football leagues. Return to football after such a long break without organized team training might increase the rate of injuries.

Objective To investigate the effectiveness of a home-based injury prevention program (IPP) on reducing injuries in semi-professional football players.

Design Prospective cohort study based on a randomized controlled trial.

Setting Iranian semi-professional male football players.

Participants A total of 178 players from 11 clubs participated in study. From the total of 178 subjects (90 subjects in the intervention group and 88 in control group), 10 subjects dropped out due to a positive Covid-19 test, leaving 87 subjects in the intervention group and 81 in the control group for the final analysis.

Interventions The IPP consisted of 8 weeks home training program with focus on the most common injury locations. The IPP was addressed strength, mobility and balance via neuromuscular and body-weight training with no equipment.

Main Outcome Measurements Non-contact injury rate in the remaining season (8 weeks), training and competition exposure, compliance with the IPP.

Results Player compliance with the IPP was very good (94%). Exposure data were comparable between groups. Pooled estimates for total (training and match) incidence per 1000 h was 7.8 for the intervention group and 15.9 for control group. A lower proportion of players in the intervention group experienced injuries (29% [27 of 87]) compared with the control group (75% [61 of 81]; relative risk [RR], 0.41; 95% confidence interval [CI], 0.29–0.61; $p < 0.001$).

Conclusions A home-based, unsupervised IPP was shown to be effective in reducing the number of injuries in semi-professional male football players after the Covid-19 break. This indicates that going back to training and match play without accompanying IPP cannot be regarded optimal.

437

THE EFFECTIVENESS OF EXERCISE INTERVENTIONS TO PREVENT SHOULDER INJURIES IN ATHLETES: A SYSTEMATIC REVIEW AND META-ANALYSIS

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Background The literature supports exercise to avert injuries in the lower extremity and injuries in general. Nevertheless, the utilisation of exercise strategies to prevent sports-related shoulder injuries remain unproven. This systematic review's primary aim is to evaluate the effectiveness of exercise interventions to prevent shoulder injuries in athletes.

Methods Twelve (12) databases were searched from inception up until July 2021. The search identified nineteen (19) eligible studies that were included and critically appraised. Data extraction and synthesis followed the JBI Reviewer's Manual for Systematic Reviews of Effectiveness and PRISMA guidelines. The data was synthesised utilising the JBI SUMARI to produce several meta-analyses.

Results The pooled results indicated a statistically significant result with moderate heterogeneity in favour of the application of exercise interventions to prevent shoulder injuries

[0.73 (0.62 – 0.87) RR, 95% CI, $P = 0$]. An analysis of upper extremity injury shows a greater effect but with substantial heterogeneity [0.60 (0.52 – 0.68) RR, 95% CI, $P = 0.001$]. Heterogeneity was fully resolved with the removal of poor methodological studies and reveals a larger statistically significant effect [0.51 (0.36 – 0.71) RR, 95% CI, $P = 0.002$]. Subgroup analysis revealed a slightly greater effect for acute shoulder injuries [0.75 (0.58 – 0.96) RR, 95% CI, $P = 0.024$] compared to overuse injuries [0.75 (0.58 – 0.96) RR, 95% CI, $P = 0.05$]. Shoulder-specific programmes showed a statistically significant but inferior effect [0.80 (0.68 – 0.95) RR, 95% CI, $P = 0.01$] compared to general programmes [0.52 (0.35 – 0.76) RR, 95% CI, $P = 0.001$].

Conclusion This systematic review with meta-analysis supports and advocates for the use of exercise interventions to prevent shoulder injuries in sport. The programmes utilised can prevent both acute and overuse shoulder injuries. Exercise interventions designed to address the shoulder specifically were not superior to programmes targeting the shoulder incidentally.

438

DOES A PEER TO PEER LEARNING TECHNOLOGY INTEGRATED WORKSHOP FACILITATE NEUROMUSCULAR TRAINING INJURY PREVENTION PROGRAM COACH LEARNING?

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Background Workshops are used to educate coaches on Neuromuscular Training (NMT) warm-ups to reduce the risk of youth sport injury. Currently, there is no research assessing different learning strategies and its influence on coaches' self-efficacy and knowledge after attending a workshop.

Objective To evaluate whether a peer-to-peer (P2P) learning technology integrated workshop, improved coaches' self-efficacy and ability to identify NMT exercise errors compared to a standard workshop.

Design Randomized controlled trial.

Setting Youth soccer clubs in Calgary, Alberta, Canada.

Participants Eighty-five recreational youth soccer coaches.

Intervention Coaches within each club randomly attended one of two workshops offered to learn a NMT warm-up: the intervention workshop (technology-integrated instruction), or control workshop (standard instruction).

Main Outcome Measures At the end of the workshop, the soccer NMT warm-up exercise test, a video-based test where coaches identify common NMT exercise errors, was completed. At the beginning and end of the workshop, the soccer NMT warm-up self-efficacy scale was completed to assess coaches' self-efficacy change in their ability to identify NMT exercises errors on a 7-point Likert scale.

Results Mean NMT warm-up exercise test scores were 72% (SD: 13%) for the control and 71% (SD: 13%) for the intervention workshop. Mean change in NMT warm-up self-efficacy scores were 0.98 (SD: 1.33) for the control and 1.77 (SD: 1.19) for the intervention workshop. Multivariable linear regression analyses indicated that workshop delivery method was not associated with the exercise test score ($b = -3.45$, 95% CI: -10.80 to 3.91, $R^2=0.13$) but was associated with a greater difference in change of self-efficacy scores for the intervention workshop ($b = 0.97$, 95% CI: 0.26 to 1.89, $R^2=0.13$).

Conclusions A P2P learning technology integrated instructional workshop did not differentially impact coaches' ability to identify exercise errors, but it did increase coaches' self-efficacy in identifying exercise errors compared to a standard workshop.

439 BUMBLED VIBRATION: 144 HZ VIBRATION DOES NOT ENHANCE SHOULDER CONTROL

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Background Stability of the upper extremity is critical for injury prevention. Vibration may improve proprioception, reducing injury risk. However, traditional vibration methods may be expensive and require a significant level of skill by the technician.

Objective Our purpose was to investigate whether an acute bout of shoulder exercise performed with an inexpensive, user-friendly vibration toy ball (BumbleBall, Cardinal Laboratories) improves shoulder position sense and joint control.

Design Participants completed an acute bout of shoulder exercise with and without vibration on separate visits. Prior to the exercise bout, participants were assessed for motion sway (path length) using a custom iPhone application previously shown reliable. Path length was reassessed following the exercise bout. A 2-way repeated measures ANOVA was used to determine differences between conditions (vibration/no vibration) and time (pre/post). Significant main effects were examined using paired t-tests - $p < 0.05$.

Setting Liberal arts undergraduate institution.

Patients (or Participants) Thirty subjects (age 18–22) completed all trials. Subject level of activity ranged from non-athletes to collegiate athletes. Exclusion criterion was an upper extremity injury in the previous month.

Interventions (or Assessment of Risk Factors) Sessions started with an app measure. Each subject held the phone on the palm, arm forward at eye level for 20 seconds each arm for all trials. Each subject then completed a full can exercise set with the randomly assigned BumbleBall state (vibration/no vibration), and then repeated the app stability measure. The toy vibrates at 144 Hertz with an amplitude of 8 mm.

Main Outcome Measurements Average path length before and after use of the BumbleBall (vibration/no vibration) assessed this intervention.

Results There was a significant ($p=0.009$ and $\eta_p^2=0.27$) main effect of time. There were no significant ($p>0.05$) 2-way interactions between condition and time.

Conclusions The vibration of this inexpensive toy at 144 Hz did not improve shoulder proprioception.

440

EVALUATING EXERCISE FIDELITY DURING NEUROMUSCULAR TRAINING PROGRAMS USING WEARABLE TECHNOLOGY

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Background Evaluating exercise fidelity during neuromuscular training (NMT) warm-ups (i.e., completing prescribed repetitions and performing exercises correctly) is important to inform the dose-response relationship of warm-up programs. Wearable technology can be used to measure exercise fidelity.

Objective To determine the accuracy of measuring NMT exercise volume and quality with wearable technology.

Design Cross-sectional study

Setting Youth basketball; Calgary, Canada

Participants Twenty-seven youth basketball players

Assessment of Risk Factors Players wore a triaxial accelerometer on the lower back during an NMT warm-up with concurrent video recording. A trained observer (physiotherapist) used an observation tool to determine whether each athlete performed the prescribed exercise volume and rate posture.

Main Outcome Measurements The number of repetitions during running, skipping and jumping were extracted from the accelerometer signal using a custom peak detection algorithm and compared to the prescribed exercise volume. The algorithm accuracy was calculated as a percentage, with the trained observer evaluation through video-analysis considered the gold standard.

For the plank, participants were evaluated on 'Good Posture (straight body, head to ankle)' and received a score of 'Yes,' 'No,' or 'Partial.' The coefficient of variation (CV) of the accelerometer signal in all three axes was compared for the three fidelity assessment outcomes.

Results The algorithm had an accuracy of 100% for the running, skipping and jumping exercise volume.

Participants who scored 'Yes' had a lower CV in the medial-lateral (median: 47.2%) and vertical (42.3%) axes, than participants who scored 'Partial' (85.4% and 67.6%) and 'No' (115.1% and 115.5%). There were no differences in CV in the anterior-posterior axis.

Conclusions A custom algorithm can be used to measure the number of running, skipping and jumping repetitions. The variability of the accelerometer signal can identify postural changes during a plank. Accelerometer signals may be used to evaluate movement quantity and quality during NMT.

441

LONGITUDINAL CHANGES IN FORCE PLATE MEASURES ARE VALID INDICATORS OF MUSCULOSKELETAL HEALTH IN PROFESSIONAL AMERICAN FOOTBALL PLAYERS

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