Are Coach-led Intervention Programs Effective in Reducing ACL Injury?
A systematic review

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Objective: To systematically review the available literature to determine whether coach led prevention programs are as effective as a mixed leadership group in reducing the incidence of ACL injury in athletes.
Data Sources: We searched PubMed, CINAHL, SPORTDiscus, and Medline for articles published through February 2014 using the terms *anterior cruciate ligament, ACL, prevention, prevention program,* and *neuromuscular training.*
Study Selection: Criteria for inclusion required that (1) the article was published in a peer-reviewed journal and available in English, (2) a preventative training program was implemented, (3) a description of who led the prevention program was provide, and (4) ACL injury incidence and athlete exposure were reported. Eight articles met inclusion criteria and were rated using the Phsyiotherapy Evidence Database (PEDro) Scale. PEDro scores ranged from 3 to 8 with a mean of 5.44 and a standard deviation of 1.51.
Data Synthesis: The eight articles were divided based on intervention leader. Incidence rates for ACL injury in each study were compared to determine prevention program efficacy. When ACL injury rates weren't given, they were calculated based on reported results.
Conclusion: Many variations were found between prevention program designs and implementation. All interventions but one resulted in a decreased incidence with an equal amount of coach led programs and mixed group led programs reaching statistical significance. In conclusion, prevention programs are effective at reducing ACL injury incidence regardless of the personnel in charge of implementing them. Future studies should focus on isolating the intervention leader variable while keeping other variables consistent.

Key Words: ACL injury, prevention program, leadership

Knee injuries are often debilitating and lead to loss of function both short term and long term.[1,2] It is estimated that 100,000 Anterior cruciate ligament (ACL) injuries occur annually in the United States alone.[3] Not only does this injury have immediate effects on a person's quality of life, but may also lead to long-term disability through the early development of osteoarthritis.[1] It has been demonstrated that ACL injury patients show radiographic evidence of knee osteoarthritis just 12 years after injury.[1] As the average age of ACL injury is 19-23 years old, this corresponds to a life-long disability developing in early 30-year old patients.[1] These injuries result in over $7 billion annually in costs associated with surgical reconstruction and rehabilitation strategies.[4]

Prospective studies have identified biomechanical and neuromuscular risk factors associated with noncontact ACL injury.[5–18] Strategies to reduce long-term disability are costly and ineffective[1,2], and therefore, prevention programs implemented prior to injury are the best means of eliminating both short- and long-term impacts of ACL injury. There are various results reported in the literature regarding the effectiveness of reducing ACL injury rates following the use of injury prevention programs.[19–34] By targeting the most common risk factors, prevention programs could lead to adaptations that effectively reduce injury rates and consequently the long-term impact of injury.

There are many variables that can play a role in whether an injury prevention program results is effective at decreasing injury risk. Some of the variables involved in the design and implementation of prevention programs include frequency and duration of the program, length of training session, components of the program, participant age and sex, participant's history of previous injury, and personnel in charge of leading the program. Other studies have focused on identifying aspects related to prevention program design.[35–43] However, there are no known studies that investigate whether the outcome of the intervention is influenced by the individual leading the intervention program. The literature presents two primary strategies for implementing an ACL prevention program. Researchers rely either on coaches instructed on program delivery or an approach that uses a mixed leadership group of coaches and clinicians (athletic trainers, physical therapists, physiotherapists).

As the components and strategies for implementing ACL injury prevention programs continue to evolve there is a need for consideration of how to most effectively implement these programs to achieve the desired outcome. In order to best employ these programs, it is necessary to determine the personnel required. If programs can be effective when coach led, the cost of implementing them can be reduced and populations that may not have regular access to a healthcare provider can benefit from the intervention. Therefore, the purpose of this systematic review is to determine whether coach led prevention programs are as effective as a mixed leadership group in reducing the incidence of ACL injury in athletes.

METHODS

Literature Search

A comprehensive literature search of PubMed, EBSCO host (CINAHL, SPORTDiscus, and Medline) was performed in February 2014. Search terms included combinations of *anterior cruciate ligament, ACL, prevention, prevention program,* and *neuromuscular training.* Similar reviews and articles were cross-references for articles not found using the search terms. Searches resulted in a total of 964 articles which were subsequently limited according to the following criteria: (1) the article was published in a peer-reviewed journal and available in English, (2) a preventative training program was implemented, (3) a description of who led the prevention program was provide, and (4) ACL injury incidence and athlete exposure were reported.

Quality of Methodology and Level of Evidence Assessment Methods

Each study included underwent quality assessment scoring using the PEDro scale.[44,45] For our evaluation purposes, each author independently reviewed the articles and scored them according to the PEDro scale guidelines. A collective level of evidence was determined for the articles included in this systematic review using the Centre of Evidence Based Medicine (CEBM)-Levels of Evidence chart.[46] The CEBM establishes criteria for grading the collective body of evidence using both numerical and alphabetical scales to provide a grade and an overall recommendation for the quality of evidence.

RESULTS

A total of 964 articles were identified using the search terms previously described. Based on the seeming relevance of article title, abstracts for 102 studies were reviewed. Fifteen full-text articles were obtained to determine whether they met the inclusion criteria resulting in eight final articles included for review. (Figure 1) The most common reason for exclusion was a failure to report athlete exposure, the incidence of ACL injury or the person(s) responsible for leading the prevention program. Quality of each article, assessed via of the PEDro scale, ranged from 3 to 8 with a mean score of 5.44 and a standard deviation of 1.51. Characteristics of each study are presented in Table 1 and individual study summaries are described in chronological order. Among the studies identified for review, four studies were entirely coach led and three studies were lead by a mixed group of any combination of coaches, athletic trainers, physiotherapists, or physical therapists. One study[28] conducted their intervention over a two-year period with the first season being coach led and the second season being led by a mixed group. For the purposes of this review, this study by Myklebust et al. will be divided according to intervention year in order to distinguish the effect of leadership on the results from each respective season.

Hewett et al.[27]

In this prospective controlled cluster study, the authors investigated whether a neuromuscular training program would affect the incidence of knee injury in female athletes. Of the 43 high school teams monitored, 15 girls' teams (n=366) participated in the six week intervention, while 15 girls' teams (n=463) and 13 boys' teams (n=434) served as a control population. Athletes participated in volleyball, soccer, or basketball. Injury and athlete exposure was recorded and reported by certified athletic trainers associated with each team. An athlete exposure was defined as one athlete participating in one practice or match. All ACL injuries were diagnosed by an experienced athletic trainer, referred to an experienced sports medicine physician, and confirmed by arthroscopy.

The neuromuscular training program implemented consisted of jump landing training divided into three phases. The objective of the program was to increase vertical height and increase strength as well as teach proper jumping and landing techniques. Phase 1 primarily focused on proper jump technique. Phase 2 built a base of strength, power, and agility before the final phase, Phase 3, emphasized achieving maximum vertical jump height. Each session lasted approximately 60 to 90 minutes and was completed three days per week for six weeks during the preseason. Training sessions were led by both coaches and athletic trainers after being instructed using a supplied videotape and manual documenting the training regimen. Results showed the intervention group had significantly (p=0.05) fewer noncontact ACL injuries as compared to the untrained control group, with trained females resulting in an incidence rate of 0.058 injuries per 1,000 athlete exposures compared to 0.216 injuries per 1,000 athlete exposures in the untrained female group and 0.047 injuries per 1,000 hours in the untrained male group.

Myklebust et al.[28]

The authors of this prospective cross-over intervention study monitored 52 female handball teams (n=850) in Norway for three consecutive years in order to assess the effectiveness of a neuromuscular training program. Baseline observational data was collected during the first season and this season served as the control group. The following two seasons the intervention program was put in place. Attendance and training schedule were reported by coaches and the competition exposure was calculated as the number of games multiplied by the duration of the game multiplied by seven players whereas practice exposure was calculated based on the average weekly number of training hours multiplied by the average attendance for training sessions reported by the coaches. Injury incidence was reported as the total number of ACL (contact and noncontact) injuries per 1,000 player-hours. Anterior cruciate ligament injuries were confirmed via arthroscopic examination and/or magnetic resonance imaging (MRI). In the control group, the incidence rate was calculated to be 0.139 injuries per 1,000 athlete exposures.

Intervention Year 1

In the first intervention season, teams were divided into three rotating groups, each doing floor exercises, using wobble boards, or using balance mats as indicated by the program design. Athletes changed positions every five minutes for an approximate total duration of 15 minutes. During preseason athletes participated in the program three times per week over a five to seven week training period and then once weekly during the season. Coaches were responsible for leading the prevention program. Athletes in the intervention group displayed an incidence of 0.133 injuries per 1,000 athlete exposures. After the first year of intervention, there was a reduction in the number of ACL injuries, but this was not statistically significant (p=0.62).

Intervention Year 2

During the final season, some modifications were made to the intervention program. These changes aimed to make the program more sport-specific and challenging, however the focus of the exercises remained the same as the previous intervention season. Physical therapists were recruited to supervise the intervention with all teams. All physical therapists were given practical and theoretical training on ACL injury prevention programs and specifically instructed in the intervention being implemented. Therapists attended team training sessions when the prevention program was being implemented. Results reflected a reduced number of injuries, but did not reach statistical significance, with an incidence rate of 0.091 per 1,000 athlete exposures in trained groups (p=0.15). A significant difference was found in the incidence of noncontact ACL injuries between the second season intervention group and the control group, with incidence rates of 0.037 per 1,000 athlete exposures and 0.086 per 1,000 athlete exposures, respectively (p=0.04).

Mandelbaum et al.[29]

This cohort study, conducted over a two-year period, aimed at determining whether a neuromuscular and proprioceptive training program is effective at reducing ACL injury in female youth soccer players. Female subjects were recruited from a Southern California soccer league with 52 teams (n=1041) participating in the intervention group during the first year and 45 teams (n=844) participating in this group during the second year. Control groups comprised of 95 (n=1905) and 112 teams (n=1913), respectively. Athlete exposure was defined as participation in any practice or game in which an athlete was exposed to the possibility of an athletic injury. Coaches monitored exposure as well as injuries and reported this data on a weekly basis. Confirmation of ACL injury required a positive MRI result and/or arthroscopic procedure.

Intervention groups completed the Prevent Injury and Enhance Performance (PEP) Program as a twenty-minute warm up. This program employs 3 basic warm-up activities, 5 stretching techniques for the trunk and lower extremity, 3 strengthening exercises, 5 plyometric activities, and 3 soccer specific agility drills. Teams received videos and a supplemental literature packet for instructional purposes. Coaches also attended a mandatory meeting to be further educated on proper biomechanical technique associated with each exercise. Teams completed the PEP program over the course of a season, being instructed and led by their respective coaches. In both years of the study, the intervention group showed a significant reduction in injury incidence with a rate of 0.05 per 1,000 athlete exposures vs 0.47 per 1,000 athlete exposures in year 1 ($p=0.0001$) and a rate of 0.13 per 1,000 athlete exposures vs 0.51 per 1,000 athlete exposures in year 2 ($p=0.0047$). Overall incidence of ACL injury was 0.49 per 1,000 athlete exposures in the control group and 0.09 per 1,000 athlete exposures in the intervention group, reaching statistical significance ($p<0.0001$).

Petersen et al.[30]

Investigators of this prospective cohort study aimed to evaluate the effects of a prevention program on injury incidence in female European team handball players. Ten teams (n=134) underwent a proprioceptive and neuromuscular training program while the control group also consisted of 10 teams (n=142). Hours of exposure during games and practice were recorded for the athletes and incidence of injury was calculated per 1,000 hours of exposure during games and practice and as a sum of both game and practice exposure. All ACL injuries were confirmed by MRI or arthroscopy.

Training in the intervention group consisted of 10-minute training sessions three times per week in the preseason and one time per week during the competitive season for a total duration of 8 weeks. A training manual describing the program was provided to each player. Divided into six phases of increasing difficulty, the program utilized soft balance-boards, wooden rectangular balance-boards, and wooden round boards. A mixed leadership group of coaches, “trainers”, and physiotherapists emphasized correct alignment of the lower extremity. The program also had a jump training component with progressions in directional jumping, jumping from a box to a specific surface, and handball-specific throwing exercises. Landing position was analyzed by the mixed leadership group with athletes being instructed to land “knee over toe”. The study failed to find a significant difference between the intervention group and the control group, but did identify a reduced rate of ACL injury after proprioceptive and neuromuscular training. Intervention groups demonstrated an incidence rate of 0.04 per 1,000 athlete exposures whereas control groups demonstrated an incidence rate of 0.21 per 1,000 athlete exposures ($p>0.05$).

Pfeiffer et al.[31]

The aim of this prospective cohort study was to evaluate the effectiveness of a specialized exercise intervention program in reducing the incidence of noncontact injuries of the ACL in high-school female athletes. Participants came from 122 girls’ teams (n=1439), where 862 subjects were in the control group and the 577 subjects were in the intervention group. Teams were recruited from 15 high schools and consisted of basketball, soccer, and volleyball athletes. Athlete exposure was defined in this study as one player participating in either one practice or one game on a given day. Weekly data was collected from coaches and athletic trainers reporting this exposure as well as noncontact ACL injuries, confirmed by MRI or during surgical procedures.

Authors utilized the Knee Ligament Injury Prevention (KLIP) program in the intervention group in efforts to develop sound body mechanics when decelerating during running with directional changes and when landing on one or two feet. This four-phase program was incorporated into practices for 20 minutes daily over one competitive season. Certified athletic trainers and coaches were involved in implementing the program as well as reporting injury incidence data to the investigators. Using an odds ratio approach, statistical analysis showed no significant differences between the control and intervention groups (odds ratio=2.05; 95% confidence interval=0.21 to 21.7). Incidence of noncontact ACL injury in the control group was calculated to be 0.078 per 1,000 exposures whereas the KLIP treatment group had a rate of 0.167 injuries per 1,000 exposures.

Gilchrist et al.[32]

This cluster randomized controlled trial included 61 NCAA Division I women's soccer teams (n=1435). The 583 athletes in the intervention group were instructed on implementing the PEP program as an alternative warm-up whereas the 852 athletes in the control group continued with their customary warm-up. Certified athletic trainers reported athlete exposure as an athlete's weekly participation in games and practices. An ACL injury was confirmed via MRI, arthroscopy, or direct visualization during repair.

A mixed instructional approach including both coaches and certified athletic trainers followed the same guidelines previously described for the PEP program in executing this intervention among their athletes. This program was used for 12 weeks in total. No statistical significance was found between the control group and the intervention group in regards to the incidence of ACL injury (p=0.198). The control group had an incidence of 0.340 ACL injuries per 1,000 athlete exposures. Intervention groups showed a rate of 0.199 ACL injuries per 1,000 athlete exposures.

Steffen et al.[33]

Authors of this cluster randomized controlled trial aimed to investigate the effect of a specific intervention program on the incidence of injury among high school age female soccer players. A total of 113 female soccer teams in Norway with 2,100 players agreed to participate in the study. Teams were then randomized to create a control group of 51 teams (n=947) and an intervention group of 58 teams (n=1,073). Match exposure was calculated by multiplying match playing time (in minutes) by 11 and training exposure was calculated by multiplying training time (in minutes) by monthly player attendance. These two exposure calculations then formed the composite athlete exposure for this study. Injuries were diagnosed through clinical testing, imaging studies, or surgery.

This coach-led prevention program, named the "11",(FIFA F-MARC 11+) focused on core stability, balance, dynamic stabilization and eccentric hamstring strength. For the purposes of this study, the 11th component, fair play, was not included in the intervention protocol. The program was employed for 15 minutes with a 5 minute jogging period before exercises for 15 consecutive sessions and followed by a maintenance session once per week throughout the remainder of the season. Instructors initially introduced the preventative program to teams at the beginning of pre-season, but coaches were responsible for leading all training sessions throughout the season in place of their normal warm-up routine. Incidence rates for trained athletes were found to be 0.060 per 1,000 athlete exposures while untrained athletes showed an incidence rate of 0.076 per 1,000 athlete exposures. The authors found no significant differences between the control group and the intervention group in regards to ACL injury incidence in this study (p=0.79).

LaBella et al.[34]

In this cluster randomized controlled trial, investigators aimed to determine the effectiveness of coach-led neuromuscular warm-up program on reducing lower extremity injuries. The control group and intervention group both comprised of 45 coaches with 755 athletes and 737 athletes, respectively. One athlete exposure was defined in this study as an athlete participating in all or part of a practice or game. Coaches completed weekly forms to report this data to the researchers. All ACL injuries were confirmed using MRI or operative notes.

Coaches attended a training session led by the principle investigator and an athletic trainer to learn how to properly implement the 20-minute neuromuscular warm-up before practices and an abbreviated version before games. The program incorporated progressive strengthening, plyometrics, balance, and agility exercises. Dynamic knee valgus position was verbally corrected during jump landing exercises and proper form was encouraged throughout. When adjusted for clustering and covariates, intervention groups demonstrated an incidence rate of 0.10 per 1,000 athlete exposures compared to the control group incidence rate of 0.46 per 1,000 athlete exposures. After statistical analysis, a significant difference was found between these incidences of ACL injury (p=0.04).

DISCUSSION

Based on this group of studies and their results, criteria from the CEBM were applied to provide an overall level of evidence as well as a grade of recommendation. Due to cohort study designs, the collective body of evidence received a Level 2a- rating. The minus was deemed appropriate due to the increased likelihood of ACL injury in one of the studies with varying statistical significance among the other studies. The overall grade of recommendation was determined to be B due to the consistent evidence level 2 studies included in this systematic review.

All coach led intervention programs showed a reduction of ACL injury incidence, but only two of the four found a statistical difference between rate of injury in control and intervention groups. In every study, coaches had to attend a specific training session before implementing the prevention program. In these sessions, the investigators or a trained clinician would demonstrate proper technique for the prevention exercises and point out flaws to identify and correct during training sessions with the athletes. Education was a key component in these sessions. By educating coaches on the importance of prevention programs in reducing ACL injury incidence rates, they are more likely to take the time out of practice to ensure their athletes are practicing proper technique and avoiding injury.

Injury incidence was also reduced in all groups but one among the mixed group led intervention studies. While most studies found a reduction between control groups and intervention groups, Pfeiffer et al.[31] instead found an increased rate of ACL injury after undergoing a prevention program. Not only was this rate increased, but it corresponded to an odds ratio of 2.05, meaning those in the trained group were over two times more likely to sustain an ACL injury than those in the untrained group. These worrisome results are likely due to the low number of athlete exposure hours reported for the trained group in comparison to the untrained group. The authors suggest that this could be a limitation for their study along with the lack of randomization. Disregarding the results of this study, all other prevention programs implemented by a mixed group of clinicians and coaches found reduced rates after training. Of these, again only two reached a significant level of difference.

Variables amongst the interventions may account for discrepancies in the final results moreso than the effect of the program leader. A common difference between studies was the definition of athlete exposure and how this data was collected and reported. Incidence is reported per 1,000 athlete exposures and therefore, a universal definition should be established to minimize these inconsistencies and allow a more feasible comparison between study results. Program components also varied, with only two studies using the same program protocol. Studies have indicated that plyometric training along with proprioceptive or neuromuscular-targeted strategies have shown the greatest promise after implementation, with plyometric training being the single most effective part of a prevention program[35,36,47,48] While most studies utilized plyometric exercises, it was not the key focus in all protocols and may explain disparities in results due to differences in adaptations.

Other variables that differed in prevention program design were the frequency with which the program was to be implemented and the duration of each training session. Again, effective parameters have yet to be established for these variables and alterations in frequency and duration can in turn affect the effectiveness of the program. Populations studied also varied. Subjects not only participated in a wide range of sports, but also spanned both experience level and nationality. Previous history of injury was an exclusion factor for participating in a few of the studies included in this review, but wasn't considered in all study designs and therefore may represent a limitation for directly comparing results.

Based upon the evidence gathered in this review, it can be concluded that prevention programs are effective at reducing ACL injury incidence regardless of the personnel in charge of implementing them. This finding can lead to prevention programs being more easily and widely implemented amongst athletic teams. Coaches educated on properly carrying out an established protocol can effectively reduce ACL injury incidence and athletes are not limited due to professional healthcare provider availability. Not only do these results suggest a reduction in incidence, but they also provide a means for reducing the economic impact and long-term disability associated with ACL injury. Future studies can further reinforce these findings by isolating the intervention leader variable while maintaining homogeneity among others such as frequency, duration, program components, and study population.

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Figure 1

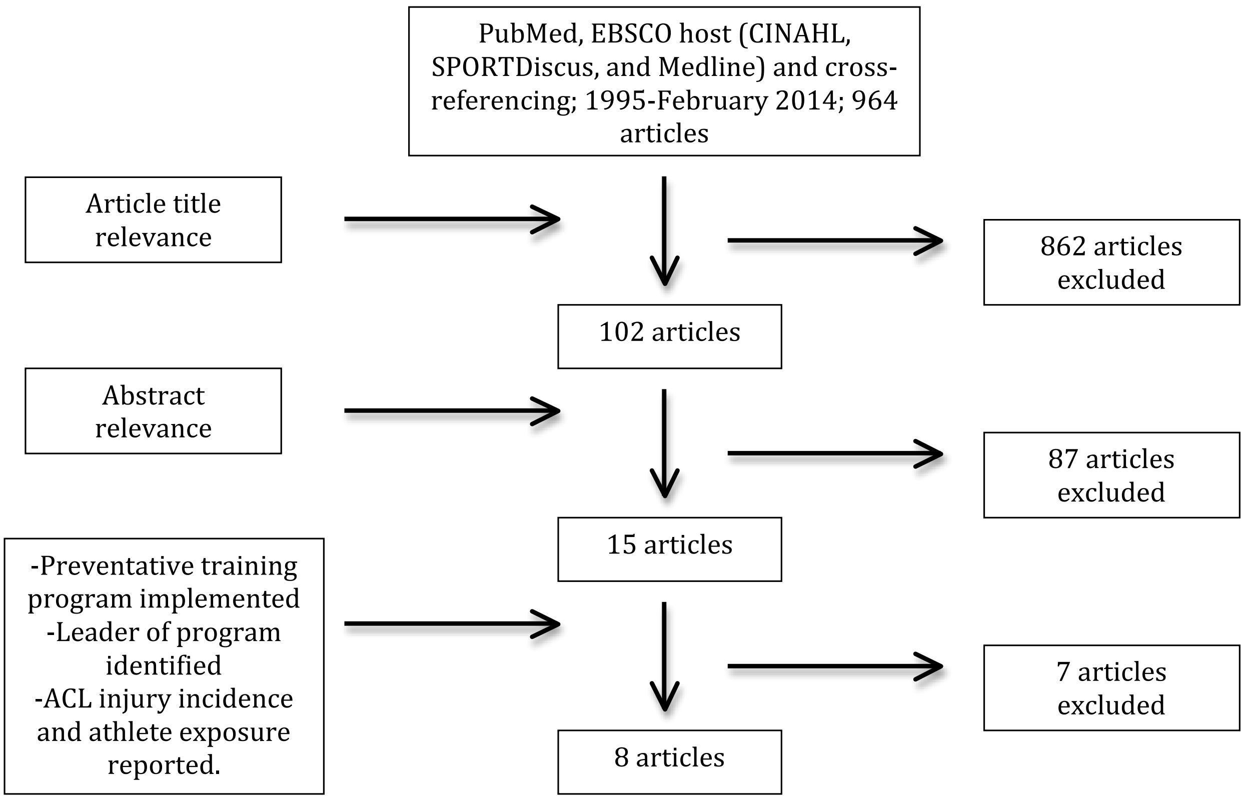
PubMed, EBSCO host (CINAHL, SPORTDiscus, and Medline) and cross-referencing; 1995-February 2014; 964 articles
Article title relevance
862 articles excluded
102 articles
Abstract relevance
87 articles excluded
15 articles
-Preventative training program implemented -Leader of program identified -ACL injury incidence and athlete exposure reported.
7 articles excluded
8 articles

Table 1

	Study			
Study Characteristic	Hewett et al.[27]	Myklebust et al.[28] (Intervention Year 1)	Myklebust et al.[28] (Intervention Year 2)	Mandelbaum et al.[29]
Study Design	Prospective controlled cluster study	Prospective cross-over intervention study	Prospective cross-over intervention study	Cohort study
Group Size (athletes)	Control: 15 female teams (463), 13 male teams (434) Intervention: 15 female teams (366)	[a]Control: 60 teams (942) Intervention: 58 teams (855)	[a]Control: 60 teams (942) Intervention: 52 teams (850)	Year 1- Control: 95 teams (1905) Intervention: 52 teams (1041) Year 2- Control:112 teams (1913) Intervention: 45 teams (844)
Population	Female high school volleyball, basketball, soccer athletes	Female team handball players in Norway	Female team handball players in Norway	Female youth soccer players
Intervention	3 phase neuromuscular training program with jump landing training	5 phase neuromuscular training program with progressive floor exercises, wobble board exercises, and balance mat exercises	5 phase neuromuscular training program with progressive floor exercises, wobble board exercises, and balance mat exercises	PEP Program (education, stretching, strengthening, plyometrics, and sports-specific agility drills)
Frequency; duration in minutes	3 days/week for 6 weeks preseason; 60 to 90 minutes each	3 days/week for 5-7 weeks preseason, 1 day/week during season; 15 minutes each	3 days/week for 5-7 weeks preseason, 1 day/week during season; 15 minutes each	Frequency not reported; 20 minutes each
Intervention Leader	Coaches and athletic trainers	Coaches	Coaches and physical therapists	Coaches
Incidence of ACL Injury (rate per 1,000 AE)	Control: 0.216 (females), 0.047 (males) Intervention: 0.058	Control: 0.139 Intervention: 0.133	[b]Control: 0.139 Intervention: 0.091	Year 1- Control: 0.47 Intervention: 0.05 Year 2- Control: 0.51 Intervention: 0.13

[a] Intervention group was monitored before study to establish control therefore control goup and intervention group contain same teams.
[b] Contact and noncontact ACL injuries reported. Significance was found in noncontact incidence rates (0.086 vs 0.037, repesctively).

Study Characteristic	Study				
	Petersen et al.[30]	Pfeiffer et al.[31]	Gilchrist et al.[32]	Steffen et al.[33]	LaBella et al.[34]
Study Design	Prospective case control study	Prospective cohort study	Cluster randomized controlled trial	Cluster randomized controlled trial	Cluster randomized controlled trial
Group Size (athletes)	Control: 10 teams (142) Intervention: 10 teams (134)	Control: 69 teams (862) Intervention: 43 teams (577)	Control: 35 teams (852) Intervention: 26 teams (583)	Control: 51 teams (947) Intervention: 58 teams (1073)	Control: 53 teams (755) Intervention: 53 teams (737)
Population	Female team handball players in Germany	Female high school volleyball, basketball, soccer athletes	Female NCAA Division I soccer athletes	Female soccer players in Under-17 Norwegian league	Female high school basketball and soccer athletes
Intervention	6 phase neuromuscular training program with balance board and jump landing exercises	KLIP Program (4 phase progressive jump landing program including plyometrics and agility drills)	PEP Program (education, stretching, strengthening, plyometrics, and sports-specific agility drills)	FIFA FMARC 11+ Program (core stability, balance, plyometrics, strength)	Progressive neuromuscular training program involving strengthening, plyometric, balance, and agility exercises
Frequency; duration in minutes	3 days/week for 8 weeks preseason, 1 day/week during season; 10 minutes each	Frequency not reported; <60 minutes each	Frequency not reported; <30 minutes each	15 sessions preseason, 1 day/week during season; 20 minutes each	Frequency not reported; 20 minutes before training, <20 minutes before games
Intervention Leader	Coaches, trainers, and physiotherapists	Coaches and athletic trainers	Coaches and athletic trainers	Coaches	Coaches
Incidence of ACL Injury (rate per 1,000 AE)	Control: 0.21 Intervention: 0.04	Control: 0.078 Intervention: 0.167	Control: 0.340 Intervention: 0.199	Control: 0.076 Intervention: 0.060	[e]Control: 0.46 Intervention: 0.10

[e] After adjustments for clustering and covariates among athletes reporting personal information