

Relationship of physical function and body composition to suicidal ideation in the elderly: A Systematic Review.

Relación de la función física y composición corporal con la ideación suicida en el adulto mayor: Una Revisión Sistemática

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Abstract:

One of the consequences of aging is the loss of independence and physical vulnerability, where mental health deterioration factors such as depression and suicidal ideation are identified. As a result, suicidal ideation increases in this age group. The relationship between physical function and body composition may be one of the avenues of research to understand suicidal ideation at this stage of life. This study conducted a systematic review to examine suicidal ideation in older adults concerning physical function and body composition in men and older adults aged 60 years and older. The search aimed to find empirical and quantitative papers, published in scientific journals in English or Spanish that assessed the link between suicidal ideation, physical function and body composition in older adults. The study found a significant positive relationship between suicidal ideation, physical function and body composition in older men, but not in women. However, the link between body composition measured by Body Mass Index (BMI) and suicidal ideation was not a significant predictor. This study highlighted the importance of preserving physical function, such as gait speed, muscle strength, and Basic Activities of Daily Living (BADL) and Instrumental Activities of Daily Living (IADL), to prevent suicidal ideation in older adults. These findings underscore the significance of therapeutic interventions for maintaining physical function.

Keywords:

Physical function, body composition, suicidal ideation, older adults, assessment

Resumen:

Una de las consecuencias que puede traer el envejecimiento es la pérdida de independencia y vulnerabilidad física donde se identifican factores de deterioro de la salud mental como la depresión e ideación suicida. Por lo anterior incrementa la ideación suicida en este grupo de edad. La relación entre la función física y composición corporal puede ser una de las vías de investigación para comprender la ideación suicida en esta etapa de la vida por lo cual en este estudio se realizó una revisión sistemática para examinar la ideación suicida en adultos mayores con relación a la función física y la composición corporal en hombres y mayores de 60 años y más. La búsqueda se realizó si eran trabajos empíricos y cuantitativos, publicados en revistas científicas, escritos en idioma inglés o español y que evaluaron la relación entre ideación suicida, función física y composición corporal en adultos mayores. La relación entre ideación suicida, función física y composición corporal en adultos mayores fue positiva y significativa en hombres, pero no en mujeres. Por otro lado, la relación entre la composición corporal resultante del Índice de la Masa Corporal (IMC) y la ideación suicida no demostró ser un predictor significativo. Este estudio aportó información valiosa sobre la importancia de prevenir la pérdida de la función física, como velocidad de la marcha, fuerza muscular y Actividades Básicas de la Vida Diaria (ABVD) e instrumentales (AIVD), para prevenir la ideación suicida en adultos mayores. Este hallazgo es importante, debido a que la función física puede ser tratada por medio de intervenciones terapéuticas.

Palabras Clave:

Función física, composición corporal, ideación suicida, adultos mayores, evaluación

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INTRODUCTION

In the current mental health landscape, concern for the psychological well-being of older adults is becoming increasingly relevant due to the alarming increase in suicidal ideation and suicide in this demographic group. The prevalence of suicide in older adults (70 years and older) is estimated to be as high as 22.3% in less developed countries.¹ While worldwide, data on suicidal ideation are variable due to the different biological, psychological, social, environmental, and cultural determinants or factors that develop depending on the country; however, countries such as Japan, South Korea, and some European countries, have shown concern for the increase in suicide rates in their population.^{2,3} This phenomenon has significant repercussions, making it necessary to carefully examine the causes, risk factors, and intervention strategies to address this sensitive issue of global concern.⁴

The most common manifestation of poor health status in this population is loss of functionality, decreased autonomy, mobility, and Basic Activities of Daily Living (BADL), including the onset of frailty and functional disability that are considered relevant in the management of disease prevention in this age group.^{5,6}

Physical exertion is one of the characteristics of physical fitness that influences the perception of older adults to perform activities of daily living because they constitute several factors to establish a positive perception that strengthens their sense of competence to practice in different areas of personal development.⁷

The present study aims to expand our understanding of the results of physical function and body composition on suicidal ideation in both male and female older adults aged 60 years and older. Therefore, the purpose of the present study was to systematically review the literature on the relationship between physical function, body composition, and suicidal ideation.

PHYSICAL FUNCTION

The World Health Organization (WHO) postulated that "health in the elderly is measured in terms of function," which consists of the study of the elderly physical capacities in their entire spectrum, from the simplest motor tasks and their capacity for self-care to exercise and independence in the environment.⁸

Among the instruments considered to evaluate the physical function of older adults are those that are part of the Comprehensive Geriatric Assessment (CGA), which aims to measure and detect the individual's functions at the cognitive and physical levels. In the latter, it adds as main indicators of frailty, assessing loss of muscle strength, decreased physical performance (which includes measurements of hand pressure strength and gait speed); in turn, physical performance measures also include tests such as the gait test named *Time Up and Go* (TUG) and the *Short Physical Performance Battery* (SPPB), which are helpful instruments for screening frailty in the general population. On the other hand, the *European Working Group on Sarcopenia in Older People* suggests a set of updated diagnostic

criteria for sarcopenia (loss of muscle mass, strength, and function) and dynapenia (loss of muscle strength).^{6,9}

On the other hand, the assessment of intrinsic capabilities should also be considered to determine the physical and mental capacity that a person possesses to function in his or her environment at the micro and macro levels, i.e., home, community, and society in general, all of this to maintain the independence of the older adult. It has been proven that negative results in the ABVD performance assessment, among them bathing, feeding, dressing, and so on, and IADL among them mobility, shopping and others, are related to mortality, since they are activities aimed at self-care and maintenance of oneself, and the loss or reduction of these capabilities can impact cognitive, motor, emotional and psychosocial functions.¹⁰

BODY COMPOSITION

The quantification of body components such as adipose tissue, total muscle tissue mass, skeletal mass, and brain mass, is a method used to assess an individual's nutritional status. These components help to understand lifestyle effects associated with physical activity, diet, and physical function. Likewise, the study and body composition monitoring show the effects of disease progression, among other factors.¹¹

Nowadays, there are several scientifically valid tools to evaluate each body component, such as Electrical Bioimpedance (EBI) and Dual X-Ray Densitometry (DXA).^{11,12}

Other indicators associated with body composition include anthropometric measurements, for example: Body Mass Index (kg/m²).¹²

BMI is widely used to detect risk factors in the general population¹³. However, it can be challenging to interpret in older adults due to changes in the aging process, such as a decrease in height, accumulation of adipose tissue, reduction of lean body mass, and the amount of water in the body.¹⁴

Adiposity can be related to psychological and physiological discomforts, thus harming overall health.¹⁵

The causes impairing psychologically older adults relate to metabolic dysregulation and physical frailty that promote the chronic course of late-life depression; diseases such as sarcopenia, obesity or, in this case, the convergence of both (sarcopenic obesity) contribute to a lower level of psychological health and quality of life, in turn, it has been proven that assessing muscle strength using dynamometric pressing force and BMI to diagnose sarcopenic obesity can predict the onset of depressive symptoms in older adults.¹⁶ It may be due to muscle contraction that contributes to brain preservation through the secretion of neurotrophic substances. Therefore, its decrease may be associated with depression and anxiety.^{17,18}

SUICIDAL IDEATION

Suicidal ideation is the name given to the thoughts that arise when contemplating, desiring, and worrying about death and suicide; these ideas can present themselves in an increasing and

decreasing manner, so the magnitude and characteristics of suicidal ideation fluctuate dramatically.¹⁹ The consequences of aging affect the biopsychosocial sphere of older adults, such as loss of physical independence, physical vulnerability, institutionalization, family losses, and deterioration of mental health, among others. Being susceptible to depression and anxiety are some of the main psychological factors that trigger suicidal thoughts.⁴ Other risk factors identified are male sex with a history of a first depressive episode after the age of 40, unemployment, family adversities, loss of social status, history of suicide in family members, and personality traits such as obsessive-compulsive disorder and borderline personality disorder.²⁰⁻²² Records on suicidal ideation show that 7% of older women and 5% of older men have had at least one suicide attempt; however, of all older adults in Mexico, 9.8% of older men and 1.2% of older women died of self-inflicted injuries.²³

METHODS

Search strategy:

This systematic review was conducted according to the guidelines of the publication guide designed to improve the integrity of the report of systematic reviews and meta-analyses (*Preferred Reporting Items for Systematic Reviews and Meta-Analyses- PRISMA*).²⁴ This study's protocol was accepted and published in the *Prospective International Registry of Systematic Reviews* (PROSPERO), with the registration number CRD42024525859. We searched a database (PubMed) for studies published between January 2013 and September 2023. For the search, we combined the keywords *suicidal ideation with physical function, body composition and elderly*.

A) Items selection

Studies selection for full-text review based on the following eligibility criteria: 1) empirical and quantitative studies; 2) published in peer-reviewed scientific journals; 3) studies that included the relationship between suicidal ideation and physical function or body composition; 4) written in English or Spanish; 5) studies that evaluated physical function based on IGV; 6) studies that directly or indirectly quantified body composition. Exclusion criteria were: 1) instrumental studies; 2) manuscripts that were documentary reviews; 3). The evaluated sample did not include adults over 60.

The titles, abstracts and keywords were independently reviewed using an intelligent platform called Rayyan.²⁵ The selected articles were then reviewed in full text. Figure 1 illustrates the review process of the studies, in accordance with the PRISMA criteria statement and checklist.²⁴

B) Methodological quality assessment

The study quality assessment was performed using the Mixed Methods Assessment Tool (MMAT).²⁶ Studies were analyzed in the following domains: Clear research questions, adequate data collection, relevant sampling strategies, representative samples of the target population, adequate measures, level of bias, and

appropriate statistical analysis. According to the above scale, each quality marker was awarded one point for a maximum score of seven.

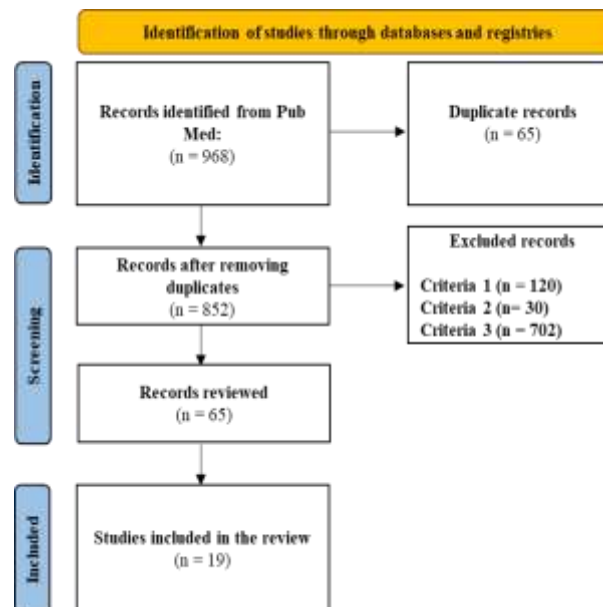


Figure 1. PRISMA flow diagram.²⁴

C) Data analysis

The studies were systematically reviewed according to the measurement methods of the variables of interest. Data were extracted from the studies after thorough evaluation and review. The variables of interest for each study were organized in standardized spreadsheets and classified according to the following characteristics: authors, years, location, study objective, population size, type of sampling, participants' age and sex, study design, instruments, prevalence, main results, magnitude, analysis and interpretation.

RESULTS

Search and quality

For this systematic review, 968 potentially relevant titles were located from a data search in an electronic database. After excluding redundant publications, 852 reports were deleted and 65 full-text investigations were considered eligible. The latter reports were evaluated according to inclusion, exclusion, and quality criteria, and in the end only 19 manuscripts were selected.²⁶ Figure 1 summarizes the review strategy. The quality ratings of the 19 manuscripts ranged from 3 to 5. Only two manuscripts had quality ratings below 75%^{5,27} due to a lack of representativeness of the target population and a low risk of nonresponse bias.

Methodology of the studies

The 19 studies had a minimum sample size of 65 and a maximum sample size of 10,674.^{28,29} Of the total number of included studies, 18 were cross-sectional (94.7%), and only one was a clinical trial (5.2%).²⁸

Seven studies were conducted in South Korea (36.8%), one in Canada (10.5%), two in China (10.5%), six in the United States (35.8%), one in Israel (10.5%) and, finally, one in Malaysia (10.5%) and one in Europe (10.5%).^{2,3,5,27-42} Three studies included only men (15.8%),^{31,40,42} and the rest included men and women (84.2%). All studies included samples of older adults aged 60 years and over (100%). Of these, three (15.8%) also included adolescents and young adults.^{3,36,42} Ten studies obtained the sample from national surveys using stratified cluster sampling (52.6%), two were obtained from community samples (10.5%), three others from institutionalized older adults (15.8%), and finally two from hospitalized older adults (10.5%).^{31,39}

To measure suicidal ideation, half of the studies (52.6%)^{29,30,32,34-36,38,43} used post-hoc (yes/no) questions, of these one (5.2%) conducted self-report (yes/no) questions based on the ESA-service (in two weeks or the last few months did you think you would be better off dead, did you refuse treatment or stop taking medication to die, did you stop taking medication to die, did you stop eating properly for several days to die?).³² Another tool used to detect suicidal ideation was the Beck Suicide Ideation Scale (BSS)^{33,34} in two studies, while other studies opted for the Geriatric Suicide Ideation Scale (GSIS).^{5,28,33}

To assess body composition, of the 19 studies, only five articles (26.3%) considered this variable, of which four recorded BMI (21%) and only one by the percentage of fat and skeletal muscle mass (SMM) obtained by Dual X-ray Densitometry (DXA).³⁴

Physical function by gait speed was found in two articles where (10.5%) one evaluated both ABVD and grip strength, while the second article combined it only with grip strength.^{5,29} Seven (36.9%) articles used the measurement of ABVD of different scales, of which one of the studies combined it with IADLs.³⁴ Of the total number of studies, two evaluated IADLs^{32,42} while muscle strength by dynamometry was measured in four (21%) of the total number of articles.^{5,34,37,40}

Regarding the analyses that studies performed to assess the relationship between suicidal ideation with physical function and body composition in older adults, eleven (57.9%) studies performed logistic regression analyses.^{3,29,30,34,35,37,39,40-42} Five studies (26.3%) performed structural equation modeling to mediate the effect between physical function and suicidal ideation but not between body composition and suicidal ideation.^{27,31-33,38} The last three studies (15.8%) performed linear regression analyses.^{2,28,36} Table 1 provides detailed information on the quantitative studies.

Suicidal ideation with physical function and body composition

Of the total articles included in this review, five (26.3%) studied the three variables of interest (physical function, body composition, and suicidal ideation), from which four studies measured the relationship between body composition and suicidal ideation with post-hoc questions (yes/no) and BMI respectively, in conjunction with the assessment of physical function with pressor strength^{34,37,40} by self-report (do you suffer

from a chronic disease diagnosed by a physician?)³⁹ and IADL.²⁹ Of the five studies, a significant relationship was found between suicidal ideation and physical function but not with body composition in both sexes, except for one study where BMI with suicidal ideation had an inverse relationship for men but not for women.³⁹

Suicidal ideation and physical function

Of the 19 articles that evaluated the relationship between suicidal ideation and physical function in older adults using equation models (26.3%), they found that it was positive and significant (total score of the scales), with magnitude ranging from small ($r = 0.14$, $p < 0.05$)³¹ using the 3-item subscale (SAGE), to medium ($r = 0.28$, $p < 0.001$)³² obtained using the ABVD scale. Concerning the studies with logistic regression analysis, a study of 1.41 ($p < 0.001$)⁴² to 8.28 ($p < 0.001$) was found using gait speed and grip strength.³⁴ On the other hand, the studies that evaluated gait speed and grip strength^{5,29} found a significant relationship, with both assessments performing best in predicting or explaining suicidal ideation in older adults; however, another instrument that also had a significant performance in one of the studies was the system for measuring functional autonomy (SMAF).²⁸

Suicidal ideation and body composition

Of the five articles that evaluated the relationship between suicidal ideation and body composition in older adults, two (10.5%) found it to be significant ($r = 0.94$, $p > 0.005$) in both sexes and, in the second study only in men ($r = 0.90$, $p < 0.05$) by BMI^{22,39} while the rest of the three articles (15.8%) found no significant relationships between suicidal ideation and body composition in older adults.^{29,34,39}

DISCUSION

The purpose of this study was to systematically review the literature on suicidal ideation as it correlates with physical function and body composition in older men and women. This review has improved the understanding of suicidal ideation in older adults, highlighting areas requiring further research. Most of the studies located in this review were cross-sectional and provided preliminary evidence on the relationship between variables. However, they do not allow to determine a clear temporal sequence between the dependent and the independent variables or covariates, since their measurement is simultaneous. Therefore, it is suggested that future research should use longitudinal designs to provide evidence on the temporal relationship between suicidal ideation, physical function, and body composition. One of the most common methods used to assess suicidal ideation in this review was post-hoc questions where the respondent answered "yes" or "no" to the following question: have you ever seriously thought about committing suicide?²⁵

Table 1. Characteristics of the included studies

Author, year, city	Age (years), sex	Study design	Physical function assessments	Body composition assessments	Analysis (p)	Ref.
Recklitis et al., 2014 United States	> 65, Men	Transversal	Short Form-12 (SF-12)	N/D	OR=0.96 (p<0.001)	35
ellqvist et al., 2014 Europa	65 a 104, Men and Women	Transversal	Scale de KATS	N/D	r=3.22 (p<0.0001)	2
Ahn et al., 2015 United States	65 a 92, Men and Women	Transversal	Korean Instrumental Activities of Daily Living (K-IADL)	N/D	r=0.280 (p=<0.001)	32
Park. S.M. et al., 2015 Corea	20 a 64 Men and Women	Transversal	International Physical Activity Questionnaire (IPAQ) and Self-Reporting	N/D	OR=2.29 men, OR=1.55 en women (p<0.001)	3
Kim.J.H et al., 2016	> 65 Men and Women	Transversal	Muscle strength; Gait speed and Author report	DXA	OR=8.28 men, OR=0.79 women (p <0.001)	34
Kim.S.H et al., 2016 Corea	> 65, Men and Women	Transversal	EuroQol to assess the functional status and Author report	N/D	OR=1.51 (p<0.05)	41
Park. J. Il et al., 2016 Corea	65 a 100, Men and Women	Transversal	Korean Instrumental Activities of Daily Living	IMC	OR= 1.45 (p=0.005)	29
Webb et al., 2018 United States	65 a 94, Men and Women	Transversal	Activities of Daily Living Scale of the Swedish Adoption Twin Study of Aging	N/D	r=0.18 (p= 0.9)	27
Sun et al., 2018 China	65 a 78, Men and Women	Transversal	Author report	IMC	r=0.90 men (p<0.05) y women r=1.01 (p>0.05)	39
Lee et al., 2018 Corea	10 a 80, Men and Women	Transversal	Muscle strength	IMC	r=0.95 men r=0.54 women (p<0.001)	40

OR = Odds Ratio, r = Correlation coefficient, β = beta coefficient, N/D = No Data, DXA = Dual Density X-ray, ADL= Activities of Daily Living, IADL = Instrumental Activities of Daily Living

Author, year, city	Age (years), sex	Study design	Physical function assessments	Body composition assessments	Analysis (p)	Ref.
Lutzman et al., 2020 Israel	65 a 94, Men	Transversal	3-item subscale of the WHO Study on Global Aging and Adult Health (SAGE).	N/D	r=0.14 (p<0.05)	31
Noh et al., 2020 Korea	65 a 80, Men and Women	Transversal	Muscle strength	BMI and Waist Circumference	OR=2.30 men OR= 0.78 women (p<0.001)	37
Xiao et al., 2020 China	65 a 75, Men and Women	Transversal	Activities of Daily Living Scale	N/D	r=0.092 (p<0.001)	38
Lutz et al., 2021 United States	75 a 91, Men and Women	Clinical Trial	Functional disability using the System for Measuring Functional Autonomy (SMAF.)	N/D	$\beta = 36$ (p<0.05)	28
Barry.L.,2021 United States	50 a79, Men	Transversal	Williams Prison Activities of Daily Living Disability Index (PADL)	N/D	r=0.218 (p<0.01)	33
Sim.H.S., 2021 Korea	65 a 80, Men and Women	Transversal	Activities of Daily Living (ADLs), Instrumental Activities of Daily Living (IADLs)	N/D	OR=1.26 in basic activities OR=1.41 in instrumental activities (p<0.001)	42
Vasiliadis., 2022 Canada	65 a 75, Men and Women	Transversal	Presence of physical disorders: Pain was assessed at three levels, "no pain", "moderate pain" and "extreme pain"; Functional disability using the System for Measuring Functional Autonomy (SMAF).	N/D	$\beta =0.45$ p<0.001	36
Bickford et al., 2022 United States	65 a 91, Men and Women	Transversal	Timed gait test; Grooved pegboard (to validate motor dexterity and coordination); Dynamometer pressure force test; WHO disability assessment questionnaires; Independent Living Scale (ILS), Money Management Scale.	N/D	Walking speed $\beta =0.44$, ABVD $\beta = 0.32$ (p<0.001)	5
Wahab et al., 2022 Malasia	60 a 80, Men and Women	Transversal	Modified Barthel Index	N/D	OR= 1.59 (p<0.001)	30

OR = Odds Ratio, r = Correlation coefficient, β = beta coefficient, N/D = No Data, DXA = Dual Density X-ray, ADL= Activities of Daily Living, IADL = Instrumental Activities of Daily Living

One of the most common methods used to assess suicidal ideation in this review was post-hoc questions where the respondent answered "yes" or "no" to the following question: have you ever seriously thought about committing suicide?²⁵ However, this type of scale produces a limited covariance with another indicator, due to the binary format, the variance of the overall scale will be limited, in other words, this could lead the respondent to an oversimplification when generating an opinion.⁴⁴ A systematic review⁴⁵ of assessment tools most commonly used to assess suicidal ideation in older adults highlighted the Geriatric Suicidal Ideation Scale (GSIS) and the Suicidal Ideation Inventory (FSII)^{28,35} used within the items included in this review.

The main physical function assessment tools identified were the 4m/s Gait Speed, Muscle Strength using dynamometry,⁸ and the Basic Activities of Daily Living (BADL) and Instrumental Activities of Daily Living (IADL) scales, the latter validated according to the site of application as in Korea.²⁹ However, one of the tools that stood out was the System for Measuring Functional Autonomy (SMAF).²⁸ This may be because this instrument is a set of functional capacity evaluations in five areas: 1) ABVD, 2) Mobility, 3) Communication, 4) Mental function, and 5) IADLs. The SMAF is an instrument with a general measurement of functional capacities similar to those classified by the WHO for disability.^{46,47}

On the other hand, although it was not the objective of this study, in this review, only one article incorporated a positive variable (Brief Coping Scale) to measure the relationship between physical function using the Korean-Instrumental Activities of Daily Living (K-IADL) and suicidal ideation measured by the Suicidal Ideation Scale (SSI), demonstrating that the study of protective factors on suicidal ideation may be an avenue for intervention in older adults with physical limitations.^{32,48,49}

In congruence with the findings of previous studies, the positive relationship between suicidal ideation and physical function observed in this review indicates that as older adults' physical function decreases, the risk of suicidal ideation increases; however, this result is more pronounced in men than in women, even though in most of the studies included in this study the prevalence of suicidal ideation before mediating it with other variables is higher in women than in men.^{2,3,29,32,32,33,34,35,35,35,36,38,47} These differences concerning gender could be because men function socially as the economic providers at home through their work activity, and the loss of functionality would imply a negative perception due to the loss of the sense of competence in different areas of personal development.^{7,50}

In the case of physical function in older adults, adverse outcomes such as loss of strength and walking speed, can be significantly predicted⁵¹, Physical and psychomotor slowing are characteristics of aging, frailty, depression and anxiety^{52,53}, suggesting that future interventions should address physical function as a mechanism of action to prevent triggers of anxiety and depression such as suicidal ideation.

One of the limitations of the studies is that almost all of them used a cross-sectional design. Therefore, it is not possible to draw a conclusion about the temporality between suicidal ideation, physical function, and body composition in older adults. Although several studies analyzed the data using structural equation modeling, they were evaluated at a time point, so conclusions regarding predictions may be unstable.

On the other hand, the relationship found in this review between suicidal ideation and body composition, only one article was relevant to this study because it directly determined the body composition of five elements by DXA³⁴. The remaining four studies indirectly measured this variable by BMI, being inefficient in determining body composition, mainly in older adults. However, studies have shown that BMI can be a marker of depressed mood and suicidal ideation.⁴⁰

Some studies were also limited concerning methodology, for example, the lack of hypotheses implementation and the description of the sampling design.^{5,27} In addition, some studies included data from population surveys, so it is not possible to generalize the results because not all countries have databases dedicated to research on suicidal ideation or suicide.^{2,3,37} It is necessary to extend the research to other samples according to culture, minorities, etc.

In this study, we evaluated the relationship between suicidal ideation with two correlates (physical function and body composition). However, more variables could play a mediating role between the observed relationships and those not included, as some protective factors such as body appreciation, functional appreciation, self-esteem, and gratitude that are part of positive psychology that could prevent suicidal ideation in older adults.⁵⁴ Despite the limitations, this study provided valuable information on the importance of maintaining physical function in older adults to prevent suicidal ideation. It also provided information on areas of opportunity for future research.

CONCLUSION

This article identified that the studies that evaluated physical function as a variable involved in suicidal ideation in older adults have a significant impact, so future interventions focused on the prevention of suicidal ideation in this age group should strengthen the physical and emotional aspects of the older adult from instruments such as gait speed, muscle strength, and SMAF, as did some of the studies included in this review.

On the other hand, it was also evident that the relationship between body composition and suicidal ideation is little studied, in addition to the fact that the studies that included this variable have been limited to using BMI. It is suggested that in future research, researchers will use variables such as fat percentage, musculoskeletal mass and calf circumference since it has been shown that these composition variables can predict adverse effects in older adults.

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