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Association between internet use and physically active leisure time: "EpiFloripa Idoso" longitudinal study

Associação entre uso de internet e manter-se ativo no lazer, estudo longitudinal EpiFloripa Idoso

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Abstract – The aim of this study was to verify the association between internet use and physically active leisure time during four years in older adults included in the "EpiFloripa Idoso" study, a population and longitudinal study with older adults (60+) residents in Florianópolis, Brazil, interviewed in 2009-10 (baseline) and 2013-14 (follow-up). The outcome was self-reported level of leisure physical activity, measured by the long version of the International Physical Activity Questionnaire, classified as remaining inactive; becoming inactive; becoming active; remaining active. Covariates were: gender; age (in years); per capita income in Reais; schooling (years of study); internet use longitudinally measured (remaining not using, stopping using, starting using, remaining using); and cognitive decline at baseline assessed by the Mini Mental State Examination. Relative risk ratio (RRR) adjusted by independent variables were estimated. Participants were 1,705 older adults at baseline and 1,197 at follow-up. The prevalence of remaining physically active during leisure time was 15.8% (95% CI 12.6 to 19.0) and was associated with being male (RRR = 2.14, 95% CI 1.50 to 3.05), less schooling (RRR = 0.99, 95% CI 0.99 to 0.99), starting using (RRR = 4.1, 95% CI 2.06 to 8.55) and remaining using the internet (RRR = 5.52, 95% CI 3.25 to 9.36). This study can contribute to public policies for active and healthy aging through stimulation of internet use, since this technological behavior can help increasing the level of leisure physical activity in this population.

Key words: Cognition; Computers; Motor activity; Older adults.

Resumo – *Objetivou-se verificar a associação entre mudanças no uso de internet e na prática de atividade física no lazer ao longo de quatro anos em idosos do estudo EpiFloripa Idoso. Estudo populacional longitudinal, com idosos residentes em Florianópolis/Brasil, entrevistados em 2009-10 (baseline) e em 2013-14 (seguimento). O desfecho foi o nível de atividade física no lazer autorreferido, mensurado pelo Questionário Internacional de Atividade Física versão longa, avaliado de forma longitudinal (manteve-se inativo; passou a ser inativo; passou a ser ativo; manteve-se ativo). Outras variaveis foram: sexo; idade (em anos completos); renda familiar per capita em Reais; escolaridade (em anos de estudo); uso de internet avaliado longitudinalmente (manteve o não uso; deixou de usar; passou a usar; manteve o uso); e o declinio cognitivo no baseline avaliado pelo Mini Exame do Estado Mental. Foram estimados razão de riscos relativos (RRR) ajustados pelas variáveis independentes, por regressão logística multinomial. Foram entrevistados 1.705 idosos no baseline e 1.197 no seguimento. A prevalência de manter-se ativo fisicamente no lazer (no seguimento) foi de 15,8% (IC95%=12,6-19,0) e associou-se ao sexo masculino (RRR=2,14; IC95%=1,50-3,05), menor escolaridade (RRR=0,99; IC95%=0,99-0,99), a passar a usar (RRR=4,1; IC95%=2,06-8,55) e a manter-se usando internet (RRR=5,52; IC95%=3,25-9,36). Os resultados deste estudo podem ter grande impacto nas políticas de envelhecimento ativo e saudável pois mostram que além de estimular a prática regular de atividades físicas de lazer deve-se estimular também o uso de internet, pois este comportamento tecnológico pode auxiliar no incremento do nível de atividade física de lazer de idosos.*

Palavras-chave: *Atividade motora; Cognição; Computadores; Idosos.*

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INTRODUCTION

Population aging has been occurring very rapidly throughout the world[1], being the age group that proportionately most increases in relation to others in most countries[1,2]. This is due to the decline in fertility and mortality rates, the development of the pharmaceutical industry, the prophylaxis of diseases and the improvement of basic sanitation[1].

The main losses caused by human aging are the increase in the number of diseases and disabilities, worsening of functional abilities of the organism[3,4] and cognitive problems[5]. Due to these losses and other risk factors, older adults are the group with the lowest levels of physical activity[4,6,7]. Low levels of physical activity accelerate human decline, increase functional disability, the occurrence of diseases, obesity and decrease quality of life[7,8].

In this perspective, the practice of leisure physical activity has been widely recommended[7,9], mainly for older adults, since they have greater availability of time due to retirement[10], and because leisure activities are optional and enjoyable and have associations with risk factors for cardiovascular diseases of greater consistency when compared to occupational and domestic activities[11]. This behavior is a determinant factor for health promotion in the different strategies of disease prevention and the search for active and healthy aging[9].

For older adults to have health benefits, they should perform aerobic physical activities (moderate and/or vigorous intensity, at least 150 minutes per week), muscle strength and flexibility exercises (at least 2 times a week) in addition to exercises to maintain or improve balance[7,12,13].

Even if started at an advanced age and with low energy expenditure, practicing physical activities can improve health, regardless of intensity or frequency[14], helping to prevent and treat chronic diseases, preventing and/or reducing the number of prescribed drugs, risk of injury, number of falls and incidence of fractures, promoting several psychological[7,12], mental[14,15] and physical benefits[12], in addition to reducing the risk of mortality[13].

However, even with all these benefits from the practice of physical activities, there are still many individuals not involved in this practice or who have stopped practicing due to various factors, especially lack of safety, low socioeconomic status, presence of diseases and disability, as well as lack of companionship[3,8].

Another intervening factor is the use of the internet which, according to some studies[16,17], can influence people to adhere to an active behavior. The internet is considered a new and efficient way of acquiring information on health[18-20] and physical activity[16,17]. Seniors with access to this technology are more informed and more able to make decisions that impact their health[21].

In this sense, it is very important to know how the relationship between internet use and practice of leisure physical activity occurs, thinking of it as a binomial, since it is not known if people who are more physically active at leisure time use more computers or if it is the inverse. Thus, stimulating these two modifiable and non-medicated behaviors becomes of great

relevance considering that they can be effectively introduced in public policies for this population[14].

Few studies have longitudinally approached this theme based on a sample representative of a city. Longitudinal studies on this topic can show in a more direct, precise and valid way the real factors that influence the relationship between internet use and leisure physical activity. In addition, the increase in age is associated with low frequency of physical activities[3] and use of computers[21]; therefore, studying these variables in a longitudinal way may help in a better understanding of these relationships.

Thus, this study aimed to verify the association between changes in the use of the Internet and the practice of leisure physical activity during four years in older adults participants of the "EpiFloripa Idoso" study.

METHODOLOGICAL PROCEDURES

Study type

This longitudinal, population-based and household study was part of the "Health Conditions of Elderly from Florianópolis" project, called "Epi-Floripa Idoso", whose more detailed explanations of methods can be found in other publications[22,23].

Population and sample

This research was carried out with people aged 60 years or older living in the urban area of Florianópolis, Santa Catarina (SC), Brazil. Data collection at the study baseline occurred from September 2009 to June 2010, and the follow-up from November 2013 to November 2014.

The sample size at the baseline was based on the prevalence calculation based on the parameters of population size with 60 years or more of Florianópolis/SC, 95% confidence level, unknown phenomenon prevalence of 50%, sample error of four percentage points, sampling design effect estimated in two added of 20% for estimated losses and 15% for association studies added to the effect of the study design and financial availability. This resulted in a minimum sample of 1,911 older adults. The baseline sample selection was performed by clusters in two stages (1st: 420 urban census sectors of Florianópolis/SC, 2nd: domiciles). Thus, a final sample of 1,702 older adults effectively interviewed (response rate of 89.1%) was originated.

In the study follow-up (2013-2014), the number of eligible individuals was based on the identification of deaths and the updating of addresses that occurred in the following sequence: conference on the Mortality Information System bank (SIM) of the Ministry of Health by place of residence (Santa Catarina), referring to years 2009, 2010, 2011, 2012 and 2013; sending letters to individuals who had full address in order to inform them about the new stage of the research; telephone contact for the updating of data and when communication was not possible, the team sought to update these data via InfoSaúde System (Health System of Florianópolis/SC), social networks, telephone directory, contact with neighbors, relatives and friends.

In both moments, losses corresponded to individuals not located after four visits in different periods and refusals when personally expressed after home visit. In the follow-up, individuals who moved to another city or were hospitalized were also considered as losses. Thus, 1,197 individuals with longitudinal information were interviewed.

Instruments and data collection

The research questionnaires were applied face-to-face by previously trained interviewers with assistance from Personal Digital Assistants (baseline) and netbook (follow-up). At both moments of the study, questionnaires were validated instruments and tested in pilot studies. At baseline, 276 questions were applied and 655 in the follow-up. Data consistency was weekly checked and quality control was performed by telephone through the application of a reduced questionnaire in approximately 10% of randomly selected interviewees.

Study variables

The study outcome was assessed by the level of leisure-time physical activity measured by the International Physical Activity Questionnaire (IPAQ) in the leisure domain[24], collected in 2009-10 and in 2013-14. Individuals who performed less than 150 minutes of moderate physical activity weekly were considered physically inactive and those who practiced 150 minutes or more of moderate physical activities weekly were considered physically active. The level of leisure physical activity was longitudinally assessed (remaining physically inactive, becoming physically inactive, becoming physically active, remaining physically active).

The independent variable was internet use after four years, longitudinally evaluated (remaining not using, stopping using, starting using, remaining using).

Control variables were: sex (female, male); age (in full years); *per capita* family income in Reais (R$) at the time of the interview; schooling (in years of study); and cognitive decline at baseline assessed by the Mini Mental State Examination (MMSE). MMSE is a cognitive assessment scale that ranges from 0 to 30 points[25]. The classification of this instrument occurred as follows[25]: individual with probable cognitive deficit: score less than 19/20 points for individuals with very low schooling and less than 23/24 points for those with formal education) and those who obtained score equal to or greater than those were considered without cognitive deficits.

Data analysis

Data were downloaded in csv format and later exported to the STATA 11.0 statistical package (Stata Corporation, College Station, USA), allowing information to be directly exported to the database construction, eliminating the typing step, thus reducing possible errors.

The design effect and sample weights were considered in all analyses. For characterization of the study sample and prevalence of the outcome,

descriptive statistics was performed, using absolute and relative frequencies for qualitative variables, and measure of central tendency and dispersion, for quantitative variables. The dependent variable was expressed in frequency and its respective 95% CI.

In order to estimate the association between changes in internet use (reference category: remaining not using) and changes in the practice of leisure physical activity (reference category: remaining physically inactive) over four years, crude and adjusted analysis by Multinomial Logistic regression with estimates of Relative Risk Ratio (RRR) and their respective 95% confidence intervals (95% CI) was used. In the adjusted analysis, variables that showed association with the outcome ($p \leq 0.05$ value) were inserted into the model.

Ethical aspects

The study met the ethical precepts of Resolution 466 of 2012, of the National Health Council, and was approved by the Ethics Committee for Research with Humans of UFSC (baseline under protocol 352/2008 and follow-up under protocol 596,126). All interviewees signed the Informed Consent Form and the post-informed consent for access to data previously collected in the 2009-10 "EpiFloripa Idoso".

RESULTS

At baseline, 1,702 older adults were interviewed (89.1% response rate referring to the sample calculation). Of these, 217 died, 111 were not found, 48 were losses, and 129 refused to participate again in the study, totaling 1,197 participants at follow-up (70.2% response rate).

In table 1, it was observed after four years of follow-up, that the prevalence of remaining physically active in the period was 15.8% (95% CI = 12.6-19.0). However, most individuals remained physically inactive, were female and remained not using the internet (they did not use the Internet in 2009-10 and remained not using it in 2013-14). The mean age of participants in 2013-14 was 73.9 ± 7.3 years.

Table 2 shows that individuals who were physically active in the four-year period were male, with no probable cognitive deficit at baseline, and who remained using the Internet during the study follow-up period.

After the crude analysis (Table 3), it was verified that remaining physically active in the longitudinal period of four years was associated with being male, younger age, lower schooling, no cognitive deficit at baseline and starting using or remaining using the internet.

In Table 4, after the adjusted analysis, it was identified that being physically active at both times of the study (2009-10 and 2013-14) was associated with being male (men were approximately twice more likely of maintaining this behavior compared to women); schooling (older people with more years of schooling were slightly less likely of being physically active when compared to individuals with less schooling); and using the

internet (people who started using the internet remained using the internet were four to six times more likely of being physically active than those who have never used the internet).

Table 1. Descriptive analysis of participants of the "EpiFloripa Idoso" study. Florianópolis/SC, Brazil, 2014.

Qualitative variables	n	% (95% CI)
Level of leisure PA		
Remained physically inactive	694	56.0 (50.4-61.6)
Became physically inactive	189	16.5 (12.4-20.5)
Became physically active	139	11.7 (9.3-14.1)
Remained physically active	175	15.8 (12.6-19.0)
Sex		
Female	1088	63.9 (61.6-66.2)
Male	614	36.1 (33.8-38.3)
Cognitive deficit at Baseline		
No	1244	73.7 (71.6-75.8)
Probable cognitive deficit	443	26.2 (24.1-28.4)
Internet use		
Remained not using it	839	70.2 (67.6-72.8)
Stopped using it	38	3.2 (2.2-4.2)
Started using it	90	7.5 (6.0-9.0)
Remained using it	228	19.1 (16.8-21.3)
Quantitative variables	x ± (SD)	
Age	73,9 ± 7,3	
per capita family income	1347,64 ± 2612,21	
Schooling	7,86 ± 5,85	

95% CI = 95% confidence interval; PA = Physical activity.

Table 2. Distribution of sociodemographic, cognitive and internet use characteristics according to the level of leisure-time PA after the four-year period of participants of the "EpiFloripa Idoso" study. Florianópolis/SC, Brazil, 2014.

Variables	Remained physically inactive	Became physically inactive	Became physically active % % (95% CI)	Remained physically active
	% (95% CI)	% (95% CI)		% (95% CI)
Sex				
Female	61.1 (56.2-65.8)	15.8 (12.3-19.3)	11.4 (8.8-13.9)	11.7 (9.1-14.3)
Male	47.4 (39.1-55.8)	17.5 (11.2-23.8)	12.3 (7.9-16.6)	22.8 (17.1-28.5)
Cognitive deficit at Baseline				
No	52.7 (46.8-56.7)	17.4 (12.6-22.1)	12.6 (9.7-15.5)	17.3 (13.7-20.8)
Probable deficit	68.7 (61.6-75.8)	13.2 (8.8-17.7)	8.1 (4.5-11.6)	10.0 (5.7-14.2)
Internet use				
Remained not using it	65.1 (60.0-70.2)	15.6 (11.5-19.8)	9.7 (7.0-12.1)	9.7 (7.3-12.0)
Stopped using it	51.4 (29.5-73.2)	16.9 (4.0-29.7)	10.8 (1.5-20.2)	20.9 (0.5-41.2)
Started using it	36.5 (24.5-48.5)	23.7 (13.8-33.7)	17.7 (6.9-28.4)	22.1 (10.8-33.3)
Remained using it	35.1 (25.1-45.2)	16.3 (8.5-24.2)	16.5 (10.8-22.2)	32.0 (24.2-39.9)

RRR = Relative Risk Ratio; 95% CI = 95% confidence interval.

However, it has also been shown that older people who started using the internet in 2013/14 and those who remained using the internet at both times of the study also increased their chances of becoming physically inactive.

Table 3. Crude analysis of factors associated with remaining physically active in the leisure time after the period of four years of participants of the "EpiFloripa Idoso" study. Florianópolis/SC, Brazil, 2014.

Variables	Became physically inactive		Became physically active		Remained physically active	
	RRR (95% CI)	p	RRR (95% CI)	p	RRR (95% CI)	p
Sex		0.093		0.146		<0.001
Female	1		1		1	
Male	1.42 (0.94-2.15)		1.39 (0.89-2.16)		2.50 (1.77-3.56)	
Age	0.99 (0.96-1.02)	0.449	0.96 (0.93-0.98)	0.002	0.95 (0.92-0.99)	0.005
Family income						
Schooling	0.99 (1.00-1.00)	0.224	0.99 (0.99-0.99)	<0.001	0.99 (0.99-0.99)	<0.001
Cognitive deficit at Baseline		0.032		0.016		<0.001
No	1		1		1	
Probable deficit	0.57 (0.36-0.95)		0.49 (0.28-0.87)		0.44 (0.27-0.72)	
Internet use		0.002		<0.001		<0.001
Remained not using it	1		1		1	
Stopped using it	1.36 (0.55-3.38)		1.44 (0.50-4.09)		2.73 (0.70-10.58)	
Started using it	2.70 (1.46-5.00)		3.29 (1.26-8.61)		4.06 (1.98-8.33)	
Remained using it	1.93 (1.00-3.74)		3.19 (1.83-5.54)		6.13 (3.64-10.30)	

RRR = Relative Risk Ratio; 95% CI = 95% confidence interval.

Table 4. Adjusted analyses of factors associated with remaining physically active at leisure after the period of four years in participants of the "EpiFloripa Idoso" study. Florianópolis/SC, Brazil, 2014.

Variables	Became physically inactive		Became physically active		Remained physically active	
	RRR (95% CI)	p	RRR (95% CI)	p	RRR (95% CI)	p
Sex		0.129		0.322		<0.001
Female	1		1		1	
Male	1.38 (0.91-2.10)		1.29 (0.78-2.13)		2.14 (1.50-3.05)	
Age	1.00 (0.98-1.03)	0.763	0.97 (0.95-0.99)	0.042	0.98 (0.94-1.01)	0.214
Family income	1.00 (0.99-1.00)	0.493	1.00 (1.00-1.00)	0.064	1.00 (1.00-1.00)	0.131
Schooling	0.99 (0.95-1.04)	0.849	0.97 (0.92-1.02)	0.218	0.99 (0.99-0.99)	0.001
Cognitive deficit at Baseline		0.145		0.165		0.752
No	1		1		1	
Probable deficit	0.70 (0.43-1.13)		0.67 (0.37-1.18)		0.92 (0.53-1.57)	
Internet use		0.002		0.001		
Remained not using it	1		1		1	<0.001
Stopped using it	1.36 (0.55-3.38)		2.73 (0.69-10.76)		2.41 (0.60-9.66)	
Started using it	2.70 (1.46-5.00)		3.93 (1.87-8.27)		4.19 (2.06-8.55)	
Remained using it	1.93 (1.00-3.74)		5.63 (3.08-10.28)		5.52 (3.25-9.36)	

RRR = Relative Risk Ratio; 95% CI = 95% confidence interval.

DISCUSSION

The prevalence of remaining physically active at leisure in the four-year longitudinal period found in this study was low (RRR = 15.8; 95% CI = 12.6-19.0). It is known that the practice of physical activities decreases with increasing age and that the elderly are the population group with the lowest levels of physical activity[4,6,7,10]. Different studies have shown the low prevalence of physical activity in all domains in the elderly, including in leisure time[6,10]. However, the use of different instruments and criteria to evaluate the level of physical activity used in studies on this theme makes comparisons difficult[7].

In relation to factors associated with remaining physically active during the two periods of the study (2009-10 and 2013-14), there was an association between the outcome and being male, having lower schooling and using the internet (start using the internet or remaining using it) when compared to their peers.

The fact that older men are more physically active than older women has already been evidenced in literature[7,10,18,26]. Hirvensalo and Lintunen[3] explain that the practice of physical activities is organized according to certain cultural and social conventions, among them, sex, where men are more physically active than women. This statement can be explained by some reasons such as the fact that women report greater number of barriers that lead them not to practice regular physical activities[8,18,26]. Men generally associate physical activity with pleasure, while women associate it to health and aesthetic issues[26]. Another explanation is that even in more advanced ages, women have less time to practice leisure physical activities because in the majority of the times, they are responsible for housework[18,26].

The findings of this study evidence that older people with higher schooling are less likely of remaining physically active in leisure than those with less schooling, unlike some studies that report that people with higher schooling levels are more physically active in leisure time[3,8,10,26]. People with higher schooling levels live in a social environment where physical activity is recognized as beneficial for health, have more knowledge about the benefits of physical activity, and have more opportunities, facilities and access to practice[26].

This contradictory fact evidenced in the present study that older people with lower schooling levels are more likely to remain physically active during the four-year period than those who are more educated may be explained by some reasons such as: the association between socioeconomic level and physical activity is very complex[27] because the expenditure of physical activities, the modality practiced as well as the time spent with these activities vary greatly in their relation with socioeconomic variables; the individuals surveyed are mostly retirees, which leads them to have more time to practice leisure physical activities[26], which increase their chances of remaining physically active regardless of schooling; the majority of individuals (58%) had minimum of five years of schooling[22], which may influence the analysis of data, since only 42% of them have low monthly income, thus biasing the analysis; Florianópolis had one of the highest Human Development Indexes (HDI) in Brazil in 2010 (year in which the study baseline was collected), which may influence the health and behavioral habits of the studied cohort[23], as well as greater similarities of sociodemographic variables, such as income.

The use of the internet was significantly associated with remaining physically active at leisure during the four-year longitudinal study period. Older people who started using the Internet in 2013-14 or those who remained using it between 2009-10 and 2013-14 were more likely of becoming physically active in leisure time when compared to those who

did not use this technology. Other investigations have shown that older internet users maintain a healthier and more active lifestyle[16]. However, it should be pointed out that data from CETIC[28] show that only about 19% of Brazilian elderly use the Internet and that if the monthly income is considered, the prevalence is even lower.

An intervention study with adults (age between 20 and 55 years)[17] also evidenced the relationship between internet use and practice of leisure physical activity, showing that people who received advice on a more active lifestyle through an internet site (n = 173) and people who received the same information along with other physical exercise tips (n = 129) had higher levels of physical activity than people who had no access to any active lifestyle information (n = 132). Another intervention research with physically inactive adults (aged 50-69 years) (n = 30) concluded that the simple sending of three emails over three months may decrease the perception of barriers to physical activity[29].

Using the internet can help older people to redeem their participation in society by improving citizenship, health, education, work, leisure and social life. These benefits can help reduce mental and socioeconomic limitations associated with aging and increase the level of physical activity of these individuals[30].

In this sense, the use of the Internet has enormous potential to inform and facilitate behavior changes in relation to the practice of physical activities, and is highly recommended for behavior change in relation to this behavior[21].

However, even with all these benefits of using the internet and its relationship with leisure physical activity, there is a concern that is the fact that much of the information available on the Internet about physical activities, diseases, treatments and other aspects related to health, is inadequate or scientifically incomplete[20]. Thus, the Internet can also represent a great risk in the health area if it is not well used[20].

Another point to highlight in this research is that individuals who started using the internet in 2013/14 and those who remained using it in the two moments of the study also increased their chances of becoming physically inactive, that is, internet use increased the sedentary time of these individuals. In this sense, the use of the internet and the practice of physical leisure activities should be a binomial for people to use the internet, but also to practice leisure physical activities on a regular basis in order to maximize the benefits of these two behaviors.

The main limitations of this study were the time bias for the performance of interviews, where individuals may forget some information, and the selection bias, given the non-evaluation of hospitalized individuals. Among the positive aspects of this investigation, the design and the sample calculation are highlighted, as well as the low proportion of selective follow-up loss (less than 10%).

Further epidemiological and longitudinal studies should be performed so that the relationship between remaining using the internet and the

practice of leisure physical activity is better clarified. In addition, randomized intervention studies should be carried out separating groups of older adults using the Internet and those who practice leisure physical activities to verify which behavior has greater influence on the other.

CONCLUSION

The results of this study showed that older adults who remained using the Internet during the longitudinal study period were more likely to remain physically active during the same period (2009-10 to 2013-14) when compared to those who did not use the Internet. This is an important finding because it emphasizes the influence of the use of internet on the practice of leisure physical activities and can have a great impact on policies of active and healthy aging, since it shows that in addition to stimulating the regular practice of leisure physical activities, it also stimulates the use of the internet, since this technological behavior can help increasing the level of leisure physical activity by this population group, consequently improvement health and quality of life.

New proposals combining the practice of leisure physical activity and internet use should be stimulated, elaborated with the aim of promoting healthy aging.

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