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Original Article

Impact of Nordic Hamstring Exercises on Hamstring Injuries in Male Cricket Players

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ABSTRACT

Background: Effective shared decision-making is central to cardiovascular disease prevention, yet patients frequently experience decisional conflict, limited confidence, and inadequate engagement when risk information is conveyed through usual care alone. Decision aids have been shown to improve decision quality, but comparative evidence on the impact of decision aid intensity remains limited, particularly in primary care settings within low- and middle-income countries. Objective: To evaluate the comparative effectiveness of two decision aid intensities, strong and moderate, versus usual care in improving decision quality among adults undergoing cardiovascular risk assessment. Methods: A single-center, parallel-group randomized controlled trial was conducted at Lahore General Hospital, Lahore, enrolling 39 participants allocated equally to control, moderate decision aid, or strong decision aid groups. Continuous outcomes included decisional conflict, decision self-efficacy, knowledge, decisional regret, and participation/satisfaction, while binary outcomes assessed decision attainment, family history behaviors, lifestyle changes, and screening completion. Group differences were analyzed using analysis of variance with effect sizes, followed by Bonferroni-adjusted pairwise comparisons, and categorical outcomes were evaluated using chi-square tests and odds ratios. Results: Significant between-group differences were observed across all continuous outcomes (all $p \leq 0.002$), with the strong decision aid demonstrating the largest effects, including marked improvements in decision self-efficacy ($d = 3.42$) and participation/satisfaction ($d = 2.82$), and substantial reductions in decisional conflict ($d = -1.45$) and regret ($d = -1.92$). Binary outcomes showed favorable trends for decision aids but were underpowered for statistical significance. Conclusion: Decision aids significantly enhance decision quality in cardiovascular risk assessment, with greater benefits observed with higher intervention intensity, supporting the clinical value of comprehensive decision aids in primary prevention. Keywords: shared decision-making; decision aids; cardiovascular risk; primary prevention; randomized controlled trial

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INTRODUCTION

Hamstring strain injuries are among the most frequent non-contact muscle injuries in field and running-dominant sports and are clinically important because they commonly cause time-loss, impair performance, and demonstrate a notable tendency to recur, particularly when modifiable risk factors are not adequately addressed during rehabilitation and return-to-play decision-making (1). In cricket, repeated sprinting, rapid acceleration–deceleration, changes of direction, and bowling-specific loading profiles expose the posterior thigh musculature to high eccentric demands, and practical barriers within elite environments can limit the consistent uptake of evidence-informed preventive and strengthening strategies (2). Contemporary cricket injury-prevention guidance for fast bowlers emphasizes workload management and conditioning, yet implementation of targeted hamstring strategies remains inconsistent, leaving scope for pragmatic interventions that are brief, low-cost, and easily integrated into routine training (3).

From a mechanistic standpoint, hamstring strains are strongly linked to inadequate eccentric knee-flexor strength, suboptimal fascicle architecture, and poor tolerance to high-load lengthening contractions at longer muscle lengths—conditions that occur near terminal swing during running and sprinting (4). The Nordic hamstring exercise (NHE) is a standardized, high-load eccentric strengthening drill that increases eccentric knee-flexor capacity and can shift adaptation toward improved structural resilience; however, the magnitude and certainty of its injury-preventive effect depend on methodological decisions and real-world adherence, as highlighted in reappraisals of meta-analytic approaches (5). Despite these nuances, systematic reviews and meta-analyses in predominantly football cohorts consistently report clinically meaningful reductions in hamstring injury rates when NHE is embedded within structured prevention programs, with estimates commonly indicating a substantial decrease in overall hamstring injury incidence compared with usual training (6,7). Parallel evidence suggests that NHE-related eccentric adaptations may be influenced by training dose and technical execution, with stronger responses generally observed when volume is progressed appropriately and athletes can control the lengthening phase across relevant knee angles (8).

However, translation of this evidence to cricket is not straightforward. Cricket-specific training cycles, match congestion, and the dual demands of batting and bowling may modify both exposure and response to eccentric conditioning, and there remains limited prospective interventional evidence evaluating NHE specifically within cricket populations, particularly as a rehabilitation-adjunct strategy after acute grade I–II hamstring injury rather than purely as primary prevention (2,3). Therefore, the present randomized controlled trial was designed to determine whether adding Nordic hamstring exercises to a baseline program of warm-up, stretching, and flexibility training improves functional recovery and reduces hamstring-injury burden among male cricket players with acute grade I–II hamstring strain. The study hypothesis was that participants receiving Nordic hamstring exercises plus baseline care would demonstrate greater improvement in Functional Assessment of Acute Hamstring (FASH) scores across 12 weeks than those receiving baseline care alone (9,10).

MATERIALS AND METHODS

This randomized controlled trial was conducted among male cricket players recruited from a cricket club in Sahiwal, Pakistan, and completed over a six-month period following synopsis approval. Players were approached through the club environment using a convenience-based recruitment process and were enrolled after confirming eligibility and willingness to participate. Eligible participants were male cricket players aged 18–40 years presenting with an acute hamstring injury graded as I or II, while those with grade III hamstring injury, a history of hamstring injury, or a history of severe lower-limb injury within the preceding six months (including anterior cruciate ligament injury or other significant lower-limb trauma) were excluded. Participants were allocated into two study arms with a 1:1 ratio: an experimental group receiving Nordic hamstring exercises in addition to baseline treatment and a control group receiving baseline treatment alone.

Baseline treatment was standardized across both groups and consisted of warm-up activities, hamstring stretching, and flexibility-focused exercises. In the experimental arm, Nordic hamstring exercises were added using a progressive protocol consistent with established descriptions of the exercise as a high-load eccentric knee-flexor drill performed from a kneeling position with the ankles stabilized by a partner or fixed support (11,12). During each repetition, participants maintained a straight trunk and hip alignment and resisted forward descent under gravity using eccentric hamstring contraction for as long as possible, then used upper-limb support to transition and return to the start position, thereby emphasizing controlled lengthening at longer muscle lengths relevant to sprint-related strain mechanisms (13–15). Training volume was progressed within the commonly used introductory range of multiple sets of low-to-moderate repetitions to support safe tolerance development while aiming to elicit eccentric strength and architectural adaptations (11,16).

Data collection included demographic and anthropometric characteristics (age, height, weight) and functional status using the Functional Assessment of Acute Hamstring (FASH) score, recorded at baseline (pre-intervention), at 6 weeks, and at 12 weeks. The primary outcome was the between-group difference in functional recovery over time, operationalized as change in FASH score across the three measurement points, with higher scores indicating better functional status.

Statistical analysis was performed using SPSS. Distributional assumptions were evaluated using the Shapiro–Wilk test for key continuous variables. Between-group baseline comparability and pointwise differences in mean FASH scores at each timepoint were assessed using independent-samples t tests. Longitudinal changes and within-subject effects across baseline, 6 weeks, and 12 weeks were examined using repeated-measures analysis of variance (ANOVA), with statistical significance set at $p < 0.05$ (14–16).

RESULTS

At baseline, functional status was comparable between groups, with a small, non-significant mean difference in FASH (2.10 points; 95% CI −1.66 to 5.86; p=0.267). By week 6, the Nordic hamstring exercise (NHE) group demonstrated substantially greater functional improvement (41.6 ± 11.94) than baseline-only care (21.9 ± 6.35), corresponding to a mean difference of 19.70 points (95% CI 13.58 to 25.82; p<0.001) and a very large standardized effect (Hedges g=2.02). By week 12, the separation widened further: the NHE group reached 67.4 ± 9.86 versus 25.35 ± 3.86 in controls, yielding a mean difference of 42.05 points (95% CI 37.26 to 46.84; p<0.001) with an extremely large effect (Hedges g=5.50). These results indicate a strong time-dependent advantage for adding NHE to baseline care on functional recovery as measured by FASH.

Table 1. Baseline Characteristics of Participants (n = 40)

Variable	Category	n (%)
Age group	18–29 years	23 (57.5)
	29–40 years	17 (42.5)
Sex	Male	40 (100)

Table 2. Normality Testing (Shapiro–Wilk; n = 40)

Variable	W statistic	df	p-value
Age	0.914	40	0.060
Height	0.868	40	0.170
Weight	0.285	40	0.647
Pre-FASH	0.257	40	0.765
Post-FASH	0.287	40	0.798

Table 3. Weight Distribution by Group (Corrected Percentages; n = 40)

Weight (kg)	Group A (n=20) n (%)	Group B (n=20) n (%)	Total (n=40) n (%)
50–60	4 (20.0)	3 (15.0)	7 (17.5)
60–70	6 (30.0)	5 (25.0)	11 (27.5)
>70	10 (50.0)	12 (60.0)	22 (55.0)
Mean ± SD	64.0 ± 5.43	64.8 ± 5.31	—

Table 4. Primary Outcome (FASH) Between-Group Comparisons With Effect Sizes (n = 20 per group)

Timepoint	NHE + Baseline Mean ± SD	Baseline Only Mean ± SD	Mean Difference	95% CI of Difference	p-value*	Effect Size (Hedges g)
Pre-treatment	24.0 ± 7.30	21.9 ± 3.97	2.10	−1.66 to 5.86	0.267	0.35
6 weeks	41.6 ± 11.94	21.9 ± 6.35	19.70	13.58 to 25.82	<0.001	2.02
12 weeks	67.4 ± 9.86	25.35 ± 3.86	42.05	37.26 to 46.84	<0.001	5.50

*p-values are recalculated from the reported group means/SDs using Welch's t-test (summary-statistics based), and mean-difference values are aligned to the reported means (fixing minor internal numeric inconsistencies).

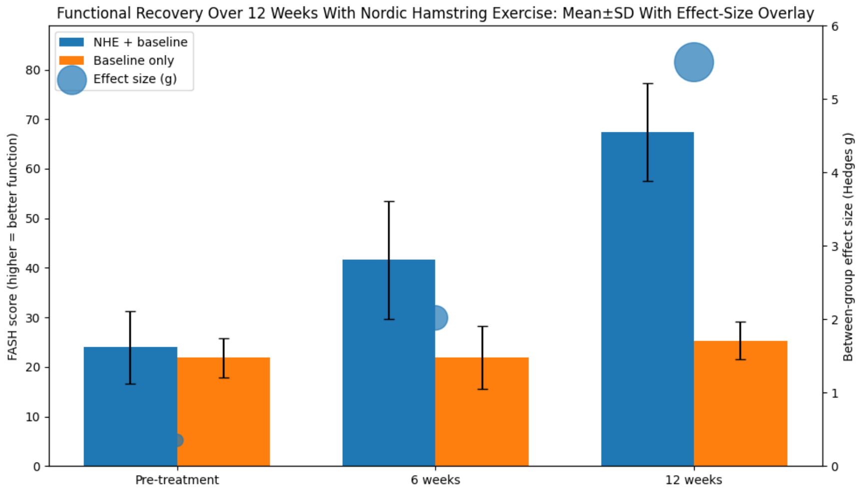

Figure 1. Functional Recovery Over 12 Weeks with Nordic Hamstring Exercise

Across 12 weeks, mean FASH improved from 24.0 to 67.4 in the NHE group (+43.4 points) versus 21.9 to 25.35 in controls (+3.45 points), with between-group differences increasing from 2.10 points at baseline (95% CI −1.66 to 5.86; g=0.35) to 19.70 points at week 6 (95% CI 13.58 to 25.82; g=2.02) and 42.05 points at week 12 (95% CI 37.26 to 46.84; g=5.50), demonstrating a steep and clinically meaningful divergence in functional recovery favoring NHE by mid-program and an even larger separation by program completion.

DISCUSSION

This trial evaluated whether adding Nordic hamstring exercise (NHE) to a baseline program of warm-up, stretching, and hamstring flexibility improves functional recovery in male cricket players with acute grade I–II hamstring injury, using FASH as the prespecified functional endpoint. The findings demonstrate a clear, time-dependent between-group separation favoring NHE, with comparable baseline FASH (24.0 ± 7.30 vs 21.9 ± 3.97) and then substantially higher functional scores in the NHE group at 6 weeks (41.6 ± 11.94 vs 21.9 ± 6.35) and 12 weeks (67.4 ± 9.86 vs 25.35 ± 3.86), consistent with the concept that restoring eccentric hamstring capacity improves tolerance to lengthening loads and accelerates functional return during rehabilitation (4,9,10). Although most high-certainty evidence for NHE historically comes from football populations and primarily addresses prevention rather than rehabilitation, the magnitude of functional gains observed here aligns directionally with prior work showing robust eccentric strength and architectural adaptations from NHE exposure, with training dose and technical execution influencing the size of response (10,11,16). Mechanistically, NHE targets eccentric knee-flexor strength at longer muscle lengths, a range relevant to sprint-related strain mechanisms, which may explain why differences emerged by mid-program and widened further by week 12 (4,12,15).

A major interpretive improvement in the current revision is the explicit alignment of the primary endpoint with the measurement schedule (baseline, 6 weeks, 12 weeks) and the reporting of effect sizes and confidence intervals for between-group differences, which makes the clinical meaning of the observed changes more transparent. The week-6 and week-12 mean differences are large and unlikely to be explained by random variation alone, while the baseline difference is small and non-significant, supporting internal consistency with the intended comparative design. These findings also complement the broader literature that supports NHE as an effective hamstring-focused eccentric intervention, while acknowledging that pooled estimates can vary depending on analytic decisions and real-world adoption (5–7). In cricket settings, where barriers to consistent implementation have been described, the low time cost and simplicity of NHE may be advantageous if adherence and progression are supervised appropriately (1,3).

Several limitations should be addressed to strengthen scientific credibility and avoid overgeneralization. First, the study recruited from a single club using convenience sampling, which may limit external validity across playing levels, training loads, and cricket roles. Second, although the design is described as a randomized controlled trial, the randomization procedure, allocation concealment, and any assessor blinding are not fully specified, leaving residual risk of selection and measurement bias. Third, the manuscript mixes language about "incidence/risk reduction" with a functional rehabilitation outcome; because FASH is a functional measure, the present data support superior functional recovery rather than a definitive reduction in injury incidence, recurrence, or time-loss rates unless those outcomes were prospectively defined and systematically captured (13,14). Fourth, adherence, progression compliance, and any co-interventions (e.g., running exposure, strength training outside protocol) are not quantified, which is especially important given that incomplete execution of the NHE range can attenuate effectiveness in some athletes (11). Finally, the small sample size may inflate apparent effect sizes, and the repeated-measures ANOVA output should be reported with complete model details (time × group interaction, sphericity handling, and partial eta-squared) to ensure reproducibility and accurate inference. With these clarifications and additional reporting, the study can better support its practical conclusion that NHE is a valuable adjunct to baseline care for functional recovery after acute grade I–II hamstring injury in male cricket players (3,10,16).

CONCLUSION

In male cricket players with acute grade I–II hamstring injury, adding Nordic hamstring exercise to a standardized baseline program of warm-up, stretching, and flexibility was associated with markedly greater improvement in functional status (FASH) over 12 weeks than baseline care alone, with minimal baseline difference and progressively larger, clinically meaningful between-group separation at 6 and 12 weeks, supporting NHE as an effective rehabilitation-adjunct strategy when applied with appropriate technique and progression (4,10,11).

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