

We realized a systematical review of scientific literature on the effects of the stretching methods in sport. Method: Articles were researched in Scopus and Pubmed databases using MesH and textwords. All articles related to stretching and performance, prevention, strength were reviewed, eliminating those that did not fulfil the inclusion criteria established and those that were not pertinent for the study. After this process, the number of selected articles was 118 references (01/1980 – 12/2010). Results: Literature shows that static stretching realized before the physical activity do not prevent the risk of injuries. Moreover numerous studies indicate that static stretching negatively affects the performance by reducing the explosive strength capacity. Nevertheless the dynamic stretching does not seem to be negative and could even improve the capacity of strength production. Regular programs of stretching could positively affect the performance in sport.

Keywords: Stretching, Performance, Recovery, Injury, Prevention

INTRODUCTION

To stretch is a common practice in sport. Sports professionals traditionally recommended stretching exercises to develop flexibility, to prevent injuries and to improve performances. The purpose of this review was to clarify some points about the effects that stretching methods have on injuries and performances in sport.

PROTOCOL

Criteria of inclusion and exclusion: In order to identify articles and to include them in our review the following criteria was set: articles must be published in journals with revision by pairs. Studies have to indicate the criteria of inclusion of the population, the method of work of flexibility and the duration of the study. The present review includes data from January 1980 to December 2010.

Strategy research: was realised through Scopus and Pubmed databases using MeSH and textwords for English-language: exercise, sport, flexibility, stretching, injuries, strength, prevention and warm-up.

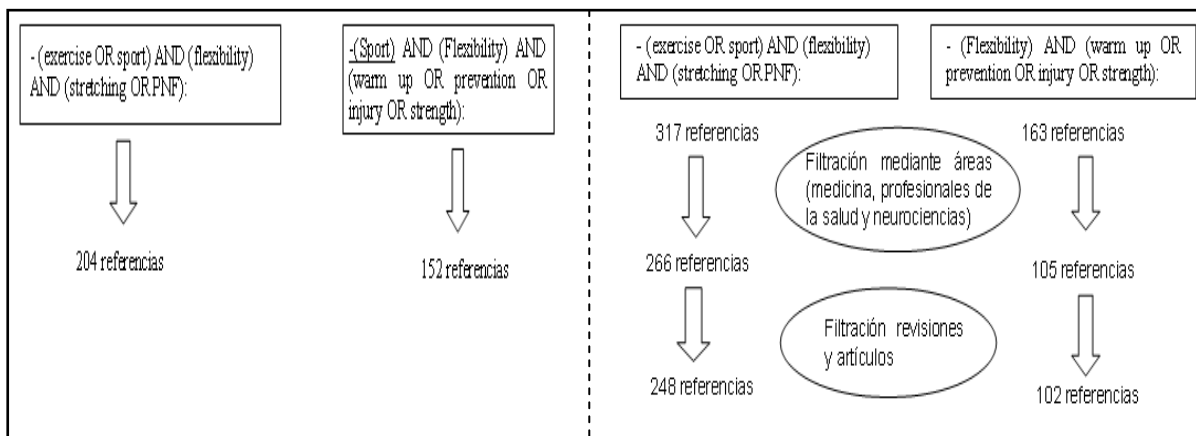


Fig 1: Strategies research A) Pubmed B) Scopus

After reviewing all the references obtained in the two data bases, the total number of articles was of 118 (fig 1). Additional references were reviewed from the bibliographies and from citation searches on key articles like books (Wiemann and Klee, 2010) and thesis.

MAIN RESULTS

Prevention of injuries: the inclusion of the static stretching during warm-up to prevent injuries is not justified for different reasons. They reduce the blood circulation (Ylinen, 2009) and increase to the risk of injury by producing an analgesic effect that could hide the pain. In

addition, they increase compliancy of the muscle causing a reduction in the capacity to absorb energy (Shier, 2007). Moreover, regular stretching programs do not reduce the percentage of total injuries. Nevertheless if the injuries are classified according to the kind of tissue, then regular stretching programs seem to reduce the muscular-skeletal injuries (Amako et al., 2003).

Strength, Immediate effects: static stretching before physical activity could produce a reduction of the strength and the muscular resistance (Nelson et al., 2005). The possible causes of this reduction can be explained by the long and intense static stretching which 1) produces muscular damage, 2) increases compliancy of the muscle and 3) produces a neural inhibition (Shier, 2004). On the other hand, the dynamic stretching increases the muscular temperature, reason why it could support the strength production (Manoel et al., 2008)

Strength, effects of the regular programs of stretching: They positively influence the strength performances for different reasons (Kokkonen et al., 2007), induction of muscular hypertrophy (Shier, 2004) and enhancement of the reusability of the elastic energy (Kubo et al., 2002)

Gain of range of movement (ROM): stretching methods are effective to increase the ROM. Studies do not allow determining with reliability what method of stretching has more beneficial effects than the others (Ylinen, 2009). Several authors affirm that the increase of ROM is due to a higher tolerance to the pain (Fasen et al., 2009; Shier, 2004).

CONCLUSION

On one hand, the scientific evidence does not support the inclusion of the methods of stretching in the warm-up if the aim is reducing the number of injuries. Moreover, static stretching before the physical activity has mainly an immediate negative effect on strength production. On the other hand, it is probable that regular stretching programs could reduce the injury risk during the physical activity and could improve performances in the different manifestations of the strength. Finally, recent studies argue the most consistent theory to explain the ROM gain is the increase of the pain tolerance.

REFERENCES

- Amako M., Oda T., Masuoka K., Yokoi H., Campisi P. (2003). Effect of static stretching on prevention of injuries for military recruits. *Mil Med*, 168(6), 442-446.
- Fasen JM., O'Connor AM., Schwartz SL., Watson JO., Plataras CT., Garvan CW., Bulcao C., Johnson SC., Akuthota V. (2009). A Randomized Controlled Trial of Hamstring Stretching: Comparison of Four Techniques. *J Strength Cond Res*, 23(2), 660-7.
- Klee A., Wiemann K. (2010). *Movilidad y flexibilidad. Método práctico de estiramiento*. Barcelona: Paidotribo.
- Kokkonen J., Nelson AG., Eldredge C., Winchester JB. (2007). Chronic static stretching improves exercise performance. *Med Sci Sports Exerc*, 39(10), 1825-31.
- Kubo K., Kanehisa H., Fukunaga T. (2002). Effects of resistance and stretching training programmes on the viscoelastic properties of human tendon structures in vivo. *J Physiol*. 1, 538, 219-226.
- Manoel ME., Harris-Love MO., Danoff JV., Miller TA. (2008). Acute effects of static, dynamic, and proprioceptive neuromuscular facilitation stretching on muscle power in women. *J Strength Cond Res*, 22(5), 1528-1534.
- Nelson AG., Kokkonen J., Arnall DA. (2005). Acute muscle stretching inhibits muscle strength endurance performance. *Journal of Strength & Conditioning Research*, 19(2), 338-343.
- Shrier I. (2007). Does stretching help prevent injuries? In: MacAuley, D. Best, T. (Eds.), *Evidence-Based Sports Medicine* (pp. 36-58). London: BMJ Publishing group.
- Shrier I. (2004). Does stretching improve performance? A systematic and critical review of the literature. *Clin J Sport Med*, 14(5), 267-73.
- Ylinen J. (2009). *Estiramientos terapéuticos en el deporte y en las terapias manuales*. Barcelona: Masson.