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RESEARCH ARTICLE

Usefulness of Nurse Conditioning for Athletes in the Orthopedic Field: A Systematic Review

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Abstract

This study aimed to examine the usefulness of nurse conditioning for athletes in the field of orthopedics using a systematic review approach and provide suggestions for building future support. The Minds Practice Guidelines Development Manual 2020 ver. 3.0 was used for this systematic review. The Medical Journal Web, PubMed, CINAHL/MEDLINE, Cochrane Library, and PsycINFO databases were searched, and two eligible articles were selected. Two articles met the eligibility criteria for primary and secondary screening, and were reviewed by two investigators to assess the effectiveness of the intervention program. These articles suggested that nurse-assisted conditioning was useful in preventing athlete trauma and injury and returning to sports. However, the usefulness of nurse conditioning for athletes could not be fully validated because studies were few, and the interventions differed. Additionally, the accumulation of randomized controlled trials was an issue. Further research and the development of shared intervention programs are necessary.

Keywords: Orthopedics, Sports, Athletes, Nursing, Conditioning

1. Introduction

In the field of orthopedics, conditioning has been emphasized in terms of sports trauma and sports disorders. Recently, the importance of implementing daily conditioning and technical training has increased[1-8]. Previous studies of Canadian university student athletes reported that 202 of 295 athletes had at least one injury[9]. Many students in Japan play sports, and 3,614 students have been reported to have sports injuries or disabilities, an increase of 1,012 compared to the previous year[10]. Top athletes are often considered physically strong and easily conditioned to enhance performance. However, athletes competing at the top level are expected to compete under various conditions that can have a negative impact on conditioning. One of the conditioning problems athletes face is the "overtraining syndrome,"[11] a chronic state of fatigue caused by excessive sports and training. Many athletes experience this problem. Nevertheless, in orthopedics—a surgical specialty that aims to help athletes return to competition—it is difficult to establish a methodology for returning to competition, and establishing a support system is an urgent issue.

Against this backdrop, the Japanese Olympic Committee (JOC) has identified the actual condition of elite athletes and the surrounding environment and has prioritized individual conditioning12). Conditioning is a response to the need to adjust within a limited period for the intended games and how to continue daily training in a better and more effective manner. Conditioning for athletes includes how they spend their time before departure, on the plane, and after arrival, leading to games, diet, sleep, and infection prevention. Moreover, self-checks and physical and mental conditioning are believed to improve athletic performance and prevent sports injuries and disorders[12]. The International Olympic

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Committee (IOE) recommends periodic health examinations (PHE) for elite athletes[13]. The purpose of the PHE is to screen athletes for injuries and medical conditions that may put them at risk of safe participation. Routine health assessments and ongoing monitoring also provide opportunities to establish relationships with the healthcare providers involved in the delivery of care. Therefore, the importance of regular health assessment and ongoing monitoring has been described in the IOE[13], as well as the need for further research and the establishment of support systems.

However, research in this area has only recently begun. Therefore, nurses' conditioning of athletes in the orthopedic field, where athletes try to return to sports after surgery, has not been adequately validated. Thus, this study conducted a systematic review of nurse conditioning-focused intervention studies for athletes in the field of orthopedics and provided suggestions for building support to help athletes return to competition.

2. Materials and Methods

This systematic review was based on the Minds Clinical Practice Guideline Development Manual 2020 ver. 3.0 14).

2.1 Formation of Clinical Question and Literature Selection Criteria

The clinical question "Is nurse conditioning useful to athletes in the orthopedic arena?" was used.

A comprehensive literature search was conducted using the Central Journal of Medicine Web, PubMed, CINAHL/MEDLINE, and Cochrane Library, and the PsycINFO databases. The search terms used were "conditioning" and "nurse." The search terms were limited to intervention studies that described the conditioning of athletes by nurses in the orthopedic field. No other search terms were used to ensure a comprehensive search (last viewed on May 31, 2024). The following documents were excluded: (1) those not related to orthopedics; (2) those unrelated to sports; (3) those with a description unrelated to conditioning; (4) those with a description unrelated to nursing; (5) those that were not intervention studies; (6) review documents.

Two investigators independently conducted the primary screening. Those that did not match the clinical question of the study in the title and abstract and those that had similar themes and researcher names were extracted. In secondary screening, two researchers independently read the full text, selected articles that met the inclusion criteria, collated the results, and reviewed the eligible literature. When the results were collated, and the two researchers' opinions differed, a decision was made regarding the accepted articles, considering the opinions of a third party.

2.2 Ethical Considerations

We strived to protect the copyright of the documents targeted in this study, and two researchers extracted the results to ensure that each document's content was not damaged. The authors declare no conflict of interest.

3. Results

3.1 Literature search results

Figure 1 shows the results of the literature search.

Twenty-four references were found in the Medical Journal Web, 444 in PubMed, 418 in CINAHL/MEDLINE,167 in the Cochrane Library, and 106 in the PsycINFO. Duplicate references and those meeting the exclusion criteria established for this study were excluded. Two articles identified by the investigators as meeting the eligibility criteria were included in the analysis.

3.2. Nurse Conditioning for Athletes in the Orthopedic Field

3.2.1 Subject Selection, Allocation, and Dropout Rate

Table 1 presents the subject selection method, allocation, and dropout rates for each study.

All articles in each study clearly described how the subjects were recruited; the two studies (No.1 and No.2) included in this review were pilot studies that included only the intervention group. These intervention studies involved teenage athletes with shoulder injuries and healthy female athletes aged less than 12 or 14 years. The eligibility criteria for selecting subjects were clearly stated in all papers but were not uniform; two studies (No.1 and No.2) were not assigned because both included only the intervention group. The dropout rates were not clearly stated in both studies (No.1 and No.2).

3.2.2 Intervention Programs and Their Usefulness

Table 2 shows the content and effectiveness of the intervention programs for athletes.

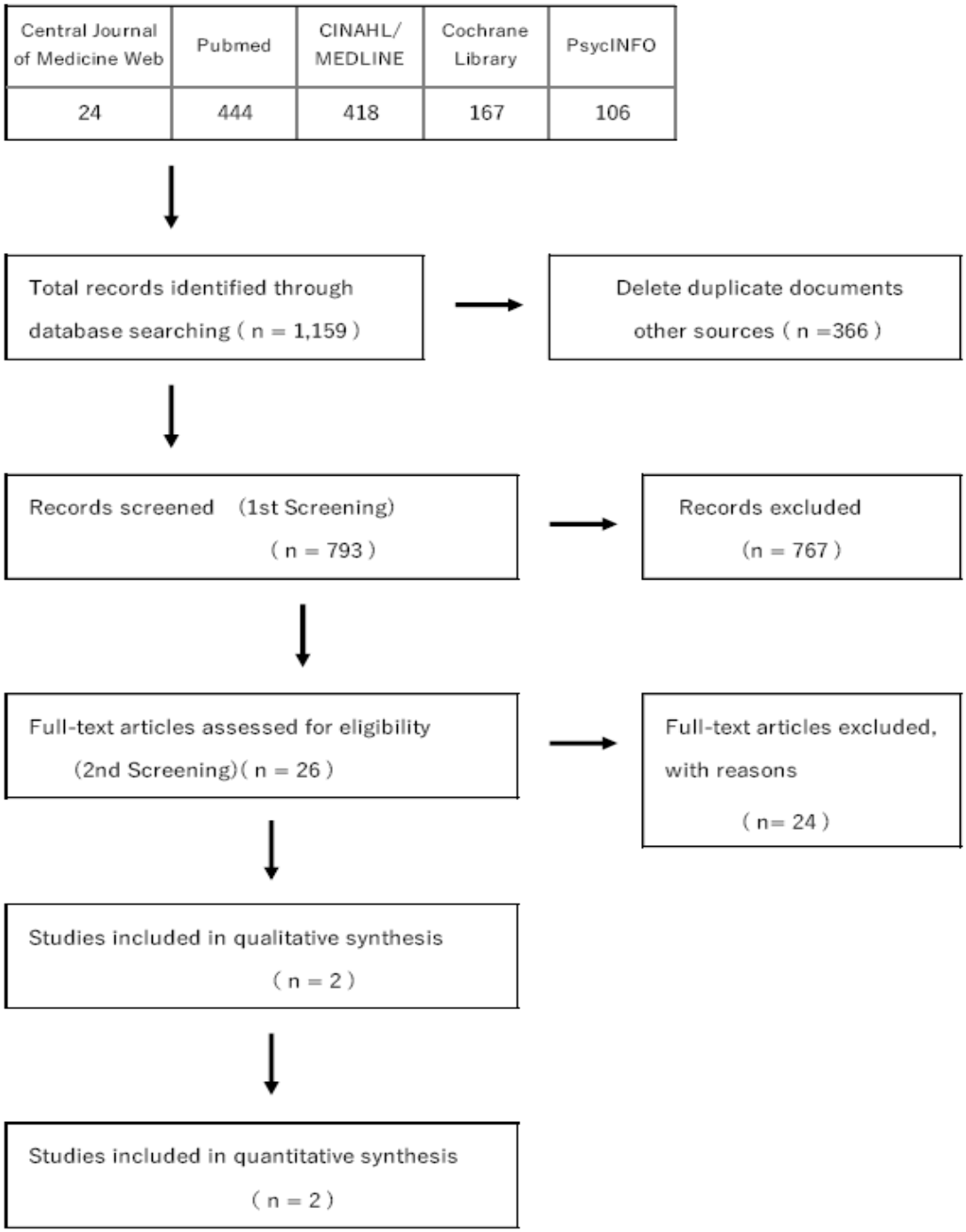

Figure 1. *Literature Search Floechart*

Both studies (Nos. 1 and 2) involved face-to-face interventions. Study (No.1) was a practical experience in which a nurse and physical therapist provided conditioning, whereas Study (No.2) was a practical experience in which a nurse, dietitian, and trainer provided conditioning. The programs used varied across studies. In one case (No.1), the nurse provided stretching instructions. The stretching program included 10 minutes of stretching the trunk and hip joints. The patient returned to sports after the subjective symptoms disappeared, and the combined abduction test (CAT) and horizontal flexion test (HFT) became negative. The results were evaluated in terms of return-to-sport rate, straight leg raising (SLR) as a measure of lower-limb flexibility before and after instruction, hip internal rotation angle (HIR), and time to return to sports. Nurses' conditioning was effective for returning to sports. In one case (No.2), an orthopedic medical check and medical interview were conducted, along with a lecture on nutrition by a dietitian, a lecture on menstruation and anemia by a nurse, and warm-up and cooling-down instructions by a trainer. The results revealed that some athletes had problems with flexibility and tenderness, and some complained of anemia. Conditioning methods varied depending on the subject, but the use of conditioning facilitated the subject's return to competition (No.1) and the prevention (No.2) of sports trauma and injury (No.3).

Table 1. *Subject selection, allocation, and dropout rate*

No	author,year of publication,country	recruit	subjects	allocation method,allocated subjects,blinding	inclusion criteria,exclusion criteria	number of subjects,number of dropouts,dropout rate
1	Sato K..etal...2008.Japan	snowball sampling(private sports medicine clinic)	teenage athlete(28)	not random not blinding	【inclusion criteria】 ①the tenth generation,②athlete,③complaints of shoulder joint pain,④patients requiring conditioning on physician's orders 【exclusion criteria】 NA	28/NA/NA ※Total of intervention and control group(28)
2	Seto T..etal… 2018.Japan	snowball sampling(One prefectural training center)	athletes under 12 years old(28),athletes under 14 years old(25)	not random not blinding	【inclusion criteria】 ①under 14 years old or under 12 years old ,②female,③ soccer players,④those selected for the training center 【exclusion criteria】 NA	53/52/1.8 【Reasons for dropping out】 ●NA

Table 2. *Intervention programs and their usefulness*

No	author,year of publication,country	therapists(number)	program,session duration,number of sessions,session duration(number of sessions),intervention method	session content	evaluation scale	results	control group
1	Sato K..etal...2008.Japan	nurse(1) physiotherapist(1) ※cooperator orthopedic surgeon(1)	stretching guidance,10 minutes,1,1,Face-to-face intervention	stretching guidance for trunk and hip joints	The following data were obtained: straight leg raising (SLR) before and after guidance, change in hip internal rotation (HIR), return-to-sport rate, and time to return to sport (return-to-sport guideline: disappearance of subjective symptoms and negative results of the combined abduction test (CAT) and horizontal flexion test (HFT)). flexion test (HFT)).	【return to Sports】 ●nursing guidance 15cases(53.5%) ●guidance of nurses and physical therapists 8cases(28.6%) ●outcome unknown 5cases(17.9%) 【duration of return to sports with nurse-only supervision】 ●31.5 days 【Change in lower extremity flexibility(A case of return to sports with only guidance from a nurse)】 ●SLR 71.2± 8.1° before instruction to 80± 5.1° after instruction (P<0.01) ●Hip internal rotation angle from 26 ± 11.1° before instruction to 34.6 ± 9.6° after instruction (P < 0.01) 【Change in lower extremity flexibility(A case of return to sports with guidance of nurses and physical therapists)】 ●SLR 74± 6.3° before instruction to 77.5± 6.4° after instruction ●Hip internal rotation angle from 25.3 ± 11.7° before instruction to 28.2 ± 12.6° after instruction	-
2	Seto T..etal… 2018.Japan	nurse(1) sport trainer(1) registered dietitian(1)	lectures and guidance,NA,NA,NA,Face-to-face intervention	①nutrition ②menstruation and anemia ③warm up and cool down	Orthopedic medical check, medical interview	【flexibility positivity rate(under 12 years old)】 ●FFD(finger floor distance) 14.8% ●psoas muscle 14.8% 【tenderness positivity rate(under 12 years old)】 ●patella 14.2% ●foot only a few ●pain when stretching lumbar spine only a few 【trunk holding function(under 12 years old)】 ●all players were able to do so without problems 【medical interview(Complaints of anemia symptoms)】 ●under 12 years old 11.1% ●under 14 years old 12% ●early hospital visits were recommended for anemia symptoms, but players and parents were less responsive.	-

4. Discussion

4.1 Utility of Conditioning Interventions for Athletes in the Orthopedic Field

4.1.1 Subject Dropout Rate

One of the included references (No.2) did not explicitly state the dropout rate; nonetheless, both studies had low dropout rates. Both interventions were face-to-face (Nos.1 and 2). Considering the low dropout rates of the previous studies included in this study, it appears that intervention programs using conditioning make it easy for athletes in the orthopedic field to sustain themselves. Looking at the overall session, in one case (No.1), instructions in trunk and hip stretching were given for 10 minutes during the initial visit; subsequently, symptoms and findings were observed during outpatient visits. The nurse intervened only once, suggesting that

conditioning-based interventions may have led to the development of self-management skills. Self-checking—the ability to self-manage conditioning—is important for the early detection of problems and early response[12], and we believe athletes must develop self-management skills. Information obtained through self-management is also an important indicator for supporting athletes[15-16]. Conditioning interventions may have influenced athletes' active participation and persistence, leading to lower dropout rates. However, conditioning does not unilaterally dictate how to solve a subject's problems. Rather than unilaterally improving a patient's problem as perceived by the healthcare provider, the patient should consider the problem their own and continue learning from it. It is assumed that athletes continue to do so because they have realized the benefits of the same. Nevertheless, the underlying mechanism remains unclear. Therefore, the low dropout rate of participants identified in this review must be verified through a series of randomized controlled trials.

4.1.2. Effects of Conditioning on Athletes

Based on the results of the targeted literature, there were differences in the intervention methods, number of interventions, and duration of interventions. However, interventions using nurse conditioning may be useful in improving the physical and psychological conditioning of athletes in orthopedic settings. Conditioning-based interventions were useful for the orthopedic athletes because the stretching instruction was tailored to the participant's characteristics, which contributed to the acquisition of the necessary muscle strength. Furthermore, it has been reported in sports psychology that improving self-correction through self-talk and imagery can assist athletes in performing exercise[17] because conditioning intervention contributes to mental stability. The articles reviewed in this study were intended for athletes seeking to prevent trauma and disability and those seeking to return to competition, which inevitably requires support from medical professionals, such as physicians, nurses, physical therapists, and dieticians. In particular, for athletes aiming to return to competition, physical rehabilitation for early recovery is the highest priority rather than conditioning. Conditioning is defined as "training and preparing the body physically for all elements related to athletic performance, such as flexibility and general endurance, while improving muscle strength and power, in order to maximize sport performance"[18]. Nevertheless, the importance of conditioning for the prevention of trauma and injury has also been reported[19-22]. Injuries have been reported to cause emotional reactions, such as depression, anxiety, and maladaptation, in relationships with athletes[23]. Moreover, even after adequate physical treatment, athletes may continue to report anxiety about returning to the field and psychogenic pain[24]. In such an environment, athletes must recognize that conditioning leads to trauma and injury prevention and is directly related to the return to competition and prevention of recurrence. In the subject literature, one case (No.1) was an athlete with shoulder joint pain, and the prevention of recurrence and new trauma/disability are important issues for athletes to continue competing. Through conditioning interventions, athletes can objectively assess changes in their physical condition such as the disappearance of subjective symptoms. Additionally, objective assessment of lower limb flexibility and hip range of motion before and after instruction allows the athlete to assess their condition objectively while accepting feelings and perceptions, such as anxiety about returning to competition and fear of reinjury. Although various factors may have prompted their return to competition, the conditioning allowed them to look objectively at themselves and consider reality. By viewing reality objectively, athletes will not perform rehabilitation that leads to overwork, prevents recurrence or new trauma and disability during rehabilitation, and leads to a smooth return to competition.

4.1.3. Limitataions of Research and Prospects

Only intervention studies using nurse conditioning were included in this study. There were differences in the eligibility criteria, exclusion criteria, and intervention methods among the included studies, except for the small number of included and intervention studies. Given the differences in the quality of the participants' skills, the following questions remain regarding whether the interventions implemented in the literature included in this study are maximally effective for athletes in the orthopedic field: There is a need to conduct randomized controlled trials to develop methodologies that will help athletes maintain and improve their conditioning before returning to competition. The usefulness of conditioning has been verified in recent years, and there is a need to develop conditioning programs that support return to competition and prevent sports trauma and disabilities.

5. Conclusion

Intervention studies through systematic reviews have demonstrated the effects of nurse conditioning

on athletes in the field of orthopedics, suggesting its usefulness. However, owing to the paucity of previous studies, it is difficult to conclude whether this methodology has been established as useful for maintaining and improving athlete conditioning, and the accumulation of randomized controlled trials remains an issue.

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