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Training Effects on Older Adults in Information and Communication Technologies Considering Psychosocial Variables

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The main aim of this study is to contribute knowledge about the impact of the use of information and communication technologies (ICT) on the self-concept, mood, and quality of life of institutionalized older adults in retirement homes and day care centers (Portuguese institutions). It also studies the influence of independent variables such as age; education; referral to the institution (own initiative, indicated by friends, indicated by family, indicated by social security); attendance schedule; and visits from family and friends. The study comprised 41 participants organized into two groups: 22 older adults in the ICT Group and 19 older adults in the Passive Control Group. There were three evaluation periods: before the onset of intervention and 11 and 22 months after intervention began. The results demonstrate that involvement with information and communication technologies produced positive effects on older adults' social behavior and their self-perception of physical and environment facets of quality of life. Moreover, they suggest that there is a relationship between psychosocial variables and independent variables.

Regardless of when the transition to old age occurs, this shift brings with it a number of inherent biological transformations. It also results in various changes that differ according to the psychosocial development of each individual. These changes are considered important targets in a person's life trajectory. In biophysiological terms, the body's systems are susceptible to structural and functional changes as a result of age-related decline. However, these differ from one individual to another. The most notable changes may occur in the nervous system, particularly in the form of cognitive decline (Albert & Kilianny, 2001; McConatha, McConatha,

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& Dermigny 1994; Miura, Kariyasu, Yamasaki, & Sumi, 2004), often associated with a drop in important psychosocial and emotional variables (Pires, 2008; Zheng, Hill, & Gardner, 2012). Cognitive decline, resulting from the aging process, is generally characterized by several changes. These include increased difficulty in understanding long and/or complex messages and retrieving specific terms; difficulty in performing reasoning activities that involve the logical and organized analysis of abstract or unfamiliar material; more repetitive speech; difficulty in selecting information; reduced ability to perform new psychomotor tasks; loss of memory, especially secondary memory, which deals with the acquisition of new information and the distribution of attention across multiple tasks; difficulties in inductive reasoning, spatial orientation, verbal and numerical aptitudes, and also in perceptual speed (Czaja & Sharit, 2013; Ryan, See, Meneer, & Trovato, 1994; Vaz-Serra, 2006). Because of all these changes, there is a prevalent idea that older adults are isolated, useless to society, and economically and physically dependent on others. However, this idea may be changing. In past decades older adult citizens often withdrew to their own homes, dedicating their time to their grandchildren and to reliving memories of the past. Nowadays, older adults are more engaged and wish to undertake projects in the short term (Charness, Kelley, Bosman, & Mottram, 2001; Cody, Dunn, Hoppin, & Wendt, 1999).

Some of these studies demonstrate that sharing technological mediated information brings certain benefits to older adults, including a general enhancement of their mental status; a strengthening of their self-concept (SC), self-esteem and self-realization (Ryan & Heaven, 1986; Whitbourne & Sneed, 2002); an increase in their quality of life (QoL) (Blusi, Asplund, & Jong, 2013; Kiel, 2005; Leung & Lee, 2005; McConatha et al., 1994; Zheng et al., 2012;); a link between their wellbeing and the existence of greater opportunities for communication, information, and entertainment (Becker, 2004; Ferreira, Veloso, & Mealha, 2010; Veloso, Mealha, Ferreira, Fonseca, & Simões, 2011; Zheng et al., 2012); an improvement in their cognitive function and their feelings of depression, as well as an increase in daily activities (McConatha et al., 1994; Whyte & Marlow, 1999). Other research has found a decrease in feelings of loneliness (White et al., 2002); a reduction in stress perception and the level of social support (Bradley & Poppen, 2003; Bruck, 2002; Clark, 2002; Nahm & Resnick, 2001; Wright, 2000;); and an increase in feelings of connectedness (Gatto & Tak, 2008). A positive link to health has also been found (Choi, 2011; Werner, Carlson, Jordan-Marsh, & Clark, 2011).

The overall aim of the present study is to contribute towards understanding the impact of the use of ICT (Information and Communication Technologies) on the SC (self-concept), mood and QoL (Quality of Life) of a group of institutionalized older adults in Portuguese institutions (PI) and how these are directly related to the ICT training sessions, as well as how these may be linked to the following variables: age, length of time the participants have been at the institution, visits from family and friends, and level of pleasure when attending the sessions.

Accordingly, and because the population aging rate is growing, there are more and more studies about older adults' use of information and communication technologies. On 31st December 2009, the resident population of Portugal was composed of 15.2% children under 15 years old, 17.9% older adults, aged 65 or over, and 66.9% of active age. The total rate of aging was 118 older adults for every 100 people under 15 (115 in 2008) (National Institute of Statistics [INE], 2010).

METHOD

Participants

The study included 41 older adults, displayed in Table 1, organized in two groups: 25 female participants and 16 male participants, with ages ranging from 66 to 96 years ($M = 83$, $SD = 7$). Among these, 22 participants belonged to the ICT Group and 19 to the Passive Control Group. In the ICT Group, there were five older adults from Portuguese institution (PI) A and PI B, and six older adults from PI C and PI D. In the Passive Control Group, six older adults belonged to PI A, five to PI B, five to PI C and three to PI D.

In the ICT Group, most of the participants were female (63.6%); half of the participants attended the institution only during the day; 68.2% of the participants were widowers, and only 13.6% were married or single; 72.7% had been at the institution for less than four years; 13.6% of the participants had been at the institution for between 15 and 19 years; 9.1% of them had been at the institution for between five and nine years; and 4.5% of the participants had been at the institution for between 10 and 14 years. In the Passive Control Group, the majority of participants were female (57.9%) and attended the institution only during the day; 73.7% were widowers and only 15.8% of the participants were married. Regarding their length of time at the institution, 84.2% of the participants had been there for less than four years. All of the participants (in the ICT Group and in the Passive Control Group) were referred to the institution by a family member.

Among the participants in the ICT Group who remain in the institution during the day and night, 70% received family visits on average three times a month. Among the participants in the passive control group who remain in the institution during the day and night, 62.5% received family visits, on average, three times a month. Further concerning visits, half of the participants in the ICT Group usually received visits from friends (on average, once a month), while in the passive control group only 37.5% of the participants were visited by friends (on average, four times a month).

The moments of evaluating the psychosocial variables will be designated as time 1 (before the onset of intervention), time 2 (after 11 months of intervention), and time 3 (after 22 months of intervention).

It should be emphasized that, from the first to the second moment of evaluation (time 1 and time 2), the ICT Group was reduced from 22 to 15 participants (five gave up for health reasons and two died). The Passive Control Group was reduced from 19 to 14 participants, from the first to the second moment of evaluation (one left the group for health reasons and four died).

Procedure

We formally established an initial contact with all the institutions in the municipality of Aveiro listed by the Portuguese National Social Security Agency. Five of these institutions expressed interest in participating in the study. We were then invited to visit the institutions in order to see their facilities, to identify the equipment available, and determine how many older adults might be interested in participating in the study. We chose four Portuguese institutions (PI) as one of the initial five could not find a sufficient number of older adults to satisfy the project's

TABLE 1
Participants' Characteristics, by Groups

	Group			
	ICT group (n = *21*)		*Passive control group* (n = *19*)	
Independent variables	*no.*	%	*no.*	%
Sex				
Male	8	36.4	8	42.1
Female	14	63.6	11	57.9
Marital Status				
Single	3	13.6	1	5.3
Married	3	13.6	3	15.8
Divorced	1	4.5	1	5.3
Widower	15	68.3	14	73.7
Education				
>4 years	5	22.7	5	26.3
4 years	14	63.6	11	57.9
5 years	1	4.5	1	5.3
6 years	2	9.1	2	10.5
Attendance at the institution				
During the day	11	50.0	11	50.0
During the day and night	10	45.5	8	45.5
Home care service	1	4.5	0	4.5
Length of time at the institution				
0 to 4 years	16	72.7	16	84.1
5 to 9 years	2	9.1	1	5.3
10 to 14 years	1	4.5	1	5.3
15 to 19 years	3	13.6	1	5.3
Referral to the institution				
Own initiative	7	31.8	5	26.3
Indicated by family	11	50.0	9	47.4
Indicated by friends	3	13.6	4	21.1
Indicated by social security	1	4.5	1	5.3
Visits from family				
During the day and night				
No	3	30.0	3	37.5
Yes	7	70.0	5	62.5
During the day				
No	9	81.8	7	63.6
Yes	2	18.2	4	36.4
Visits from friends				
During the day and night				
No	5	50.0	5	62.5
Yes	5	50.0	3	37.5
During the day				
No	9	81.8	7	63.6
Yes	2	18.2	4	36.4

four selection criteria. The institutions selected showed great sensitivity and openness to the research needs and the integration of ICT in the older adults' daily activities. After some visits and informal socializing with the older adults at these four institutions, we proceeded to define a sample selection according to the following four inclusion criteria: 65 years old or over; normal mental state (according to the personal clinical history confirmed by the institution); voluntary participation; and ability to read and write.

Two groups were created: the ICT Group and the Passive Control Group. The ICT Group was involved in twice-weekly computer training sessions held from September 2011 to July 2013, each lasting 90 minutes. The activities included free writing, transcribing texts, synchronous and asynchronous communication use (instant messaging and e-mail, respectively), and reading news online. The Passive Control Group was not submitted to any intervention besides the regular daily activities carried out as before the first moment of evaluation (time 1).

Evaluation of psychosocial variables was performed using the Self-Concept Clinical Inventory (Vaz-Serra, 1986); Philadelphia Geriatric Center Morale Scale (Lawton 1975, adapted by Paúl 1991); and the World Health Organization Questionnaire of Quality Life (WHOQOL-Bref) (Vaz-Serra et al., 2006). Their authors have duly authorized the use of scales in this study.

The Clinical Self-Concept Inventory is a 20-question self-report inventory aimed to measure self-concept through four factors (social acceptance/rejection (A/SR-SC); self-effectiveness (SE-SC); psychological maturity (PM-SC); and impulsivity/activity (I/A-SC)). The questions are scored from 1–5, with higher scores corresponding to better individual self-concept. Spearman-Brown coefficient 0.791 and fidelity test-retest coefficient .838 (Vaz-Serra, 1986).

The WHOQOL-Bref instrument was validated for the Portuguese population and showed good reliability and validity. It consists of 26 items providing scores for four domains, each one including several specific facets: physical (PH-QoL), psychological (P-QoL), social relationship (RS-QoL), and environment (E-QoL), including a facet of overall QoL. It employs a five-point scale, with higher scores indicating increased QoL. In this sample, Cronbach's alpha ranged from .70 and .85 between domains (Vaz-Serra et al., 2006).

The Philadelphia Geriatric Center Morale Scale instrument (Lawton 1975, adapted by Paúl 1991) comprises 15 items providing scores for three factors, each one including several specific facets: loneliness/dissatisfaction (L/D-mood) (Cronbach's alpha = .75), attitude towards aging (A/A-mood) (Cronbach's alpha = .71), and agitation (A-mood) (Cronbach's alpha = .71), with higher scores corresponding to better individual mood.

The researcher read out the instructions, then read the questions, described the scale, and wrote down the participant's selected answer as suggested by Vaz-Serra et al. (2006) and Steinbüchel et al., (2006). The data regarding the independent variables was collected through an initial questionnaire.

A final questionnaire was administered after 11 months of intervention and then again after 22 months of intervention, at which times the psychosocial variables were also reassessed. The objectives of the initial questionnaire were as follows: (a) to screen whether in the previous year any occurrence may have taken place that could have positively or negatively influenced the participants' lives and whether that episode could interfere with the evaluation of the psychosocial variables; and (b) to determine the level of satisfaction of the ICT Group when attending the sessions—whether they felt these sessions influenced their lives and how. The instruments for collecting data were applied at different times to allow for participants' tiredness.

Regarding the statistical procedure, *t* tests were used on independent samples (*t*), in order to test if both groups were equivalent at the beginning of the study. We verified that both groups were equivalent in terms of demographic and dependent variables at time 1.

t tests were used for paired samples (*t*) to compare means of the dependent variables from time 1 to time 2 and from time 1 to time 3 (SC, mood and QoL). *t* tests were used for paired samples to compare means of the ICT Group use and the control group at each moment of evaluation (time 1, time 2, and time 3). Pearson's correlations (*r*) were used in order to test if there are any associations between the variables studied. To calculate the effect size, the formula used was: $r = \sqrt{(t^2/(t^2 + df))}$ (Field, 2009). To calculate the determination coefficient of correlations, we used the squared *r* (r^2) (Field, 2009). According to Cohen (1988), values of .10, .24, and .37 were considered as small, medium, and large effect sizes, respectively.

Statistical analysis was performed using SPSS 19 Statistical Package for Social Sciences. Statistical significance was set at $p = .05$ and $p = .01$.

RESULTS

Differences in Psychosocial Variables at the Three Moments of Evaluation

This section presents the results of the empirical study considering the data collected at the three moments of evaluation (time 1, time 2, and time 3) from the ICT Group and Passive Control Group, displayed in Table 2 and Table 3, respectively.

In the ICT Group, SC values decreased significantly from time 1, 72.6 ($SD = 5.5$), to time 2, 63.5 ($SD = 4.9$) ($t(14) = 5.73$, $p \leq .01$, $r = .84$). Regarding QoL, the PH-QoL domain also increased significantly from time 1 ($M = 53.1$, $SD = 9$) to time 2 ($M = 62.6$, $SD = 10.4$) and with a very large effect size, $t(14) = -5.98$, $p \leq .01$, $r = .85$.

Concerning the results from time 1 to time 3, after 22 months of ICT use, SC values decreased significantly from time 1 ($M = 72.6$, $SD = 5.5$) to time 3 ($M = 66.3$, $SD = 2.8$), $t(7) = 3.54$, $p \leq .01$, $r = .8$. Regarding SC factors, factor 1, A/SR-SC, increased significantly from time 1($M = 17.5$, $SD = 1.8$) to time 3 ($M = 18.9$, $SD = 1.6$) and with a very large size effect, $t(7) = -3.42$, $p \leq .05$, $r = .79$.

In the Passive Control Group, SC mean values also decreased significantly from time 1 ($M = 72.1$, $SD = 6.2$) to time 2 ($M = 63.9$, $SD = 4.6$), $t(13) = 4.68$, $p \leq .01$, $r = .79$. Factor A/SR- SC was the only one whose mean increased from time 1 ($M = 17.7$, $SD = 1.7$) to time 2 ($M = 19.3$, $SD = 1.1$), after 11 months ($t(13) = -3.02$, $p \leq .01$, $r = .64$). Regarding the results from time 1 to time 3 for this group, after 22 months, SC values decreased significantly from 72.1 ($SD = 6.2$) to 65.2 ($SD = 5.4$), $t(8) = 3.28$, $p \leq .01$, $r = .76$.

Relationship between the Dependent and Independent Variables at the Three Moments of Evaluation

In order to ascertain whether, at time 1, there is a relationship between the independent and dependent variables, the statistical analysis results suggest that in the ICT Group, the A/SR-SC has a weak positive correlation ($r = .45$, $p \leq .05$, $r^2 = .20$) with the independent variable regarding how long the participants have been at the institution. This means that the longer the

TABLE 2
Results of the Empirical Study, ICT Group

	ICT group							
	Time 1		*Time 2*			*Time 3*		
Dependent variables	M	SD	M	SD	t	M	SD	t
SC	72.6	5.5	63.5	4.9	5.73**	66.3	2.8	3.54**
F1 – A/SR-SC	17.5	1.8	18.6	1.5	−1.82	18,9	1.6	−3.42*
F2 – SE-SC	20.1	2.6	18.7	2.0	1.24	20.9	2.7	−2.03
F3 – PM-SC	15.4	1.4	15.0	1.5	1.70	15.1	0.8	1.67
F4 – I/A-SC	11.5	1.5	11.1	1.5	.95	11.4	0.9	−.21
Mood	8.0	2.6	7.2	2.9	.9	7.6	4.2	.00
F1 – L/D-Mood	3.0	1.4	2.7	1.3	1.52	3.4	1.8	.00
F2 – A/A-Mood	3.0	1.0	2.3	1.3	1.67	2.0	1.9	1.32
F3 – A-Mood	1.9	1.2	2.2	1.1	−1.33	2.3	1.2	−2.37
QoL	60.8	16.0	57.5	13.2	.89	65.6	14.6	−1.16
D1 – PH-QoL	53.1	9.0	62.6	10.4	−5.98**	51.3	12.2	−.14
D2 – P-QoL	61.2	7.9	63.1	13.0	−.74	60.9	10.4	−.61
D3 – SR-QoL	66.7	7.3	65.0	10.5	.52	68.8	3.9	−1.87
D4 – E-QoL	66.3	5.4	67.7	5.1	−1.1	68.4	5.9	−.55

M: Mean; *SD*: Standard Deviation; SC: Self-concept; F1 – A/SR-SC: Factor 1 - acceptance/social rejection-Self-Concept; F2 – SE-SC: Factor 2 - self-efficacy-Self-Concept; F3 – PM-SC: Factor 2 - psychological maturity-Self-Concept; F4 – I/A-SC: Factor 3- impulsivity/activity-Self-Concept; F1 – L/D-Mood: Factor 1 - loneliness/dissatisfaction-Mood; F2 – A/A-Mood: Factor 2 - attitude towards aging-mood; F3 – A-Mood: Factor 3 - agitation-Mood; D1 – PH-QoL: Domain 1 - physical health-Quality of Life; D2 – P-QoL: Domain 2 - psychological-Quality of Life; D3 – SR-QoL: Domain 3 - social relationships-Quality of Life; D4 – E-QoL: Domain 4 - environmental-Quality of Life; *t*: paired samples *t* test results.

$^{*}p \leq .05$, $^{**}p \leq .01$.

participants were at the institution, the greater was their awareness of their social acceptance. Factor I/A-SC has a weak positive correlation ($r = .6$, $p \leq .05$, $r^2 = .36$) with the independent variable length of time at the institution. The results indicate that higher results of I/A-SC are related to a longer stay at the institution.

Regarding the dependent variable of mood and its factors, a correlation was found between the -mood factor and the participants' age. This factor has a weak positive correlation ($r = .46$, $p \leq .05$, $r^2 = .21$) with age, i.e., the older the person is, the more positive is their attitude to aging.

For the dependent variable of QoL and its domains, there is a correlation between domains PH-QoL, P-QoL, and SR-QoL and the participant's age. The PH-QoL domain has a weak positive correlation ($r = .44$, $p \leq .05$, $r^2 = .19$) with age, which indicates that the older participants have a higher perception of physical quality of life.

The statistical analysis results suggest that at time 2, there was a positive correlation ($r = .60$, $p \leq .05$, $r^2 = .36$) between I/A-SC and time at the institution. This suggests that increased time spent at the institution is related to greater impulsivity/activity.

There is a correlation between the dependent variables PM-SC and L/D-mood with the independent variable level of pleasure when attending the sessions, directly related to the ICT training sessions. The PM-SC factor has a weak positive correlation ($r = .60$, $p \leq .05$, $r^2 = .36$) with

TABLE 3
Results of the Empirical Study, Passive Control Group

	Passive control group							
	Time 1		*Time 2*			*Time 3*		
Dependent variables	M	SD	M	SD	t	M	SD	t
SC	72.1	6.2	63.9	4.6	4.68**	65.2	5.4	3.28**
F1 – A/SR-SC	17.7	1.7	19.3	1.1	−3.0**	19.7	1.3	−2.1
F2 – SE-SC	20.2	2.2	19.1	2.1	1.15	19.1	2.6	.92
F3 – PM-SC	15.1	2.1	14.5	1.8	.39	15.2	1.5	−1.27
F4 – I/A-SC	11.1	1.7	10.9	1.4	−.43	11.2	1.1	−.94
Mood	7.3	2.1	7.3	2.7	.2	7.3	1.1	.57
F1 – L/D-Mood	2.5	1.1	2.5	1.5	.53	3	1.5	−.36
F2 – A/A-Mood	2.6	1.1	2.3	1.0	.48	2.1	1.2	.5
F3 – A-Mood	2.2	1.1	2.5	1.0	−.89	2.2	1.1	.31
QoL	52.0	14.6	53.6	16.6	.19	56.9	19.9	.61
D1 – PH-QoL	56.6	5.5	56.9	15.9	−.21	50.8	8.7	1.62
D2 – P-QoL	61.6	6.0	66.1	10.7	−1.58	61.1	7.2	1.11
D3 – SR-QoL	64.0	8.4	66.7	5.7	−.23	68.5	6.9	−1.41
D4 – E-QoL	64.0	6.9	63.8	4.7	−.15	69.4	4.4	−1.25

M: Mean; *SD*: Standard Deviation, SC: Self-concept; F1 – A/SR-SC: Factor 1 - acceptance/social rejection-Self-Concept; F2 – SE-SC: Factor 2 - self-efficacy-Self-Concept; F3 – PM-SC: Factor 2 - psychological maturity-Self-Concept; F4 – I/A-SC: Factor 3- impulsivity/activity-Self-Concept; F1 – L/D-Mood: Factor 1 - loneliness/dissatisfaction-Mood; F2 – A/A-Mood: Factor 2 - attitude towards aging-mood; F3 – A-Mood: Factor 3 - agitation-Mood; D1 – PH-QoL: Domain 1 - physical health-Quality of Life; D2 – P-QoL: Domain 2 - psychological-Quality of Life; D3 – SR-QoL: Domain 3 - social relationships-Quality of Life; D4 – E-QoL: Domain 4 - environmental-Quality of Life; *t*: paired samples *t* test results.

**$p \leq .01$.

the level of satisfaction when attending sessions. Psychological maturity is higher when the level of satisfaction when attending sessions is higher. Furthermore, the factor L/D-mood has a weak negative correlation ($r = -.62$, $p \leq .05$, $r^2 = .38$) with the level of pleasure when attending the sessions. This means that loneliness/dissatisfaction is higher when the level of pleasure when attending sessions is lower.

At time 3, the SC has a strong positive correlation ($r = .94$, $p \leq .05$, $r^2 = .88$) with the variable length of time at the institution. This suggests that increased time spent at the institution is associated with better perspective on SC. Factor A/SR-SC has a strong positive correlation with age ($r = .94$, $p \leq .05$, $r^2 = .88$). The oldest participants show a higher perception regarding the social acceptance of the SC factor. The AE-AC factor (self-efficacy) has a strong positive correlation with the variable length of time at the institution ($r = .75$, $p \leq .05$, $r^2 = .56$). This means that increased time at the institution is associated with higher self-efficacy. The participants who most often receive visits from friends feel greater self-efficacy. Factor A-mood has a strong negative correlation with the frequency of family visits ($r = -.66$, $p \leq .05$, $r^2 = .44$). Fewer visits received are associated with better mood. The physical domain of QoL has a strong positive correlation with the independent variable age ($r = .74$, $p \leq .05$, $r^2 = .55$). The results suggest that increased age is associated with better perspective of physical quality of life.

In the passive control group, the statistical analysis results at time 1 did not find any significant correlations. In the passive control group, the time 2 results indicate that the PM-SC factor has a weak positive correlation ($r = .63$, $p \leq .05$, $r^2 = .4$) with age. This means that increased age is related to higher perception of psychological maturity. The time 2 results indicate that the E-QoL domain has a weak negative correlation ($r = -.58$, $p \leq .05$, $r^2 = .34$) with the independent variable age. This means that low perception of environmental quality of life is associated with increased age.

The time 3 results indicate that the SR-QoL domain has a strong negative correlation with the variable frequency of friends visits ($r = -1p \leq .05$, $r^2 = 1$). This suggests that more visits from friends are associated with increased perception of social quality of life. The E-QoL domain has a strong positive correlation with the variable frequency of family visits ($r = .97$, $p \leq .05$, $r^2 = .94$). This result suggests that a higher frequency of family visits is associated with better perception of environmental quality of life.

GENERAL DISCUSSION

The present study indicates that short-term use of ICT has positive effects on the participants' perception of their physical and environmental quality of life and on their short-medium-term perception of social acceptance.

The results reveal a reduction in older adults' Self-Concept in both groups studied, although there is a more marked decrease in the passive control group. Schaie and Willis (2002) emphasize that the simple fact of getting older already has a negative impact on adults' Self-Concept. However, this is not supported by authors such as Vaz-Serra (1986) and Whitbourne and Sneed (2002), who argue that despite being faced with a depreciative assessment from society and negative situations, older adults maintain high self-esteem and positive feelings about their Self-Concept. Nevertheless, perception of social acceptance increased in the passive control group 11 months following the initial evaluation, and it increased after 22 months in the ICT Group. The attention given to the Passive Control Group at the moments of evaluation may explain the result obtained, although this effect was not observed in the long term (at the 22-month evaluation moment). On the other hand, continued ICT training for 22 months was shown to have a significant effect on perception of social acceptance.

In the ICT Group, the physical domain of quality of life registered an increase. Indeed, Lai (2005), when studying quality of life related to health, confirmed that preventing functional incapacity is the most important issue for institutionalized older adults.

Comparison of the ICT group and the Passive Control Group when they were both evaluated 11 months after intervention began also leads us to conclude that the ICT Group shows greater perception of environmental quality of life than the participants without ICT.

For the second part of this study, the results of statistical analysis suggest the following in the ICT Group:

- Increased time at the institution is associated with greater social acceptance and perception of impulsivity/activity level.
- Increased age is associated with more a positive attitude towards aging.
- Increased age is also related to higher levels in the PH-QoL, P-QoL and E-QoL domains. The study carried out by Correia (2009), however, referring to overall QoL, indicates an

opposite result. Younger seniors, aged 68 and 75 years old, have a better perception of their QoL.

- Participants registering higher levels of pleasure when attending ICT sessions also had higher levels of psychological maturity and less loneliness and dissatisfaction (White et al., 2002).

Regarding the older adults who were part of the Passive Control Group, the data suggests the following:

- Frequency of family visits positively influenced participants' self-efficacy perception.
- Psychological maturity is higher when age is higher.
- As age increases, perception of environmental quality of life goes down.

In spite of an awareness of the limitations related to the sample dimension, this research strengthens the need to carry out additional studies. Such studies include research into the relationship between older adults' psychosocial variables and their use of ICT, the relationship between psychosocial variables and social-demographic variables and their relationship, in turn, with institutional variables. The inclusion of other evaluation methods, such as neuroimaging or hormonal tests (cortisol, for example), can also provide considerable information.

This study reinforces the need for pertinent and current contributions to foster the integration of older adults in an increasingly technological society. The promotion of diversified activities, such as use of ICT, in the daily life of older adults has a key role in psychosocial variables.

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