

Strength training for physical performance and injury prevention in sports Individualised and supervised training for female athletes

Akademisk avhandling

för avläggande av medicine doktorsexamen
vid Sahlgrenska akademien vid Göteborgs universitet
kommer att offentligen försvaras i Academicum, Arvid Carlssons hörsal
fredagen den 9 oktober, 2009, kl 09.00

av

Sofia Ryman Augustsson
legitimerad sjukgymnast

Fakultetsopponent:
Professor Suzanne Werner
Centrum för idrottsskadeforskning och utbildning,
Institutionen för molekylär medicin och kirurgi
Karolinska Institutet, Stockholm

Avhandlingen baseras på följande delarbeten:

- I. **Injuries and preventive actions in elite Swedish volleyball.**
Augustsson SR, Augustsson J, Thomeé R, Svantesson U. Scand J Med Sci Sports 2006;
16: 433-440.
- II. **Gender differences and reliability of selected physical performance tests in young women and men.**
Augustsson SR, Bersås E, Magnusson Thomas E, Sahlberg M, Augustsson J,
Svantesson U. Advances in Physiotherapy 2009: 11: 64-70.
- III. **Performance enhancement following a strength and injury prevention programme: a 26-week individualized and supervised intervention in adolescent female volleyball players.**
Augustsson SR, Augustsson J, Thomeé R, Karlsson J, Eriksson B, Svantesson U.
Submitted.
- IV. **Athletes' experience of individualised and supervised strength training for physical performance and injury prevention.**
Augustsson SR, Willén C.
Submitted.



UNIVERSITY OF GOTHENBURG

Strength training for physical performance and injury prevention in sports Individualised and supervised training for female athletes

Sofia Ryman Augustsson

Institute of Neuroscience and Physiology/Physiotherapy
Sahlgrenska Academy at the University of Gothenburg
Göteborg, Sweden, 2009

The overall purpose of this thesis was to obtain knowledge about individualised, supervised strength and conditioning programmes for physical performance and injury prevention in female athletes. Data are presented both on the influence of individualisation and supervision during resistance training for physical performance and injury prevention and on the athletes' experience of resistance training and the role of the physical coach. Data are also presented on physical performance testing and injury prevalence and preventive action in female volleyball.

Study I: The purpose of this study was to examine the prevalence of injury and the extent of preventive action in elite Swedish volleyball players. Injuries to players in the elite male and female Swedish division, during the 2002-2003 season, were registered using a questionnaire. Of the 158 volleyball players, a total of 82 players (52%) reported 121 injuries, during a total exposure time of 24,632 h. The majority of the injuries were located in the ankle, knee and back. Most injuries were classified as being of minor severity. Although most players took part in some kind of preventive action, one in every two players incurred an injury during the season, which indicates that the risk of suffering an injury in elite volleyball is relatively high.

Study II: The purpose of Study II was to evaluate the test-retest reliability of sit-ups and push-ups and to investigate performance differences in muscular endurance (maximum number of repetitions) and power (timed; maximum number of repetitions in 30 s) in young women and men. Thirty-eight women and 25 men (age 18-35) participated in the study. Thirteen female participants performed two test sessions of each test using a test-retest design. A high level of reliability was noted for both the sit-up and the push-up tests. There were no significant differences between the men and the women in the sit-up test, whereas the men performed significantly more push-ups than the women.

Study III: The purpose of Study III was to evaluate the effects of a 26-week individualised and supervised strength and injury-prevention programme on performance enhancement. Young female volleyball players completed resistance training with either a supervised, individualised training programme (experimental group; n=10) or an unsupervised, non-individualised training programme (control group; n=17). Exposure and injury data were collected during the 2006-2007 season (baseline) and the 26-week programme with physical performance testing was carried out during the 2007-2008 season (intervention). After the intervention, the experimental group had improved significantly more ($p < 0.05$) than the control group in the squat, barbell bench press, push-ups and sit-ups. Individualisation and supervision of resistance training seem to improve greater training adherence and strength gains compared with non-individualised and unsupervised training.

Study IV: The purpose of Study IV was to explore and describe volleyball players' experience of an individualised, supervised strength-training programme aiming at physical performance and injury prevention. The purpose was also to use the players' observations to obtain an understanding of the role of a physical coach. The study comprised nine participants (mean age 19 years) who had been involved as the experimental group in Study III. Data were collected using semi-structured interviews and were analysed using qualitative conventional content analysis. Three overarching themes describing the content of the text emerged: 1) being in an enjoyable, relaxed situation, 2) interaction between coach and athlete and 3) mental and physical achievements.

Conclusions: Individualisation and supervision appear to be of importance for compliance, strength gains and athletic performance, during strength training. From the female team athletes' perspective, the willingness to perform strength training is dependent on team spirit, individual goal-setting and bonding with the coach. Strength training, on the one hand, could be used to improve self-esteem among young females. On the other hand, when designing strength-training intervention studies, it is important to be aware of the fear and feeling of uncertainty that may exist among the participants when it comes to strength training.

Key words: Strength training, physical performance, functional tests, strength assessment, injury prevention, physical coach, young female athletes, volleyball

ISBN 978-91-628-7808-5