Brazilian Journal of Geriatrics and Gerontology, vol. 9, núm. 1-1, 2006, pp. 21-36.

Risk factors present and involved in geriatric falls in the home?.

Arq. Yeannes Mariana Lujan.

Contents

Vol. 9 (1) . January-April/2006

ISSN 1809-9823

UnATI
envelhecimento humano

Brazilian Journal of Geriatrics and Gerontology

UnATI
UERJ

Contributions

All manuscripts should be sent to the Editor and should comply with the "Instructions for Authors", published in the end of each issue.

Subscriptions

Subscription or exchange orders should be addressed to the journal.

Correspondence

All correspondence should be sent to Revista Brasileira de Geriatria e Gerontologia at the address below:

Revista Brasileira de Geriatria e Gerontologia

UERJ/UnATI/CRDE
Rua São Francisco Xavier, 524 – 10º andar - bloco F - Maracanã
20 559-900 – Rio de Janeiro – RJ – Brasil
Telefones: (55)(21) 2587-7236 / 7672 / 7121 Ramal 6
Fax: (55)(21) 2587-7236 Ramal 211
E-mail: crdetext@uerj.br
Web: http://www.unati.uerj.br

Indexes

Latindex – Sistema Regional de Información em Línea para Revistas Científicas de América Latina, el Caribe, Espana y Portugal

Edubase – Faculdade de Educação/Unicamp/São Paulo/Brasil

Revista Brasileira de Geriatria e Gerontologia / *Brazilian Journal of Geriatrics and Gerontology is associated with*

Associação Brasileira de Editores Científicos

Risk factors present and involved in geriatric falls in the home

Factores de riesgo presentes e intervinientes en caídas hogareñas

Mariana Lujan Yeannes*

Abstract

Introduction: Falls are one of the most important geriatric syndromes; three out of ten older adults (OA) fall once a year, and more than 50% of these falls take place in the home. The objective of the present study was to analyze the presence, interaction and involvement of environmental risk factors (ERF) and behavioral risk factors (BRF) for falls, in living spaces; and to verify whether modifications regarding risk factors had been implemented by older adult fallers (OAF) who underwent preventive treatment.

Development: The sample included 129 independent older adults, both fallers and non-fallers, from the city of Mar del Plata. Data were collected using an assessment tool, through direct observation in living spaces. The data were analyzed by applying a scale of Risk Factor Presence (High - Medium - Low).

The results showed that ERF and BRF were present and interacted in different areas and under certain conditions (which according to the present study were involved in three to four of every five falls in the home). It was found that the OA had difficulties in identifying the risk factors presented and, even when such risks were identified, modifications were not necessarily implemented.

The conclusions from the present study will serve as a basis for defining and implementing *re-education* regarding habits and behavioral patterns, for *adaptation* of living spaces, as indispensable prerequisites for preventing falls.

Key words: *Aged*; accidental falls; accidents home; risk factors; accident prevention; housing

Resumen

Introducción: La caída constituye uno de los síndromes geriátricos más importantes; tres de cada diez adultos mayores (AM) sufren una caída al año y más del 50% se produce en la vivienda.

* Correspondence
Arquitecta Mariana Lujan Yeannes.
San Lorenzo 2845 - Mar del Plata CP: 7600. Buenos Aires, Argentina.
Mail: mlyeanne@mdp.edu.ar

El objetivo de éste estudio fue analizar en cada vivienda la presencia, interacción e intervención de factores de riesgo de caída, ambientales (FRA) y conductuales (FRC); y verificar la modificación del riesgo por parte de AM Caedores que recibieron tratamiento preventivo.

Desarrollo: Componen la muestra 129 personas autónomas, caedoras y no caedoras, de la ciudad de Mar del Plata. La construcción del dato se realizó mediante un instrumento de evaluación por observación directa en la vivienda. Los datos se analizan, mediante una Escala de Presencia de Factores de Riesgo. (Alta – Media - Baja).

Los resultados muestran la presencia e interacción de FRA y FRC en distintas áreas, y condiciones (que según este estudio intervienen en la generación de 3 a 4 de cada 5 caídas hogareñas). Se han detectado dificultades, por parte del AM, en la identificación de los riesgos presentes mencionados; y que, aun cuando éstos son identificados, no necesariamente son modificados.

Las conclusiones de este estudio servirán de base para pautar e implementar la *re-educación* de hábitos y conductas en la *adaptación* de la vivienda como condición ineludible para prevenir caídas.

Palabras claves: Anciano; accidentes por caídas; accidentes domesticos; factores de riesgo; prevención de accidentes

INTRODUCTION

The home has significant relevance in old age, and is one of the most important confinement spaces for older adults (OA) (Graham, 1990). There are different reasons for this, such as cultural factors (in which the home acquires strong affective connotations that imply permanence over the years without foreseeing future needs), and economic factors (relating to the maintenance of the home). These, among other reasons, give rise to the existence of large numbers of homes that do not always fulfill the minimum desired safety and adaptability conditions that would ensure the autonomy of the OA on a daily basis.

One of the main consequences derived from such circumstances is the occurrence of falls. A fall is defined as "an accident in which the person suddenly drops to the ground or to an even lower level, occurring with or without loss of consciousness" (Calvo, 1997). This is one of the most important geriatric syndromes, because of its high incidence in this sector of the population. Three out of every ten OA suffer one fall per year (Dominguez; Navarro; Cuesta; Roiz; Lazaro, 1997) and more than 50% of such falls occur in the home (Falls and hip fractures, 2004). The significance of such events in the OA population derives from the high prevalence of consequences from falls. The consequences have a wide range, from those of a physical nature (susceptibility to trauma and high incidence of hip fractures, lesions, lacerations, etc) (Sattin, 1992; Oliver, 1997) to those of a social-psychological nature (post-fall syndrome) (Salva, 1997).

It is known that there is no single cause for falls. Different risk factors are involved in such

events (Marcellan; Mesa, 1997) and these have been classified in various ways, but most classification systems recognize risk factors as intrinsic or extrinsic to the individual (Mesa; Marcellan, 1997).

The classification of risk factors has recently been expanded with the objective of elucidating greater interrelations between them. In this, three main domains have been recognized:

Personal Risk Factors (PRF), which are determined by pathological processes that predispose towards to falling, as well as the physical and mental changes that are associated with aging rather than with disease (diminished visual acuity, decreased vibratory and tactile threshold, gait disorders, etc).

Environment Risk Factors (ERF), which are determined by the characteristics or circumstances of the physical environment that are accompanied by increased likelihood or risk that a fall will occur (slippery floors, loose carpets, inadequate light or unnoticed changes of level).

Finally, there are **Behavioral Risk Factors (BRF)**, which are determined by people's activities or choices. These may alter the balance mechanism and thus favor falls (included in this definition are personal habits that determine the way an activity is performed: the use of inadequate footwear such as slippers, etc) (Connell; Wolf, 1997).

The present discussion within the scientific community is centered on identifying the risk factors that are present and involved in falls. The strongest studies are the ones that have investigated the incidence of PRF. With regard to the incidence of ERF and BRF relating to falls in the home, in the international sphere there are studies with different methodological approaches that appear to present positive results. Some of these consist of assessments of homes for independent OA, for implementing programs to modify the standard risk factors, with the ultimate aim of verifying the further incidence of falls in controlled trials (Cameron; Kurrles; Cumming, 1996).

Another type of investigation has focused on the treatment of behavioral patterns with subsequent assessment of environmental safety (Gillespie et al, 1998). This has demonstrated that behavioral interventions related to modification of the environmental risks (together with other interventions based on selective assessment) significantly reduced the numbers of people experiencing falls.

The effectiveness of the methodologies utilized in preventive educational programs regarding falls that are used in practice for prevention of the factors involved was also assessed. The conclusions from the different studies have shown that people who attended fall prevention programs were willing to make changes to their behavior and economic adaptations in their homes (Ryan; Spellbring, 1996)

With regard to future studies, the wide-ranging contributions that previous investigations have made towards knowledge of the problems surrounding BRF and ERF,

and also towards studying different methodological approaches to the question, need to be taken into consideration. Nonetheless, although the results from some investigations have shown efficacy in the programs or treatments utilized, it can also be seen that they do not specifically deal with the incidence of BRF and ERF relating to falls in the home. Moreover, there is no identification of the individual and interrelated incidence of these factors in every specific circumstance of the home.

In our country, from search through the information available, we found that only one program on primary prevention of domestic accidents had been conducted at national level, which was carried out in 1993 by PROSAI (Integrated Health Program) and INSSJP (National Institute of Social Services for the Retired and Pensioners). This study revealed that a high percentage of OA who were suffering falls were unaware of the risk factors.

Within the local sphere, three studies have been performed in the city of Mar del Plata. These highlighted the prevalence of falls among the population and the large involvement of environmental and behavioral factors in this incidence.

In the first of these studies, *Caídas Domiciliarias en los Adultos Mayores Caedores [Falls in the Home among Falling Older Adults]* (Carazza, 1999), 91% of the falls involved an extrinsic environmental risk factor (water on the floor, use of slippers or changes in level). The places identified as having greatest incidence of falls were the yard, bathroom and bedroom.

The second study, *Factores Intervinientes en las Caídas Domiciliarias de los Adultos Mayores* [Factors Involved in Falls in the Home among Older Adults] (Colavito; Serano, 1999) had the aim of characterizing the profile of older adults who tended to have falls, as a function of the interrelations between the main risk factors. This showed that, when behavioral risk factors were at a low level, the possibility of falling was significantly decreased, even when the personal and environmental risk levels were high.

In the third of these local studies (Irazabal, 1999), more than 80% of the factors involved in falls were ERF (slippery floors or changes in level). The places where most falls occurred were the bedroom, yard and bathroom. Thus, the third study corroborated the findings from the first study regarding the places in the home with the highest prevalence of falls, and the predominance of ERF involvement.

Although the local studies seem to be more specific than the international ones with regard to determining the ERF and BRF present in the home, the data compilation lacks direct observation of the phenomenon in the specific places to which the survey of risk factors refers.

Such limitations seem to recur in the different studies analyzed. Although the risks present in the home have been extensively qualified and categorized, a good proportion of the data obtained came from questionnaires. Thus, there are difficulties in comparing results from these studies, and this also limits the information available for baseline studies. (Roumec; Pasantino, 1998)

Finally, the main criticism relates to how the tools utilized for identifying the risk factors present in the homes were handled. They particularly lack observational assessments of the different risk factors.

Accepting the existence of this deficit, the present study had the aim of analyzing a population of older adults in the city of Mar del Plata, in an observational manner. The questions posed were: What presence and interaction of ERF and BRF are there in the different environments of the home? What are the factors involved in falls? Furthermore, this study aimed to identify the degree of knowledge and risk factor modification in the homes of OA who underwent preventive treatment for falls at the Preventive Medicine Service (PMS)*

MATERIAL AND METHODS

The study included a baseline sample of 129 individuals over the age of 65 years, residing in the city of Mar del Plata, Argentina, and who were living autonomously. The observations were performed directly in the homes of these older adults. These observations were carried out by investigators from an interdisciplinary team that was working mainly on data collection.

Initially, a sample of falling older adults (FOA) was selected (n:67; 51.9%). FOA were taken to be individuals *who had suffered one or more episodes of falls with a one-year period, independent of the locations of such falls.* Among the FOA included, 86.4% were assessed for treatment at the Third-Age Attendance Service (*Servio de Atención para la Tercera Edad*, SATE) and, among this group, 69.7% completed the treatment and 16.7% did not.

Those who completed the treatment at SATE were considered to be aware of the risk factors. Those who did not complete it were also considered to be aware of the risk factors, since the education for preventing falls was given in the beginning of the treatment.

A similar sample of homes of non-falling older adults (NFOA) (n:62; 48.1%) was included. NFOA were taken to be individuals who had not presented more than one fall over the past year. These persons were volunteers and did not have particular motivation linked to the results of the present study. Among the NFOA, 87.1% did not go for treatment at PMS. It is thus presumed that these individuals were not aware of the risk factors in the home.

* The Preventive Medicine Service (PMS) reports institutionally to the Private Community Hospital (PCH) of the city of Mar del Plata, Argentina. The general objective of this service is to improve the quality of life of elderly individuals, by implementing programs that include three levels of prevention (primary, secondary and tertiary). Activities are performed by means of treatment programs with a group and interdisciplinary approach. Among the six programs developed by PMS, there is the *Day Hospital*, with fall groups that are attended by people referred by their personal doctors.

In addition, the study included a subsample of 88 cases that enabled control for possible adjustments to the baseline sample. *

The sample and the use of statistical significance tests

With regard to the gender of the individuals assessed, there was predominance of women (fallers 88%; non-fallers 74%). This female predominance in the fall episodes is already well known in this type of study, and in the particular case of the population under evaluation.

It is not possible to further discuss the data from the perspective of the different propensities of men and women to suffer falls, since our methodology for case selection did not allow this. However, it is known from other studies that women are more prone to falls (Rozenfeld; Camacho; Veras, 2003).

Another important characteristic of the population to be taken into consideration is the age of the individuals. It is known that, with increasing age, there is an increasing tendency to have episodes of falls. Therefore, it is important to verify whether this finding holds for the total population interviewed. The four groups considered, from youngest to oldest ages (65-70, 71-75, 76-80 and over 80) presented increasing percentages of fallers: 37%, 42%, 62% and 66% successively.

It is at this point that the limited reach of significance tests must be interpreted. When it is said that the majority of percentage differences do not have statistical significance in the light of the chi-squared distribution for the level of 0.05, this only means that, within a probabilistic sample design, percentage differences of the magnitude of those found in the study lack statistical significance. Since the selection procedure for the units analyzed did not correspond to this type of design, the value of these tests *is only indicative of the order of magnitude of the differences that would be expected in order to surmise that the homes of those who "fall" and those who "do not fall" have differences regarding the presence of certain external risk factors.* Moreover, it is well known that, when talking about significant differences through applying tests on a non-probabilistic sample, there is no assurance whatsoever that the differences observed with a certain degree of probability can be confirmed in the future. When referring to the results from such tests, only the abovementioned meaning can be considered and any other interpretation is inadvisable.

Selection of variables and indicators

The criterion for selecting variables was the determination of areas and home conditions that would cause different daily activities to be compromised, while simultaneously providing concentration of indicators for environmental and behavioral risk factors.

---

* Subsample: in the original sample, there were cases of FOA whose fall episodes had not occurred in the home, but in a street. Likewise, there were cases of NFOA with one fall in the home. In order to eliminate subjectivity relating to such cases that could prejudice the baseline study, a subsample was obtained and analyzed, in which the abovementioned cases were excluded, thereby giving a total sample of 88 cases. The statistical analysis on these two samples did not show any differences or incompatibilities between them. This means that the results did not vary in either a substantive or significant manner, thus making it possible to proceed with the baseline sample.

Within the home, the following were considered to be observable environments: sitting room, bedroom, bathroom, kitchen and external areas.

The variables were distributed as follows: environmental risk factors (ERF) and behavioral risk factors (BRF) in the storage rooms, in the circulation areas and the under the lighting conditions in the different areas mentioned. In addition, a detailed analysis of the same variables was performed for the bathroom.

The selection of risk indicators for the areas and conditions determined was performed according to three data survey types. First, the environmental and behavioral risk factors were considered and assessed using a standard environmental evaluation tool (Home Environment Survey (HES).* This was specifically designed for identifying environmental dangers in the home, in a standard and quantitative manner. Following this, the indicators used in the local investigations mentioned earlier (studies on the interactions between ERF and BRF) were compiled. Finally, the environmental and behavioral factors involved in the falls were considered: these were collected from the clinical histories of falling patients attended at SATE during the period of investigation.

Data collection method: Implementation

The method utilized for the environment assessment was the Home Environment Survey (HES), which was designed by the Centers for Disease Control and Prevention, Atlanta, USA. This evaluation was based on an observational investigation, thus allowing registration of the risk factors in the home of the OA.

Since this was a predetermined technique, it was necessary to make a series of adaptations that would enable correct implementation of the variables and indicators selected. The adaptations were performed by an interdisciplinary team** that was in charge of translating and defining the terminology to be used in our region.

Prior to the implementation, the original survey was completed, incorporating the variables and indicators that were necessary for this study but had not been specified. They were considered within a format that could allow for possible comparison with the results from the original survey.

---

* The Home Environment Survey (HES) measurement tool was designed at the Centers for Disease Control by the authors Andrew L. Baughman, Richard W. Sattin, Carolee A. DeVito, Donna L. Ragland, Sandro Bacchelli and Judy A. Stevens. One of the authors of the HES (Dr. Sattin) provided the present investigation team with the protocol for the investigation and the corresponding definitions and validations.

** The interdisciplinary team entrusted with the technical adaptations consisted of the occupational therapists Bettina Roumec, Mariana Serrano and Marisol Colavito, the architects Horacio Rigone and Maria de la Paz Temperley, the psychologist Inés Canale, the sociologist Jorge López and the author of the present study. This team formed the investigation group "Habitat and Community for the Third Age" at the Facultad de Arquitectura Urbanismo y Diseño, Universidad Nacional de Mar del Plata, under the direction of the architect Juan Manuel Escudero.

Constructing the Scale for Risk Factor Presence (Table 1)

TABLE 1 - Scale for the presence of risk factors for falls (in % of homes)

Overall level scale		Scale with 8 categories	
LOW			
Presence of factor (0 to 37.5)	B (-)	Very low presence of factor	0 to 12.5
	B	Low presence of factor	12.6 to 25
	B (+)	Relatively low presence of factor	25.1 to 37.5
MEDIUM			
Presence of factor (37.6 to 62.5)	M (-)	Low medium presence	37.6 to 50
	M (+)	High medium presence	50.1 to 62.5
HIGH			
Presence of factor (62.6 to 100)	A (-)	Relatively high presence	62.6 to 75
	A	High presence of factor	75.1 to 87.5
	A (+)	Very high presence of factor	87.6 to 100

A scale with eight intervals that allowed two levels of readings was specially created. At an "overall" level, the percentages of homes that presented the risk factors under examination were grouped into three categories. At a more sensitive level of reading, the categories of low and high percentages were subdivided into three categories each, and the intermediate category was subdivided into two categories.

This scale of eight categories allowed a good level of precision to be maintained in the assessment, without losing information, while allowing for regrouping for overall readings.*

RESULTS

The results were analyzed in three stages, in accordance with the objectives:

Stage 1. Sample results relating to the presence and interaction of ERF and BRF in different areas and conditions of the home. 1 Storage areas, 2 Circulation areas, 3 Lighting conditions, 4 Bathroom. Previously, the implications of the indicators used in each case were described.

Stage 2. Factors involved in the falls were identified.

* It is important to clarify that this scale only showed the *presence* of risk as percentages of homes, classified as a function of the numbers of times that the indicators selected were presented in the different areas and conditions of the home. At no time did the classification place a *value* on the risk factor present.

Stage 3. The degree of knowledge and risk factor modification were determined in the homes of FOA who had undergone treatment at the Preventive Medicine Service (PMS). For this, firstly, the differences between the homes of those who were experiencing falls and those who were not were analyzed.

STAGE 1. Presence and Interaction of Environmental and Behavioral Risk Factors in the different areas of the Home

1. Storage areas

The term "storage area" refers to all objects of any type, for daily use, to which people have autonomous access (jars, pans, clothes, etc)

Table 2 shows the results relating to the presence of risk in storage areas. It shows that the perception of the OA regarding the difficulty in reaching storage areas was slightly lower than the risk recorded by the investigators. Thus, there was a difference in the perception of the real risk. In this case, the behavioral and environmental risk factors are interrelated.

TABLE 2 - Presence of risk in storage areas (total number of homes)

		Presence of Risk per Room			
Type of Factor	INDICATORS OF RISK FACTORS	Sitting Room	Bedroom	Kitchen	Bathroom
ENVIRON MENTAL Risk Factor	Presence of difficult-to-reach areas (too high or too low according to the perception of the older adult	M-	A-	A-	B+
	Presence of difficult areas according to the investigators	M+	A	A	M-
BEHAVIORAL Risk Factor	The older adult had to stand on something to reach things in the storage area	M-	A-	A-	B+

2. Circulation areas

A circulation area is any floor area that has a gap of at least 0.15m between the walls and the furniture, and with enough length to allow it to be stepped into.

Table 3 shows the results relating to the presence of risk in circulation areas. It shows that, in general, the environmental risks are low. Nonetheless, the loose carpets in the bathroom created a situation of increased risk because they were in an environment that from time to time was wet.

Table 3 – Presence of risk in circulation areas (total number of homes)

		Presence of Risk per Room			
Type of Factor	INDICATORS OF RISK FACTORS	Sitting Room	Bedroom	Kitchen	Bathroom
ENVIRON	Presence of water on the floor	B-	B-	B-	
MENTAL	Presence of fixed carpets	B	B-	B-	
Risk Factor	Presence of loose carpets	B+	B	B-	
	Presence of loose cables	B+	B	B-	
BEHAVIORAL	The older adult does not keeps the				
Risk Factor	circulation area tidy	B	B	B-	B-
	The older adult waxes the floor	B-	B	B	B-
	Presence of loose objects	B-	B	B	B-

3. Lighting conditions

This question refers to the presence of risk related to the natural and artificial lighting conditions in the home.

Table 4 shows the results relating to the presence of risk factors derived from the lighting conditions. This shows that, although the indicators for environmental risk factors did not present possible risks of falls, the behavioral risk factors did present an incidence of risk. Therefore, independence between the behavioral and environmental factors was observed.

Table 4 – Presence of risk in lighting conditions. Total number of homes

		Presence of Risk per Room			
Type of Factor	INDICATORS OF RISK FACTORS	Sitting room	Bedroom	Kitchen	Bathroom
ENVIRON	Presence of dangerous switch	B-	B-	B-	B-
MENTAL	Presence of difficult or inadequate				
Risk Factor	switch	B	B-	B-	
	Presence of excessive brightness	B+	B	B-	
BEHAVIORAL	The older adult enters the room without				
Risk Factor	turning on the lights	B	B	B-	B-
	The person does not leave a light on				
	during the night	A	A	A	A

4. Bathroom area – specific equipment

Table 5 shows the results from the bathroom. It demonstrates that there is a high incidence of environmental risk factors due to the absence of even minimal adaptations. Despite the low presence of behavioral risk factors, it must be considered that the lack of adaptations clearly increases the risk of falls.

TABLE 5 – Presence of risk in the bathroom area

Type of Factor	INDICATORS OF RISK FACTORS	Presence of risk
ENVIRONMENTAL Risk Factor	Bathrooms without bars on the bath/shower	**A**
	Bathrooms without bar beside the toilet	**A+**
	Bathroom without lid on the toilet	**A**
	Bathroom with bath	**A-**
BEHAVIORAL Risk Factor	The older adult does not use a non-slip carpet when having a bath	**B+**
	The older adult has a bar to hold onto while having a bath, but does not use it	**B-**
	The person has a bar to hold beside the toilet, but does not use it	**B**

STAGE 2. Identification of factors involved in falls in each environment

The falls in each environment were assessed cumulatively, by identifying the risks that were present in the event and then quantitatively characterizing these risks as ERF, BRF and PRF.

Table 6 shows the incidence of each of the risks involved in the episodes of falls, distributed according to environment, using the baseline sample.

TABLE 6 – Identification of factors involved in falls. Number of falls

ROOM risk factor	BRF Behavioral risk factor	ERF Environmental risk factor	PRF Personal risk factor	Unspecified	Total
Bedroom	11	1	1	1	14
Sitting room	5	3	2	3	13
Kitchen	4	1	0	1	6
Bathroom	2	2	1	5	10
External space	5	2	3	4	14
TOTAL NUMBER OF FALLS	27	9	7	14	57
% of each factor	47	16	12	25	100

Unfortunately, 25% of the fall events could not be specified because of problems in correctly identifying this indicator. It was difficult for the investigators to obtain an effective determination of the factors involved in the falls, thus resulting in a large percentage of unspecified falls.

From the total number of fall events, nearly half (47%) were due to BRF. This proportion that would increase to two-thirds of the whole population, if the distribution of unspecified cases were projected proportionally. This indicates the relevance of BRF over the other factors.

Analysis according to environment showed that falls in the bedroom and kitchen – environments in which unspecified factors were minimal – showed the preponderance of BRF. The same variables were analyzed in a subsample containing only those "who fall".

The predominance of behavioral risks as the main factor was maintained. However, a proportional projection would transfer part of the previous significance such that the importance of the ERF was highlighted: this could be present in one in every four cases.

In falls in the home, the ERF and BRF were the cause of three to four events out of each five, thereby indicating the great importance of preventive and corrective action aimed at controlling such factors.

STAGE 3. Identification of the degree of knowledge and risk factor modification in the homes of FOA who had undergone treatment at the Preventive Medicine Service (PMS)

This study was carried out with the hypothesis that FOA who had been treated would have fewer behavioral and environmental risk factors in their homes than did the FOA without treatment. On the other hand, NFOA would not have risk factors in their homes.

The disparity between the samples of FOA with treatment (86.4%) and without treatment (13.6%) did not allow the establishment of a reliable comparison that would have enabled comparative identification of the presence of risk factors in the homes of these two populations.

It was possible to establish a comparison between the samples of homes belonging to NFOA and FOA, in order to identify significant differences that could allocate the presence of risks previously registered in Stage 1 (in which the whole sample was analyzed), to one population rather than to the other.

All the indicators were reviewed comparatively between the two populations, and the only significant differences (according to chi-squared results of less or equal to 0.05) were found in the following items:

Circulation: thresholds in door openings, throughout the home

Obstructed circulation in the external areas.

These items were part of the incorporations effected in the original model and none of the incorporations were submitted to reliability studies. There were no statistical calculations regarding individual dangers, or on groups of dangers, as was done for the original indicators of the investigation. Therefore, it is supposed that there should have been an adjustment for another implementation, considering that there were no significant differences between the homes of the two populations.

It is important point to highlight that, during the survey, it could be seen from the reports on the subjects that the population of OA who had received treatment showed a high degree of knowledge regarding identification and awareness of risks. It was observed that the risk factors were equally present in the homes of FOA who had undergone treatment, and in those of NFOA who had not received treatment, without any difference between them.

To say that slipping, standing on chairs and waxing the floor may constitute risks for their lives does not mean that these subjects will stop performing such activities tomorrow. *Knowledge of risks does not necessarily motivate changes.*

DISCUSSION

Direct observation of the environmental and behavioral risk factors in the homes of OA allowed strong registration of the main risks presented there (Stage 1). The results highlighted both the degree of interaction between the risks (in the cases of storage areas and bathrooms, where the environmental and behavioral factors were combined) and the independence of these factors (with regard to lighting conditions, the risk was solely due to behavioral factors, without any influence from the environment).

It is certain that the absence of analysis regarding the personal risk factors (PRF) makes the conjectures on individual risk partially incomplete, but it is important to highlight that this combination is not a preestablished condition and cannot be presented independently.

With regard to the factors involved in the risks of falls (Stage 2), the predominance of BRF influencing this event (47% of the cases) seems to be a reliable finding. This coincides with the results from the local studies mentioned in the Introduction. The difficulties found by the investigators in identifying some of the factors involved made it impossible for the present study to directly associate the risks present with the factor involved.

At the second reading, it was observed that in the storage areas studied, the OA had a lower perception of risk than did the investigators. This different perception of risk may account for the absence of preventive measures. Nonetheless, it was observed that risk factors were identified by OA who had undergone the program implemented at the PMS (Stage 3) and even then the risks continued to be present. With regard to risk modification, there may be an intention to do so, but this does not become a concrete action.

The absence of modifications may be due to two situations: on the one hand, there may be *an alteration in the perception of real risk*, but on the other hand there may be *strong resistance to change*.

Finally, from the present study, the authors support the position that environmental adaptations for the elderly are not a simple matter that can be resolved only by dealing with the environmental requirements (Ceransky; Haertlein, 2002).

In order to achieve significant environmental and behavioral changes, it is essential to make the adult individual understand the risk and participate in the necessary changes. For this, *re-education* regarding the existing habits and behavioral patterns is needed, and also an understanding that environmental adaptations will largely depend upon *behavioral adaptations*.

The present study contributes towards finding answers and alternatives that may decrease the incidence of falls in the home, considering both the person and the environment. Some of the studies presented in the Introduction have drawn conclusions from results that are merely statistical and, although they show the dimensions of the problem, in many cases they do not consider other variables that are directly related to the *person living in the home*.

In addition to providing quantifiable results, the present study also had the aim of considering the person as the main player in *constructing the change*, i.e. in modifying the risks. The authors believe that the only way to conduct the actions is through interdisciplinary work and with the individual himself.

NOTES

*Autora: Arquitecta Mariana Lujan Yeannes

Funding: Doctoral grant from Concejo Nacional de Investigaciones Cientificas y Técnicas (CONICET)

Institution: Universidad Nacional de Mar del Plata. Argentina. Facultad de Arquitectura, Urbanismo y Diseño. Centro de Estudios de Diseño. Grupo de Investigación Hábitat y Comunidad para la Tercera.

Investigation directed by the architect Juan Manuel Escudero and co-directed by Dr. Diana Scharovsky

ACKNOWLEDGEMENTS

To the director of the study, the architect Juan Manuel Escudero. To Dr. Diana Scharovsky, the co-director. To the Preventive Medicine Service of Mar del Plata. To the occupational therapist Bettina Roumec. To the sociologist Jorge López. To the architect Fernando Cacopardo, for advice. To those who participated in the initial investigation. To those who participated in the data collection.

REFERENCES

CALVO, J. J. Caídas en la comunidad y en instituciones. In: SOCIEDAD ESPAÑOLA DE GERIATRÍA Y GERONTOLOGÍA. Grupo de trabajo de caídas. *Evaluación del anciano con caídas a repetición*. Madrid: Editorial Fundación Mapfre Medicina, 1997. p. 3-11.

CAMERON, I; KURRLES, S.; CUMMING, R. Preventing falls in the elderly at home: a community-based program. *Med J Aust.*, v. 165, n. 8, p.459-460, Oct. 1996

CARAZZA, Nava. *Caídas domiciliarias en los adultos mayores caedores*. 1999. Tesis (Doctorado) - Facultad de Ciencias de la Salud y Servicio Social, Universidad Nacional, Mar del Plata, 1999.

CERANSKI, S.; HAERTLEIN, C. Helping older adults prevent falls. *OT Practice Magazine*, American Occupational Therapy Association. v. 7, n. 13, p. 12-17, 2002

COLAVITO, M.; SERANO, M. *Factores intervinientes en las caídas domiciliarias de los adultos mayores*. Una propuesta de prevención secundaria. Tesis (Doctorado) - Facultad de Ciencias de la Salud y Servicio Social, Universidad Nacional, Mar del Plata, 1999.

CONNELL, P.; WOLF, S. Environmental and behavioral circumstances associated with falls at home among healthy elderly individuals. *Arch. Phys Med Rehabil*, Atlanta, v. 78, 1997.

DOMÍNGUEZ, M.; NAVARRO, C.; CUESTA, F.; ROIZ, H.; LAZARO, M. Evaluación del riesgo de caídas. In: SOCIEDAD ESPAÑOLA DE GERIATRÍA Y GERONTOLOGÍA. Grupo de Trabajo de Caídas (Ed.) *Evaluación del anciano con caídas a repetición*. Madrid: Editorial Fundación Mapfre Medicina 1997. p. 83-105.

FALLS AND HIP FRACTURES AMONG OLDER ADULTS. National Center for Injury Prevention and Control Hallado. Disponible en: <http://cdc.gov/ncipc/factssheets/fall.htm> Acceso en: 19 abr. 2004.

GRAHAM, R. Un lugar llamado hogar. In: CARTENSESN, Laura; EDELSTEIN, Barry (Ed.). Intervención psicológica y social. Barcelona: Ediciones Martines Roca, 1990. p. 173-180

GILLESPIE, L. D.; GILLESPIE, W. J.; CUMMING, R.; LAMB, S. E.; ROWE, B. H. Interventions to reduce the incidence of falling in the elderly (Cochrane Review). *The Cochrane Library*, Oxford, Update Software, n. 3, 1998.

IRAZABAL, G. *El anciano, la ciudad y su entorno*. (Informe final de Beca de investigación inédita) Mar del Plata: Universidad Nacional. Facultad de Arquitectura, Urbanismo y Diseño. Centro de Estudios de Diseño. Grupo Hábitat y Comunidad para la Tercera Edad, 1999.

MARCELLAN, B.; MESA, P. Factores de riesgo en la comunidad e instituciones. In: SOCIEDAD ESPAÑOLA DE GERIATRÍA Y GERONTOLOGÍA. Grupo de Trabajo de Caídas (Ed.) *Evaluación del anciano con caídas a repetición*. Madrid: Editorial Fundación Mapfre Medicina 1997. p. 33-43.

MESA, P.; MARCELLAN, T. Factores de riesgo extrínsecos e intrínsecos. In: SOCIEDAD ESPAÑOLA DE GERIATRÍA Y GERONTOLOGÍA. Grupo de Trabajo de Caídas (Ed.) *Evaluación del anciano con caídas a repetición*. Madrid: Editorial Fundación Mapfre Medicina 1997. p.15-31.

OLIVER, M. Consecuencias médicas: mortalidad y morbilidad de las caídas. In: SOCIEDAD ESPAÑOLA DE GERIATRÍA Y GERONTOLOGÍA. Grupo de Trabajo de Caídas (Ed.) *Evaluación del anciano con caídas a repetición*. Madrid: Editorial Fundación Mapfre Medicina 1997. p. 47-67.

ROUMEC, B.; PASANTINO, L. *Definición y evaluación de la caída domiciliaria en la Tercera Edad*. (Informe de Investigación Inedito). Mar del Plata: Universidad Nacional. Facultad de Arquitectura, Urbanismo y Diseño. Centro de Estudios de Diseño. Grupo Hábitat y Comunidad para la Tercera Edad, 1998.

ROZENFELD, S.; CAMACHO, L.Y.; VERAS, R. Los medicamentos como factor de riesgo de caídas en mujeres mayores de Brasil. *Rev Panam Salud Publica*. v.13, n. 6, p.369-375, 2003.

RYAN, J.; SPELLBRING, A. M. Implementing strategies to decrease risk of falls in the older women, *J Gerontol Nurs.*, v. 22, p. 5-31, 1996.

SALVA, A. Consecuencias psicológicas: síndrome post caidas. In: SOCIEDAD ESPAÑOLA DE GERIATRÍA Y GERONTOLOGÍA. Grupo de Trabajo de Caídas (Ed.) *Evaluación del anciano con caídas a repetición*. Madrid: Editorial Fundación Mapfre Medicina 1997. p. 69-79.

SATTIN, R. Falls among older persons: a public health perspective. *Ann Rev Public Health*, Atlanta, p. 489-508, 1992.

Received for publication: 09/9/2005
Accepted: 05/12/2005