

Balance Relationships Between the Multi-Directional Reach Test and Upper Body Dressing

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Postural balance is a complex phenomenon however balance assessments often measure only one aspect of balance, are not occupation-based, require expensive equipment or take a lot of time to conduct, and often they do not reflect real-world balance demands. The Multi-Directional Reach Test (MDRT) quickly measures the furthest distance a person can reach with the arm at 90 degrees of shoulder flexion (abduction) while also trying to maintain one's balance (i.e., limits of stability). Shirt dressing involves arm elevation and extension (reach) to don and doff a shirt. The purpose of the exploratory quasi-experimental study was to examine the relationships between the balance demands during the MDRT, when reaching in four directions, and the balance demands during upper body dressing. A repeated measures correlation design was implemented in a research clinic across one visit rather than in homes due to Covid-19 precautions. Healthy Midwestern adult participants aged 18 years or older were a sample of convenience who could reach forward and to each side (at 90°), step onto a force plate, follow two to three step commands, and perform shirt dressing while standing. Researchers used verbal invitation to those on a university campus, community flyers, emails, and snowball sampling to recruit participants. Participants performed three trials of reaching in each of the four MDRT directions and performed three cycles of donning and doffing a short-sleeved shirt, with task order being randomized. The distance reached during the MDRT was measured manually (cm) using a yard stick mounted on a height-adjustable coat rack. Balance demands during the MDRT and dressing were measured by center of pressure and time which was captured by Digital Acquire 4.1.20 software and a portable Bertec 4060-PT force plate. MDRT balance demands were also measured using cm for reach. Data were analyzed on 50 participants who met inclusion criteria. A priori G*Power analysis indicated our sample was sufficient to identify a small effect size for the Spearman Correlation analyses (data not normally distributed) conducted with SPSS 24 (IBM Corporation Armonk, NY, USA). Mean age was 33.00 years (± 2.13 SD), mean BMI $27.42 \pm .93$ kg/m², and most were female (86%), Caucasian (86%), right-handed (86%), and highly educated (53% Bachelor's degree or higher). Center of pressure excursion during the MDRT was statistically significant with center of pressure excursion during both don and doffing anteroposteriorly and mediolaterally ($r_s = .923 - .991$, $p < .001$). A statistically significant correlation occurred between the MDRT's manual measures for right reach (cm) with doff time ($r_s = -.320$, $p = .023$) and total dressing time ($r_s = -.340$, $p = .016$). The further the participant reached to the right (good balance), the faster was their dressing time and a smaller right reach distance (poorer balance) correlated with a longer dressing time. Follow-up analysis revealed that dominance was the agent associated with dressing time. Most participants were right handed and likely familiar with performing challenging reaching tasks to the right. The more a person challenged their limits of stability to the right, the more likely it is that the person tolerated dynamic forces well. This was evidenced in faster ability to handle the dynamic challenges during dressing. The center of pressure excursion during the MDRT when standing on a firm surface is statistically correlated with the center of pressure excursion during short-sleeved shirt dressing when standing on a firm surface. Time-based dressing tasks may be a robust indicator of balance for occupational therapists to use, but further investigation is needed.

References

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