The use of a new biofeedback insole weight-bearing measuring device in the assessment and rehabilitation of soccer players: A case study review.

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INTRODUCTION

Limited weight-bearing is clinically prescribed when sportspersons use crutches or canes during the process of fracture-healing or certain post-hip, knee and ankle pathologies as well as surgical procedures. The general medical prescription in these cases include instructions such as non-weight-bearing (NWB), touch-weight-bearing (TWB), partial weight-bearing (PWB) and full weight-bearing (FWB). The current methods for PWB or FWB gait training are mainly subjective and studies confirm the inability of the subjects to reproduce the required weight-bearing result. Until recently, there have only existed static methods of measuring weight-bearing and distribution. These include scales (Bohannon RW et al, 1989) and various force plate platform systems that utilize weight-bearing strain sensors (Gapis JJ et al, 1982). They are limited in their functional usage, as they cannot accurately measure weight-bearing in walking, sitting to standing and stair climbing – all basic functional daily activities. Auditory and visual biofeedback devices that are currently available to encourage increased weight-bearing have also been limited to the static weight-bearing positions. Research on these devices has been limited to weight-bearing characteristics of individuals with amputations (Chow DH, 2000), as well as in various neurological cases (Batavia et al, 2001).

An innovative computerized air-insole auditory biofeedback system (CAIABS)** was utilized to measure the weight-bearing in the heel and forefoot during locomotion (Isakov E, 2006) (Pic. 1).

Pic. 1: The computerized air-insole auditory biofeedback system
The biofeedback facility of the system was utilized to accurately train the injured player to progressively increase his weight-bearing ability until FWB was prescribed by the referring sports physician. It was used to accurately and objectively quantify progress in order to return his affected side to equal bilateral weight-bearing and gait-sequence patterns.

CASE PRESENTATION

A 22 year old male professional soccer player underwent a surgical procedure to his left knee which included a micro fracture to a small area of his medial femoral condyle. This surgical procedure has been previously described in cases of severe local cartilage damage, Simon TM and Jackson DW (2006). The surgeon's post-operative instructions were NWB gait for three weeks, PWB (30% body-weight) for a further three weeks, and finally PWB (60% body-weight) for another two weeks. At the termination of the three week NWB period, the player was trained using the CAIABS to weight–bear an average of 25 kg (30%) on the operated leg while walking with two crutches (Fig. 1).

Following this initial training period, his weight-bearing ability was reassessed to determine whether he had maintained this weight-bearing level. The results exhibited almost perfect maintenance (Fig. 2).

Fig. 1: Results after biofeedback session 1.

Following this initial training period, his weight-bearing ability was reassessed to determine whether he had maintained this weight-bearing level. The results exhibited almost perfect maintenance (Fig. 2).
At six weeks, he was progressed in a similar manner as described above to 60% weight-bearing (50 kg) for a further two weeks (Fig. 3).

Finally, he trained using the system to achieve equal bilateral weight-bearing and gait-sequence patterns (Fig. 4).
An innovative computerized air-insole auditory biofeedback system (CAIABS) was successfully utilized to gradually increase the weight-bearing of a soccer player who had undergone sensitive knee surgery. The new system proved to objectively and accurately quantify the weight-bearing during the rehabilitation process. The biofeedback facility was used to train the player to actually "feel" the correct amount of weight-bearing allowed during the treatment sessions, and repeated analysis after the training period showed the ability to retain what was gained. This is the first reported case study utilizing the CAIABS in the process of graduated weight-bearing in sports rehabilitation.

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CONCLUSION

An innovative computerized air-insole auditory biofeedback system (CAIABS) was successfully utilized to gradually increase the weight-bearing of a soccer player who had undergone sensitive knee surgery. The new system proved to objectively and accurately quantify the weight-bearing during the rehabilitation process. The biofeedback facility was used to train the player to actually "feel" the correct amount of weight-bearing allowed during the treatment sessions, and repeated analysis after the training period showed the ability to retain what was gained. This is the first reported case study utilizing the CAIABS in the process of graduated weight-bearing in sports rehabilitation.

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Fig.4: Comparison between both legs at 8 weeks.
REFERENCES


