Original article

Association between the cost of dual-task and cognitive function in older people with Motoric Cognitive Risk Syndrome: a cross-sectional study

Associação entre o custo da dupla tarefa e a função cognitiva em pessoas idosas com Síndrome do Risco Cognitivo Motor: um estudo transversal

Gabriel de Amorim Batista[1]
Letícia Bojikian Calixtre[2]
Bruno Remígio Cavalcante[3]
Juliana Daniele de Araújo Silva[4]
Késia Moreira Sampaio Amaral[5]
Ruth Lahis da Silva Gonçalves[6]
Michele Callisaya[7]
Ana Carolina Rodarti Pitangui[8]
Rodrigo Cappato de Araújo[9]

[1,2,4-6,8]Universidade de Pernambuco (Petrolina). Pernambuco, Brazil.
[3]Universidade Federal do Vale do São Francisco (Petrolina). Pernambuco, Brazil.
[7]Monash University (Melbourne). Victoria, Australia.
[9]Corresponding contact. Universidade de Pernambuco (Petrolina). Pernambuco, Brazil. rodrigo.cappato@upe.br

ABSTRACT | BACKGROUND: Dual-task mobility tests are considered more sensitive than single-task assessments for detecting early cognitive impairment in older adults. However, their association with cognitive performance in individuals with Motoric Cognitive Risk Syndrome (MCR) has not been well established. **OBJECTIVE:** To investigate the relationship between the cost of dual-task testing in the Timed Up and Go (TUG) test with different cognitive demands and cognitive function in older individuals with MCR. **METHODOLOGY:** Fifty-nine older individuals with MCR were included (89.8% women; mean age: 70 years). The cost of dual-task testing was assessed in two conditions: TUG with counting backwards and TUG with animal naming. Cognitive function was assessed using the Montreal Cognitive Assessment (MoCA), Trail Making Test Part A (TMT-A), Digit Span, and Verbal Fluency tests. Multiple linear regressions, adjusted for age, sex, and education, were conducted. **RESULTS:** The dual-task cost of the TUG with counting backwards correlated positively with performance in attention and processing speed (TMT-A; r = 0.52; β = 0.17 [0.05 to 0.29]) and negatively with global cognitive performance (MoCA; r = -0.48; β = -1.18 [-2.22 to -0.11]). The TUG with animal naming showed no significant associations with cognitive tests. **CONCLUSION:** The dual-task cost during the TUG with counting backwards was moderately associated with attention, processing speed, and global cognition in older adults with MCR. No significant associations were observed for the TUG with animal naming. These findings highlight that the type of cognitive demand used in dual-task testing may influence the degree of motor-cognitive interference.

KEYWORDS: Cognition. Dementia. Frailty. Risk Factors.

RESUMO | INTRODUÇÃO: Testes de mobilidade com dupla tarefa são considerados mais sensíveis do que avaliações com tarefa única para a detecção precoce de comprometimento cognitivo em idosos. No entanto, sua associação com o desempenho cognitivo em pessoas com Síndrome do Risco Cognitivo Motor (SRCM) ainda não está bem estabelecida. **OBJETIVO:** Investigar a relação entre o custo da tarefa dupla no teste Timed Up and Go (TUG), com diferentes demandas cognitivas, e a função cognitiva em idosos com SRCM. **METODOLOGIA:** Cinquenta e nove idosos com SRCM foram incluídos (89,8% mulheres; idade média: 70 anos). O custo da tarefa dupla foi avaliado em duas condições: TUG com contagem regressiva e TUG com nomeação de animais. A função cognitiva foi avaliada por meio do Montreal Cognitive Assessment (MoCA), Teste de Trilhas Parte A (TMT-A), Dígitos Diretos e Inversos e Fluência Verbal. Regressões lineares múltiplas, ajustadas por idade, sexo e escolaridade, foram realizadas. **RESULTADOS**: O custo da tarefa dupla no TUG com contagem regressiva correlacionou-se positivamente com atenção e velocidade de processamento (TMT-A; r = 0,52; β = 0,17 [0,05 a 0,29]) e negativamente com o desempenho cognitivo global (MoCA; r = -0,48; β = -1,18 [-2,22 a -0,11]). O TUG com nomeação de animais não apresentou associações significativas com os testes cognitivos. **CONCLUSÃO:** O custo da tarefa dupla no TUG com contagem regressiva associou-se moderadamente com atenção, velocidade de processamento e cognição global em idosos com SRCM. Esses achados destacam que o tipo de demanda cognitiva utilizada durante testes de dupla tarefa pode influenciar o grau de interferência entre desempenho motor e cognitivo.

PALAVRAS-CHAVE: Cognição. Demência. Fragilidade. Fatores de Risco.

Submitted July 7th, 2025, Accepted Oct. 11th, 2025,
Published Dec. 15th, 2025
J. Physiother. Res., Salvador, 2025;15:e6367
https://doi.org/10.17267/2238-2704rpf.2025.6367 | ISSN: 2238-2704
Assigned editor: Marina Makhoul

How to cite this article: Batista CA, Calixtre LB, Cavalcante BR, Silva JDA, Amaral KMS, Gonçalves RLS, et al. Association between the cost of dual-task and cognitive function in older people with Motoric Cognitive Risk Syndrome: a cross-sectional study. J Physiother Res. 2025;15:e6367. https://doi.org/ 10.17267/2238-2704rpf.2025.6367

1. Introduction

Motoric Cognitive Risk (MCR) syndrome is a pre-dementia condition that combines reduced slow gait speed and subjective memory complaints in the absence of clinical dementia[1]. Its prevalence ranges from 7% to 10% among older adults and is associated with an approximately twofold increased risk of developing dementia[1,2]. MCR stands out as a viable screening tool for primary care settings, as it does not require detailed cognitive assessments or the presence of a specialist, facilitating the early identification of individuals at high risk of progression to dementia[3].

Growing evidence indicates that gait and cognition share common neural substrates, particularly in the prefrontal cortex, suggesting that changes in motor function may reflect early cognitive deficits[4,5]. However, single-task walking assessments were not shown to be a sensitive predictor for the transition to dementia[6,7]. Possibly, straight-line gait tests may not be challenging enough to identify individuals at higher risk[6]. In this context, the inclusion of dual-task mobility tests emerges as an alternative and more sensitive approach to detect early cognitive deficits, especially in older individuals with MCR[7].

Despite this, only two studies have analyzed the relationship between dual-task cost and cognitive performance in individuals with MCR, and existing findings remain inconclusive[8,9]. The literature indicates that dual-task interference varies according to the type and complexity of the secondary cognitive task[7,10]. Tasks that demand executive control, working memory, or divided attention, such as backward counting or verbal fluency, tend to impose greater cognitive–motor interference than simpler tasks[7,10,11]. Thus, the type of cognitive task used during dual-task assessments may influence the degree of interference observed, as different tasks engage distinct cognitive domains and levels of complexity[11].

Some studies have proposed the use of Time Up and Go (TUG) as an alternative to increase the motor complexity of the assessment[12,13]. TUG involves multiple transitions (standing up from a chair, walking three meters, turning around, and sitting back down in a chair), requiring greater attention and executive functions than straight-line walking[14]. Given these gaps, we hypothesized that the dual-task cost would be more strongly associated with cognitive performance when the cognitive demand involves executive-attentional components. Therefore, the present study aimed to investigate the association between the cost of dual-task performance during the Timed Up and Go (TUG) test — under two cognitive conditions (counting backwards and animal naming) and cognitive function in older adults with MCR.

2. Method

2.1 Study design

The study was conducted in accordance with the Declaration of Helsinki and presents a cross-sectional design, using baseline data from a randomized controlled trial approved by the Ethics and Research Committee of the Universidade de Pernambuco (University of Pernambuco) (CAAE: 38402120.0.0000.5195) and registered in the Registro Brasileiro de Ensaios Clínicos (Brazilian Registry of Clinical Trials) (RBR-5z5h789). All individuals provided written informed consent prior to participation. The description and presentation of the results follow the recommendations of the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE).

2.2 Setting and participants

Participants were recruited from primary and secondary healthcare services of the Sistema Único de Saúde - SUS (Unified Health System) in Petrolina, Pernambuco, and surrounding municipalities in Vale do São Francisco, Brazil. Data collection took place between early 2022 and 2023.

The inclusion criteria for participation in the study were: (1) aged ≥ 65 years; (2) presence of MCR, defined by: (a) subjective memory complaints identified by question 10 of the Geriatric Depression Scale ("Do you think you have more memory problems than most people?")[15]; and (b) slow gait speed, below sex- and age-specific normative values[16]; (3) ability to walk 10 meters without assistance; (4) adequate visual and auditory capacity for cognitive test; and (5) absence of diagnosed dementia or antipsychotic medication use.

As this is a cross-sectional study, participants would be excluded if they withdrew from participating in the research during the interview or if they presented missing data in the questionnaire.

2.3 Descriptive variables

Sociodemographic and health-related data were obtained through structured interviews conducted by trained physical therapists, including age, sex, anthropometric measures, and years of education. Clinical variables comprised the presence of systemic arterial hypertension, type 2 diabetes, and hypercholesterolemia. Physical activity was estimated by measuring daily step count using the Xiaomi Mi Band 6 (Xiaomi Corp., Beijing, China), a wearable activity tracker equipped with a low-power 3-axis accelerometer and a 3-axis gyroscope (combined as a 6-axis inertial sensor) to detect linear and rotational motion. Participants wore the device continuously for seven consecutive days, with data synchronized to the mobile application Mi Fit (Huami Co., Ltd, Hefei, China). After the monitoring period, the data were exported and used to calculate the average number of steps per day to characterize habitual ambulatory behavior. The Mi Band smart wristband device has been validated for step-count measurement in older adults, showing good accuracy compared with criterion devices[17]. Although step count does not distinguish the intensity of movements, it represents a practical and objective indicator of overall physical activity. In this study, the participants' physical activity levels were classified according to the daily step-count thresholds proposed by Tudor-Locke et al.[18], in which approximately 7,000 to 8,000 steps per day correspond to meeting the World Health Organization's recommendation of 150 minutes per week of moderate-intensity activity. Despite its limitation in differentiating activity intensity, this approach provides a valid framework for categorizing the habitual physical activity level of older adults.

2.4 Timed Up and Go (TUG)

The TUG test was used to assess mobility and functional performance. Participants were instructed to rise from a chair, walk 3 meters, turn 180 degrees, return, and sit down[19]. The participants were instructed to walk as quickly as possible, safely and comfortably. After verbally explaining the test to the participant, the researcher performed a demonstration to avoid possible doubts during the test.

Two trials of single-task TUG were performed first, followed by two dual-task conditions in random order: (1) TUG with counting backwards; (2) TUG with animal naming. The duration of the TUG test was recorded using a stopwatch.

• TUG–Countdown: Participants counted backwards from a number between 20 and 100, chosen by the examiner. This task engages working memory and attention[4,20].

• TUG–Animals: Participants named as many different animals as possible during the test. This task measures semantic verbal fluency[4,20].

The dual-task cost (DTC) was calculated using the formula recommended by Cullen et al.[4] to quantify in percentage terms how much the cognitive task interfered with the motor skill. During the test, the participant was instructed to simultaneously distribute their attention to the cognitive and motor tasks.

DTC (%) = (Dual-task time – Single-task time) x 100/ Single-task time

2.5 Montreal Cognitive Assessment (MoCA)

Global cognitive function was assessed using the translated and validated Brazilian version of the Montreal Cognitive Assessment (MoCA). This instrument is structured in 12 tasks, grouped into eight cognitive domains[21]. The global MoCA score ranges from 0 to 30 points (higher values indicate better global cognitive function), with an additional score added for participants with low levels of education (less than 12 years)[21]. A global assessment of cognition was also performed to ensure that the included participants did not have mild cognitive impairment, according to the established cutoff points[22].

2.6 Trail Making Test Part A (TMT-A)

The TMT-A consists of drawing lines connecting numbers from 1 to 25, randomly distributed, following the numerical sequence (in ascending order), where the shortest time to complete the task reflects better performance. The time spent to complete the test was used to assess visual attention and processing speed, respectively[23].

2.7 Digit Span Forward

The Digit Span Forward and Backward test consists of a sequence of random digits with gradual increase up to a maximum number of nine digits[24]. In the Digit Span Forward condition, participants must repeat the sequence of digits in the same order (e.g., 4 → 8 → 1 → 6), whereas in the Digit Span Backward condition, the digit sequences are performed in reverse order (e.g., 7 ← 6 ← 0 ← 4). The final score, in both conditions, was defined based on the greater number of successful sequences, which suggests better performance in the cognitive domains of attention and working memory[24].

2.8 Verbal fluency

Language proficiency was assessed using the semantic verbal fluency test[25]. The test consisted of the individual saying as many words as possible in the “animal” category for one minute, and the score was calculated based on the total number of words mentioned.

2.9 Information quality control

Some measures were adopted to reduce possible sources of bias: 1) training researchers to administer the questionnaires; 2) administering the questionnaires individually and in a quiet place; 3) explaining and demonstrating the tests to the older adults before they were administered.

2.10 Sample size calculation

To define the sample size, a correlational design calculation was used[26] considering a two-tailed test, a 5% significance level, statistical power of 0.80, and expected correlation coefficient of 0.38, based on the association between the cost of the dual-task and the cognitive composite score reported by Ward et al.[8]. The required sample size was 52 participants.

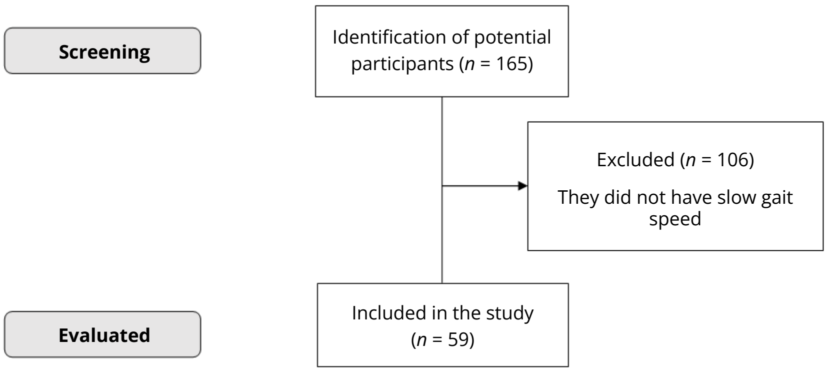
2.11 Statistical analysis

Descriptive statistics were presented as means and standard deviations or frequencies, as appropriate. Data normality was verified using the Shapiro–Wilk test. Multiple linear regression models were used to analyze the association between dual-task cost and cognitive test scores, adjusting for age, sex, and education level. Assumptions of multicollinearity (VIF < 5), residual normality and homoscedasticity, absence of influential cases (Cook’s distance < 1), and independence of residuals (Durbin–Watson between 1.5 and 2.5) were verified. Correlation strength was interpreted as: weak (< 0.40), moderate (0.41–0.70), and strong (> 0.70). Analyses were performed using JAMOVI software (version 2.3), adopting a 5% significance level.

3. Results

Figure 1 presents the flowchart of the assessments of older adults with MCR. After identifying 165 potential participants, 59 met the inclusion criteria, consented to participate in the study and were assessed.

Figure 1. Study flowchart



Source: the authors (2025).

Table 1 presents the descriptive characteristics of the participants. The sample was predominantly female (89.8%) with a mean age of 70.6 ± 6.1 years. Most participants (59.3%) had more than 12 years of formal education. Regarding health conditions, 62.7% had systemic arterial hypertension, 27.1% had type 2 diabetes, and 47.5% reported hypercholesterolemia. The average number of steps recorded over the previous week was 5,409 ± 2,632, suggesting that the participants were classified as insufficiently active. The average time to complete the single-task TUG was 10.43 ± 2.95 seconds. During the dual-task conditions, participants took longer to complete the TUG: an increase of 18.4% ± 27.82 for the countdown condition and 16.6% ± 20.99 for the animal naming condition, on average.

Table 1. Descriptive data of elderly people with Motoric Cognitive Risk syndrome (to be continued)

Features	*n* = 59
Age (years) mean ± SD	70.6 (6.1)
Sex	
Man – *n* (%)	6 (10.2)
Woman – *n* (%)	53 (89.8)
Body mass (kg), mean ± SD	66.23 (11.37)
Height (meters), mean ± SD	1.54 (0.06)
Body Mass Index (kg/m2), mean ± SD	27.48 (3.88)
Education (years), median (IQR)	10 (5 – 15)
Systemic arterial hypertension – n (%)	37 (62.7)
Type 2 diabetes – n (%)	16 (27.1)
Hypercholesterolemia – n (%)	28 (47.5)
Walking speed – 6-meter test (seconds), mean ± SD	7.00 (1.33)
Geriatric Depression Scale (maximum 15 points), mean ± SD	4.18 (2.25)
Number of steps (last 7 days), mean ± SD	5,409.46 (2,632.10)
TUG – single task (seconds), mean ± SD	10.43 (2.95)
Dual-Task TUG – Countdown (seconds), mean ± SD	12.27 (4.02)

Table 1. Descriptive data of elderly people with Motoric Cognitive Risk syndrome (conclusion)

Features	*n* = 59
Dual-task TUG – Animals (seconds), mean ± SD	12.15 (3.93)
Dual-Task Cost – Countdown (%), mean ± SD	18.39 (27.82)
Dual-Task Cost – Animals (%), mean ± SD	16.55 (20.99)
MoCA (maximum 30 points), mean ± SD	21,04 (5,23)
21.04 (5.23)	88,00 (46,96)
Trail Making Test -A (seconds), mean ± SD	88.00 (46.96)
Trail Making Test -A (errors), mean ± SD	1.11 (2.82)
Digit Span forward (maximum14), mean ± SD	4.68 (2.37)
Digit Span backward (maximum 14), mean ± SD	3.71 (1.78)
Verbal Fluency (numbers of animals mentioned), mean ± SD	14.44 (4.37)

Source: the authors (2025).
Abbreviations: TUG - Timed Up and Go, MoCA - Montreal Cognitive Assessment.
Note: Data are presented as mean ± standard deviation (SD), median (interquartile range, IQR), or absolute and relative frequency [*n* (%)].

Table 2 presents the results of the regression analyses adjusted for the covariates age, sex and level of education. The cost of dual-task (TUG-countdown) showed a positive and moderate correlation (r= 0.52; β= 0.17 [0.05; 0.29]) and explained 22% of the TMT-A scores. The MoCA scores (r= -0.48; β= -1.18 [-2.22; -0.11]) maintained negative and moderate correlations with the cost of dual-task (TUG-countdown).

The cost of dual-task explained 18% of the MoCA score. The verbal fluency, Digit Span and TMT-A score (errors) tests did not correlate with the cost of dual-task (TUG-countdown) (p > 0.099). The cost of the dual-task (TUG-animals) did not correlate significantly with the cognitive tests evaluated in the present study (Table 3).

Table 2. Results of multiple linear regression models for cognitive variables and the cost of the TUG-countdown dual-task

Variables	Adjusted *R*	Adjusted R^2	β	SE	CI 95%	*p*-value
MoCA	-0.48	0.19	-1.20	0.52	-2.24; -0.15	0.025*
TMT-A	0.52	0.22	0.17	0.06	0.05; 0.29	0.008*
DGS forward	0.39	0.15	-0.19	1.04	-2.29; 1.91	0.856
DGS backward	0.41	0.12	-1.27	1.40	-4.07; 1.54	0.369
Verbal Fluency	-0.45	0.12	-1.25	0.74	-2.75; 0.24	0.099
TMT-A (errors)	0.39	0.10	-0.07	0.90	-1.87; 1.73	0.936

Source: the authors (2025).
Abbreviations: MoCA - Montreal Cognitive Assessment, TMT-A - Trail Making Test Part-A, DGS - Digit Span, CI - Confidence Interval – 95%.
Note: Adjusted for age, sex and level of education. * $p < 0.05$.

Table 3. Results of multiple linear regression models for cognitive variables and the cost of the TUG-animals dual-task

Variables	Adjusted *R*	Adjusted R^2	β	SE	CI 95%	*p*-value
MoCA	0.03	0.01	-0.06	0.61	-1.28; 1.17	0.928
TMT-A	0.17	0.03	-0.09	0.07	-0.23; 0.06	0.235
DGS forward	0.03	0.01	0.07	1.18	-2.30; 2.45	0.950
DGS backward	0.06	0.01	0.58	1.61	-2.66; 3.81	0.722
Verbal Fluency	0.14	0.06	-0.81	0.83	-2.48; 0.86	0.335
TMT-A (errors)	0.05	0.01	-0.27	0.99	-2.26; 1.72	0.785

Source: the authors (2025).
Abbreviations: MoCA - Montreal Cognitive Assessment, TMT-A - Trail Making Test Part-A,
DGS - Digit Span, CI - Confidence Interval – 95%.
Note: Adjusted for age, sex and level of education. * $p < 0.05$.

4. Discussion

This is the first study to evaluate the association between dual-task cost during the TUG and cognitive performance in older adults with MCR using two distinct cognitive demands. Our findings demonstrated that the TUG-countdown condition was moderately associated with measures of attention, processing speed, and global cognitive function, while no significant associations were found for the TUG-animal naming condition. These results suggest that different cognitive tasks may differentially influence motor-cognitive interference in this population.

Both dual-task conditions resulted in increased TUG completion time compared to the single-task, indicating a dual-task cost. However, the association between cognitive performance and dual-task cost was more consistent in the TUG-countdown condition. This may reflect the greater cognitive demand of backward counting, which requires sustained attention and working memory, cognitive domains often compromised in individuals at risk for dementia. Importantly, while our results support the use of the TUG–countdown to explore motor-cognitive interactions in MCR, the study design does not allow conclusions about its diagnostic superiority or predictive capacity.

The absence of significant associations between the TUG–animal naming condition and the cognitive tests warrants further consideration. One hypothesis is that semantic fluency tasks, such as naming animals, may be less cognitively demanding in time-limited motor tasks like the TUG, particularly in community-dwelling older adults[25,27]. Additionally, the short duration of the test (~10–12 seconds) may not provide sufficient time for participants to generate enough verbal output to meaningfully tax executive function or semantic fluency. This is consistent with findings that the number of animals named during the TUG dual-task is often low, potentially limiting the sensitivity of the test to detect subtle cognitive deficits, especially in individuals with preserved cognition[28,29]. Another possibility is a ceiling effect, in which community-dwelling older adults with relatively preserved language and executive function, performance on semantic fluency tasks may cluster at the higher end, reducing between-subject variability and limiting the ability to detect associations with cognitive test scores This ceiling effect is a recognized limitation in studies of high-functioning populations[13]. It is also plausible that participants prioritized motor execution over the verbal task, especially in a context where safety or performance is implicitly emphasized by the evaluator.

Moreover, while dual-task gait assessments using animal naming have shown utility in distinguishing between cognitive groups and predicting conversion to dementia, their discriminative power is more evident in populations with mild cognitive impairment or early dementia, and less so in cognitively intact individuals. In such cases, the task may not be sufficiently demanding to elicit cognitive-motor interference. Additionally, although some studies have found associations between TUG performance — particularly in subtasks such as turning — and cognitive domains like executive function and verbal fluency, these associations tend to be modest and generally do not extend to the walking component or to global cognitive measures in healthy older adults[28,30-32].

From a theoretical perspective, these findings align with models of limited attentional resource allocation. According to these frameworks, when two tasks compete for overlapping cognitive resources — such as executive control or attentional shifting — performance in one or both tasks may deteriorate[33,34]. The TUG–countdown condition likely generated greater dual-task interference due to overlap in attentional and executive demands between the motor task and the working memory task. In contrast, the semantic fluency task may have relied on more automatic retrieval processes with less competition for the same cognitive pathways required for motor planning and execution[35].

When analyzing the literature, we observed that only two studies verified the correlation between the cost of dual-tasking in older people with MCR and cognitive performance[8,9]. Ward et al.[8] demonstrate a weak correlation between cognitive performance and the cost of dual-tasking (animal naming). These results differ from the findings of the present study and can be explained by methodological differences in the cognitive tests and motor tasks chosen. We observed that the authors did not adjust the analyses considering some confounding factors, such as age and education, which could generate bias in the results, since dual-tasking performance is affected mainly by age[36] and education[37].

Udina et al.[9] found similar results to ours, with no significant correlations being found between the cost of the dual-task (animal naming) and the cognitive tests. We emphasize that the authors made essential adjustments in the analyses, considering age, education, and comorbidities, reducing potential confounding factors in the analyses. Furthermore, this is the only study that explored the difference between the cost of the dual-task in subjects with and without MCR[9]. The results demonstrate that there are no significant differences in the cost of the dual--task with verbal fluency (animal naming) between older people with and without MCR. However, the study observed that older people with MCR had higher rates of oxygenation in the prefrontal cortex[9]. The authors argue that older people with MCR probably prioritized the motor task, and that this may result in greater activity of the prefrontal cortex due to the influence of compensatory mechanisms to reduce deficits in gait performance[9,38].

We emphasize that further studies are needed to investigate the correlation between cognitive tests, oxygenation rate in the prefrontal cortex, and dual-task cost in individuals with MCR to understand the potential mechanisms involved. Future studies should mainly consider more complex motor and cognitive tasks with greater challenges of attention and executive functions to provide greater demand on shared cortical areas.

Our results provide additional information that TUG-countdown may be more closely associated with specific cognitive domains and appear to be broadly in line with the study by Montero-Odasso et al.[7], which evaluated older individuals with a similar phenotype to the present study. The authors analyzed the association between the cost of dual-tasking with cognitive demands (countdown and animal naming) and the incidence of dementia in older individuals with mild cognitive impairment[7].

The results demonstrate that the incidence of dementia was associated with the cost of dual-tasking for counting backward (HR, 3.79; 95% CI, 1.57-9.15) and animal naming (HR, 2.41; 95% CI, 1.04-5.59)[7]. It was observed that the dual-task condition involving backward counting was more informative for identifying individuals at higher risk of dementia. When the results were stratified by gait speed, the risk of developing dementia increased 13-fold for dual-task cost (counting backwards) (HR, 13.39; 95% CI, 3.76-47.75) and nine-fold for dual-task cost (animal naming) (HR, 9.89; 95% CI, 2.91-33.62)[7]. Previous studies have shown that subtraction activities are more complex and rely on working memory and attention[20]. This type of cognitive demand may affect gait variability and speed, especially in individuals with mild cognitive impairment[11].

This study has several limitations. First, the sample was predominantly composed of women, which may limit the generalizability of our findings. Second, the absence of a control group of older adults without MCR restricts our ability to compare cognitive-motor interference across groups. Third, due to the cross-sectional design, causal relationships cannot be inferred. Fourth, participants were recruited using convenience sampling from local health services, which may introduce selection bias and reduce representativeness. Fifth, although the testing procedures were standardized and conducted by trained evaluators, the lack of blinding may have influenced performance due to observer-expectancy effects. Lastly, the order of TUG test conditions was only partially randomized, which may have introduced learning or fatigue effects that could affect the results. Future studies should address these limitations by including longitudinal designs, larger and more diverse samples, randomized task sequences, and control groups. The inclusion of objective neurophysiological markers, such as prefrontal cortical activation or dual-task gait variability, may also help elucidate the underlying mechanisms of motor-cognitive interactions in older adults with MCR.

5. Conclusions

The present study found that dual-task cost during the Timed Up and Go test with backward counting was moderately associated with measures of attention, processing speed, and global cognitive function in older adults with Motoric Cognitive Risk syndrome. In contrast, the dual-task condition involving animal naming did not show significant associations with cognitive performance. These findings suggest that the type of cognitive demand imposed during dual-task testing may differentially impact motor performance, particularly when tasks engage executive and attentional processes. While these results provide insight into motor-cognitive interactions in MCR, further longitudinal and mechanistic studies are needed to determine the clinical relevance and prognostic value of dual-task performance in this population.

Funding

This study received support from Fundação de Amparo à Ciência e Tecnologia do Estado de Pernambuco – FACEPE (Foundation for the Support of Science and Technology of the State of Pernambuco) (APQ-0274-4.08/20) and was supported by Coordenação de Aperfeiçoamento de Pessoal de Nível Superior - CAPES (Coordination for the Improvement of Higher Education Personnel) with a Ph.D. scholarship for the student Gabriel de Amorim Batista.

Acknowledgment

The authors sincerely thank all participants for their willingness to contribute their time, effort, and experiences to this research. Their collaboration was essential for the completion of this study.

Authors' contributions

The authors declared that they have made substantial contributions to the work in terms of the conception or design of the research; the acquisition, analysis or interpretation of data for the work; and the writing or critical review for relevant intellectual content. All authors approved the final version to be published and agreed to take public responsibility for all aspects of the study.

Competing interests

No financial, legal, or political conflicts involving third parties (government, private companies, and foundations, etc.) were declared for any aspect of the submitted work (including but not limited to grants and funding, advisory board participation, study design, manuscript preparation, statistical analysis, etc.).

Indexers

The Journal of Physiotherapy Research is indexed by DOAJ, EBSCO, LILACS and Scopus.

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