveness in a sport setting. This is important because a programme may be theoretically sound yet difficult to implement consistently in athletes because of training schedules, compliance issues, or limited recovery time. A small controlled trial can therefore provide useful early evidence about whether a corrective exercise protocol is practical and whether it produces a measurable change in lumbar lordosis before larger trials are planned (Bayattork et al., 2020; V. Dimitrijević et al., 2022).

Rationale

The present pilot study was justified because university basketball players represent a population exposed to repeated mechanical stress, possible postural adaptation, and clinically relevant low back symptoms. A 12-week corrective exercise programme that combines stretching, strengthening, and motor-control exercises is biomechanically plausible for improving lumbopelvic alignment and may offer a low-cost, non-invasive preventive strategy. Since lumbar lordosis can be measured radiographically, the study also provides an opportunity to examine whether postural change is detectable with an objective method rather than relying only on subjective appearance or functional impressions (Been et al., 2014; Proskura et al., 2023).

The pilot design is especially appropriate because it can inform feasibility, early effect size estimation, and future sample size planning. In sports medicine research, such preliminary studies are valuable when the intervention is novel in a specific athletic population and when there is not yet enough evidence to support definitive claims. For this reason, the current study serves as an early step toward building sport-specific rehabilitation and injury-prevention evidence for basketball players (Borges et al., 2023; Bayattork et al., 2020).

The aim of this pilot study was to evaluate the feasibility and preliminary effectiveness of a 12-week corrective exercise programme on lumbar lordosis among university basketball players.

The primary objective was to compare changes in lumbar lordosis angle between the experimental and control groups after the 12-week intervention. The secondary objective was to examine within-group changes from pre-test to post-test and to estimate the magnitude of the intervention effect using effect size statistics.

Hypothesis of the study was that university basketball players who completed the 12-week corrective exercise programme would show a greater reduction in lumbar lordosis angle than those in the control group.

2. MATERIALS AND METHODS

2.1 Participants

The participants were selected from university-level basketball players enrolled at ITM University, Gwalior, India. A total of 24 participants (12 in the experimental group and 12 in the control group) were included in this pilot study. The participants were between 18 and 25 years of age and had radiographic evidence of altered lumbar lordosis requiring corrective intervention.

Participants were selected from the larger study population through purposive sampling. The experimental group participated in the structured corrective exercise programme, whereas the control group continued their regular basketball training and daily activities without any additional corrective intervention throughout the study period.

2.2 Inclusion Criteria

Participants were eligible for inclusion if they:

1. were university-level basketball players;
2. were between 18 and 25 years of age;
3. demonstrated altered lumbar lordosis based on radiographic assessment;
4. were medically fit to participate in physical exercise; and
5. voluntarily agreed to participate in the study by providing informed consent.

2.3 Exclusion Criteria

Participants were excluded if they:

1. had a history of spinal surgery or severe musculoskeletal injury;
2. had neurological or systemic disorders affecting posture or movement;
3. were undergoing physiotherapy or any other corrective intervention during the study period;
4. were unable to attend the exercise sessions regularly; or
5. sustained an injury during the intervention period that prevented continued participation.

2.4 Outcome Measure

The primary outcome variable was lumbar lordosis angle (degrees), which served as an indicator of spinopelvic alignment. Measurements were obtained through radiographic (X-ray) assessment of the lumbar spine and pelvis. All radiographs were interpreted by qualified medical professionals using standard radiological procedures. Lumbar lordosis angle was measured before the commencement of the intervention (pre-test) and immediately after completion of the 12-week programme (post-test).

2.5 Intervention Programme

The experimental group participated in a structured corrective exercise programme designed to improve lumbopelvic stability, muscular balance, flexibility, and postural alignment. The programme was administered for 12 weeks, with exercise sessions conducted three times per week under supervision.

The exercise protocol included:

Exercise	Prescription	Purpose
Pelvic Tilts	2 sets × 10 repetitions	Improve pelvic control and lumbar mobility
Glute Bridges	3 sets × 12 repetitions	Strengthen gluteal and posterior chain muscles
Bird-Dog Exercise	2 sets × 10 repetitions per side	Improve core stability and spinal control
Hip Flexor Stretch	3 repetitions per side, 20–30 s hold	Improve hip flexor flexibility
Hamstring Stretch	3 repetitions per side, 20–30 s hold	Improve hamstring flexibility
Wall Sits	3 sets, 30–60 s hold	Improve lower-limb strength and postural endurance
Cat-Cow Stretch	2 sets × 10 repetitions	Enhance spinal mobility and flexibility

The exercises were progressively supervised throughout the intervention to ensure proper technique and participant adherence. The control group did not receive any corrective exercise programme and continued their routine basketball practice during the study period.

2.6 Study Procedure

Prior to data collection, institutional permission was obtained from the concerned authorities of ITM University, Gwalior. Eligible participants underwent baseline radiographic assessment to determine lumbar lordosis angle. Based on the study design, participants were allocated to either the experimental or control group.

The experimental group completed the 12-week corrective exercise programme, whereas the control group maintained their usual physical activities without additional intervention. At the end of the intervention period, all participants underwent repeat radiographic assessment using the same measurement protocol as the baseline evaluation. The pre-test and post-test data were subsequently compiled for statistical analysis.

2.7 Study Design

This pilot study employed a pre-test–post-test controlled experimental design to evaluate the preliminary effectiveness and feasibility of a 12-week corrective exercise programme on lumbar lordosis among university basketball players. Baseline (pre-test) and follow-up (post-test) measurements of lumbar lordosis angle were obtained for both the experimental and control groups. The study was conducted over a period of twelve weeks following standardized intervention procedures.

2.8 Statistical Analysis

Statistical analysis was performed using IBM SPSS Statistics. Descriptive statistics, including mean and standard deviation, were calculated for all study variables. The normality of continuous variables was assessed using the Shapiro–Wilk test.

Baseline comparability between the experimental and control groups was evaluated using an independent samples t-test. Within-group changes in lumbar lordosis angle from pre-test to post-test were analysed using paired samples t-tests. Improvement scores were calculated by subtracting post-test values from pre-test values. Between-group differences in improvement scores were assessed using an independent sample t-test. When the assumption of homogeneity of variance was violated, Welch's t-test was used.

To estimate the magnitude of the intervention effect, Cohen's d and Hedges' g effect sizes were calculated. Statistical significance was established at $p < .05$, and 95% confidence intervals were reported where appropriate.

2.9 Ethical Considerations

The study was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki. Participation was voluntary, and informed consent was obtained from all participants before enrolment. Participant confidentiality was maintained throughout the study by anonymising all collected data, and radiographic assessments were performed in accordance with standard clinical safety procedures.

3. RESULTS

3.1 Participant Characteristics

A total of 24 university basketball players participated in this pilot study, with 12 participants allocated to the experimental group and 12 participants to the control group. The mean age of the experimental group was 21.50 ± 2.07 years, while the control group had a mean age of 20.17 ± 1.53 years. At baseline, the experimental group demonstrated a mean lumbar lordosis angle of 50.67 ± 1.87°, whereas the control group demonstrated a mean angle of 49.08 ± 2.11°. Participant characteristics are presented in Table 2.

Table 2. Baseline characteristics of the study participants.

Variable	**Experimental Group (n = 12)**	**Control Group (n = 12)**
Age (years)	21.50 ± 2.07	20.17 ± 1.53
Sex (Male/Female), n	6/6	3/9
Pre-test Lumbar Lordosis Angle (°)	50.67 ± 1.87	49.08 ± 2.11

Note. Continuous variables are presented as **mean ± standard deviation (SD)**. Sex is presented as the number of male and female participants.

3.2 Baseline Comparison

An independent samples t-test was performed to determine whether the two groups differed at baseline. Levene's test confirmed homogeneity of variances ($F = 0.055$, $p = 0.816$). No statistically significant difference was observed in pre-test lumbar lordosis angle between the experimental and control groups ($t(22) = 1.944$, $p = 0.065$), indicating comparable baseline characteristics (Table 3).

Table 3. Baseline comparison of lumbar lordosis angle.

Variable	Experimental Group (n = 12)	Control Group (n = 12)	t	p
Lumbar Lordosis Angle (°)	50.67 ± 1.87	49.08 ± 2.11	1.944	0.065

Note. Values are presented as **mean ± standard deviation (SD)**. Independent samples *t*-test was used to compare baseline lumbar lordosis angle between groups. The difference was **not statistically significant** ($p > .05$), indicating comparable baseline characteristics.

3.3 Within-Group Changes Following the Intervention

Following the 12-week corrective exercise programme, the experimental group exhibited a significant reduction in lumbar lordosis angle, decreasing from 50.67 ± 1.87° at baseline to 45.25 ± 1.36° at post-test. The mean reduction was 5.42° (95% CI: 4.58°–6.25°), which was statistically significant ($t(11) = 14.309$, $p < 0.001$). Conversely, the control group demonstrated no change in lumbar lordosis angle between the pre-test (49.08 ± 2.11°) and post-test (49.08 ± 1.98°) assessments ($t(11) = 0.000$, $p = 1.000$). These findings are summarized in Table 4.

Table 4. Within-group comparison of lumbar lordosis angle before and after the intervention

Group	Pre-test (Mean ± SD)	Post-test (Mean ± SD)	Mean Difference (°)	t	p
Experimental (n = 12)	50.67 ± 1.87	45.25 ± 1.36	5.42	14.309	<0.001*
Control (n = 12)	49.08 ± 2.11	49.08 ± 1.98	0.00	0.000	1.000

Note. Values are expressed as **mean ± standard deviation (SD)**. Paired-samples *t*-test was used to compare pre-test and post-test lumbar lordosis angle within each group. $p < .05$ indicates statistical significance. *Significant at the 0.05 level.*

3.4 Between-Group Comparison of Improvement Scores

Improvement scores were calculated by subtracting post-test lumbar lordosis angle from pre-test values. Since Levene's test indicated unequal variances ($F = 5.673$, $p = 0.026$), Welch's independent samples t-test was applied. The experimental group demonstrated significantly greater improvement (5.42 ± 1.31°) compared with the control group (0.00 ± 0.60°) ($t(15.45) = 13.000$, $p < 0.001$). The mean between-group difference in improvement was 5.42° (95% CI: 4.53°–6.30°) (Table 5).

Table 5. Between-group comparison of improvement scores.

Variable	Experimental Group (Mean ± SD)	Control Group (Mean ± SD)	Welch's *t*	p
Improvement in Lumbar Lordosis Angle (°)	5.42 ± 1.31	0.00 ± 0.60	13.000	<0.001*

Note. Values are expressed as **mean ± standard deviation (SD)**. Improvement was calculated as the change in lumbar lordosis angle from pre-test to post-test. Welch's independent-samples *t*-test was used because of unequal variances between groups. $p < .05$ indicates statistical significance. *Significant at the 0.05 level.*

3.5 Effect Size

The intervention produced an extremely large effect, with Cohen's d = 5.31 and Hedges' g = 5.12, indicating a substantial difference in improvement between the experimental and control groups (Table 6).

Table 6. Effect size of the intervention.

Outcome	Cohen's *d*	Hedges' *g*	Interpretation
Improvement in Lumbar Lordosis Angle	5.31	5.12	Extremely large

Note. Cohen's *d* and Hedges' *g* were calculated to quantify the magnitude of the intervention effect. According to conventional benchmarks (small = 0.20, medium = 0.50, large = 0.80), both effect size estimates indicate an **extremely large treatment effect** of the 12-week corrective exercise programme on reducing lumbar lordosis angle.

4. DISCUSSION

The present pilot study found that a 12-week corrective exercise programme produced a significant reduction in lumbar lordosis angle among university basketball players, whereas the control group showed no meaningful change. This pattern suggests that the intervention was associated with a genuine postural adaptation rather than random variation, especially because baseline values were comparable between groups and the between-group improvement was large. These findings are consistent with previous evidence showing that exercise-based interventions can influence spinal posture when they target both mobility and neuromuscular control (Bayattork et al., 2020; Warneke et al., 2024; Du et al., 2023).

The observed reduction in lumbar lordosis is biomechanically plausible. Pelvic tilts, glute bridges, bird-dog exercises, wall sits, and cat-cow movements likely improved lumbopelvic control and trunk stabilization, while hip flexor and hamstring stretching may have reduced soft-tissue restrictions that contribute to anterior pelvic tilt and exaggerated lordotic posture. Recent reviews indicate that postural change is more likely when strengthening and stretching are combined, rather than when stretching is used alone, because changes in sagittal alignment depend on both flexibility and motor control adaptations (Warneke et al., 2024; Bayattork et al., 2020). In this respect, the present programme appears to have provided a balanced corrective stimulus for the lumbar-pelvic region.

The magnitude of improvement in this study appears stronger than what is commonly reported in the literature. A meta-analysis of corrective exercise interventions for lumbar lordotic angle found a positive overall effect, but the pooled change was moderate rather than extreme (Dimitrijević et al., 2022). Similarly, randomized trials in other populations have reported beneficial changes in lumbar curvature after structured corrective or core-stability training, although the size of the response varies according to the sample and the intervention design (Proskura et al., 2023; Ghaffari et al., 2026). The very large effect size in the present pilot study may reflect the responsiveness of a young athletic sample, the objective radiographic outcome, and the small sample size typical of pilot work.

The basketball-specific context strengthens the clinical relevance of these findings. Basketball players are exposed to repeated jumping, landing, trunk rotation, and unilateral loading, all of which may influence spinopelvic alignment and increase stress on the lumbar region over time. Epidemiological studies have shown that low back pain and musculoskeletal disorders are common in basketball players, and postural changes have also been reported in adolescent federation players (Borges et al., 2023; Yabe et al., 2020; Pasanen et al., 2016; Guedes & João, 2014). This makes lumbar lordosis a meaningful variable for injury prevention and postural screening in basketball populations.

The results also align with earlier work showing that structured corrective exercise can improve lumbar curvature. Proskura et al. (2023) reported that individualized exercise based on the diagnosed postural pattern produced better correction effects than non-specific exercise in adults with low back pain and altered spinal posture. Other intervention studies have similarly shown that corrective exercise can improve lumbar lordotic angle and related outcomes in populations with postural imbalance or low back pain (Dimitrijević et al., 2022; Warneke et al., 2024). Although those studies were not conducted in basketball players, they support the principle that posture-specific exercise can alter sagittal spinal alignment when applied consistently.

From a physiological perspective, the improvement may be explained by enhanced activation of the gluteal and trunk-stabilizing musculature, better pelvic control, and improved flexibility of muscles that influence anterior pelvic tilt. Contemporary evidence suggests that strengthening may be especially important for postural correction because it helps reorganize movement control and load distribution across the lumbopelvic region (Warneke et al., 2024; Bayattork et al., 2020). In this study, the combination of strengthening, activation, and stretching may have created a more favorable environment for reducing excessive lumbar curvature than any single exercise category could have achieved alone.

Clinically, the findings suggest that a simple corrective exercise programme may be useful in university basketball settings as a preventive or early intervention strategy. Because the programme was low-cost, non-invasive, and compatible with regular training, it has practical value for coaches, strength and conditioning staff, and sports medicine practitioners. Postural assessment may help identify players who could benefit from such intervention, and lumbar lordosis measurement may serve as one component of a broader musculoskeletal screening approach (Du et al., 2023; Borges et al., 2023).

The study has several strengths. It used a controlled design, a radiographic outcome, and a clearly defined 12-week intervention, which strengthens the interpretation of the findings. Objective imaging is particularly important because posture studies often rely on indirect or visual measures that are less precise (Been et al., 2014; Lee et al., 2013). Reporting effect size in addition to significance testing is also appropriate in pilot research because it helps readers judge the practical importance of the observed change (Turner et al., 2006; Lakens, 2013).

Several limitations should be noted. The sample size was small, which limits generalizability and may have inflated the effect estimate. Purposive sampling also restricts external validity because the participants may not represent all university basketball players. In addition, the study did not include long-term follow-up, so it is unknown whether the reduction in lumbar lordosis was maintained after the intervention ended. Finally, although radiographic assessment is objective, posture can still vary with measurement conditions, so future studies should standardize imaging procedures carefully (Been et al., 2014; Lee et al., 2013).

Future research should use larger samples, random allocation, and longer follow-up periods to determine whether the observed changes persist and whether they are associated with reduced pain or injury risk. It would also be useful to compare corrective exercise with other approaches such as core stabilization alone, mobility training alone, or combined rehabilitation strategies. In basketball-specific research, future studies should examine whether changes in lumbar lordosis are accompanied by improvements in landing mechanics, trunk endurance, movement quality, and low back pain outcomes (Harris-Hayes et al., 2022; Borges et al., 2023).

5. CONCLUSION

This pilot study suggests that a 12-week corrective exercise programme may be effective in reducing lumbar lordosis angle in university basketball players. The findings support the use of targeted exercise as a practical, non-invasive strategy for improving lumbopelvic alignment in a population that is exposed to substantial spinal loading and a meaningful burden of low back problems (Borges et al., 2023; Yabe et al., 2020; Wall et al., 2022). Although the sample was small, the large improvement observed in the experimental group indicates that corrective exercise warrants further evaluation in larger controlled trials with longer follow-up and broader functional outcomes (Dimitrijević et al., 2022; Du et al., 2023).

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