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Japanese community-living older adults' perceptions and solutions regarding their physical home environments

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Abstract

This study examined perceived causes of accidental falls, the solutions implemented, and differences in scores on the Falls Efficacy Scale (FES) based on experiences of accidental falls, implementation of solutions, and experiences of problems in participants' current environments. Data were collected individually from Japanese community-living older adults. Of the 41 participants, 71% experienced accidental falls, 41.5% implemented solutions, and 39.0% experienced problems in their current environments. Some solutions were implemented, including both appropriate and inappropriate ones. The FES scores differed significantly, based on experiences of problems in participants' current environments, suggesting that a consultation-style intervention would contribute towards improved FES scores among clients experiencing problems in their current environments.

Background

Due to the fear of falling (FOF), older adults restrict themselves in their participation in activities, with no difference in terms of the location (inside or outside the house) of their previous accidental falls,¹ as well as age, gender, and recent history of falls.² The restriction and avoidance lead to a decline in the quality of life of community-living older adults.³ Older adults have reported feeling increased vulnerability, depression, frustration, and self-blame after experiencing accidental falls.⁴ They may also avoid participating in activities due to these feelings.

FOF is a risk factor for accidental falls in older people.⁵ Therefore, healthcare professionals prefer that older adults perform activities without FOF. The Falls Efficacy Scale (FES) is used internationally to measure older adults' confidence during the performance of listed activities without FOF.⁶⁻¹¹ The FES includes 10 activities of daily living (ADL), such as "get dressed and undressed," "take a bath or a shower," and "get in/out of bed," and instrumental activities of daily living (IADL) such as "prepare a simple meal," "answer the door or telephone," and "light housekeeping." A high score indicates high fall efficacy. Exercise interventions are typically implemented towards older adults by physio and occupational therapists so as to improve and maintain FES scores. A study by Jung et al. (2015) found that older adults with low FES scores were excessively careful when performing activities; this tendency induced activity avoidance or reduction.¹⁰ However, older adults may be unable to avoid some activities when there is no one to offer them help with these, or when their roles include performing IADL for

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4 other family members. Recently, the combination of behavioral and exercise interventions was
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6 proposed, as it significantly improved FES scores and physical functions, in comparison to
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8 interventions merely entailing exercises.¹² A study by Nakamura-Thomas and Kyougoku (2013)
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10 identified significant correlations in scores between the FES and Occupational Self Assessment
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12 (OSA), concluding that improving an individual's competence in performing and participating
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14 in daily activities would be an important role for occupational therapists, concerned with
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16 community-living older adults.¹³ The OSA measure, developed in occupational therapy settings,
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18 allows an individual to rate his/her own competence in 21 areas of performance and
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20 participation.¹⁴
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28 Many older adults attribute their falls to trips or slips inside the home or in immediate
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30 home surroundings when performing ADL and IADL. However, these older adults do not
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32 readily recognize potential physical barriers, including clutter and untidy electrical wires.¹⁵ In
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34 view of these studies, older adults may seem to disregard potential barriers in their home
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36 environments. When guiding potential clients in terms of appropriate behavior within their
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38 physical home environments, it may also be important to examine their understanding and
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40 perceptions of what constitutes barriers and actions in this regard.
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47 Environmental assessment, as prescribed by occupational therapists, significantly
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49 contributes towards a decrease in the number of falls in high-risk individuals.¹⁶ Occupational
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51 therapists assess the relationships between community-living older adults' performance and safe
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53 practices and physical barriers in home environments, rather than considering barriers only.¹⁷
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4 They assess home environments using instruments that assess safety, in an effort to improve
5 performance in ADL and IADLs.^{16,18-21} To date, none of these instruments have been translated
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8 into Japanese. The following items are commonly identified as safety hazards in studies: clutter
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10 or debris, untidy electrical wires and plugs, steps or curbs at an entrance, unstable furniture,
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12 inadequate lighting, loose rugs, a slippery floor, kitchen with too many objects, bathtub with no
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14 handrail, washbasin with cabinets that are too high, and a toilet with an inappropriate height, and
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16 wearing slippers inside a house. Accumulating information regarding home barriers through
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18 examination of common safety hazards, followed by recommendations regarding home
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20 modification, may be useful for client guidance.
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28 In addition to aiming towards proposing occupational therapy interventions to improve
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30 home safety among community-living older adults, this study also posed the following research
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32 questions: (1) What are the perceived causes of accidental falls in participants' physical home
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34 environments? (2) What solutions did participants implement to perceived problems when they
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36 had to perform ADL and IADL? (3) Do FES scores differ according to experiences of accidental
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38 falls, the implementation of solutions, and experiences of problems in participants' current
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40 physical home environments?
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49 **Methods**

50 *Design and Setting*

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52 In this study, Japanese community-living older adults were recruited regardless of gender,
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4 whether they lived alone or not, and mobility. This is because, in a previous study on Japanese
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6 community-living older adults by Maeda and Takenaka (2010), FES scores were not
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8 significantly associated with gender, living status (e.g., living alone or not), or walking duration
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10 per week.²² This research protocol was reviewed and approved by the Research Ethics
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12 Committee of the Faculty of Health, Medicine and Welfare of Saitama Prefectural University
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14 (No. 26105). We conducted the recruitment of participants, data collection, and data analysis
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16 based on the protocol. Data were collected individually through face-to-face home visit
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18 interviews.
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25 ***Study Participants and Recruitment***

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27 The study participants were Japanese community-living older adults in the urban area of Tokyo,
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29 Japan. Flyers for recruiting potential participants were distributed through a community center
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31 after obtaining permission from the residents' committee in the area. A convenience sampling
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33 procedure was employed. Inclusion criteria were as follows: (1) aged 60 years or older, (2)
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35 performed ADL and IADL by oneself, (3) could understand questions and respond
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37 independently, and (4) let a researcher visit one's house to ask questions and observe the home
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39 environment. The exclusion criteria were as follows: (1) aged 59 years or younger, (2) could not
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41 perform any of the activities listed in the FES, and (3) had cognitive problems barring
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43 participation in this study.
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51 ***Data collection***

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53 The first author collected data using the Japanese version of the FES and a questionnaire
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4 developed for this study, as described below, between April and September in 2017. The date
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7 and time of the home visits were decided according to participants' preferences.
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10 **Fall Efficacy Scale.** Due to its wide usage, we used the Japanese version of the FES.^{8,22} The
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12 Japanese version had the same format and scoring system as those of the original version,
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14 including 10 ADL and IADL items. Participants were asked to rate their confidence regarding
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16 each item on a scale of 0 ("not confident at all") to 10 ("very confident"). The score range was
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18 0–100, and a high score indicated high fall efficacy.
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23 **Participants' experiences of accidental falls and solutions implemented.** A questionnaire
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25 was developed for this study, including the questions presented henceforth. (1) "Have you
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27 experienced any accidental falls?" We did not ask when or how long ago this had happened. "If
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29 yes, (2) please indicate items from the following list and show them to the visitor: (a) clutter or
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31 debris, (b) untidy electrical wires and plugs, (c) the entrance (no handrail, steps, or curbs), (d)
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33 unstable furniture, (e) inadequate lighting, (f) loose rugs, (g) slippery floor, (h) the kitchen
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35 (inappropriate height or presence of obstacles against smooth mobility), (i) your bathtub (no
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37 handrail, or inappropriate height), (j) your washbasin with an inappropriate height, (k) your toilet
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39 (no handrail, steps, or inappropriate height), and (l) wearing slippers inside a house." (3) "Did
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41 you carry out any solutions? If yes, (4) please tell us what you have done regarding the items in
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43 the following list" (similar to that in the second question). When visiting participants' houses, the
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45 researcher visited focused only on data collection, rather than judging whether the implemented
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47 solutions were appropriate or not, asking participants the following: (5) "Do you currently
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5 experience any problems in your home environment? ('Yes' or 'No')." We did not examine the
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7 reliability and validity of the original questionnaire prior to this study, as ours was a pilot study.
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10 As closing questions, participants were asked their age, gender, the number of people that they
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12 resided with in the house, and whether they had diagnostic health issues that were under the
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14 control of physicians.
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16 17 ***Data Analysis***

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19 We calculated the frequencies of all response options for all questions, excluding the fourth
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21 question. In terms of the qualitative data, the solutions described (the fourth question in the
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23 questionnaire) were categorized according to the items listed in the second question.
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28 After confirming the non-normal distribution of the FES scores by means of the
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30 Kolmogorov-Smirnov test, we assessed differences in the scores between the following groups:
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32 (1) two groups, based on experiences of accidental falls in the home environment, (2) two
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34 groups, based on implementation of solutions, and (3) two groups, based on experiencing
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36 problems in the current home environments. Statistical analysis was performed using the HAD
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38 Version 16.00.²³ A significance level (p value) of 0.05 was established to determine statistical
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40 significance for all comparisons.
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49 **Results**

50 51 ***Recruitment***

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54 There were 41 participants in this study. Table 1 shows the participants' characteristics. Their
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4 mean age was 74.5 years, with a standard deviation of 6.3. The median age was 75 years, and
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7 range, 60 to 89 years. The group aged 70–79 years (68%) was in the majority, followed by the
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10 group aged 80–89 years (22%), and the group aged 60–69 years (10%). Eighty-three percent of
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12 participants were women; 17% were men. Fifty-one percent of participants lived alone; 42%,
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14 with a partner; and 7%, with their own single child. Participants' following health issues were
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16 under control by physicians: high blood pressure (48.8%), knee pain due to osteoarthritis (12%),
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18 and diabetes (5%). Thirty-four percent of participants reported no health issues. The FES mean
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20 score was 88.3, with a standard deviation of 11.9; the median score was 93, and range, 60 to 100.
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23 Additionally, all participants had lived in the same house for more than 20 years, completed
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25 junior high school, and obtained no rehabilitation service.
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31 [Insert Table 1 about here]
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33 **Participants' experiences of accidental falls**

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36 Table 2 shows the responses to the questionnaire. For the first question (“Do you experience any
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38 accidental falls?”), 29 participants (71%) reported, “yes.” “Wearing slippers inside a house” (n =
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40 19) was the most common reason, followed by “clutter or debris” (n = 13), and “loose rugs” (n =
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42 10), in response to the second question. All 29 participants indicated one or more items as
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44 reasons for falls. None of the participants indicated “the entrance,” “unstable furniture,” and “the
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46 kitchen” as reasons.
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51 **Solutions implemented by participants**

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54 For the third question (“Did you carry out any solutions?”), 17 participants (41.5%) reported,
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4 “yes.” Four participants received home modification services, such as installation of ramps for
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7 the entrance, and handrails for bathtubs and toilets. These participants were supported by their
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10 children who went to a city office and submitted the relevant documents for their parents to
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12 obtain the services. Service providers in charge of home modifications visited participants’
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14 homes and installed the ramps and handrails according to the manual of social care services for
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16 older adults. Among other reported solutions, some were recommendable, such as “trying not to
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18 put things in certain locations (regarding clutter or debris),” “binding wires,” “putting wires
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20 along the room’s edge,” “installing a sensor system for lighting,” and “using the handrails and
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22 ramps.” Some were not recommendable, such as “putting wires under rugs,” “using scotch tape
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24 to fix untidy rugs,” and “leaning against the wall during tiling.” Regarding the fifth question
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26 (“Do you currently experience any problems in your home environment?”), 16 participants
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28 (39.0%) reported, “yes.”
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36 [Insert Table 2 about here]
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38 ***Comparing FES scores between groups*** 39

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41 Table 3 shows comparisons of FES scores between groups, based on experiences of accidental
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43 falls, implementation of solutions, and experiences of problems in participants’ current physical
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45 home environments. A significant difference in FES scores was observed between groups,
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47 according to experiences of problems in participants’ current environment ($p = 0.016$), with a
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49 significantly lower score obtained by the group experiencing problems in their current
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51 environments. No significant difference in the FES score was observed between groups,
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4 according to the experiences of accidental falls and the implementation of solutions.
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10 11 12 **Discussion** 13

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15 The first research question was, “What are the perceived causes of accidental falls in participants’
16 physical home environments?” The percentage of participants who reported accidental falls
17 (71%) was higher than that in other reports examining community-living, healthy Japanese
18 adults receiving no rehabilitation services; for example, those reporting 24.9% of 362
19 participants,²⁴ and 15.8% of 1122 participants²⁵. The face-to-face home visit interviews in this
20 study may have resulted in participants responding without hesitation, thereby increasing the
21 number of those reporting accidental falls. Japanese community-dwelling older adults who had
22 experienced falls in the previous year and pain in lower extremities tend to experience recurring
23 falls.²⁶ Participants with pain in lower extremities and accidental falls need immediate
24 interventions. The current study found that the majority of causes of accidental falls were
25 manageable, such as “wearing slippers inside a house,” followed by “clutter or debris,” and
26 “loose rugs.” As previous studies have reported, Japanese community-dwelling older adults
27 receiving no rehabilitation services experienced accidental falls due to manageable items, rather
28 than steps and stairs.²⁴⁻²⁵
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51 The second research question was, “What solutions were implemented to problems that
52 participants perceived when they had to perform ADL and IADL?” Only four participants used
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4 home modification services. A study by Kamei et al. (2015) emphasized the importance of a
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6 home hazard modification program, as it proved effective for fall prevention among Japanese
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8 community-living older adults.²⁷ In order to receive home modification services, older adults are
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10 required to submit an application form, along with the relevant documents, to a city office. The
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12 documents include information on care levels based on the performance levels of ADL and
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14 IADL, as assessed by healthcare professionals in charge of social care services. The
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16 performance levels are categorized according to the following eight levels of care need from the
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18 status requiring no need to perform ADL and IADL to the status requiring maximum support to
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20 perform those activities: no need, support 1, support 2, care 1, care 2, care 3, care 4, and care 5.
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28 None of the participants in this study underwent rehabilitation services, suggesting that their
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30 assessment was likely to indicate “no need” or support 1 levels. The study participants may have
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32 failed to obtain the necessary information to make their home environments safer. This study
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34 also identified both appropriate and inappropriate solutions, based on participants’ responses to
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36 the third question (“Did you carry out any solutions?”), suggesting that participants needed
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38 interventions by occupational therapists.
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44 The third research question was, “Do FES scores differ according to experiences of
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46 accidental falls, the implementation of solutions, and experiences of problems in participants’
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48 current physical home environments?” This study provided a new insight, namely, that
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50 experiencing problems in one’s current physical home environment affected FES scores, with
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52 engagement in ADL and IADL proving to be important for fall efficacy. Solving the problems
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4 that they experienced in their current physical home environments was seemingly important to
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7 participants. FES scores did not vary according to experiences of accidental falls in this study, in
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10 contrast with the results of previous studies that concluded that FES scores vary according to
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12 experiences of accidental falls.^{1,2} The participants in this study engaged in their ADL and IADL,
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15 despite some having experienced accidental falls. The accidental falls may not have been serious
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18 enough to warrant non-engagement in ADL and IADL. Alternatively, participants may have
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21 been able to resume these engagements, as none was undergoing rehabilitation services.
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23 A consultation-style intervention may be needed for people who experience problems in
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25 their current physical home environments. Such an intervention would entail visits by
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28 occupational therapists, who would listen to complaints among community-living older adults
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31 and provide possible and recommendable solutions. This study also found that all participants
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34 who had installed handrails and ramps used the installed objects, suggesting that they
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37 appreciated the modifications. The modifications should be based on clients' perspectives, as
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40 client-centered home modification has been shown to contribute to daily performance among
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43 older adults.¹⁹ Additionally, action plans, known as "behavioral contracts" or "implementation
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46 intentions," could help people act on their intentions and modify their behaviors through
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49 occupational therapists asking them when, where, and how they would perform their daily
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52 activities.²⁸

53 A discrepancy between physical functioning and the FES score is associated with a higher
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56 risk of accidental falls.²⁹ However, physically focused interventions for maintaining mobility,
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4 strength, and performance of ADL are not sufficiently comprehensive strategies for the
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6 prevention of falls.³⁰ There is a need to identify the risks of falls related to individuals and the
7
8 environment, respectively.³¹ Occupational therapists are well placed to solve individually
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10 perceived potential barriers, as they have established theory and assessments that aid the
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12 understanding of the relationship between an individual's performance and his or her
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14 environment.¹⁶⁻²¹ Community-based geriatric occupational therapy services are becoming
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16 increasingly important, due to the rapid aging of the population. However, current services are
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18 provided in the form of rehabilitation services for people with health-related problems in Japan.
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20 This study suggests that community-dwelling older adults who do not receive rehabilitation
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22 services may benefit from occupational therapy services, so as to improve the safety of their
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24 home environments.
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36 **Limitations.** Participants were not randomly selected; thus, several common characteristics
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38 among them may have affected the results obtained in this study. These include living in the
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40 same house for more than 20 years in an urban area of Tokyo, Japan, completing junior high
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42 school, not receiving rehabilitation services due to independent performance of ADL and IADL,
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44 and participation in this study with no special support. Guidelines must be set for the selection of
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46 participants in future studies, including those relating to having resided with people for shorter
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48 durations, living in a rural area, use of rehabilitation services, and requiring support for
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50 participating in studies. The reliability and validity of the original questionnaire developed for
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4 this study were not examined. A standardized questionnaire must be developed for future
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10 11 12 **Conclusions**

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15 This study showed that FES scores differed significantly according to experiences of problems
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17 in the current physical home environments of Japanese community-living older adults. Some
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19 participants implemented solutions in their home environments; however, the solutions as
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21 implemented by the participants may seem insufficient. This study proposes a consultation-style
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23 intervention for individuals who experience problems in their current physical home
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25 environments.
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30 31 **Declaration of Conflicting Interests**

32
33 The authors have no potential conflicts of interests with respect to the research, authorship,
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35 and/or publication of this article.
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46 47 **Supplementary Data**

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49 Primary data can be requested through contact with the primary author.
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For Peer Review

Table 1. Participants' characteristics (N=41).

Variable		N (%)	
Age (years)			
	Mean	74.5	
	Median	75.0	
	Standard deviation	6.33	
	Range	60-89	
	Age groups		
		60-69	4 (9.76)
		70-79	28 (68.29)
		80-89	9 (21.95)
	Missing	0	
	Total	41 (100)	
Gender			
	Women	34 (82.93)	
	Men	7 (17.07)	
	Missing	0	
	Total	41 (100)	
Number of people in the home			
	One (lived alone)	21 (51.22)	
	One A spouse	17 (41.46)	
	other person A single child	3 (7.32)	
	Missing	0	
	Total	41 (100)	
Diagnosed health issues, under control by physicians			
	High blood pressure	20 (48.78)	
	Knee pain due to osteoarthritis	5 (12.20)	
	Diabetes	2 (4.88)	
	No health issues	14 (24.14)	
	Missing	0	
	Total	41 (100)	
The Falls Efficacy Scale (obtained from all participants)			
	Mean	88.3	
	Median	93.0	
	Standard deviation	11.87	
	Range	60-100	
	Skewness	-0.960	
	Kurtosis	-0.152	

Table 2. Responses to the questionnaire (N=41).

Question items		N (%)
(1) Experiencing accidental falls	Yes	29 (70.7)
	No	12 (29.3)
Among the 'yes' group, (2) selected items		
(a) Clutter or debris		13
(b) Untidy electrical wires and plugs		3
(c) The entrance in each apartment (no handrail, steps, curbs)		0
(d) Unstable furniture		0
(e) Inadequate lighting		6
(f) Loose rugs		10
(g) Slippery floor		1
(h) The kitchen (inappropriate height, existence of obstacles)		0
(i) The bathtub (no handrail, inappropriate height)		1
(j) The washbasin with inappropriate height		1
(k) The toilet (no handrail, steps, inappropriate height)		1
(l) Wearing slippers inside a house		19
(3) Carrying out solutions	Yes	17 (41.5)
	No	24 (58.5)
Among the 'yes' group, (4) Solutions		
(a) Clutter or debris	Try not to put things	1
(b) Untidy electrical wires and plugs	Put wires under rugs	1
	Bind wires	1
	Put wires along the room's	1
(c) The entrance	edge Use the ramp installed	2

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Table 2. Responses to the questionnaire (Continued).

Question items		N (%)
(d) Unstable furniture		0
(e) Inadequate lighting	Use a torch light	2
	Installing a sensor system for lighting	1
(f) Loose rugs	Use scotch tape to be stable	1
(g) Slippery floor	Not to hurry	1
(h) The kitchen		0
(i) The bathtub	Use the handrail installed	4
(j) The washbasin with inappropriate height	Not use the cabinet in higher places	1
(k) The toilet	Use the handrail installed	4
	Leaning against the wall during tilting	1
(l) Wearing slippers inside a house	Use only in the kitchen	3
(5) Experiencing problems in the current home environments	Yes	16 (39.0)
	No	25 (61.0)

Table 3. Comparison of FES scores between groups according to questions (N=41).

Variable	Response	Mean	FES scores		<i>p</i> value
	Yes/No (%)		SD	Median	
Experiencing accidental falls	Yes (71%)	84.52	11.69	90.00	0.374
	No (29%)	90.25	12.59	94.50	
Implementing solutions	Yes (41.5%)	89.12	10.69	93.00	0.989
	No (58.5%)	87.75	12.83	92.50	
Experiencing problems in current environments	Yes (39%)	83.56	12.67	88.00	0.016
	No (61%)	91.36	10.47	95.00	

Note. FES = Falls Efficacy Scale, SD = Standard deviation, Brunner-Munzel test was used.