Published in final edited form as:
Transl Med Aging. 2023 ; 7: 80–86. doi:10.1016/j.tma.2023.06.002.

Body composition, fear of falling and balance performance in community-dwelling older adults

Ladda Thiamwong[a,b,*], **Rui Xie**[c], **Norma E. Conner**[a,b], **Justine M. Renziehausen**[d], **Eunice Oladepe Ojo**[a], **Jeffrey R. Stout**[b,d]

[a]College of Nursing, University of Central Florida, Orlando, FL, USA

[b]Disability, Aging and Technology Cluster, University of Central Florida, Orlando, FL, USA

[c]Department of Statistics and Data Science, College of Science, University of Central Florida, Orlando, FL, USA

[d]School of Kinesiology and Rehabilitation Sciences, College of Health Professions and Sciences, University of Central Florida, Orlando, FL, USA

Abstract

Objectives: We aimed to 1) assess body composition using a portable technology, bioelectrical impedance analysis, (BIA) and 2) examine the associations between body composition and the discrepancy of fear of falling (FOF) and balance performance.

Methods: A cross-sectional study included 121 older adults 60 years and older, 78% were female, 41% lived alone, and 71% had no history of falls. The discrepancy between fear of falling and balance performance was categorized into four groups. We found 47% rational (low FOF and normal balance), 19% incongruent (low FOF despite poor balance), 18% irrational (high FOF despite normal balance), and 16% congruent (high FOF and poor balance).

Results: Body Fat Mass (BFM), Percent Body Fat (PBF), and Body Mass Index (BMI) were correlated with fear of falling and balance performance. BMI was significantly different in the rational group ($p = 0.004$) and incongruent group ($p = 0.02$) compared to the congruent group. PBF was significantly different between the incongruent ($p = 0.002$), irrational ($p = 0.014$), and rational ($p < 0.001$) groups, compared to the congruent group.

Conclusions: The study found that body BFM, PBF, and BMI were correlated with fear of falling and balance impairment. High Body Mass Index and Body Fat Mass were associated with

*Corresponding author. College of Nursing, University of Central Florida, 12201 Research Parkway, Orlando, FL, 32826-2210, USA. ladda.thiamwong@ucf.edu (L. Thiamwong).

Author contributions
Ladda Thiamwong: Conceptualization, Methodology, Investigation, Funding acquisition; Writing- Original draft preparation (see Fig. 3)
Rui Xie: Conceptualization, Methodology, Data analysis, Writing- Reviewing and Editing.
Norma E. Conner: Conceptualization, Funding acquisition, Writing- Reviewing and Editing.
Justine M. Renziehausen: Investigation, Writing- Reviewing and Editing.
Eunice Oladepe Ojo: Investigation, Writing- Reviewing and Editing.
Jeffrey R. Stout: Conceptualization, Methodology, Writing- Reviewing and Editing, Supervision.

Declaration of competing interest
The authors declare that they have no conflicts of interest.

a discrepancy between FOF and balance. Body composition analysis devices, such as BIA and other portable technologies, could be taken to underserved communities and may help identify community-dwelling older adults who are frail and may be at high risk of falling.

Keywords

Body composition; Body fat; Body mass index; Falls; Fear of falling; Bioelectrical impedance analysis (BIA)

1. Introduction

Body composition is a frailty biomarker and has been associated with chronic diseases and mortality in community dwelling-older adults [1]. Body composition and balance deficit are risk factors for falls, especially in males with low body mass and females with high total fat mass [2]. In addition, body fat percentage and balance performance are critical predictors of fear of falling (FOF) [3]. Older adults with high FOF have an increase in functional decline and falling [4]. A recent systematic review with ten cross-sectional and longitudinal studies indicated that FOF increases the risk of frailty in community-dwelling older adults [5]. The discrepancy between FOF levels and balance performance may lead to decreased daily activities, mobility and muscle weakness [6,7]. Furthermore, older adults with high FOF but normal balance tend to restrict their daily physical activities because of fear and are more likely to increase their sedentary time. Increased sedentary behavior and limited physical activity in community-dwelling older adults can increase body fat and muscle loss [8].

About 38% of people aged 60 years and over are obese [9] and obesity is related to frailty [10]. Obese and frail older adults exhibited a significantly increased mortality rate [11]. Older persons with obesity had a 31% higher risk of falls than healthy-weight older adults [12]. There is minimal evidence related to the classification of obesity according to body fat percentage [13] and body fat distribution measurements [14]. The most common body composition methods include weight, skinfold, and abdominal circumference assessments. These methods seem potentially intrusive and may not be as accurate in obese populations. Although body mass index (BMI) and frailty are used to predict mortality in community-dwelling older adults, a systematic review indicated that BMI was not the most appropriate predictor of morbidity and mortality in older adults due to its inability to discern or detect age-related body fat redistribution [14]. BMI does not differentiate between fat mass and lean body mass or the distribution of fat tissue [15]. In addition, the optimal BMI range for the lowest mortality in the elderly was overweight ($25\ kg/m^2 \le BMI < 30\ kg/m^2$) or mildly obese ($30\ kg/m^2 \le BMI < 35\ kg/m^2$) [14].

Using a portable technology-based body composition assessment can serve as a straightforward, low-cost solution and increase accessibility in measuring specific body composition components among community-dwelling older adults at their residential homes. Although dual-energy x-ray absorptiometry (DXA) is considered the preferred method for assessing body composition in older populations, it is expensive and not widely available [16]. Therefore, additional research utilizing a reliable portable device for determining body composition is needed. Also, the association between body composition and the discrepancy between FOF and balance performance has not been examined. We aimed to 1) assess body composition using a portable technology, Bioelectrical Impedance Analysis (BIA), and 2) examine the associations between body composition [(Body Fat Mass (BFM), Percent Body Fat (PBF), and Body Mass Index (BMI)] and the discrepancy between FOF and balance performance. We hypothesized that high BMI and Body Fat Mass were associated with incongruent (low FOF despite poor balance), irrational (high FOF despite normal balance), and congruent (high FOF and poor balance).

2. Material and methods

2.1. Study type

A cross-sectional research design was used, and the Institutional Review Board granted ethical approval at the University of Central Florida. (Protocol No. XXX; September 10, 2020).

2.2. Study population, sample size and recruitment

2.2.1. Study population—Participants were enrolled if they were ≥60 years of age and had no marked cognitive impairment (Memory Impairment Screen, score ≥5 [17–19]). They were excluded if they had a medical condition precluding balance test (e.g., unable to stand on the balance plate) and/or medical implants (e.g., pacemakers). A total of 124 community-dwelling older adults in Orlando, Florida, were screened, and 121 participants qualified. Three were excluded because they had pacemakers and/or could not stand on the balance plate.

2.2.2. Sample size—We used convenience sampling, and the sample size was estimated using the balance variable of BTrackS Balance test score from our pilot study. The standard deviations of the mean BTrackS Balance test scores were 7.91 in the high-active group, and 7.78 in the low-active group, and a total sample of 120 was estimated as necessary for this study.

2.2.3. Recruitment—Older adults were recruited from their homes by local newsletters and word of mouth. Flyers were posted at senior centers, and researchers participated in community activities for face-to-face recruitment. The researchers maintained a log that tracks screening, eligibility, contact, and recruitment.

2.3. Study parameters

2.3.1. Body composition—Body composition determination was conducted using a direct segmental multifrequency bioelectrical impedance analysis (BIA) InBodys10 device [20]. The BIA is manufactured by Biospace Corporation Limited, Naples, FL. The BIA InBody S10 measures impedance at six different frequencies (1, 5, 50, 250, 500, 1000 kHz) for each body segment (right arm, left arm, trunk, right leg, left leg). The spectrum of electrical frequencies is used in the manufacturer’s equation to estimate fat mass, muscle mass, and body water levels. The reliability of the test-retest of the BIA was high, with an ICC of 0.89 [21].

2.3.2. Fear of falling—Fear of falling was assessed using a short Fall-Efficacy Scale International (FES-I). The short FES-I is a 7-item self-report Likert-type questionnaire with a four-point Likert scale that provides information on the level of concern about falls for a range of activities of daily living such as getting dressed or taking a bath [22,23]. Scores range from 7 to 28; 7–10 indicate low concern about falling, while scores 11–28 indicate high concern [23]. The short FES-I has been validated in community-dwelling older adults [22] with good validity, reliability, and responsiveness [25].

2.3.3. Balance performance—Balance performance was measured using the BTrackS balance system. The BTrackS consists of a portable BTrackS balance plate, a foam pad and a balance software installed on a computer with Windows 7 or higher. The portable BTrackS balance plate is an approved medical force plate used to measure balance performance [26,27]. The BTrackS balance system was used to assess static balance and has good validity using Pearson correlations ($r > 0.90$) and excellent test-retest reliability using intraclass correlation co-efficients (0.83) [28]. The BTrackS balance scores range from 1 to 100. Scores 0–30 indicate low physiological fall risk [29]. The scores were interpreted based on age and sex but not body size, so the percentile rankings were determined between various age groups and for men and women separately [30].

2.3.4. Data collection—The first author and the trained research assistant met with the participants and gave information about the study objectives and the data collection process. After obtaining formal consent from participants, they were asked to complete a survey that included demographic information, a history of falls and fear of falling. Following the survey, the participants were instructed to perform the BTrackS Balance Test and body composition test. Participants were asked to sit for 10–15 min before the tests, empty their bladders and remove shoes and metal objects (e.g., jewelry). They were instructed to stand as still as possible on the BTrackS balance plate with hands on hips and eyes closed for about 1–2 min [30]. The researcher let the participants know that he/she stayed behind the participants to ensure they did not fall while testing.

For the body composition testing, the researcher placed touch-type electrodes on their left and right ankles, middle fingers, and thumbs during sitting. They held this position for 1 min as the BIA device conducted a minute electrical current through their body to determine body composition. The researcher then removed the touch-type electrodes from their left and right ankles, middle fingers, and thumbs. No risks or discomforts were associated with using bioelectrical impedance analysis. The total time spent giving instructions and completing the tests was 10–15 min per participant [31].

2.3.5. Statistics—Data were analyzed using the statistical software R (version 4.1.0). The significance level $\alpha = 0.05$. Multinomial logistic regression examined the associations between body composition and a discrepancy between FOF and balance performance. The discrepancy between FOF and balance performance or fall risk appraisal was classified into four quadrants and treated as the dependent variables in the analysis. The congruent category was used as a reference group [6].

a. *Congruent*: high FOF (short FES-I score >10) and poor balance (BBS score = 31–100).

b. *Rational*: low FOF [Short Fall Efficacy Scale International (short FES-I) score ≤10] and aligned with normal balance (BBS score = 0–30).

c. *Incongruent*: low FOF (short FES-1 score ≤10) despite poor balance (BBS score = 31–100).

d. *Irrational*: high FOF (short FES-I score >10), whereas normal balance (BBS score = 0–30).

The multinomial logistic regression reports the odds of being in the different categories of the congruent group. The relative risk ratios reflect the relationship between the discrepancies and selected predictors.

3. Results

We evaluated 121 older adults 60 years and older (Mean ± SD, 75 ± 7); 78% were female, 41% lived alone and 71% had no history of falls. The discrepancy between fear of falling and balance performance was categorized into four groups. We found 47% rational (low FOF and normal balance), 19% incongruent (low FOF despite poor balance), 18% irrational (high FOF despite normal balance), and 16% congruent (high FOF and poor balance) (Table 1).

Fig. 1 presents the correlation between Body Fat Mass (BFM), Percent Body Fat (PBF), Body Mass Index (BMI), fear of falling and balance performance (see Fig. 2).

BMI was significantly different in the rational group ($p = 0.004$) and the incongruent group ($p = 0.02$) compared to the congruent group.

PBF was significantly different between the incongruent ($p = 0.002$), irrational ($p = 0.014$), and rational ($p < 0.00$) groups compared to the congruent group.

Table 2 presents the results from a multinomial logistic regression that age and body composition variables, including Body Fat Mass (BFM), Percent Body Fat (PBF), Body Mass Index (BMI), Whole Body Phase Angle, Skeletal Muscle Mass (SMM), and Skeletal Muscle Index (SMI), were associated with the incongruent, irrational and rational groups.

4. Discussion

The findings of this study contribute to the existing body of knowledge on the use of portable technology-based body composition assessments for the community-dwelling older adults. The portable technology was an easy-of-use and useable alternative to the more expensive approach. However, the measurement of body composition can be influenced by several variables such as hydration status and prior physical activity. So, measures of body composition should be performed in the morning or at the same time of day. It is essential to ensure older adults are well hydrated and their body composition measurements are taken regularly and frequently (weekly or monthly) to observe any change or trends over time.

Body Fat Mass (BFM), Percent Body Fat (PBF), and Body Mass Index (BMI) were correlated with fear of falling and balance performance. However, all the correlation values obtained were weak due to the small sample size and the majority of the population chosen were healthy. A cross-sectional study (n = 251) in Turkey found a relationship between BMI, loss of balance, and poor posture, indicating that obesity causes loss of balance [32]. A cross-sectional study (n = 200) in Brazil found that obesity is associated with postural balance on an unstable surface but not with FOF in older adults [33]. However, a pilot study (n = 30) in India found that overweight individuals have more FOF than individuals with normal BMI. Functional mobility decreased in overweight individuals more than in individuals with normal BMI [34]. Furthermore, obese women have a high restriction in activity due to FOF and have low confidence in daily activities ($p < 0.05$) [32,35]. Frail older adults have a higher fat percentage and lower muscle mass [36].

BMI and PBF were significantly different in the rational and incongruent groups compared to the congruent groups. PBF also differed significantly between the irrational and congruent groups. Since this is the first study that we are aware of that examined the relationship between body composition measures and the disparity between FOF and balance performance, we do not have the previous literature to discuss on this finding. Our findings indicated that it is essential to identify those who are not at a high risk of falling but have a high FOF as it diminishes their mobility. Also, it is necessary to identify those who are not fearful because they have a greater risk of falling, as it decreases their fall risk awareness and makes them more likely to have injurious falls.

Obesity was associated with a higher prevalence of falls in middle-aged and older adults [36]. A previous study indicated that all adiposity measures were positively associated with an increased risk of falls [16]. A previous study demonstrated that older adults with congruent (high FOF and poor balance), incongruent (low FOF despite poor balance), and irrational (high FOF despite normal balance) tend to have more falls than older adults with rational (low FOF and normal balance) [6]. Also, older adults in the congruent category had poor balance and experienced multiple falls that may cause high FOF [6]. Older adults with high FOF have a higher risk for falls, and chronic FOF is associated with an increased risk of functional decline [4]. Older adults in the congruent group were more likely to report a history of falls, similar to the cohort study in which 41% of older adults in the congruent group fell [24].

The novelty of our findings and objective measurements of body composition and balance performance are key strengths of this study. However, our limitations include: 1) the selection of participants was not random; 2) the cross-sectional research design limited the ability to draw causal-effect inferences, and 3) the majority of the study sample was composed of non-Hispanic white and functionally independent, which may reduce the applicability of the findings to other racial/ethnic groups and frail older populations.

5. Conclusion

This is the first study to examine the relationship between portable technology-based body composition assessment and the disparity between FOF and balance performance. This study indicated that BFM, PBF and BMI were correlated with FOF and poor balance. In addition, BMI and BFM were associated with a discrepancy between FOF and balance. Using portable technology such as BIA to assess body composition may allow older adults in underserved communities who are frail and have a high risk of falling to be reached on a larger scale. It is essential to identify those who are not at a high fall risk but have an increased fear of falling as it diminishes their mobility. Also, it is crucial to identify those who are not fearful because they have a greater risk of falling, as it decreases their fall risk awareness and makes them more likely to have injurious falls.

Additional cohort studies are required to investigate the interrelationships of specific components of body composition including BFM, PBF, and BMI, in predicting chronic FOF and future falls. Furthermore, future research should investigate the mechanisms underlying the disparity between FOF levels and balance performance in older adults.

Acknowledgments

Ladda Thiamwong, Rui Xie, and Jeffrey R. Stout have received financial support from the National Institute on Aging (R03AG06799) and the National Institute on Minority Health and Health Disparities (R01MD018025) of the National Institutes of Health. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health.

Norma E. Conner received a grant from the Florida Blue Foundation. This grant supported a study in assessing adiposity and fall risk among older adults in Paramore community, Orlando, FL.

Eunice Oladepe Ojo has received a McKnight Doctoral Fellowship. This fellowship program aims to increase the underrepresentation of African American and Hispanic Ph.D. graduates and faculty in Florida.

References

[1]. Falsarella GR, Gasparotto LP, Barcelos CC, et al. , Body composition as a frailty marker for the elderly community, Clin. Interv. Aging 10 (2015) 1661–1666. [PubMed: 26527868]

[2]. Waters DL, Qualls CR, Cesari M, Rolland Y, Vlietstra L, Vellas B, Relationship of incident falls with balance deficits and body composition in male and female community-dwelling elders, J. Nutr. Health Aging 23 (1) (2019) 9–13. [PubMed: 30569062]

[3]. Badrasawi M, Hamdan M, Vanoh D, Zidan S, Alsaied T, Muhtaseb TB, Predictors of fear of falling among community-dwelling older adults: cross-sectional study from Palestine, PLoS One 17 (11) (2022) e0276967. [PubMed: 36395173]

[4]. Kyungwon C, Gyeong-Suk J, Sung-il C, Prospective study on the impact of fear of falling on functional decline among community dwelling elderly women, Int. J. Environ. Res. Publ. Health 14 (5) (2017) 469, 2017(5):469.

[5]. de Souza LF, Canever JB, Moreira BS, Danielewicz AL, de Avelar NCP, Association between fear of falling and frailty in community-dwelling older adults: a systematic review, Clin. Interv. Aging 17 (2022) 129–140. [PubMed: 35173427]

[6]. Thiamwong L, Sole ML, Ng BP, Welch G, Huang H, Stout J, Assessing fall risk through combined physiological and perceived fall risk measures using innovative technology, J. Gerontol. Nurs 46 (4) (2020) 41–47.

[7]. Cappleman AS, Thiamwong L, Fear of falling assessment and interventions in community-dwelling older adults: a mixed methods case-series, Clin. Gerontol 43 (4) (2020/07/03 2020) 471–482. [PubMed: 31805830]

[8]. Kirwan R, McCullough D, Butler T, Perez de Heredia F, Davies IG, Stewart C, Sarcopenia during COVID-19 lockdown restrictions: long-term health effects of short-term muscle loss, GeroScience (2020/10/01 2020).

[9]. Batsis JA, Zagaria AB, Addressing obesity in aging patients, Med. Clin. North Am 102 (1) (2018) 65–85. [PubMed: 29156188]

[10]. Reinders I, Visser M, Schaap L, Body weight and body composition in old age and their relationship with frailty, Curr. Opin. Clin. Nutr. Metab.Care Jan. 20 (1) (2017) 11–15. [PubMed: 27749713]

[11]. Lee Y, Kim J, Han ES, Ryu M, Cho Y, Chae S, Frailty and body mass index as predictors of 3-year mortality in older adults living in the community, Gerontology 60 (6) (2014) 475–482. [PubMed: 24993678]

[12]. Mitchell RJ, Lord SR, Harvey LA, Close JC, Associations between obesity and overweight and fall risk, health status and quality of life in older people, Aust. N. Z. J. Publ. Health 38 (1) (2014) 13–18. Feb.

[13]. Hiol AN, von Hurst PR, Conlon CA, Mugridge O, Beck KL, Body composition associations with muscle strength in older adults living in Auckland, New Zealand, PLoS One 16 (5) (2021) e0250439–e0250439. [PubMed: 34048458]

[14]. Chang S-H, Beason TS, Hunleth JM, Colditz GA, A systematic review of body fat distribution and mortality in older people, Maturitas 72 (3) (2012) 175–191. [PubMed: 22595204]

[15]. Moonen HPFX, van Zanten FJL, Driessen L, et al. , Association of bioelectric impedance analysis body composition and disease severity in COVID-19 hospital ward and ICU patients: the BIAC-19 study, Clin. Nutr (2020).

[16]. Neri SGR, Gadelha AB, de David AC, et al. , The association between body adiposity measures, postural balance, fear of falling, and fall risk in older community-dwelling women, J. Geriatr. Phys. Ther (3) (2019) 94.

[17]. Kuslansky G, Buschke H, Katz M, Sliwinski M, Lipton RB, Screening for Alzheimer's disease: the Memory Impairment Screen versus the conventional three-word memory test, J. Am. Geriatr. Soc 50 (6) (2002) 1086–1091. [PubMed: 12110070]

[18]. Böhm P, Peña-Casanova J, Gramunt N, Manero RM, Terrón C, Quiñones-Ubeda S, [Spanish version of the Memory Impairment Screen (MIS): normative data and discriminant validity], Neurologia 20 (8) (Oct 2005) 402–411. [PubMed: 16217689]

[19]. Buschke H, Kuslansky G, Katz M, et al. , Screening for dementia with the memory impairment screen, Neurology 52 (2) (1999), 231–231. [PubMed: 9932936]

[20]. InBody S10 Biospace Corporation Limited (2019). https://inbodyusa.com/products/inbodys10/.

[21]. Buckinx F, Reginster J-Y, Dardenne N, et al. , Concordance between muscle mass assessed by bioelectrical impedance analysis and by dual energy X-ray absorptiometry: a cross-sectional study, BMC Muscoskel. Disord 16 (2015), 60–60.

[22]. Kempen GIJ, Yardley L, van Haastregt JCM, et al. , The Short FES-I: a shortened version of the Falls Efficacy Scale-International to assess fear of falling, Age Ageing 37 (1) (2008) 45–50. [PubMed: 18032400]

[23]. Delbaere K, Close JCT, Mikolaizak AS, Sachdev PS, Brodaty H, Lord SR, The Falls Efficacy Scale International (FES-I). A comprehensive longitudinal validation study, Age Ageing 39 (2) (2010) 210–216. [PubMed: 20061508]

[24]. Delbaere K, Close J, Brodaty H, Sachdev PS, Lord SR, Determinants of disparities between perceived and physiological risk of falling among elderly people: cohort study, BMJ Br. Med. J. (Clin. Res. Ed.) 341 (2010) c4165.

[25]. Marques-Vieira CMA, Sousa LMM, Severino S, Sousa L, Caldeira S, Cross-cultural validation of the falls efficacy scale international in elderly: systematic literature review, J. Clin. Gerontol. Geriatr 7 (3) (2016) 72–76.

[26]. Balance Tracking Systems I. BTrackS™ Assess Balance. Balance Track. Syst. Inc. Available at: https://balancetrackingsystems.com/assess-balance/.

[27]. Goble DJ, Validating BTrackS to measure balance. Balance tracking systems. http://balancetrackingsystems.com/wp-content/uploads/2015/03/ValidatingBTrackS-Final-Feb2015.pdf. August 17, 2017.

[28]. Levy SS, Thralls KJ, Kviatkovsky SA, Validity and reliability of a portable balance tracking system, BTrackS, in older adults, J. Geriatr. Phys. Ther 41 (2) (2018) 102–107. [PubMed: 27893566]

[29]. Goble DJ, Baweja HS, Postural sway normative data across the adult life-span: results from 6280 individuals on the Balance Tracking System balance test, Geriatr. Gerontol. Int (8) (2018) 1225. [PubMed: 29897159]

[30]. Goble DJ, Baweja HS, Postural sway normative data across the adult life-span: results from 6280 individuals on the Balance Tracking System balance test, Geriatr. Gerontol. Int 18 (8) (2018) 1225–1229. [PubMed: 29897159]

[31]. Thiamwong L, Stout JR, Park J-H, Yan X, Technology-based fall risk assessments for older adults in low-income settings: protocol for a cross-sectional study, JMIR Res. Protoc 10 (4) (2021/4/7 2021) e27381. [PubMed: 33825688]

[32]. Ercan S, Baskurt Z, Baskurt F, Cetin C, Balance disorder, falling risks and fear of falling in obese individuals: cross-sectional clinical research in Isparta, J. Pak. Med. Assoc Jan 70 (1) (2020) 17–23. [PubMed: 31954018]

[33]. Garcia PA, Queiroz LLd, Caetano MBD, Silva KHCVe, Hamu TCDdS, Obesity is associated with postural balance on unstable surfaces but not with fear of falling in older adults, Braz. J. Phys. Ther 25 (3) (2021/05/01/2021) 311–318. [PubMed: 32830064]

[34]. Priya SSSE, Athira MV, Correlation between body mass index and fear of fall on functional mobility in elderly, Int. J. Physiother Res 7 (5) (2019) 3257–3261.

[35]. Rosic G, Milston AM,Richards J, Dey P, Fear of falling in obese women under 50 years of age: a cross-sectional study with exploration of the relationship with physical activity, BMC Obes. 6 (2019) 7. [PubMed: 30867933]

[36]. Fjeldstad C, Fjeldstad AS, Acree LS, Nickel KJ, Gardner AW, The influence of obesity on falls and quality of life, Dyn. Med 7 (2008) 4. Feb 27. [PubMed: 18304350]

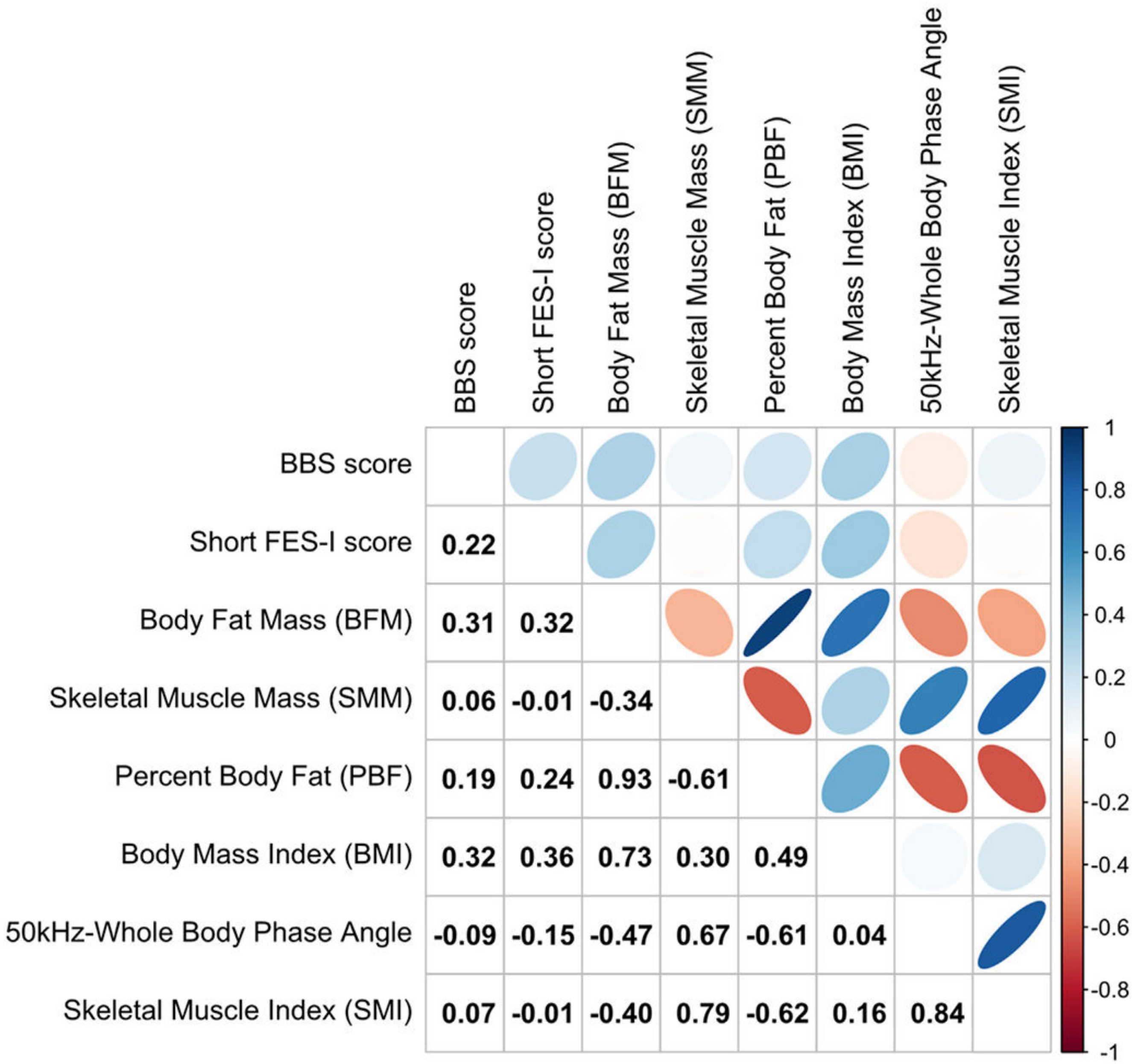

Fig. 1.

The correlation matrix (Pearson correlation) of the body composition measures, fear of falling and balance performance. The insignificant correlation coefficients are left blank.

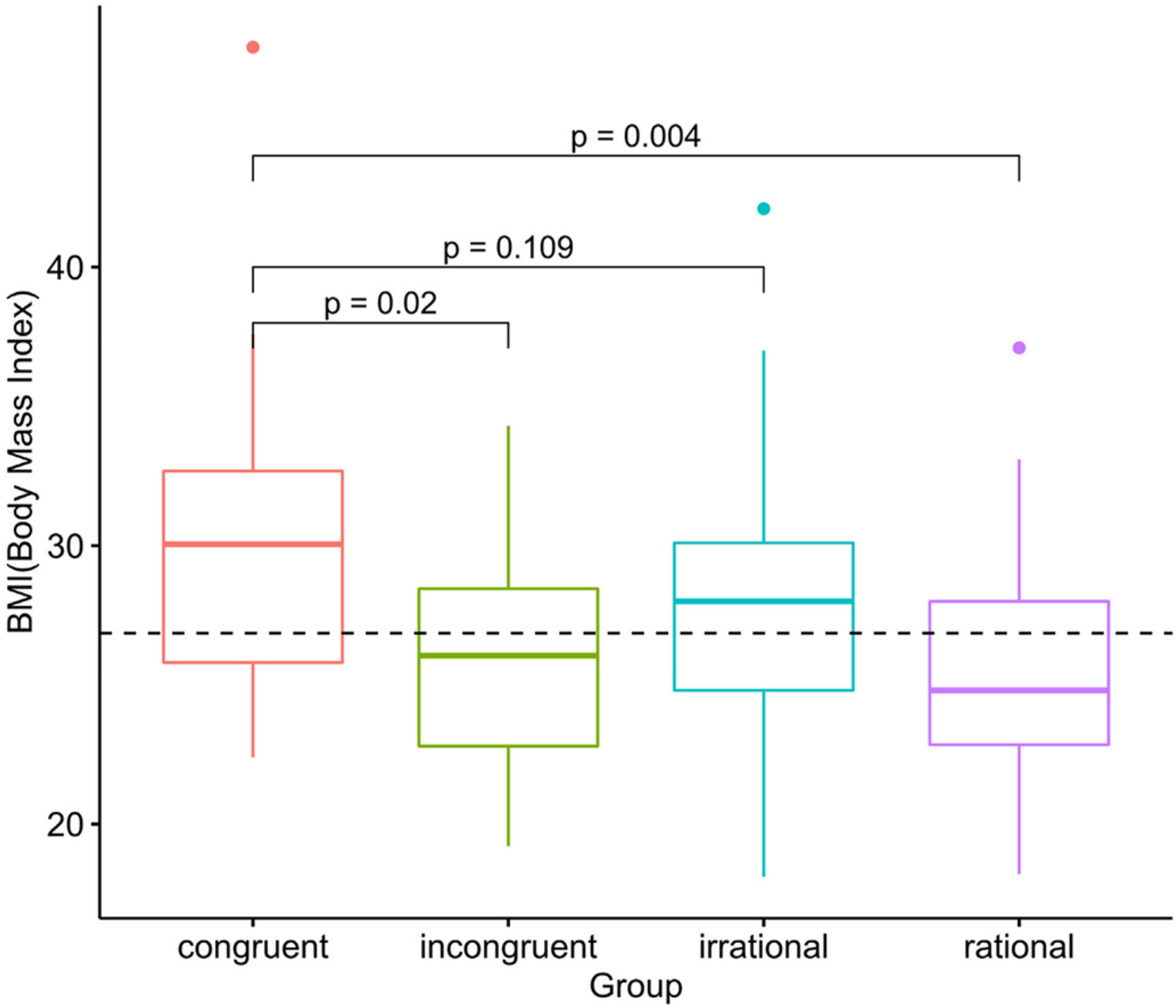

Fig. 2.

Body Mass Index and Fall Risk Appraisal Categorization

Note: For all the boxplots, the dash line indicates the overall average of the variable across all four groups. The pairwise *t*-test p-value is reported in the boxplot with congruent group as the reference.

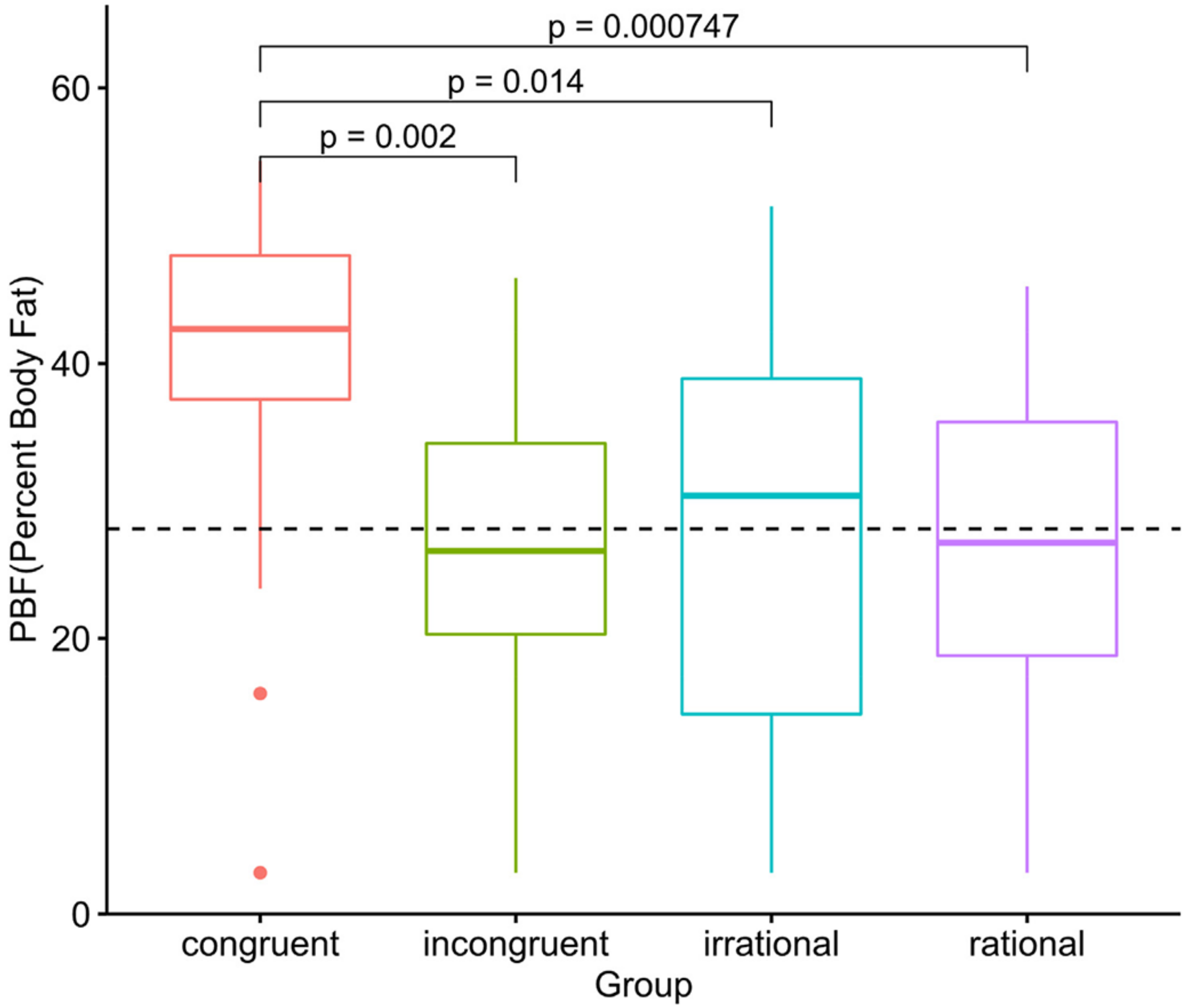

Fig. 3.
Body Fat and Fall Risk Appraisal Categorization

Note: For all the boxplots, the dash line indicates the overall average of the variable across all four groups. The pairwise *t*-test p-value is reported in the boxplot with congruent group as the reference.

Table 1

Description of the sociodemographic characteristics (N = 121).

Variable	Levels	Number (%)
Gender	Female	94 (78%)
	Male	27 (22%)
Age	60–69	31 (27%)
	70–79	61 (53%)
	>80	29 (20%)
Race	Asian	4 (3%)
	African American	9 (7%)
	Hispanic	21 (17%)
	Non-Hispanic white	87 (72%)
Education	Primary or middle school	2 (2%)
	High school	33 (27%)
	College or higher	86 (71%)
General Health	Excellent	20 (17%)
	Very good	45 (37%)
	Good	50 (41%)
	Fair	5 (4%)
	Poor	1 (1%)
Living with	Alone	50 (41%)
	Partner or spouse	55 (45%)
	Family or friend	6 (5%)
	Other	10 (8%)
History of falls	None	86 (71%)
	One	19 (16%)
	Two	8 (7%)
	More than two	6 (5%)
Number of injurious falls $_{(p = 0.50)}$	0	109 (91%)
	1	9 (7%)
	2	1 (1%)
	>2	1 (1%)
Age	Mean (SD)	75 (7)
	Median (IQR)	74 (69–79)
	Range (Min-Max)	60–96
BTrackS balance test score	Mean (SD)	31 (18)
	Median (IQR)	27 (20–36)
	Range (Min-Max)	10.5–111
Short FES-I score	Mean (SD)	10 (4)
	Median (IQR)	9 (7–12)
	Range (Min-Max)	7–25

Table 2

Multivariate associations between body composition characteristics and fall risk appraisal categorization (N = 121).

Body Composition Characteristics	Dependent variable: Three groups of Fall Risk Appraisal Categorization (Reference: Congruent group)		
	Incongruent group	**Irrational group**	**Rational group**
Age	0.960***	0.880***	0.840***
	(0.041)	(0.047)	(0.043)
Body Fat Mass (BFM)	1.090***	1.000***	1.010***
	(0.058)	(0.062)	(0.059)
Skeletal Muscle Mass (SMM)	0.970***	0.930***	0.960***
	(0.051)	(0.051)	(0.050)
Percent Body Fat (PBF)	0.740***	0.810***	0.840***
	(0.119)	(0.120)	(0.119)
Body Mass Index (BMI)	0.880***	1.170***	0.890***
	(0.194)	(0.197)	(0.185)
50 kHz-Whole Body Phase Angle	1.070***	0.950***	1.050***
	(0.311)	(0.322)	(0.308)
Skeletal Muscle Index (SMI)	0.790***	0.850***	0.800***
	(0.341)	(0.343)	(0.321)

Note: The tables present the relative risk ratios (RR) and standard errors (SE, in parenthesis) obtained from multinomial logistic regression analysis. The significance level used to determine statistical significance is denoted as

*** $p < 0.01$.