

Using Cell Phone While Walking Increases the Risk of Accidents in the Elderly



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Abstract

Aim: To analyze the risks of accidents in older adults caused by the use of cell phone while walking.

Design: A systematic review was performed with manuscripts published between the years 2000 and 2021. The search was conducted in which the terms "cell phone", "walking", "balance", and "risks of falls" were confronted by the boolean operators "and", "or", and "not", in articles published in the National Library of Medicine citation database (MEDLINE/NLM®). Two researchers screened the articles independently and included manuscripts that addressed the impact of cell phone use on gait, balance and risk of falls in older adults. Studies were compared in terms of sample size, clinical profile of the participants, assessments, inferential analyses, and outcome.

Results: Primary analysis with the term "cell phone" identified 23,060 articles published in journals linked to MEDLINE/NLM®. The eligibility criteria reduced the number of articles to 95, 16 of them involving older adults. The sample size of the studies varied between 16 to 408 participants. The studies assessed mainly subjects' balance and gait. The comparisons involved tasks with and without the use of cell phone. Most of the statistical analyses used paired tests (Student t-tests or repeated measure ANOVAs), correlations and regressions. The main outcomes showed that performing dual tasks decrease gait speed and increase imbalance in older adults.

Conclusion: This systematic review confirm the risks of older adults in using cell phones while walking. The number of manuscripts addressing this topic is still low, highlighting the need of further studies assessing the impact of cell phone use simultaneous to a walking task.

Keywords: Cell phone; Accidental falls; Aged; Systematic review; Aging diseases; Alzheimer's disease; Risk of falls; Statistical analyses; Longevity; Memory loss

Introduction

Life expectancy has increased in recent years. This happened due to scientific and technological advances, and to changes in habits. Access to health care services, active lifestyle and healthy eating are some of the factors associated with a greater longevity [1]. As consequence, the number of subjects over 65 years will increase substantially, surpassing 1.4 billion inhabitants in the next 15 years [2]. In addition to the growing number of older adults, there has been a change in the routine of the subjects. In the past, it was common to identify the elderly by their restriction to the family environment, fragile locomotion, presence of "common to aging diseases" and by stigmas such as urinary incontinence, memory loss and reduced level of attention. Nowadays, the elderly are more active, with a healthier diet, many still employed

and with a leisure routine different from the one present in the past [3-4].

Change of habits of the elderly is going through digital inclusion. Older adults have access to internet on computers, laptops and tablets [5]. However, it was with cell phones that digital technology was incorporated into the routine of the elderly [6]. The use of cell phones by older adults is becoming more and more frequent. Sending messages, chatting, video calling, leisure and health apps justify the growing use of cell phones by this population. It is noticeable that the use of cell phones is benefiting the elderly [7]. However, a new challenge began when people started using their cell phones simultaneously with a secondary task. It is common to see people using their cell phones

while walking, at the gym, when shopping and even while driving [8].

The performance of two tasks at the same time is called dual task [9]. When the focus of a person’s attention is divided between more than one task, a decrease stimulus for each of the task is estimated [10]. Previous studies highlight risks of older adults in performing dual tasks [11-13]. Lower cadence, higher number of steps, imbalance, and lower gait speed are signs of an indirect protective response of the organism when submitted to simultaneous tasks. When associated to neurological diseases, such as stroke, Parkinson’s disease or Alzheimer’s disease, the impact of dual tasks is even more dangerous [14-16].

Most of the studies that assessed dual tasks in older adults used non-routine activities, such as counting numbers or spelling letters while walking. Studies focusing on the effect of using cell phone while walking have been developed only in recent years. This happened because the use of cell phones by older adults occurred mainly in the last decade, with all the attractions of the smartphones [17].

The aim of this study was to perform a systematic review assessing the effects of cell phone use by older adults simultaneous to a walking task. The researchers believe that this study will be of interest to readers of the OAJ Gerontology & Geriatric Medicine, given that the results are discussed and confronted from the perspective of aging and its functional changes.

Materials and Methods

This systematic review was based on the checklist recommended by PRISMA (Preferred Reporting Items for

Systematic Reviews and Meta-Analyses) [18]. The search for articles was carried out in the National Library of Medicine citation database (MEDLINE/NLM®).

The articles were screened according to the following keywords: cell phone, dual task, gait, balance, and risk of falls. The boolean operators “and”, “or” and “not” were included to adjust the search for articles. Additional studies were identified by manually searching the references obtained in the articles. The search was limited to articles written in English, Spanish or Portuguese, published between 2000 and 2021. Cross-sectional, prospective and retrospective longitudinal studies that used data collected from the elderly were included. Letters to the editor, abstracts, dissertations, theses, reviews, and pre-print articles were excluded. Studies that cited the use of cell phone in older adults without performing dual-tasks were also excluded.

The manuscripts identified in the search strategy had their title, abstract and text evaluated by two researchers. Only studies that used cell phone associated to a secondary walking task were included in the analysis. Studies were compared in terms of clinical profile of the participants, sample size, evaluation mechanisms, inferential analyses, and outcome.

Results

The researchers identified initially 23,060 manuscripts. By adding the term “dual task”, the number of articles was reduced to 338. The eligibility criteria reduced the number of studies to 95. Of these, 16 assessed the impact of using cell phone while walking in older adults. (Figure 1) details the searching criteria of this systematic review.

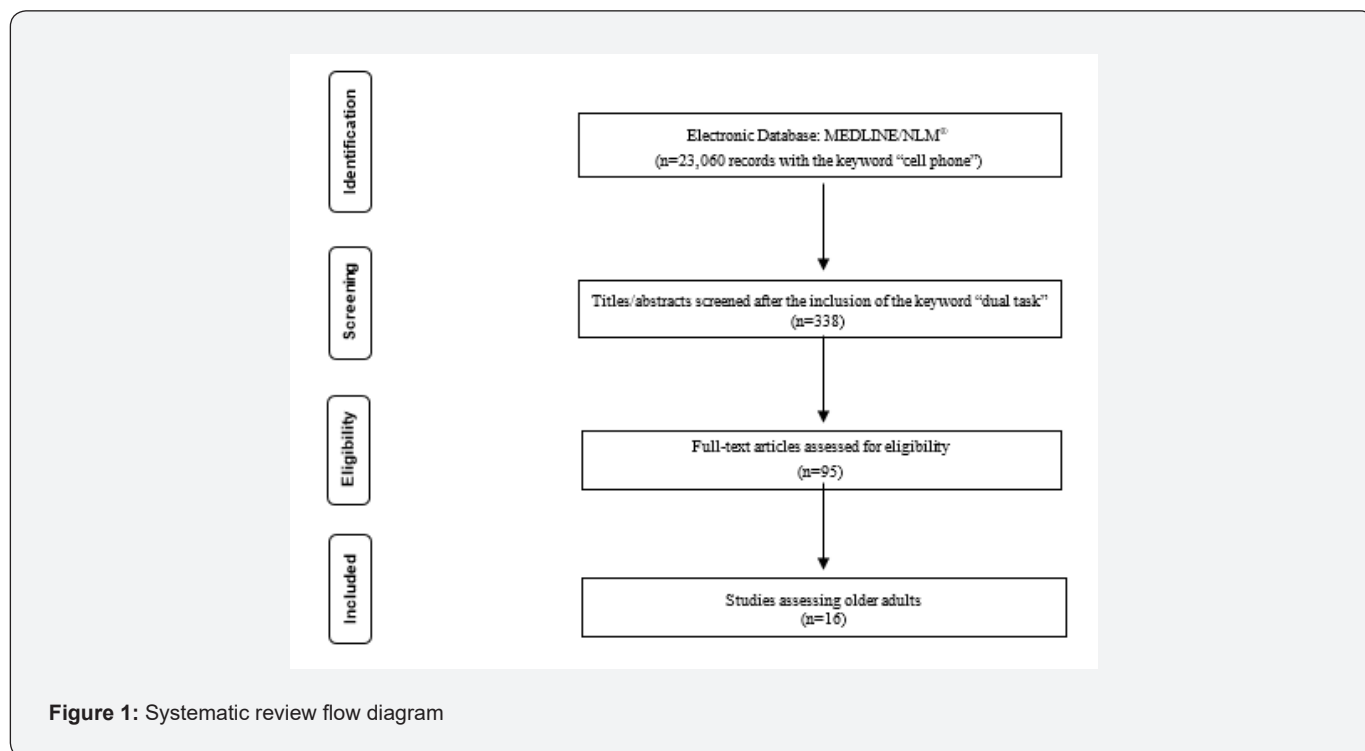


Figure 1: Systematic review flow diagram

(Table 1) details the studies included in this systematic review. The sample size of the studies varied between 16 to 408 participants. The studies assessed mainly subjects' balance and gait parameters. The comparisons involved tasks with and without

the use of smartphone. Most of the statistical analyses used paired tests (Student t-tests or repeated measure ANOVAs), correlation and regression tests. The outcomes showed that performing dual tasks decrease gait speed and increase imbalance in older adults.

Table 1: Characteristics of studies included in this systematic review.

Authors	Participants	Sample size	Assessments	Statistical analyses	Outcomes
Alapatt et al. [19]	Older compared to younger adults.	408	Gait analysis in single and dual tasks with cell phone.	Chi-squared test, Fisher's exact test and paired comparisons.	Lower gait speed, higher typing errors and increased exposure to environmental hazards.
Belur et al. [20]	Older compared to younger adults.	50	Gait analysis in single and dual tasks with cell phone.	Chi-squared test, independent Student t-test, multivariate analyses with Bonferroni correction.	Lower gait speed and step size during dual task, with maintenance of cadence.
Ehlers et al. [21]	Older adults.	195	Virtual street-crossing task.	Repeated measure tests, correlations and complementary tests form specific statistical models.	Street performance was better on single-task trials when compared with dual-task trials.
Hsiao et al. [22]	Older compared to younger adults.	50	Balance.	Chi-squared test, independent Student t-test, Mann Whitney U and multivariate analyses of variance	Balance instability while performing dual tasks with cell phone.
Kao et al. [23]	Older compared to younger adults.	16	Gait analysis on treadmill.	Mann Whitney U-test, Wilcoxon with Bonferroni correction.	Older adults during dual tasks make use of protective mechanisms, such as longer strides and lower joint variability.
Krasovsky et al. [24]	Older compared to younger adults.	50	Single- and dual-task texting and walking indoors and outdoors, with and without a mixed reality display.	Mann Whitney U-test, Wilcoxon, Friedman and multivariate analyses of variance with Bonferroni correction.	Lower gait speed with smaller step length and longer stride time.
Laatar et al. [25]	Older compared to younger adults.	40	Balance and mobility.	Repeated measure analysis of variance with post hoc and Fisher Snedecor.	Risk of falls due to balance and gait changes.
Neider et al. [26]	Older compared to younger adults.	36	Dual task in virtual reality environment simulating street activities.	Repeated measure analysis of variance.	Multitasking costs is particularly dangerous for older adults even during everyday activities such as crossing the street.

Porciuncula et al. [27]	Older compared to younger adults.	24	Six wireless sensors used during a functional test	Mixed-design analysis of variance (ANOVA) with random-nested factor of subject, and fixed factors of age, group and phase.	Older adults had more pronounced mobility decrements than young adults during straight-ahead walking and turns.
Prupetkaew et al. [28]	Older compared to younger adults.	24	Gait analysis in single and dual tasks with cell phone.	Fisher exact test, Student t-test and multivariate analysis of variance.	Visual and cognitive demands while using cell phones influences gait.
Seymour et al. [29]	Older compared to younger adults.	22	Walking tests on treadmill.	Repeated measure analysis of variance with post hoc analyses.	Dual tasking influence kinematic gait variables in a manner consistent with promotion of stability.
Souza Silva et al. [30]	Older compared to younger adults.	33	Gait parameters on virtual environment	Repeated measure mixed models with post hoc analyses.	Delayed obstacle detection times with text messages.
Souza Silva et al. [31]	Older compared to younger adults.	30	Gait parameters on virtual environment	Repeated measure mixed models with post hoc analyses.	Stage of an avoidance strategy at which text messages are received impacts on pedestrian circumvention.
Strouwen et al. [32]	Older adults with Parkinson's disease.	121	Gait analysis in single and dual tasks with cell phone.	Regression models for absolute dual task values, entering only determinant with higher correlation.	Executive function in Parkinson's disease is significantly associated with gait velocity during the mobile phone task.
Takeuchi et al. [33]	Older compared to younger adults.	31	Accelerometers and 16 channel infrared spectroscopy system	Repeated measure analysis of variance with post hoc analyses.	Lateralization of motor and cognitive tasks aids in efficient task completion during the use of cell phone while walking.
Yamada et al. [34]	Older adults with Parkinson's disease compared to healthy peers.	40	Gait analysis in single and dual tasks with cell phone.	Multivariate two-way analysis of variance with Bonferroni post hoc test.	Older adults with Parkinson's disease walked with lower speed, cadence, shorter step length and swing time in relation to healthy peers.

Most of the studies assessing the impact of cell phone use in older adults was published in the last decade. (Figure 2) shows

the evolution of the studies addressing this thematic according to year of publication.

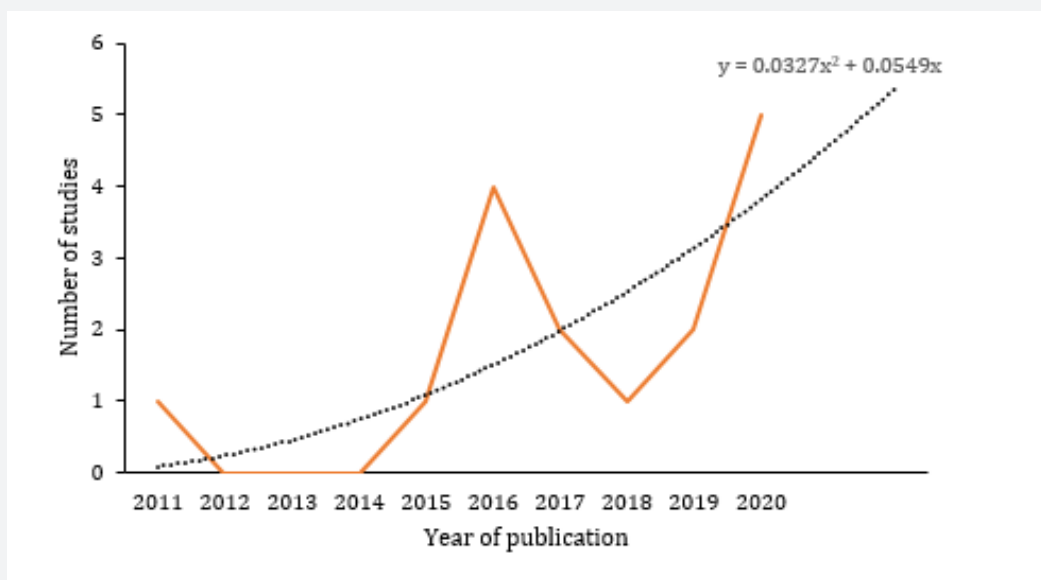


Figure 2: Year of publication and tendency line of the studies assessing the impact of cell phone use while walking in older adults.

Discussion

The aim of this study was to investigate articles published in MEDLINE/NLM® that have addressed the impact of cell phone use while walking in older adults. The results point to a lack of research addressing this topic in the elderly population. Only sixteen articles were included in this review. All of the studies identified risks of the elderly when the cell phone is used in a dual task condition.

The literature has already addressed the risks of cell phone use simultaneous to a secondary daily task [35-36]. Most of the studies focused young adults, since this audience represents the largest niche market of cell phone users worldwide [37-38]. With the increasing use of cell phones by older adults, this systematic review becomes important by alerting about the risks of using the cell phone while walking. The studies included in this systematic review were published between 2011 and 2020. This shows how recent and current the topic of this discussion is. The sample size of the manuscripts varied between 16 to 408 subjects. Readers should be aware that small sample sizes, if not controlled by alfa (α) and beta (β) statistical errors, could bias the findings.

No study in this thematic was published in 2021. This can be associated to the COVID-19 pandemic, which required social isolation and had catastrophic events particularly for the elderly population [39]. Authors believe that the studies published in 2020 were developed before the COVID-19 pandemic. There are several databases that publish scientific research. The authors opted to include only articles published in MEDLINE/NLM®

because this is one of the most important database to assess medical journals and articles.

An important aspect identified in this study was a slower gait speed of older adults during the dual task activity. This pattern may represent a protective mechanism for the elderly when realizing dual tasks [20-24]. The current literature suggests that gait performance is decreased by an increasing task demand and that specific brain areas are activated according to attentional and energy-optimization challenges [16]. Most of the studies included in this review was carried out in a controlled environment (laboratory), without external factors. Dual task with cell phone in an external environment (public street with noises, lights, pedestrians, whether changes and vehicles) should increase the vulnerability of the elderly. This aspect should be further addressed by new research.

As a limitation of this systematic review, it was not possible to perform meta-analysis test. The meta-analysis is highly relevant because it provide clinical guidelines. Meta-analysis is usually applied in randomized clinical trials. Since most of the studies included did not configure clinical trials (but cross-sectional studies with different groups, eg, older versus young adults), the researchers chose not to perform meta-analysis in this review.

Conclusion

This systematic review identified a lack of studies discussing the impacts of cell phone use while walking in older adults. Most of the studies was published in the last five years, demonstrating

how recent and current the topic of this discussion is. The results showed that using cell phone while walking can be very risky for older adults. More studies should explore this thematic.

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Conflict of interest

The authors declare no conflict of interest.

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