

# Functional autonomy of elder women living in urban and rural areas: a comparative study

## *Estudo comparativo da autonomia de ação de idosas residentes em áreas rurais e urbanas*

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**Abstract** – Functional autonomy plays an important role in the quality of life of older adults. However, the effects of the context of rural and urban living on autonomy in this population are little known. The present study compared the autonomy of older women living in urban areas of Greater Vitória, state of Espírito Santo (UG, n=30, age=65.5±0.72 years) versus that of older women living in the rural area of Alfredo Chaves, Espírito Santo (RG, n=31; age=65.1±0.74 years), using the Senior System for Evaluation of Autonomy of Action (SysSen). The SysSen consists of a questionnaire (QSAP) and a field test (TSMP). The QSAP provides an Index of Expressed Autonomy (IAE) and the TSMP, an Index of Potential Autonomy (IAP). The ratio of IAP to IAE defines the Index of Autonomy of Action (IAP/IAE=ISAC). An ISAC≥1.0 categorizes the subject as autonomous. The results revealed that: a) IAP was higher in the UG, but requirements in terms of IAE physical activities were greater; b) the Total Index (ITOT) for upper body strength was higher than the aerobic capacity (PA) in the RG; c) the four parts of the QSAP provided similar contributions toward the overall IAE. The conclusion was that both groups showed similar levels of deficit of autonomy according to ISAC, due to insufficient physical fitness in relation to IAE.

**Key words:** Aging; Autonomy; Environment; Healthy.

**Resumo** – A autonomia de ação é um fator importante para a qualidade de vida de pessoas idosas. Todavia, os efeitos dos contextos de moradia rural ou urbana sobre a autonomia de ação deste grupo alvo são pouco conhecidos. O presente estudo comparou a autonomia de ação de idosas residentes em áreas urbanas da Grande Vitória/ES (GU, n=30, idade=65,5±0,72 anos) e na área rural do município de Alfredo Chaves/ES (GR, n=31; idade=65,1±0,74 anos), utilizando o Sistema Sênior de Avaliação da Autonomia de Ação (SysSen). O SysSen é composto por questionário (QSAP) e teste de campo (TSMP). O QSAP fornece um Índice de Autonomia Exprimida (IAE) e o TSMP, um Índice de Autonomia Potencial (IAP) que, cruzados, definem o Índice de Autonomia de Ação (IAP/IAE=ISAC). Um ISAC≥1,0 caracteriza o sujeito como autônomo. Os resultados revelaram que: a) O IAP foi maior para o GU, mas as necessidades em termos de atividades físicas IAE foram similares; b) O ITOT da força de membros superiores (FO) foi maior que a potência aeróbica (PA) no GR; c) A contribuição das quatro partes do QSAP para o IAE foi equilibrada. Em conclusão, idosas residentes em áreas rurais e urbanas, exibiram níveis similares de déficits de autonomia de ação traduzidas pelo ISAC, em função de condição física insuficiente em relação ao IAE.

**Palavras-chave:** Ambiente; Autonomia; Envelhecimento; Saúde.

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## INTRODUCTION

Healthier living in old age is closely tied to the maintenance and restoration of autonomy and independence<sup>1</sup>. In this age range, the greater one's autonomy, the greater one's quality of life<sup>2</sup>. This means having the physical conditions to meet one's daily needs and carry out any other desired activities.<sup>2</sup> There is a broad consensus on the importance and benefits of physical activity to achieving this autonomy<sup>3,4</sup>.

Each individual may have a distinct concept of what constitutes quality of life, which has a direct impact on self-assessment of what one regards as important in terms of personal achievement. Therefore, a legitimate means of assessing the health of older adults is to determine their degree of autonomy and independence in the activities of daily living<sup>5</sup>.

In this context, there is a need for a system of autonomy assessment that takes into account the various aspects of the aging process, the environment in which older adults live, and their perception of loss or persistence of their autonomy<sup>5,6</sup>. However, most systems for assessment of autonomy in older adults are constructed from a "negative" perspective, that is, they focus mostly on the loss of autonomy and disabilities associated with advancing age<sup>7</sup>.

Interest in assessing and comparing levels of autonomy in older adults living in rural and urban settings stems from the need for determining the current status of these levels and identifying potential heterogeneity in autonomy in each setting, as one's living environment may optimize or, conversely, hinder behavioral processes such as autonomy and independence<sup>5</sup>.

Many older adults find new meaning in their lives by joining senior citizens' groups. In urban areas, they can form organized networks, engage in physical activities and arts and crafts, attend senior centers in the community, and take part in sports days and dances within a framework of partnerships<sup>8</sup>.

In rural areas, the leisure activities of older adults basically consist of going to church, attending religious events, and visiting relatives or neighbors<sup>9</sup>. Although there is no habit of structured or organized physical activity in rural settings, older adults in this environment tend to continue to carry out the predominant occupational activities they engaged in when younger, which implicitly entails spontaneous or disorganized physical activity<sup>10</sup>, as most adults living in rural areas are involved in agriculture and animal husbandry on a daily basis.

According to Kassouf<sup>11</sup> a much higher percentage of persons living in rural areas perceive their health status as poor or very poor as compared to those living in urban areas. Nevertheless, heart disease and blood pressure abnormalities are less common in those living in rural areas (12% vs. 17% in city dwellers). According to the author, National Household Survey (PNAD/IBGE) data show that, when inquired as to their health condition on a scale of 0 (poor or very poor) to 1 (good or very good), older adults living in rural and urban areas gave scores of  $0.57 \pm 0.49$  and  $0.66 \pm 0.47$

(mean  $\pm$  SD) respectively. This shows that self-perception of health is superior among persons living in urban areas. Furthermore, differences in living conditions may also have an impact on the functional autonomy of older adults living in rural versus urban areas. Therefore, the present study sought to determine and compare the functional autonomy profile of elderly women living in rural and urban areas.

## METHODS

### Sample

We assessed the functional autonomy of 30 older women living in urban areas (urban group, UG) in Greater Vitória and 31 older women living in the rural area (rural group, RG) of the municipality of Alfredo Chaves, both located in the state of Espírito Santo, Brazil. Municipalities with a population of less than 25000 were considered rural, whereas municipalities with more than 25000 inhabitants were defined as urban<sup>12</sup>.

Mean age was  $65.5 \pm 0.7$  (mean  $\pm$  SEM) in both groups. The following criteria for exclusion were adopted: a) medical restrictions on the practice of physical exercise; b) motor or cognitive dysfunction severe enough to preclude administration of the questionnaire or performance of the proposed tests; c) high blood pressure (systolic  $>150$  or diastolic  $>100$  mmHg) at rest; d) musculoskeletal or metabolic disorders that might constitute contraindications to the test. All subjects were informed of the objective of the study and gave written consent for participation. The study was approved by the Universidade Federal do Espírito Santo Ethics Committee with judgment no. 101/08. Participants in the UG engaged in regular physical exercise, but those in the RG did not.

### ASSESSMENT OF AUTONOMY

Autonomy was measured with the Senior System for Evaluation of Autonomy of Action (SysSen), which was proposed and described in previous studies<sup>7,13</sup>. This instrument focuses on current activities and functional status to assess autonomy. The SysSen enables calculation of an Index of Autonomy of Action (ISAC) based on the interaction between two types of autonomy, measured by specific tests: a) expressed autonomy, which reflects the activities carried out by the subject, the needs imposed on the subject by the environment, and the feelings elicited by activities the subject can no longer do or would like to continue doing; b) potential autonomy, defined by the potential physical resources—namely, upper body strength (FO) and aerobic power (PA)—available for carrying out the activities associated with expressed autonomy.

The SysSen comprises two independent, complementary instruments. The Senior Questionnaire of Physical Activity (QSAP) is used to measure expressed autonomy, that is, the respondent's needs in terms of select physical qualities, associated with the physical activities actually carried out and/

or desired by the respondent in order to feel autonomous<sup>6,14,15</sup>. The QSAP yields indices that express personal needs in terms of aerobic power (PA) and upper body strength (FO), represented by the Expressed Autonomy Index (IAE)<sup>14</sup>. The second constituent test of SysSen is the Senior Walk and Carry Test (TSMP), designed to assess physical fitness. This field test consists of an 800-meter walk while carrying a gender-specific load (6.5 kg for female subjects). The results are used to calculate a representative index of the potential for carrying out tasks that depend on the functional interaction between PA and FO, the Index of Potential Autonomy (IAP).

Based on the results of both tests, the ratio between potential autonomy and expressed autonomy (IAP:IAE) is calculated; this corresponds to the Senior Index of Autonomy of Action (ISAC). ISAC scores measure functional standpoint from a positive standpoint, which ascribes value to the conditions that ensure and reinforce self-determination and capacity<sup>14</sup>.

### Data collection

Data were collected between August and September 2009 at community centers in rural and urban areas by investigators trained to administer the QSAP and conduct all SysSen tests. Furthermore, all investigators had prior experience in care of older persons and senior citizen educational activities. The SysSen was administered over two days for each participant. The QSAP was administered on the first visit. The mean duration of the questionnaire session was 22 minutes. During the second visit, prior to testing, height and body mass were measured using a stadiometer (Asimed, Goiânia, GO, Brazil) and digital scales (Soehnle, Goiânia, GO, Brazil). Resting heart rate (HR) was measured with a Polar FS2 monitor (Polar Electro Oy, Kempele, Finland), and blood pressure, with a G-Tech Premium digital sphygmomanometer (G-Tech, Beijing, China). Blood pressure measurement was performed in accordance with 5th Brazilian Arterial Hypertension Guidelines recommendations<sup>16</sup>.

The QSAP and TSMP were always administered individually, with no other subjects present and no persons walking alongside the participant. The TSMP was carried out as 16 laps of a 50-meter course or eight laps of a 100-meter course as available, for a total 800-meter walk. HR was monitored continuously from the pre-fatigue stage (before the start of the actual 800-meter walk) until the end of the test.

### Statistical analysis

Univariate statistics were used to ascertain the normality of distribution of ISAC, IAE, IAP, ITOT (PA), and ITOT (FO). Then, 2 x 2 between-groups factorial ANOVA followed by a post-hoc Fisher's test was used to compare IAE vs. IAP and ITOT (PA) vs. ITOT (FO) in the RG and UG groups. ISAC in the UG and RG groups was compared using the Student t-test for independent samples.

The Student t-test for paired samples was used for within-group comparison of findings concerning autonomy requirements associated with

the physical qualities measured by the QSAP (FO and PA). Finally, potential between-group differences in aerobic power and upper body strength in the various parts of the QSAP (TOT I, TOT II, TOT III, and TOT IV) were compared using the Kruskal-Wallis test followed by a post-hoc Mann-Whitney U. The Friedman test (and the Wilcoxon test as necessary) was used for within-group comparison of partial QSAP findings (Part I vs. Part II vs. Part III vs. Part IV).

The Student t-test for independent samples was used for between-group comparison of mean age, weight, height, BMI, total 800-meter time, number of pauses, resting HR, and immediate post-walk HR. The significance level was set at  $p \leq 0.05$  for all tests. Calculations were performed with the SigmaStat 3.11 (Systat Software, NY, US) and Statistica 7.0 (Statsoft, OK, US) software packages.

## RESULTS

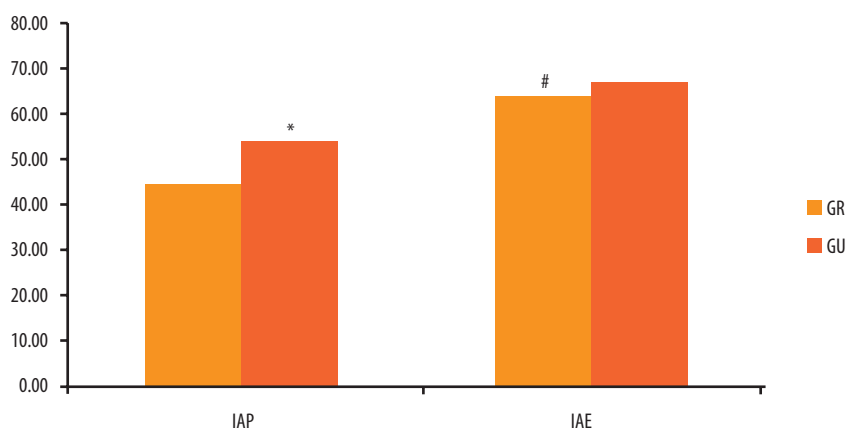
The sample profile of both groups (RG and UG) is shown in Table 1. There were no significant between-group differences in anthropometric variables or age.

**Table 1.** Comparison of age and anthropometric in groups RG and UG (mean  $\pm$  standard deviation).

	Age (years)	Height (m)	Weight (kg)	BMI (kg/m <sup>2</sup> )
RG	65.1 $\pm$ 0.74	1.57 $\pm$ 0.01	61.9 $\pm$ 2.2	24.9 $\pm$ 0.76
UG	65.5 $\pm$ 0.72	1.57 $\pm$ 0.01	65.3 $\pm$ 2.1	26.57 $\pm$ 0.83
p	0.74	0.65	0.27	0.14

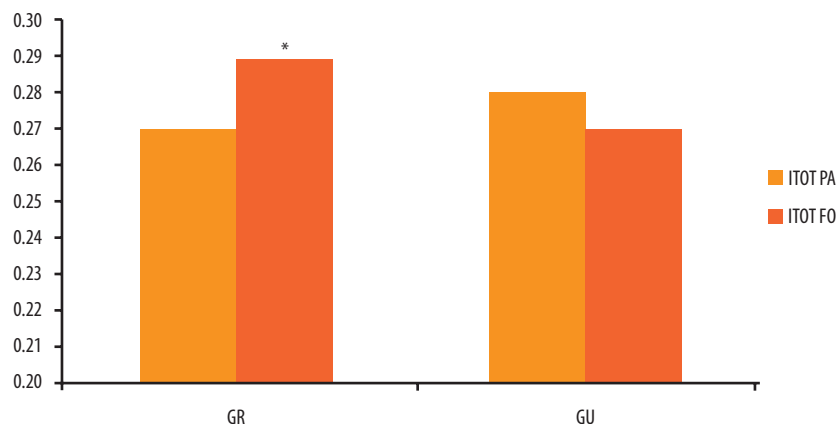
RG - rural group; UG - urban group; p – significance level

Figure 1 shows the results of between-groups ANOVA comparison of IAE and IAP. IAP scores were higher in the UG than in the RG. Likewise, IAE scores in the RG and UG groups were higher than IAP scores in their respective groups.



**Figure 1.** IAE and IAP scores in the rural (RG) and urban (UG) groups. IAP, Index of Potential Autonomy; IAE, Index of Expressed Autonomy. \*Significant between-group difference in IAP ( $p < 0.05$ ). #Significant within-group difference between IAE and IAP ( $p < 0.05$ )

Figure 2 shows a comparison of results concerning autonomy needs associated with the physical qualities measured by the QSAP (PA and FO). ITOT (FO) was higher than ITOT (PA) in the rural group. In other words, within the rural group, participants exhibited less aerobic power but greater strength. Conversely, in the urban group, there were no significant differences between partial results in each of the dimensions measured by the QSAP (upper body strength and aerobic power).



**Figure 2.** Mean ITOT (PA) and ITOT (FO) values in the rural (RG) and urban (UG) groups. ITOT (PA), aerobic power required for autonomous living, as determined by the QSAP; ITOT (FO), upper body strength required for autonomous living, as determined by the QSAP. \*Statistically significant within-group difference between ITOT (FO) and ITOT (PA) in the RG ( $p < 0.05$ ).

TSMP results are shown in Table 2. Mean number of pauses, post-walk HR, percentage of maximum HR, systolic blood pressure (SBP), and diastolic blood pressure (DBP) were similar in the rural and urban groups. Total walk time was significantly shorter in the UG than in the RG ( $p = 0.05$ ).

**Table 2.** TSMP results in groups RG and UG (mean  $\pm$  standard error of the mean). N=31 in RG and 30 in GU.

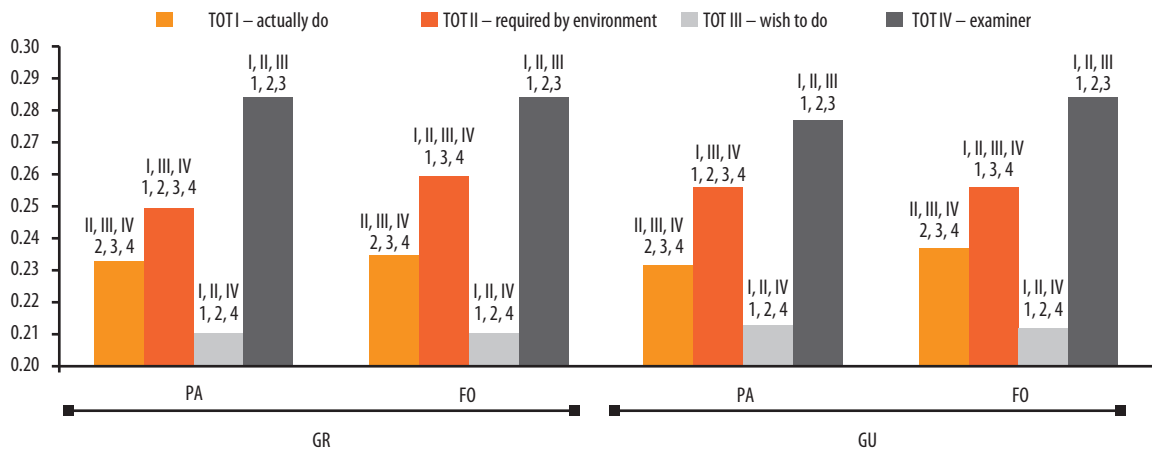
	Total time	N° pauses	HR (bpm)	% HRmax	Resting HR (bpm)	SBP (mmHg)	DBP (mmHg)
RG	722.5 $\pm$ 17	0.71 $\pm$ 0.3	123 $\pm$ 4	79 $\pm$ 2.4	79 $\pm$ 1.9	128 $\pm$ 2.3	78 $\pm$ 1.9
UG	673.6 $\pm$ 17	0.46 $\pm$ 0.2	121 $\pm$ 4	79 $\pm$ 2.4	78 $\pm$ 2.2	125 $\pm$ 2.8	78 $\pm$ 1.9
P	0.05*	0.49	0.82	0.84	0.71	0.45	0.96

RG - rural group; UG - urban group; p - significance level

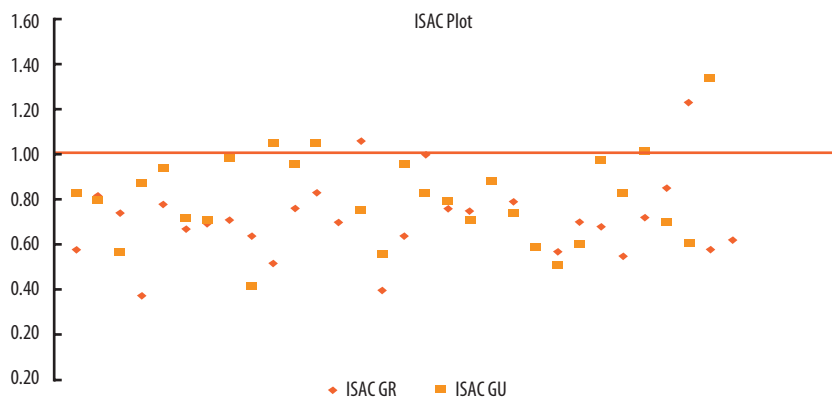
Figure 3 shows partial QSAP scores in the rural and urban groups. There were no significant between-group differences for any one part of the questionnaire. Separate analysis of its parts reveals a significant within-group difference between TOT PA and TOT FO, both in the rural and urban groups.

Analysis of the overall SysSen index (IAP:IAE = ISAC) revealed no significant between-group differences on comparison of mean ISAC scores (RG, 0.72; UG, 0.79;  $P = 0.12$ ). The ISAC plot (Figure 4) shows the deficit in functional autonomy of all participants in the rural and urban groups. As

the plot clearly shows, most participants had an ISAC score of less than 1, that is, below the cutoff for adequate autonomy of action.



**Figure 3.** Partial QSAP scores in the rural (RG) and urban (UG) groups. There were no significant between-group differences for any one part of the questionnaire. Numbers (Roman numerals for PA and Arabic numerals for FO) denote a significant within-group difference between the marked part of the questionnaire and the other parts ( $p < 0.05$ ). For instance, in the rural group, TOT I (PA) was significantly lower than TOT II (PA) or TOT IV (PA), but higher than TOT III (PA).



**Figure 4.** Plot of ISAC results for each subject in relation to the cutoff point for functional autonomy ( $ISAC \geq 1.0$ ), shown as a solid line. Blue diamonds, RG; red squares, UG.

## DISCUSSION

The present study sought to compare SysSen results in elderly women living in rural and urban areas. Groups were similar in terms of anthropometric characteristics—weight, height, and BMI—and age (Table 1).

Elderly women in the UG engaged in physical exercise regularly, whereas those in the RG did not, as there were no exercise facilities or programs in the area. However, it bears noting that, in a rural setting, older adults tend to persist in the occupational activities that predominated throughout their lives; most engage in agricultural activities or animal husbandry on a daily basis<sup>10</sup>.

There was no manipulation or strict control of the exercise variable (regarding intensity, frequency, or duration, for instance) in the UG. Despite this limitation, our results suggest that, even though UG

participants outperformed their rural counterparts on the field test and thus had higher IAP scores, this did not translate into significantly higher functional autonomy as expressed by the ISAC. This means that, although UG subjects had greater physical fitness, the activities they are required to carry out for autonomous living are also greater. In fact, QSAP results showed that IAE scores were significantly higher than IAP scores in both groups. This explains the impossibility of achieving an optimal Index of Autonomy of Action, that is, an ISAC score of 1 or higher<sup>6</sup>.

Between-group comparison of mean IAP scores (Figure 1) shows a significant difference in favor of the UG. Therefore, the physical fitness index was lower in women who lived in rural areas and did not engage in physical exercise on a regular basis. This is an interesting finding, as it means the activities usually carried out by these older adults are not sufficient to keep them physically fit at the levels required by the activities they consider important (whether due to the demands of their surroundings or to their own perceptions) to remain satisfactorily autonomous.

Regarding TSMP characteristics (Table 2), only the time variable had a significant between-group difference; subjects in the RG were slower than their UG counterparts. As the walk test includes a simultaneous load-carrying component, the shorter 800-meter walk time of UG subjects is probably due to superior cardiorespiratory capacity and muscle strength. Therefore, it is reasonable to surmise that RG participants would benefit from the effects of regular physical exercise<sup>3,4,17,18</sup>. The more dynamic lifestyle of urban dwellers is another factor that should be taken into account.

Conversely, RG participants exhibited greater upper body strength, which may be explained by their engagement in agricultural activities, which are quite demanding in terms of upper extremity strength. Superior performance on TSMP variables (walking speed, number of pauses, lower HR during the test), regardless of IAP score, may be considered relevant to maintenance of functional autonomy in older adults, particularly at very advanced ages. In this context, the higher IAP scores of UG participants is an interesting finding from a practical standpoint, as, in principle, these subjects would be in a better position to carry out their activities of daily living.

Comparison of partial QSAP scores (Figure 2) expresses the requirements specifically associated with upper body strength (ITOT FO) and aerobic power (ITOT PA). Data from the urban group suggest that the activities believed to be required for maintenance of autonomy entailed similar upper body strength and aerobic power requirements. In the rural group, however, ITOT FO scores were higher than ITOT PA scores, which suggests that the activities performed by RG subjects require more upper body strength than aerobic power.



Bearing in mind that habitual or regular physical activity can be defined as any bodily movement produced by musculoskeletal contractions that results in a substantial increase in energy expenditure above resting levels, an operational definition of physical activity can include any and all movements of daily living, including manual labor.<sup>9,19</sup> Therefore, the fact that elderly women in the rural group have agriculture, animal husbandry, and heavy-duty household chores as their main activities of daily living may account for their higher ITOT FO scores.<sup>10</sup> These comparisons between ITOT PA and ITOT FO variables is important, as it reveals the main fitness requirements of the activities reported by participants, including their relative upper body strength and aerobic requirements.

Comparison of the various parts of the QSAP revealed an imbalance between upper body strength and aerobic power requirements (the TOT FO and TOT PA indices) in both groups. There were no significant between-group differences in PA or FO (RG vs. UG), but there were significant within-group differences between PA and FO (RG vs. RG, UG vs. UG). TOT II (FO) was significantly higher than TOT II (PA) in the rural group, which suggests that elderly women living in a rural setting are subjected to greater upper body strength requirements as compared to aerobic capacity requirements.

Mean scores in Part III (activities which participants wish to engage in, or the level of dissatisfaction associated with no longer doing or no longer being able carry out activities perceived as determinants of autonomy) were 0.08 in both groups. This value was lower than that usually reported in prior studies that have employed this method. Perez et al.<sup>20</sup> compared elderly women who engaged in regular physical exercise versus those who did not and found a mean TOT III in the region of 0.17. Farinatti et al.<sup>6</sup> compared Belgian and Brazilian older women and found a TOT III score of approximately 0.25 in the latter group. This is a significant finding, as elderly women in both groups were reasonably satisfied with their daily routines, however different these routines may have been.

Another relevant indicator is that, in both groups, there was a significant difference between the activities participants actually carry out (Part I) and those they would like to carry out (Part III); scores were higher in Part I than in Part III in terms of activities and difficulties associated with doing them. According to Farinatti et al.<sup>6</sup>, in an optimal scenario, Part I scores should rise progressively, with older adults engaging in more and more of the activities they desire to do, which would tend to drive down Part III scores. On the other hand, this would not mean that PA and FO requirements would be fully met, as the requirements of environmentally imposed activities were greater than the physical potential of participants.

This was made quite clear by participants' scores on the broadest SysSen index, the ISAC. Although there were no statistically significant between-group differences in autonomy of action, there was a slight absolute advantage in favor of the urban group (RG, 0.72; UG, 0.79;  $p=0.12$ ). It is in no way surprising that between-group differences in ISAC scores were not statistically significant. The design of the SysSen means that participants who are less fit may be considered more autonomous (higher ISAC score) than fitter subjects, as long as superior fitness (as expressed by IAP score) is still insufficient to meet the subject's QSAP-measured needs (expressed by the IAE). In our sample, the IAP advantage was not sufficient to have a significant impact on ISAC scores, probably because IAE scores balanced out the difference. On close analysis of the study data as a whole, it is acceptable to conclude that these findings were the result of a physical and functional fitness deficit in the rural group. The overall autonomy deficit revealed by comparing fitness requirements (expressed autonomy) and actual physical and functional fitness (potential autonomy) is clearly shown in the ISAC plot, which shows that, in both groups, a far greater number of participants were below rather than above the line of optimal autonomy (ISAC=1). A similar trend has been observed in prior studies.<sup>6</sup> Additional research is required to determine whether this profile is typical of Brazilian older adults regardless of the region in which they live.

As the sample was not randomly selected, generalization of the results of this study to other groups of older adults living in rural or urban settings should be approached with caution. Furthermore, readers who wish to use the SysSen instrument are advised to peruse the cited literature, as we were unable to provide a complete description of the system in this article due to space constraints.

## CONCLUSIONS

Elderly women living in rural and urban areas had similar levels of functional autonomy, as measured by the ISAC. QSAP results for environmentally imposed physical activities believed to be important for the perception of autonomous living, as expressed by the IAE, were similar in the two groups. On the other hand, participants in the urban group, who engaged in physical exercise, had significantly superior physical fitness as expressed by the IAP. However, this superiority was not enough to meet the demands of autonomy-defining activities in this group. Therefore, elderly women living in rural and urban areas had similar deficits in functional autonomy as measured by the ISAC, due to insufficient physical fitness to meet their reported needs.

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