International Journal of
Physical Therapy & Rehabilitation
Original Article Open Access

Timed Up and Go Test is an Effective Indicator to Reflect the Capacity of Bathing and Stair Activities in Older Adults Requiring Care

Daisuke Takagi[1*] and Masatoshi Kageyama[2,3]
[1]*Department of Shizuoka Physical Therapy, Faculty of Health Science, Tokoha University, Shizuoka 420-0831, Japan*
[2]*Long-Term Care Health Facilities Sunrise Ohama, Japan*
[3]*Graduate School, Hamamatsu University School of Medicine, Cooperative Major in Medical Photonics, Shizuoka 431-3912, Japan*

Abstract

Background: Bathing is one of the most difficult activities of daily living (ADL) for the elderly. Similarly, stair navigation is also another activity that elderly individuals find difficult. A previous study reported an association between ADL capacity and physical function in older adults. The Timed Up and Go test (TUG) is a simple field test that comprehensively assesses balance, standing, walking, and sitting abilities. TUG has the potential for early and easy assessment of physical functions required for performing activities, such as bathing and stair navigation. However, few studies have examined the usefulness of TUG and its cutoff values for bathing and stair navigation in older adults requiring care.

Methods: In this cross-sectional study, we analyzed 152 elderly individuals aged 65 years or over requiring care. We measured the TUG and Barthel index (BI) to evaluate the capacity to perform activities, such as bathing and stair navigation. We divided the participants into two groups based on their BI scores for bathing and stair navigation abilities.

Results: Both the bathing- and stair-independent groups were significantly faster in TUG time compared to the bathing- and stair-dependent groups, respectively ($p < 0.05$). TUG time was a significant independent explanatory variable in both the bathing and stair groups despite adjusting for confounding factors ($p < 0.05$). Moreover, the cutoff values for TUG time to determine independence or dependence in performing activities, such as bathing and stair navigation, were 12.45 and 13.75 seconds, respectively, based on the receiver operating characteristic curve.

Conclusion: These findings suggest that changes in bathing and stair navigation capacity can be detected early and efficiently by using TUG, potentially preventing a decline in these abilities among older adults requiring care.

Publication History:

Received: February 06, 2025
Accepted: February 26, 2025
Published: February 28, 2025

Keywords:

Stair activity, Bathing activity, Timed Up and Go test, Older adults requiring care

Background

Bathing is one of the most difficult activities of daily living (ADL) for elderly individuals [1], while stair navigation presents another notable challenge [2]. Caregivers may experience an increased burden when assisting older adults with bathing and stair navigation. The ADL capacity is associated with physical function in older adults [3]. Therefore, it is essential to assess declines in physical function early and efficiently to preserve and improve ADL capacity in older adults.

The number of individuals certified as requiring support or care under Japan's long-term care insurance system has been steadily increasing each year, reflecting the country's aging population (data from 2009 to 2019) [4]. In Japan, frailty is a condition that often precedes the need for support and care [5]. Therefore, older adults in need of care may be particularly vulnerable to conditions that necessitate assistance with bathing and stair navigation. It is essential to assess their physical functions early and efficiently to preserve and improve their ability to perform these activities.

Although several methods exist for evaluating physical function, the Timed Up and Go test (TUG) is a simple field test that comprehensively assesses balance, standing, walking, and sitting abilities [6,7]. Additionally, it has been reported that TUG is associated with ADL capacity in older adults [7]. Moreover, a previous study reported that TUG effectively predicts the decline in transfer ability in elderly individuals requiring care [8]. TUG has the potential to provide an early and simple assessment of the physical function required for bathing and stair navigation. However, few studies have examined the usefulness of TUG and its cutoff values for performing activities, such as bathing and stair navigation, in older adults who require care. By detecting changes in bathing and stair navigation abilities early and efficiently, we can clarify the usefulness of TUG and its cutoff values in assessing these functions. This approach may help prevent the decline of bathing and stair navigation abilities in older adults who require care.

In this study, we aimed to clarify the relationship between TUG and the ability to perform activities, such as bathing and stair navigation, in older adults requiring care. Additionally, we established cutoff values for TUG to determine independence and dependence in performing activities, such as bathing and stair navigation.

Methods

Participants

This cross-sectional study included 154 elderly individuals, aged 65 years or older, who regularly attended one of the five adult day

***Corresponding Author:** Prof. Daisuke Takagi, Department of Shizuoka Physical Therapy, Faculty of Health Science, Tokoha University, 1-30 Mizuochi-cho, Aoi-ku, Shizuoka-City, Shizuoka 420-0831, Japan. Tel: +81 54-297-3200

Citation: Takagi D, Kageyama M (2025) Timed Up and Go Test is an Effective Indicator to Reflect the Capacity of Bathing and Stair Activities in Older Adults Requiring Care. Int J Phys Ther Rehab 11: 189. doi: https://doi.org/10.15344/2455-7498/2025/189

Copyright: © 2025 Takagi et al. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

facilities covered by Japan's long-term care insurance between July 2022 and September 2024. Participants were excluded if they met any of the following criteria: 1) inability to complete the assessments, 2) difficulty walking independently (except under supervision), or 3) presence of a pacemaker. The data from 152 participants were analyzed, excluding two with incomplete data. Japan's long-term care insurance system categorizes individuals into seven severity levels: support levels 1 and 2 and care levels 1 to 5, with support level 1 being the least severe. The levels reflect the amount of care required, ranging from 25 to 32 minutes for support level 1 to over 110 minutes for care level 5. In our study, the distribution of participants across care severity levels was as follows: support level 1: n = 10, support level 2: n = 15, care level 1: n = 71, care level 2: n = 36, care level 3: n = 12, care level 4: n = 5, and care level 5: n = 3. The study was approved by the Ethics Committee of the Health Science University, and all eligible participants provided written informed consent after reviewing the consent form.

Timed Up and Go test (TUG)

Participants began by rising from a chair with armrests, walking around a cone positioned 3 m away, and then returning to sit down as quickly as possible [6]. The test was performed twice for each participant, and the average completion time was used for analysis. Participants who regularly used walking aids in daily life were allowed to use them during the test.

Activities of daily living (ADL) capacity

We assessed ADL capacity using the Barthel index (BI) [9], which measures performance in 10 daily activities. These activities included walking, transferring between a wheelchair and a bed (scored 0, 5, 10, or 15 points), eating, getting on and off the toilet, stair navigation, dressing, bowel and bladder control (scored 0, 5, or 10 points), and grooming and bathing (scored 0 or 5 points). BI scores range from 0 to 100, with lower scores indicating a greater need for assistance with ADL.

Statistical analysis

The results were presented as mean ± standard deviation. The participants were categorized into two groups based on their bathing and stair navigation activity scores: the independent group (bathing = 5, stair = 10) and the dependent group (bathing = 0, stair = 5 or 0). The difference in TUG time between the two groups was evaluated using an unpaired t-test, with Fisher's exact test applied for sex. Next, the association between TUG time and the ability to perform activities, such as bathing and stair navigation, was assessed using multiple logistic regression analysis dependent variable: the independent group (bathing = 5, stair = 10) and the dependent group (bathing = 0, stair = 5 or 0)]. The explanatory variables included sex, age, body mass index (BMI), and TUG time. Sex, age, and BMI are factors related to the ADL capacity [10-12]. Additionally, we calculated the cutoff values, area under the curve (AUC), sensitivity, and specificity using the receiver operating characteristic (ROC) curves for TUG time against the independent group (bathing = 5, stair = 10) and the dependent group (bathing = 0, stair = 5 or 0). Data were analyzed using IBM SPSS Statistics version 29.0 for Mac (IBM Corp., Tokyo, Japan). A P-value of <0.05 was considered statistically significant.

Results

The characteristics of each group—the independent group (bathing = 5, stair = 10) and the dependent group (bathing = 0, stair = 5 or 0)—are described in Table 1. Both the bathing-independent and stair-independent groups completed the TUG test significantly faster than the bathing-dependent and stair-dependent groups, respectively ($p < 0.05$, Table 1). In the multiple logistic regression analysis, TUG time was a significant independent explanatory variable in both the bathing and stair groups, even after adjusting for sex, age, and BMI ($p < 0.05$, Table 2). Moreover, the cutoff values for TUG time to determine independence or dependence in performing activities such as bathing and stair navigation, as assessed using ROC curves, were 12.45 s and 13.75 s. The corresponding AUC, sensitivity, and specificity values for these cutoff points were as follows: for 12.45 s, AUC = 0.731, sensitivity = 0.821, and specificity = 0.604 (bathing); for 13.75 s, AUC = 0.796, sensitivity = 0.852, and specificity = 0.640 (stair).

Discussion

In our study, TUG was found to be associated with the ability to perform activities, such as bathing and stair navigation, in older adults requiring care. Additionally, even after adjusting for confounding factors, TUG remained a significant independent explanatory variable in both the bathing and stair groups. Moreover, cutoff values for TUG time were established to assess the independence or dependence in performing these activities. These findings suggest that changes in the ability to bathe and navigate stairs can be detected early and efficiently. This approach could help prevent a decline in these abilities among older adults requiring care.

We observed a relationship between TUG and the ability to perform activities, such as bathing and stair navigation in our study. The ADL capacity is associated with physical function in older adults [3]. TUG is associated with the ADL capacity in older adults [7]. TUG can comprehensively assess balance, standing, walking, and sitting abilities [6,7]. Therefore, in our study, TUG reflected the capacity to perform the aforementioned activities. Besides, the average values of TUG time in the elderly individuals requiring support were 17.6 ± 10.2 seconds for males and 17.9 ± 9.4 seconds for females, according to the Ministry of Health, Labor and Welfare, Japan [13]. In our study, the overall average TUG time was 16.0 ± 12.0 seconds (n = 152). We did not expect our participants to differ significantly in physical function from the general elderly Japanese population.

In our study, the cutoff values for TUG time to determine independence or dependence in performing activities, such as bathing and stair navigation, were 12.45 and 13.75 seconds, respectively. Previous studies have indicated that a TUG time cutoff value of 13.5 seconds is used to predict non-fallers and fallers in older adults, while a cutoff value of 12 seconds is used to distinguish between community-dwelling elderly women and those in institutional settings [14,15]. Our cutoff values for TUG time are consistent with those reported in previous studies. A TUG time of approximately between 12 and 14 seconds appears to be the cutoff value for detecting a decline in physical function and ADL capacity in older adults. In contrast, the cutoff value of TUG time for determining sarcopenia is ≥20 seconds, according to the European Working Group on Sarcopenia in Older People 2 [16]. Future studies should provide more detailed data on TUG time, as current information remains insufficient.

Variables	Bathing-independent group (n =96)	Bathing-dependent group (n =56)	P value
Gender, n (male / female)	41/55	22/34	0.734
Age (year)	84.6 ± 6.2	86.5 ± 7.1	0.082
Height (cm)	153.3 ± 10.2	150.1 ± 10.1	0.063
Weight (kg)	50.2 ± 10.8	50.5 ± 11.3	0.895
BMI (kg/m²)	21.1 ± 3.6	22.2 ± 3.7	0.062
TUG (seconds)	13.6 ± 7.6	20.1 ± 16.5	0.001
BI (score)	99.6 ± 1.7	92.1 ± 3.3	<0.001
Variables	Stair-independent group (n =125)	Stair-dependent group (n =27)	P value
Gender, n (male / female)	53/72	10/17	0.671
Age (year)	84.9 ± 6.6	87.2 ± 6.3	0.095
Height (cm)	152.7 ± 10.3	149.2 ± 10.0	0.117
Weight (kg)	50.5 ± 11.3	49.5 ± 9.6	0.684
BMI (kg/m²)	21.4 ± 3.7	22.1 ± 3.4	0.332
TUG (seconds)	13.8 ± 6.3	26.1 ± 22.9	<0.001
BI (score)	98.3 ± 3.0	89.8 ± 2.6	<0.001

Table 1: The characteristics of each group in this study.

BMI Body mass index, BI Barthel index, TUG Timed up and go test

Bathing			
Variables	OR	95% CI	P value
Sex	0.913	0.437 – 1.906	0.808
Age	0.957	0.904 – 1.012	0.125
BMI	0.928	0.840 – 1.025	0.139
TUG	0.939	0.897 – 0.983	0.007
Stair			
Variables	OR	95% CI	P value
Sex	0.698	0.252 – 1.934	0.490
Age	0.950	0.880 – 1.026	0.193
BMI	0.986	0.858 – 1.133	0.845
TUG	0.900	0.854 – 0.949	<0.001

Table 2: Association of TUG time with the capacity of bathing and stair activities using multiple logistic regression analysis.

OR Odds ratio, 95 % CI 95 % Confidence interval
BMI Body mass index, TUG Timed up and go test

Our study has some limitations. The sample size was small and comprised only of Japanese participants, which limits the generalizability of the findings. Additionally, our study included participants with varying levels of severity under Japan's long-term care insurance system and various medical histories and complications. Future studies should focus more specifically on the characteristics of these participants. Moreover, we used the BI to evaluate participants' ADL capacity. However, other measures, such as the Functional Independence Measure, which includes 18 items scored on a 7-point scale [17], may provide a more comprehensive assessment of assistive device use and the level of assistance required.

Conclusion

In our study, TUG was associated with the capacity to perform activities, such as bathing and stair navigation in older adults requiring care. Additionally, TUG remained a significant independent explanatory variable in both the bathing and stair groups, even after adjusting for confounding factors. Moreover, the cutoff values of TUG time were established to determine the independence or dependence in performing these activities. These findings suggest that we can detect changes in the ability to perform activities, such as bathing and stair navigation, early and efficiently. As a result, we may be able to prevent a decline in the ability to perform these activities in older adults requiring care.

Funding

This study was supported by JSPS KAKENHI (Grant No. 20K19466)

Competing Interests

The authors declare that they have no competing interests.

Refrences

1. Chen W, Fang Y, Mao F, Hao S, Chen J et al. (2015) Assessment of disability among the elderly in xiamen of china: A representative sample survey of 14,292 older adults. PLoS One 10: e0131014.
2. Williamson JD, Fried LP (1996) Characterization of older adults who attribute functional decrements to "old age". J Am Geriatr Soc 44: 1429-1434.
3. Wang DXM, Yao J, Zirek Y, Reijnierse EM, Maier AB (2020) Muscle mass, strength, and physical performance predicting activities of daily living: a meta-analysis. J Cachexia Sarcopenia Muscle 11: 3-25.
4. The cabinet office in Japan. Accessed February 3 2024. https://www8.cao.go.jp/kourei/ whitepaper/w-2022/html/zenbun/s1_2_2.html
5. Arai H (2018) Clinical guide for frailty, Life science, Tokyo, 2-3. (in japanese)
6. Mathias S, Nayak US, Isaacs B. (1986) Balance in elderly patients: the "get-up and go" test. Arch Phys Med Rehabil 67: 387-389.
7. Podsiadlo D, Richardson S (1991) The timed "Up & Go": a test of basic functional mobility for frail elderly persons. J Am Geriatr Soc 39: 142-148.
8. Suzukawa M, Shimada H, Watanabe S, Kobayashi K, Suzuki T (2011) The relationship between physical performance and ADLs decline during 6 months in frail elderly people utilizing long-term care insurance. Rigakuryouhougaku 38: 10-16. (in japanese).

9. Mahoney FI, Barthel DW (1965) Functional evaluation: the barthel Index. Md State Med J 14: 61-65.

10. Sahin A, Tekin O, Cebeci S, Işik B, Ozkara A, et al. (2015) Factors affecting daily instrumental activities of the elderly. Turk J Med Sci 45: 1353-1359.

11. Kamiyama T, Muratani H, Kimura Y, Fukiyama K, Abe K, et al. (1999) Factors related to impairment of activities of daily living. Intern Med 38: 698-704.

12. Davis JW, Ross PD, Preston SD, Nevitt MC, Wasnich RD (1998) Strength, physical activity, and body mass index: relationship to performance-based measures and activities of daily living among older Japanese women in Hawaii. J Am Geriatr Soc 46: 274-279.

13. Ministry of Health, Labour and Welfare, Japan. Accessed February 3 2024. https://www.mhlw.go.jp/topics/2009/05/dl/tp0501-1d.pdf.

14. Shumway-Cook A, Brauer S, Woollacott M. (2000) Predicting the probability for falls in community-dwelling older adults using the Timed Up & Go Test. Phys Ther 80: 896-903.

15. Bischoff HA, Stähelin HB, Monsch AU, Iversen MD, Weyh A et al. (2003) Identifying a cut-off point for normal mobility: a comparison of the timed 'up and go' test in community-dwelling and institutionalised elderly women. Age Ageing 32: 315-320.

16. Cruz-Jentoft AJ, Bahat G, Bauer J, Boirie Y, Bruyère O et al. (2019) Sarcopenia: revised European consensus on definition and diagnosis. Age Ageing 148: 16-31.

17. Keith RA, Granger CV, Hamilton BB, Sherwin FS (1987) The functional independence measure: a new tool for rehabilitation. Adv Clin Rehabil 1: 6-18.