Stride Length

Subjects: Health Care Sciences & Services

Contributor: Ibadete Bytyçi

Stride length was defined as the distance measured parallel to the line of progression, including two consecutive steps. Stride width was defined as side-to side distance between the heel of the current foot and heel of the next opposite foot. On the other hand, step width was determined as the distance between the outermost borders of two consecutive footprints. The standard deviation of the three variables (stride length) was used to represent the variability of the stride length.

stride length adverse clinical events older adult

1. Introduction

Advances in medical management of patients with various conditions, particularly cardiovascular conditions, have resulted in a significant increase in longevity [1][2]. This older population may, however, be limited by other medical problems, including arthro-skeletal stiffness and its consequences, e.g., physical disability and falls, which may lead to a decline in the functional capacity and quality of life as well as increased risk of dependence and institutionalization [3][4]. Physical disability also reflects difficulties that individuals may experience in interaction with society [5], which can lead to psychological disorders [6].

Physical activity/exercise is an essential disease-preventive measure, irrespective of age [7]. While standards and objective targets are well established, they might not necessarily apply to older people because of other various comorbidities or pre-existing chronic conditions [8]. Gait speed has been shown to be associated with better survival among older adults and to reflect health and functional status [9][10].

2. Stride Length Predicts Adverse Clinical Events in Older Adults

The results revealed the following: (a) baseline stride length was shorter and stride length variability was higher in the older population who developed adverse clinical events compared to those with no clinical events, while the other gait parameters were not different between groups; (b) the shorter stride length predicted MAE, physical disability and mortality in the older adults; (c) a baseline stride length ≤ 0.64 m had higher accuracy in predicting adverse clinical events compared to a stride length variability of 5.7%.

Many researchers have focused on associations between gait speed, physical disability and other adverse events in older adults [11][12][13]. It has been reported that slowing the walking speed reflects health and functional status and predicts survival [14][15]. However, gait is a complex neuromotor behavior, with many measurable facets in addition to velocity. It also has an intricate relationship with different aspects of the psychomotor system. In addition, other quantitative parameters of gait, such as swing phase, stride length and gait variability, demonstrated better predictive value of disability compared to speed alone [13][16]. Body balance is a crucial factor in maintaining healthy and safe walking and for avoiding falls. Shorter stride length and higher stride length variability are two important factors directly involved in the mechanisms of poor balance, which has been shown as a marker of low survival, physical disability and other adverse clinical events [16][17]. These parameters might indicate a certain body inability to improve or recover from future adverse events. Our results support this concept and strengthen further the importance of shorter stride length as a robust marker in predicting MAE, physical disability and mortality. In addition, our analysis proposes a summary cut-off value for stride length of 0.64 m with high accuracy compared with stride length variability in predicting clinical events; our suggestion for future direction is to establish cut-off values based on the demographic characteristics of each country.

Clinical Implications

Stride length and stride length variability, as important parameters of body balance during walking in older adults, can be a target for intervention through medical, rehabilitative and health-promoting behavioral strategies. These interventions should aim at maintaining long strides in order to sustain improved long-term physical function and survival in older adults.

3. Conclusions

The results support the significant value of stride length in predicting life-threatening clinical events in older adults. A stride length of 0.64 m accurately predicts the occurrence of future clinical events and thus should provide potential guidance towards optimum individual exercise and support.

References

1. Kennedy, B.K.; Pennypacker, J.K. Drugs that modulate aging: The promising yet difficult path ahead. Transl. Res. 2014, 163, 456–465.
2. Sonntag, W.E.; Ungvari, Z. GeroScience: Understanding the interaction of processes of aging and chronic diseases. AGE 2016, 38, 377–378.
3. Motl, R.W.; McAuley, E. Physical activity, disability, and quality of life in older adults. Phys. Med. Rehabil. Clin. N. Am. 2010, 21, 299–308.
4. Battalio, S.L.; Jensen, M.P.; Molton, I.R. Secondary health conditions and social role satisfaction in adults with long-term physical disability. Health Psychol. 2019, 38, 445–454.
5. Ashok, L.; Shetty, B.; Mayya, S.; Chandrasekaran, V.; Kuvalekar, K.; Kamath, R. Quality of life among persons with physical disability in udupi taluk: A cross sectional study. J. Fam. Med. Prim.

Care 2015, 4, 69–73.

6. Simning, A.; Kittel, J.; Conwell, Y. Late-life depressive and anxiety symptoms following rehabilitation services in medicare beneficiaries. Am. J. Geriatr. Psychiatry 2019, 27, 381–390.
7. Chodzko-Zajko, W.J.; Proctor, D.N.; Fiatarone Singh, M.A.; Minson, C.T.; Nigg, C.R.; Salem, G.J.; Skinner, S.J. American college of sports medicine position stand. Exercise and physical activity for older adults. Med. Sci. Sports Exerc. 2009, 41, 1510–1530.
8. Zbrońska, I.; Mędrela-Kuder, E. The level of physical activity in elderly persons with overweight and obesity. Roczniki Państwowego Zakładu Higieny 2018, 69, 369–373.
9. Studenski, S. Gait speed and survival in older adults. JAMA 2011, 305, 50–58.
10. Hall, W.J. Update in geriatrics. Ann. Intern. Med. 2006, 145, 538–543.
11. Doi, T.; Nakakubo, S.; Tsutsumimoto, K.; Kim, M.-J.; Kurita, S.; Ishii, H.; Shimada, H. Spatio-temporal gait variables predicted incident disability. J. Neuroeng. Rehabil. 2020, 17, 1–7.
12. Inzitari, M.; Newman, A.B.; Yaffe, K.; Boudreau, R.; De Rekeneire, N.; Shorr, R.; Harris, T.B.; Rosano, C. Gait speed predicts decline in attention and psychomotor speed in older adults: The health aging and body composition study. Neuroepidemiology 2007, 29, 156–162.
13. Van Kan, G.A.; Rolland, Y.; Andrieu, S.; Bauer, J.; Beauchet, O.; Bonnefoy, M.; Vellas, B. Gait speed at usual pace as a predictor of adverse outcomes in community-dwelling older people. J. Nutr. Health Aging. 2009, 13, 881–889.
14. Mortaza, N.; Abu Osman, N.A.; Mehdikhani, N. Are the spatio-temporal parameters of gait capable of distinguishing a faller from a non-faller elderly? Eur. J. Phys. Rehabil. Med. 2014, 50, 677–691.
15. Waite, L.M.; Grayson, D.A.; Piguet, O.; Creasey, H.; Bennett, H.P.; Broe, G.A. Gait slowing as a predictor of incident dementia: 6-year longitudinal data from the Sydney Older Persons Study. J. Neurol. Sci. 2005, 229–230, 89–93.
16. Hausdorff, J.M.; Rios, D.A.; Edelberg, H.K. Gait variability and fall risk in community-living older adults: A 1-year prospective study. Arch. Phys. Med. Rehabil. 2001, 82, 1050–1056.
17. Verghese, J.; Wang, C.; Lipton, R.B.; Holtzer, R.; Xue, X. Quantitative gait dysfunction and risk of cognitive decline and dementia. J. Neurol. Neurosurg. Psychiatry 2007, 78, 929–935.