Preliminary Results of the Effects of Progressive Lenses on Gait Performance among Different Age Groups

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Abstract

Background: Multifocal lenses (MfL) are designed for both near and distance viewing, distort vision in the lower part of the visual field at ground level while walking. Safe ambulation relies on the lower visual field to detect obstacles (Marigold et al, 2008). The need for investigating the connection between MfL glasses and falls is important for healthcare providers and fall preventative measures (Lord et al, 2002). Observing the effects of MfLs on age can determine MfLs as a moderating variable between vision and gait impairment.

Objective: This study will show that when wearing MfLs both young and middle-aged individuals will experience a significant decrease in functional gait performance compared to when wearing single lenses.

Participants: Twenty 18-35 year olds and fifteen 45-60 year olds who do not currently wear multifocal lens glasses and have no history of balance or gait impairments. Preliminary analysis of 5 young adults.

Design: A within-between subjects repeated measures MANOVA, with three biomechanical variables and a functional gait assessment (the Dynamic Gait Index) as the dependent variables. Len condition (with or without progressives) and age group will be the independent variables.

Preliminary Results: Results from motion capture analysis of five young participants show an increase in toe clearance (p<0.05) DGI-m analysis of five young participants show an increase in toe clearance during the ramp/step or step/ramp trial.

Hypotheses:

1. Young non-experienced MfL wearers will show a decreased functional gait performance when using MfL glasses compared to single lenses.
2. Middle-aged non-experienced MfL wearers will show a decreased functional gait performance when using MfL glasses compared to single lenses.
3. Given groups of individuals (young non-experienced MfL wearers and middle-aged non-experienced MfL wearers) will both show the same within group gait performance difference when using MfL glasses compared to single lenses when using three biomechanical instruments and the gait index.

Methods

This study examined performance of 5 healthy young adults while wearing a 2.75 progressive lens and non-corrective single lens glasses for a 1.5 hour testing session. Dependent variables used in trials include: Dynamic Gait Index-modified (DGI-m) and biomechanical measurements. Participants performed 36 trials of a loop course. The loop course includes 15 meters of walking straight while encountering a ramp/step or step/ramp followed by a DGI-m task. Single and progressive lenses glasses were switched every 18 trials.

DGI-m consists of 9 functional gait tasks that are scored by a trained rater. A perfect score is 45.

Results

Preliminary analysis consists of the DGI-m and toe clearance of five young, healthy adults (hypothesis one). Future analysis will include previously mentioned variables for all 30 participants using within and between group analyses.

Background

It is estimated that over 85% of all adults over the age of 45 will develop presbyopia (Holden, 2008). This condition develops with age and causes loss of near distance viewing. Because of this dilemma, multifocal lenses, which include lined bifocals, trifocals, and progressive lenses, are often prescribed. Multifocal lenses (MfL) are designed for both near and distance viewing and result in distorted vision in the lower part of the visual field at ground level while walking. Safe ambulation relies on the lower visual field to detect obstacles (Marigold et al, 2008).

References


Heasley, K., Buckley, J.G., Scally, A., Twigg, p., & Elliott, D.B. (2006). Falls risk increases as visual impairments increase with age due to a decrease in balance (Lord et al, 2006; 2002). Falls risk increases as visual impairments increase with age, thus, vision acts as a moderating factor for increased fall rates as individuals age (Heasley et al, 2005).

Conclusion

• Increase in toe clearance indicates a visual impairment and a change in gait. This change in gait increases the amount of time a individual is balancing on one leg and slows movement.

• Decrease in DGI-m scores indicates a functional gait impairment. A functional gait impairment may lead to falls or near falls.

• Overall participants showed a significant involuntary gait adaptation to the new MfLs.

• Involuntary adaptation may be a result of uncertainty caused by visual impairment.

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