

RELATIONSHIP BETWEEN FOOT PRESSURE DISTRIBUTION AND ANKLE/FOOT AND BALANCE IMPAIRMENTS IN CHILDREN WITH DOWN SYNDROME

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BACKGROUND AND PURPOSES

Down Syndrome (DS) is characterized mainly by variable intellectual disability, distinct facial phenotype, generalized hypotonia and joint laxity. Physical disability can be an additional problem in people with DS and manifests as reduced lower limb muscle strength and impaired balance.

The objectives of this study were to characterize the foot pressure and contact area among children with DS and to study their relation to disability related to the ankle/foot and balance impairment.

SUBJECTS AND METHODS

28 children with DS aged 11.07±1.65 years (DSG); 28 children, age/sex-matched, without DS (CG) represented the sample of the study.

Children were excluded from the study if there was history of previous lower limb surgery, were unable to walk without a supportive device such as a walker or brace, or had a concomitant medical condition or injury that could affect their physical function (e.g. Neurological or inflammatory disorder). Oxford ankle Foot questionnaire was used to measure disability related to ankle/foot problems (parents version) through an interview with parents before measurements. During the interview the parents agreement about participation is confirmed by signing a consent form. Pressure sensitive mat was used to assess the foot pressure, contact area and arch index(AI). After demonstration, participants were asked to walk barefoot across the platform at a walking speed similar to the usual. participants were asked to take four steps prior to hitting the platform and continue afterward. These procedures were repeated until five passes were obtained (five recordings of dominant foot). A trial was repeated if the foot is placed near to or on the edges of the platform. Biodex balance system was used for measuring the limits of stability (LOS). This test challenges children to move and control their center of gravity within their base of support. During each test trial, patients must shift their weight to move the cursor from the center target to a blinking target and back as quickly and with as little deviation as possible.

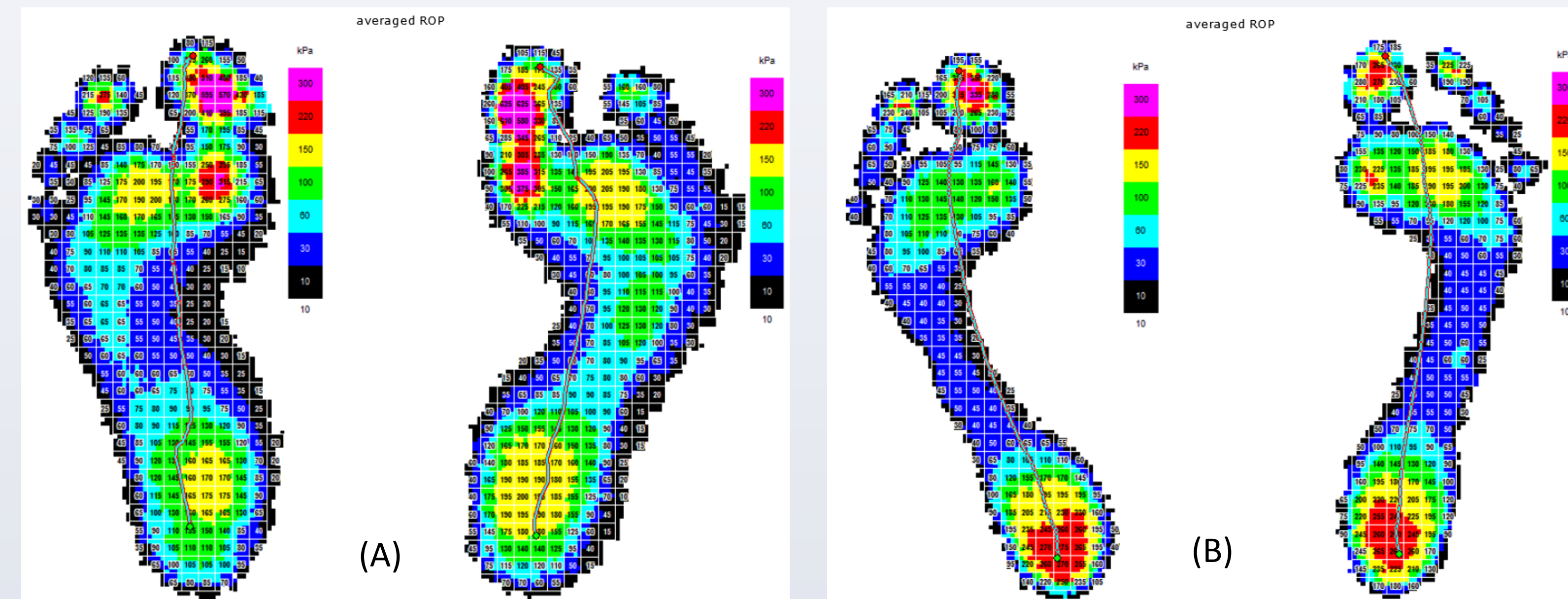


Figure 1: (A) Average rollover period for one of participants with Down syndrome (B) Average rollover period for one of healthy participants.

RESULTS

The values obtained were then compared with those calculated from a sample of age- and gender-matched healthy children. There were significant differences between the domains (Physical, School and play, Emotional, foot wear and clothing ($p<0.05$) of the Oxford ankle Foot questionnaire. There were significant differences in arch index, maximum force, contact area ($p<0.05$). Overall LOS is significantly decreased in DS children ($p<0.05$). There was no relation between contact area and LOS or Physical domain score of the Oxford ankle Foot questionnaire.

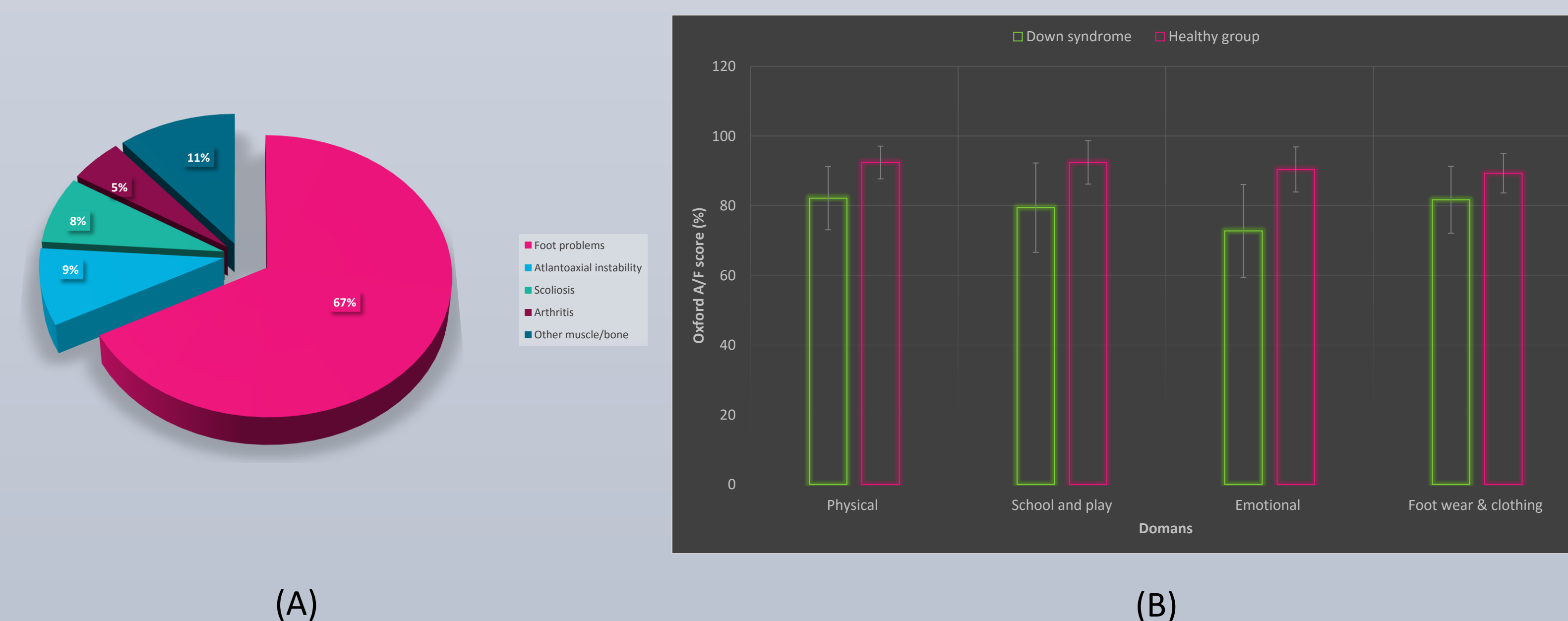


Figure 2: (A) Medical conditions associated with participants with Down syndrome (B) significant differences between the domains (Physical, School and play, Emotional, foot wear and clothing ($p<0.05$) of the Oxford ankle Foot questionnaire between Down and healthy subjects.

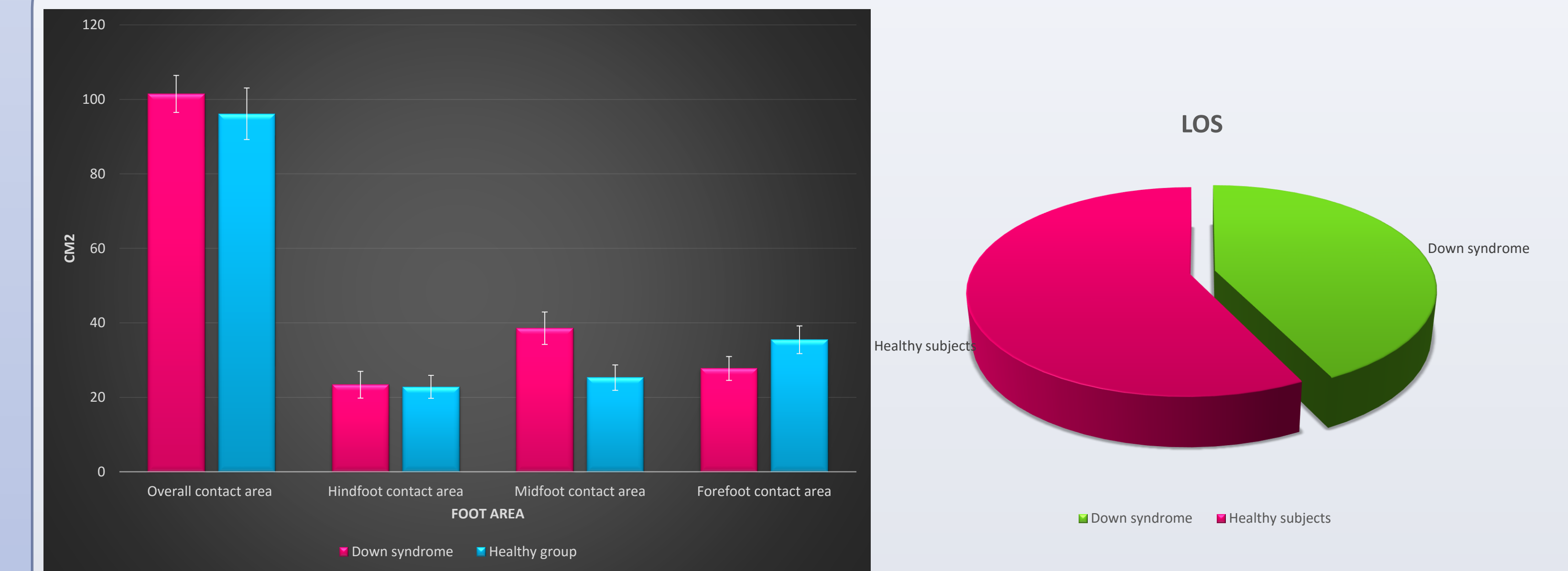


Figure 3: (A) There was a significant difference in contact area between both groups and the Overall limits of stability is significantly decreased in DS children ($p<0.05$).

DISCUSSION

Children with DS exhibited larger midfoot and reduced forefoot contact areas with respect to healthy matched children. Increased AI values and increased average contact pressures in the midfoot and forefoot are largely related to high prevalence of pesplanus in children with DS. Flatfeet can be caused by the generalized hypotonia and ligamentous laxity associated with the presence of higher average contact pressure in midfoot and forefoot. This findings justify the need for careful podiatric surveillance. It seems that impairment of balance in children with DS is a multifactorial problem not only related to changes in foot pressure and contact area. Studies are needed for further understanding of the caused behind balance impairment.

REFERENCES

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