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Older adults and ICT adoption: Analysis of the use and attitudes toward computers in elderly Spanish people

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ABSTRACT

Contemporary research on older people information and communication technologies (ICT) adoption underlines conducting studies with objective (frequency and type of use) and also subjective (perceived barriers, associated usefulness …) data, and from a multivariate approach. In the current study the use of and the personal experience with ICT, with special reference to personal computer (PC), are analyzed in a sample of 212 community-dwelling Spanish adults aged 60 or older. Participants completed a structured questionnaire about a) perceived barriers, frequency and type of use, associated usefulness, and sense of control with respect to three ICT devices (smartphone, PC, and tablet); and b) attitudes toward PC, assessed (from a multidimensional approach) by the Spanish version of the Computer Attitude Scale. Two multivariate statistical techniques were used to detect profiles of older people related to PC adoption, and to identify the specific attitudinal dimensions that influence members belonging to these profiles. Descriptive statistics show a certain digital divide related to age, but also a relevant heterogeneity in ICT adoption. Multivariate analyses reveal three types of older adult-PC users, and underline usefulness and behavioral attitudinal components as key factors for promoting a more active PC adoption by older people.

1. Introduction

1.1. Older people and digital divide

The growing and rapid expansion of Information and Communication Technologies (ICT), and the increasing possibilities they offer, are inextricably linked to the concern about the potential consequences of barriers to ICT adoption. The "digital divide" concept refers to the form of inequality affecting individuals and/or groups that, for a variety of reasons, face obstacles regarding access to and/or use of ICT (Agudo, Pascual, & Fombona, 2012; Casado & Lezcano, 2018; Colombo, Aroldi, & Carlo, 2015; Loges & Jung, 2001; Selwyn, 2004). The digital divide has been characterized as a contemporary form of illiteracy, since (as with limitations with reading and/or writing) it conditions access to a wide range of basic goods and services (material, cultural, social…) which, in today's technological society, are increasingly linked to ICT (Näsi, Räsänen, & Sarpila, 2012; Peacock & Künemund, 2007; Slegers, Van Boxtel, & Jolles, 2009). Therefore, obstacles for ICT adoption may work as risk factors for inequality, marginalization, and even for social exclusion (Cabero & Ruíz, 2018; Casado & Lezcano, 2018; Ihm & Hsieh, 2015; Klimova, Simonova, Poulova, Truhlarova, & Kuca, 2016; Selwyn, 2004; Zavala, García, Durón, Ruiz & Valenzuela, 2016).

In this regard, older people constitute a group which could gain tremendously from ICT, but they tend to find it hard to realize this potential. On the one hand, new technologies provide older people with a wide range of information from a multitude of sources requiring the development of new skills and competences, opening up a broad swathe of possibilities in different areas of everyday life (communication, expression, social participation, access to services, social relations, etc.). Many studies have shown how ICT adoption may promote life-long learning, social participation, and, in general, greater quality of life in old age (Agudo et al., 2012; Chopik, Rikard, & Cotten, 2017; González, Fanjul, & Cabezuelo, 2015; Hur, 2016; Laganá, Oliver, Ainsworth & Edwards, 2011; Macedo, 2017; Pino, Soto, & Rodríguez, 2015; Zavala, García, Durón, Ruíz, & Valenzuela, 2016). In fact, some of the benefits of adopting ICT highlighted by older people include the ability to keep up with the times and to adapt to today's society, to continue thinking and learning, gathering information, keeping in contact with other people,

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or spending less time doing passive activities (watching TV in particular) (Broady, Chan, & Caputi, 2010; Colombo et al., 2015; Llorente, Viñarás, & Sánchez, 2015; Pino et al., 2015). However, older people represent one of the main groups on the wrong side of the digital divide. Results of population studies (EUROSTATS, 2018) show that 84% of Europeans use the internet on a regular basis, but this percentage drops to 52% amongst older people; or that only 13% of Europeans have never used the internet, with this figure rising to 42% in older people. According to the same source (EUROSTATS, 2018), Europeans who use the internet on a daily basis do so on a PC (64% of cases, but only 37% in older people) or via a smartphone (63%, 24% amongst the elderly). As with population studies, the ones carried out with samples of young and old people show a lag in ICT adoption in older people (Broady et al., 2010; Casado & Lezcano, 2018; Ihm & Hsieh, 2015; Loges & Jung, 2001; Macedo, 2017).

1.2. Older people and ICT adoption: objective and subjective approach

In spite of the evidences above described, the age-related digital divide is reducing due to the significant increase in the use of new technologies amongst older people. According to EUROSTATS (2018) population data, in 2007 only 16% of Europeans aged 65–74 years used the internet regularly (compared to 52% in 2017 above mentioned); 11% did so using a computer (37% in 2017), and 80% had never used the internet (42% in 2017). Non-population studies point in the same direction and, furthermore, they indicate that this increase is steeper in those groups which have traditionally been less familiar with ICT such as women and older people (Chopik et al., 2017; Colombo et al., 2015; Ihm & Hsieh, 2015; Näsi et al., 2012; Peacock & Künemund, 2007; Sánchez, Eizmendi, & Azkoitia, 2006).

With respect to ICT adoption, there is an increasing tendency to differentiate between access to these devices and other indicators such as frequency and type of use, because, according to Selwyn (2004) and Selwyn, Gorard, Furlong, and Madden (2003), the former does not necessarily imply the latter. Thus, a distinction between *primary* and *secondary digital divide* has been proposed to differentiate between those older people who do not use the technologies because they do not have them, from those who have access to ICT but decide not to use them (Colombo et al., 2015). Research into older people's perceived barriers for ICT adoption indicates that those who have access to technologies but do not use them give two reasons: a) the lack of knowledge/ability and the concern about making mistakes (which has been identified as lack of digital competence or even computer illiteracy) (Klimova et al., 2016; Pino et al., 2015; Sánchez et al., 2006; Zavala et al., 2016), and b) lack of motivation because they do not consider ICT to be tools which could play a useful role in fulfilling their own interests and needs (González et al., 2015; Ihm & Hsieh, 2015; Macedo, 2017). In the same way, ICT studies with elderly users show that frequency and type of ICT use are related to a sense of perceived digital competence, to a positive attitude toward these technologies, and particularly to their associated usefulness (Broady et al., 2010; Chopik et al., 2017; Colombo et al., 2015; González, Ramírez, & Viadel, 2012; Hur, 2016; Macedo, 2017; Peacock & Künemund, 2007). According to these studies, older adults do not appear to be interested in ICT as such, instead they are more likely to use them if they feel they have a reason for using them (Hur, 2016). Specifically, they use new technologies for both instrumental and social purposes (Ihm & Hsieh, 2015): the most frequent activities are searching for information and communicating with other people, and the less frequent are related to leisure activities, paperwork, and e-commerce (Agudo et al., 2012; Casado & Lezcano, 2018; González et al., 2015; Hur, 2016; Llorente et al., 2015).

It should be noted that the findings of many studies on this topic are based on bivariate analyses which, due to their nature, cannot identify multiple and complex relations regarding ICT use. Nevertheless, the trend in current research is towards examining the differences existing within the group of older people as a whole using multivariate analyses. These studies point out that new technology adoption by older adults is not so much to do with isolated indicators (feeling more or less competent, whether ICTs are more or less useful in daily life, more or less likely to use them, etc.) as with more global profiles, with a wide range of indicators that tend to be reinforced over time (older people who feel more competent with ICTs will use them more and find more uses for them, making them even more active and competent as users). Studies pointing in this direction include the cluster analyses reported by Colombo et al. (2015), the regression analyses of Chopik et al. (2017) and Näsi et al. (2012), the factorial analysis computed by Hur (2016), the structural equation model of Ihm and Hsieh (2015), or the results of the analytical model of Peacock and Künemund (2007). These studies showed profiles in the use and perceived utility of ICT amongst older people, and underlined the importance of a complex and multivariate approach to the analysis of new technologies in this group.

With respect to the difficulties many older people have to benefit from new technologies, research evidence supports the positive effects of interventions designed to promote ICT and to reduce digital illiteracy in the elderly (Agudo et al., 2012; Chiu, Tasi, Yang, & Guo, 2019; González et al., 2012; Laganà, Oliver, Ainsworth, & Edwards, 2011; Llorente et al., 2015; Villar, 2003). In addition, these positive results are coherent with the main transnational sociopolitical guidelines on ageing. On this matter, the most influential international framework is the concept of "active ageing", proposed by the World Health Organization (WHO) at the *Second United Nations World Assembly on Ageing* (held in 2002 in Madrid, Spain), whose core document *Political Declaration and Madrid International Plan of Action on Ageing* was approved at this assembly (United Nations, 2002). At this forum, active ageing was defined as "the process of optimizing opportunities for health, participation and security in order to enhance quality of life as people age" (World Health Organization, 2002: 12), its determinants and associated challenges were analyzed and discussed, and a set of key policy proposals were approved, including digital literacy and to provide older people with opportunities to develop skills related to ICT (World Health Organization, 2002: 51). In a review of these proposals, the experts assembled in Brazil by the International Longevity Centre (2015) suggested "technology revolution" as one of the nine converging global trends which generate new challenges in terms of ageing, and reformulated the pillars or key-areas of active ageing and recommendations for promoting it. In this review, "technological inclusion and digital divide reduction" were again underlined as key actions (ILC, 2015: 88). The active ageing concept and framework have proven to be influential in guiding political agendas about older people and ageing throughout the world. In Europe, the Council of the European Union determined 2012 as "European Year for Active Ageing and Solidarity between Generations" and as a framework for adopting specific commitments for strategies promoting active ageing in the medium-long term. This included the Declaration 16592/12, which urged member states to develop policies in line with the 19 Guiding Principles for Active Ageing, two of which ("Lifelong learning", and "Age-friendly environments and goods and services") highlight digital literacy and ICT (Council of the European Union, 2012: 10–11).

1.3. Older people and personal computers

The analysis of how older people relate to ICT, and particularly the circumstances associated to digital divide reduction in this group, is justified and makes demographic, scientific and sociopolitical sense. Hence, more in-depth studies are needed to better understand how much, how, and why older people use new technologies, and how they feel when they use them. This paper looks specifically at personal computers (PCs), one of the ICTs devices used most by older people (EUROSTATS, 2018). Studies into the use and subjective experience of PCs show similar findings to general ICT research. Thus, older people tend to use the PC for both instrumental and social purposes (Ihm & Hsieh, 2015): the most frequent activities are looking for information on

the internet, communicating with others via e-mail, organizing photos and/or documents; less habitual activities are related to e-commerce and financial transactions (Agudo et al., 2012; EUROSTATS, 2018; Klimova et al., 2016; Pino et al., 2015; Villar, 2003).

Regarding socio-demographic correlates, the more active elderly PC users tend to be the younger and/or better educated ones (Agudo et al., 2012; Colombo et al., 2015; González et al., 2012; Näsi et al., 2012). As for gender, the differences between older males and females do not seem to be direct, they are instead associated to other sociodemographic indicators, such as educational level (women with a low level of studies use the computer less than men with a comparable level of studies, but these differences do not appear between older men and women with average or high levels of studies; Agudo et al., 2012), or age (most of those who use the PC started to use one in their fifties, but of those who started using this ICT device when they were over 65, most are women; Colombo et al., 2015). These results point not so much to isolated sociodemographic effects as to generational differences, which is common in this group, especially with new technologies (Peacock & Künemund, 2007).

As for subjective experience with PCs, the barriers that the elderly experience are similar to the ones already mentioned (anxiety/fear of making mistakes through ignorance, lack of motivation because they cannot see the benefits, etc.) together with their high cost compared to other ICT devices (Broady et al., 2010; Macedo, 2017; Slegers et al., 2009; Villar, 2003). In turn, some studies have examined the attitude of the elderly towards PCs in terms of perceived competence, how useful they find them, or their motivation and interest towards them. These studies report a generally positive attitude (Laganà et al., 2011; González et al., 2012; Pino et al., 2015; Villar, 2003), particularly at the younger end of the age bracket, probably because (and again owing to a generational effect; Broady et al., 2010; Peacock & Künemund, 2007) these devices are increasingly part of daily life and are perceived as part of today's culture, so using them is associated to being up to date. Likewise, attitudes towards PCs seem to generate their own momentum: willingness to use them encourages more and better use, which improves the user's experience (increasing sense of competence/control and potential advantages/benefits) which in turn encourages the elderly person to be an even more active user (Broady et al., 2010; González et al., 2012; Laganà et al., 2011; Villar, 2003).

The study by Villar (2003) is particularly interesting because this author argues that attitude towards PCs, which are frequently approached in a unidimensional and dichotomic manner (positive or negative attitude), encompass aspects which, while being related, should be analyzed separately. Specifically, and according to Selwyn (1997), Villar (2003) differentiates four PC attitudinal dimensions: perceived usefulness, behavioral components, affective components, and perceived control. Results reported by Villar (2003) show that the first two attitudinal dimensions are the most relevant: older people consider PCs to be useful tools and are more willing to use them, compared to how at ease and sure they feel using them. Furthermore, Villar (2003) found that older people attitudes towards PCs were initially positive but improved after these people became involved in an educational program to optimize their understanding and skills. In three of the four attitudinal components there was a significant increase and the only dimension which increased but not in a statistically significant manner was the utility associated to these devices (which had already been the highest attitudinal component before the intervention). Other studies (Broady et al., 2010; González et al., 2012; Laganà et al., 2011; Slegers et al., 2009) point in the same direction: older adults' PC adoption is modifiable by way of psycho-educative interventions, particularly if the program is not restricted to promoting greater use of PCs but focused on improving both the sense of competence/control and the perceived benefits of these ICT devices.

The general aim of this study was to analyze ICT adoption in a sample of community-dwelling older adults, paying special attention to personal experience with PC, and from a multivariate approach. The specific objectives of this paper, and the related research hypothesis, were:

Objective 1. To describe the availability, the use (frequency and purpose), and the personal experience (perceived barriers, daily usefulness, and sense of control) of three ICT devices: PC, Smartphone and tablet.

Hypothesis 1. (H1). Many older people have access to and frequently use the three ICT devices, for both instrumental and social purposes.

Hypothesis 2. (H2). There are older people with barriers (both objective and/or subjective) to adopt the three ICT devices.

Hypothesis 3. (H3). PC is the ICT device adopted in a more active and diverse way.

Objective 2. To examine, from a multivariate approach, differences in older adults' use and personal experience with the PC.

Hypothesis 4. (H4). Different profiles in older adults exist regarding the frequency and variety of use of the PC.

Objective 3. To analyze, from a multivariate approach, the role played by four components of attitudes towards PC (affective, perceived usefulness, perceived control and behavioral) to promote a more active PC adoption.

Hypothesis 5. (H5). Older peoples' attitude toward PC includes related but differentiated dimensions, highlighting perceived usefulness and willingness to use PCs.

Hypothesis 6. (H6). The attitudes of older adults towards PCs are differently distributed according to the use of these ICT devices.

Hypothesis 7. (H7). Some attitudinal components towards PCs promote more active PC adoption than others.

2. Method

2.1. Participants

The sample consisted of 212 adults aged 60 years and over (M = 72.25, SD = 7.79, rank = 60–93): 43.9% (n = 93) were 60–69 years old, 34.4% (n = 73) 70–79 years old, and 21.7% (n = 46) 80 years or older. Females accounted for 54.7% (n = 116) of this sample, and 45.3% (n = 96) were male. 69.6% (n = 142) were married and 20.6% (n = 42) widowed; only 4.9% (n = 10) were single and 4.9% (n = 10) had separated or divorced. Regarding education, 26.8% (n = 56) had not completed basic studies, 24.9% (n = 52) had completed primary studies, 25.8% (n = 54) had finished high school, and 22.5% (n = 47) had gone to university. As for employment, 36.3% (n = 77) had never been in paid employment (in all cases these were women who had worked as housewives), and those that had worked had been in jobs which required no/low (45.9%, n = 62), average (24.4%, n = 33) or a high-level of qualifications (29.6%, n = 40). The sample in this study is a fairly accurate representation of the population in southern Spain of people over 60, at least in terms of age (45.93% 60–69 years old, 32.20% 70–79 years old, and 21.87% 80 years or older) and gender (45.01% male and 54.09% female) distributions (National Statistical Institute, 2018).

2.2. Measures

Data reported here were collected using a self-administered structured questionnaire specifically designed for the present study. The order of questions and questionnaires was not varied through the process. This instrument collects sociodemographic information (sex, age, educational background, and employment history) and the following data:

- ICT adoption of three devices: 15 items designed ad-hoc about the availability, perceived barriers, frequency and type of use, daily

usefulness, and sense of control of three ICT devices: PC, smartphone, and tablet.

- Attitudes toward PC: Spanish version for older adults (Villar, 2003) of the *Computer Attitude Scale* (CAS; Selwyn, 1997). The CAS consists of 22 statements with a Likert scale ranging from 0 *(strongly disagree)* to 3 *(strongly agree)*. It provides weighted scores (range 0–3) for four PC attitudinal components: affective (positive feelings associated to these ICT devices), usefulness (extent to which they are considered practical tools for daily life), perceived control (subjective perception of control), and behavioral (willingness to use them). CAS internal consistency in the present study was $\alpha = 0.75$ (affective subscale), $\alpha = 0.85$ (usefulness subscale), $\alpha = 0.69$ (perceived control subscale), and $\alpha = 0.80$ (behavioral subscale).

2.3. Procedure

The study used a non-probability sampling method to recruit participants. We contacted undergraduate students in their final year of Psychology at the University of Huelva (Spain) and asked them to help with the selection of older people over 60 from their social networks. Those elderly people who agreed to take part were asked to go to the university to give written consent to participate and fill in the questionnaires. If any problems arose understanding the questions, the questionnaire was administered as a structured interview, reading the items aloud and clarifying any doubts. Data were computed and analyzed with IBM SPSS-20 (IBM Corp. Released, 2011).

2.4. Data analyses

In order to approach the objectives of the present study, both bivariate and multivariate analyses were conducted following standard statistical guidelines in social sciences (v.g., Clatworhty, Buick, Hankins, Weinman, & Horne, 2005; Nunnally & Berstein, 1994; Tabachnick y Fidell, 2007). Before the statistical analyses, diverse exploratory testing was performed. Firstly, atypical and influential cases were tested, both univariate and multivariate. Specifically Box and whisker plot tests for each variable and the Mahalanobis distance did not reveal the existence of univariate or multivariate extreme cases. After this, the necessary prior assumptions for the use of parametric tests in the bivariate and multivariate analyses (normality, computing Shapiro-Wilk test using unstandardized residuals; collinearity/indepedence problems, attending to correlation indices between the different dimensions and Durbin-Watson test; and homocedasticity, computing standardized residuals and typify residuals graphics) were checked.

Bivariate relations were examined as follows: a) contingency analysis with the statistic χ^2, and Cramer's V as effect size and analysis of corrected standardized residuals (for categorical variables); b) Pearson's r (for continuous variables); c) Student's t-test for two independent samples; and d) analysis of variance (ANOVA) with Snedcor's F and DMS post hoc contrast test.

The multivariate techniques computed were:

e) Cluster analysis, to identify groups defined by similarities in multiple dimensions, so that members of the resulting groups were as similar as possible to others within their group (high within-group homogeneity) and as different as possible to those in the other groups (low between-group homogeneity). Prior to clustering, all selected measures were standardized in order to equate the variables. Initial groupings were derived through hierarchical cluster analysis with squared Euclidean distance and nearest neighbor method used as linkage measurement. The best solution (number of clusters) was determined by examining both the agglomeration schedule and the dendogram. The centroids of the initial clusters were put through an iterative clustering procedure (K-means cluster analysis) to refine final cluster membership.

f) Multinomial logistic regression, to form logistic models taking into consideration Hosmer and Lemeshow's chi-square distribution to calculate goodness of fit, as well as the rate of correct classification of the observed and predicted subjects of the resulting model. Nagelkerke's pseudo-R^2 statistic was used to assess the resulting model's degree of explanation. After creating the model and satisfactorily confirming its viability, the meaning and direction of the coefficients were examined using the Wald statistic and odds ratios (OR).

3. Results

3.1. Objective 1: Use of and personal experience with the PC, smartphone and tablet

Most of the sample (88.2%, $n = 187$) had access to one of the three ICT devices (particularly the smartphone and PC), with only 11.8% ($n = 25$) not having any of the devices. Regarding the barriers, most of the older people who did not have access to any of the three ICT devices reported they would not use them if they had them. Amongst those who had access and willingness to use one of the devices, the ones who would use a PC if they knew how to use it or if they had a reason to use it should be outlined. Smartphone was the ICT device most used (87% used it on a daily or weekly basis) followed by the PC (65.7%), with the tablet used least (46%). The type of use varied across the three devices, with one of the most frequent activities being the search for information (via PC –77.4%– and tablet –68%–), and communicating with other people, using Whatsapp with the smartphone (66.7%), or exchanging e-mails on the PC (64.3%). It should be noted that the use given to the PC for information (paperwork, search for information, read the papers) as well as for communication (social networks, send e-mails) is richer and more varied than the use given to the smartphone and the tablet. As for their personal experience with each device, the ICT device considered fairly or very useful was the smartphone (81.4%) followed by the PC (76.3%); the tablet was the device seen to be the least useful, although more than half of the sample (55.5%) considered it to be a very or fairly useful tool. As for their level of control of the devices, again the smartphone came first (64.9% said they were fairly or very in control when using it) followed by the PC (63.3%), while the tablet was the device they controlled least, although 55.6% of the elderly who used it said they were fairly or very in control when using it. Table 1 presents descriptive statistics about the use and subjective experience with the three ICT devices.

The aforementioned results confirm both **H1** (many older people have access to ICT devices, and they usually use them for both instrumental and social purposes) and **H2** (there are still older people with objective and/or subjective barriers to adopt ICT). On the other hand, data obtained in this paper partially confirm **H3**: PC is not the most frequently used ICT device, but it highlights for the type and variety of use.

3.2. Objective 2: Typology of older people regarding use of the PC

To examine the existence of profiles of older people with respect to how they used the PC (frequency and use), a cluster analysis in two stages were performed with the subsample that had access to this device (63.2%, $n = 134$). For the dimension of use, a sum of the number of tasks carried out with the PC was computed (read/send e-mails, social networks, paperwork, search for information, read the papers and others). The mean for this indicator was 2.40 ($SD = 1.70$). The cluster analysis, both exploratory and confirmatory, identified three different groups in terms of the frequency and use of the PC (Fig. 1), confirming **H4**. The three groups were of similar size: C1 ($n = 41$; 33.3%), C2 ($n = 33$; 39.8%) and C3 (43; 26.8%).

All the differences in these groups were statistically significant. The first cluster (C1, Passive users) was characterized by low both frequency and variety of use of the PC; the third cluster (C3, Active users) used this ICT device a lot and for a variety of purposes; and the second cluster (C2, Moderate users) used the PC frequently but in a less diverse way than the active users (C3).

The three groups were compared in terms of their sociodemographic

Table 1
Descriptive statistics about the use and the personal experience with the three ICT devices.

		PC	Smartphone	Tablet
Availability	Yes	63.2%	84.8%	30.3%
	No	35.4%	15.2%	69.7%
Perceived barriers	Doesn't have access but would use it	28.4%	35.9%	49.7%
	Doesn't have access and wouldn't use it	51.1%	54.8%	41.4%
	Has access but doesn't know how to use it	11.4%	3.2%	0.7%
	Has access but doesn't seem useful	9.1%	3.2%	5.5%
	Has access but doesn't want to use it	0%	3.2%	2.8%
Frequency of use	Never	13%	1.7%	17.5%
	Very rarely	16%	9.6%	30.2%
	Monthly	5.3%	1.7%	6.3%
	Weekly	16.8%	11.2%	9.5%
	Daily	48.9%	75.8%	36.5%
Type of use[a]	Calls only	–	31.6%	–
	To read and send whatsapp	–	66.7%	–
	To read and send e-mails	64.3%	29.3%	44%
	Social networks	38.3%	29.3%	34%
	Paperwork (Internet)	42.6%	12.1%	26%
	Search for information (Internet)	77.4%	31.6%	68%
	Read the papers (Internet)	34.8%	12.6%	40%
Daily usefulness	None	0%	0.6%	9.3%
	Low	23.7%	18%	35.2%
	Moderate	33.1%	32%	25.9%
	High	43.2%	49.4%	29.6%
Sense of control	None	2.6%	5.3%	7.4%
	Low	34.2%	29.8%	37%
	Moderate	40.2%	39.8%	31.5%
	High	23.1%	25.1%	24.1%

[a] Non-exclusive dichotomic responses.

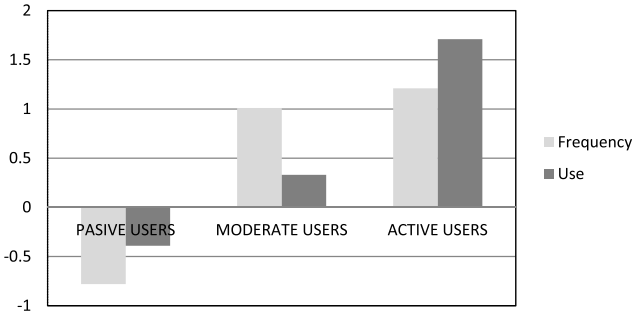

Fig. 1. Final cluster groups of the type of older people depending on their use of the PC.

characteristics. These analyses found statistically significant differences according to age $-\chi^2$ (4,123) = 11.67, $p = .020$, $V_{Cramer} = 0.22$–, sex $-\chi^2$ (2,123) = 19.14, $p < .001$, $V_{Cramer} = 0.39$–, and educational level $-\chi^2$ (6,120) = 16.11, $p = .013$, $V_{Cramer} = 0.26$–, but not according to employment history $-\chi^2$ (4,83) = 7.99, $p = .092$, $V_{Cramer} = 0.22$–.The corrected standardized residuals showed that C1 (Passive users) consisted mainly of women, people aged between 70 and 79, and without studies; C3 (Active users) included above all men, aged between 60 and 69 and with high educational levels; finally, C2 (Moderate users) did not stand out for any particular sociodemographic profile. As highlighted above, these results confirm **H4**.

3.3. Objective 3: The role of attitudes in the profiles of elderly users of PCs

Table 2 presents descriptive statistics for the four scores provided by CAS. The behavioral component was the most prevalent, while that of control was the least highlighted. Despite these differences, correlation analyses showed that all the attitudinal components were associated positively and in a statistically significant manner. These results confirm partially **H5**: the most relevant component of attitudes about PC was the behavioral one (that is, the willingness to use this device), but not the sense of usefulness (as this attitudinal dimension was statistically lower that behavioral component, and similar to the affective one).

The scores of the four attitudinal components were distributed differently in the three clusters (see Table 3), confirming **H6**. C1 (Passive users) was defined by lower results than in the other groups in affective, utility, control and behavioral components. The Active users (C3) were differentiated from the Passive (C1) and Moderate users (C2) by their high scores in the affective and utility attitudinal components, but they obtained similar means to C2 (Moderate users) in the control and behavioral scores.

To identify the attitudinal components that promoted a more active use of the PC (that is, the change from C1 and C2 to C3), a multinomial logistic regression analysis was computed considering C3 (Active users) as the reference group (dependent variable). Sex, age and educational level were included as control variables (first stage), and the four attitudinal components were considered as independent variables (second stage). The only attitudinal components which contributed significantly to the explanation of the model were the utility and behavioral ones. The statistics obtained in the final model are presented in Table 4. The final model explained 59.33% of the variance, and correctly predicted 65.83% of subjects' belonging to their reference group (C1, C2 and C3, respectively). Hence, the resulting model passed the feasibility tests recommended for this multidimensional analysis, explaining a high percentage of variance of the scores, significantly predicting the classification of a large number of subjects, and confirming **H7**. Specifically, the analysis of the OR values for C1 (Passive users) showed that the higher the scores of the behavioral and utility components, the greater (0.12 for each point in each component) the probability that an older people from C1 would form part of C3 (Active users). In turn, the OR values of C2 (Moderate users) indicated that only an increase in the scores of the behavioral component increased the probability of a person from this group going to C3 (Active users) (0.23 for each point in this attitudinal component).

4. Discussion

4.1. Older people and digital divide

As experts in this area have suggested (Colombo et al., 2015; Ihm & Hsieh, 2015; Selwyn, 2004; Selwyn et al., 2003), in this study the use but also the subjective experience of older people with new technologies have been analyzed. The results obtained show, as other studies, an active and varied use of ICT by the elderly (Agudo et al., 2012; Casado & Lezcano, 2018; González et al., 2015; Hur, 2016; Ihm & Hsieh, 2015; Llorente et al., 2015): most have access to ICT devices, use them on a habitual basis, and do so for both instrumental and social activities, particularly the search for information and communication with other people. Most of the older people consider that these devices are useful for daily life, and they feel confident using them, especially in the case of the Smartphone, the ICT device used most frequently and considered most useful and easy to use/control (Broady et al., 2010; Macedo, 2017; Villar, 2003).

These results found none of the technophobia which allegedly affects the elderly, but they did find evidence of a certain digital divide associated to age, given that some (not a majority, but important nonetheless) of the elderly in this study have a range of problems with ICT. Thus, part of the sample mentioned barriers to using new technologies, related, as in other studies (González et al., 2015; Ihm & Hsieh, 2015; Klimova et al., 2016; Macedo, 2017; Pino et al., 2015; Sánchez et al., 2006; Zavala et al., 2016), to a lack of knowledge and/or interest due to

Table 2
Attitudes towards PC: Descriptive statistics, correlation analyses, and mean contrasts for CAS subscales.

CAS subscales: Attitudinal components:	*M (SD)*	*r*			*t*		
		1	2	3	1	2	3
1. Affective	1.54 (0.91)						
2. Usefulness	1.53 (0.92)	.643***			*ns*		
3. Perceived control	1.32 (0.61)	.643***	.595***		4.39***	3.87***	
4. Behavioral	2.08 (0.78)	.606***	.693***	.545***	−9.71***	−11.04***	−15.33***

ns = not significant, *$p < .05$, **$p < .01$, ***$p < .001$.

Table 3
Mean comparisons of the four CAS attitudinal scores for the three clusters.

	Affective	Usefulness	Perceived control	Behavioral
	M (SD)	*M (SD)*	*M (SD)*	*M (SD)*
C1. Passive users	1.45 (0.78)	1.46 (0.74)	1.12 (1.11)	1.98 (1.98)
C2. Moderate users	1.94 (0.72)	2.05 (0.64)	1.67 (0.52)	2.50 (0.41)
C3. Active users	2.37 (0.59)	2.45 (0.45)	1.82 (0.46)	2.71 (0.33)
F	15.73***	23.38***	24.31***	20.17***
Post hoc	C1–C2***	C1–C2***	C1–C2***	C1–C2***
	C1–C3***	C1–C3***	C1–C3***	C1–C3***
	C2–C3*	C2–C3**	C2–C3	C2–C3

*$p < .05$, **$p < .01$, ***$p < .001$.

Table 4
Estimates of the parameters for the multinomial logistic regression model in the second stage, using C3 (Active users) as reference.

R^2 Nagelkerke .59	*B*	χ^2 Wald	*p*	OR
C1: Passive users				
Intersection	12.15	22.37		
C. Utility	−2.10	5.86	.01	0.12
C. Behavioral	−2.11	11.96	>.001	0.12
C2: Moderate users				
Intersection	7.30	10.18		
C. Utility	−0.40	0.28	.59	0.67
C. Behavioral	−1.47	8.55	>.001	0.23

not considering them useful. Likewise, in this study the digital divide is related to a certain extent to the sociodemographic profile of the older people, particularly sex, age and level of studies (Agudo et al., 2012; Chopik et al., 2017; Colombo et al., 2015; Klimova et al., 2016; Sánchez et al., 2006). However, and in line with previous studies (Chopik et al., 2017; Colombo et al., 2015; Ihm & Hsieh, 2015; Sánchez et al., 2006), results reported here point to a progressive reduction in the digital divide particularly amongst the elderly groups which were traditionally less familiar with ICT (women, oldest people, and those with a lower educational level), and these results are consistent with the common generational differences found in this age-group (Broady et al., 2010; Casado y; Colombo et al., 2015; Hur, 2016; Ihm & Hsieh, 2015; Casado & Lezcano, 2018; Peacock & Künemund, 2007). In any case, this generational component of the digital divide can be dealt with by interventions promoting the use and, above all, the personal experience of being in control and seeing the ICT utility amongst those elderly people who are less familiar with new technologies (Agudo et al., 2012; Laganà et al., 2011; Llorente et al., 2015; Villar, 2003).

4.2. Older people and PC adoption

In the analysis of the frequency of use of ICT in this study, the PC stands out: this device is fairly accessible, and is one of the most widely used for a wider variety of purposes (especially to send/receive e-mails, use social media, do paperwork, and search for information). This result coincides with population data showing the PC as one of the ICT devices used most by elderly people (EUROSTATS, 2018), for both instrumental and social purposes (Ihm & Hsieh, 2015). Hence, the use of this ICT device requires further examination.

Following recommendations for a multivariate approach to the study of ICT (Colombo et al., 2015; Chopik et al., 2017; Hur, 2016; Ihm & Hsieh, 2015; Näsi et al., 2012; Peacock & Künemund, 2007), cluster analysis computed in this study showed three different profiles of elderly people in terms of the frequency and type of use of the PC. The most numerous group was the Moderate user, followed by the Passive user and finally the Active user. This typology evidences the variety existing amongst older people in relation to the use of this ICT device, but as it is only formed with older people who had access to a PC, an analysis to clarify a secondary digital gap in this group is requested (Colombo et al., 2015).

Results reported here also show differences between the three groups at a sociodemographic level. This finding is in tune with those in other studies focusing on PCs (Agudo et al., 2012; Colombo et al., 2015) and other ICT devices (Chopik et al., 2017; Eurotast, 2018; Klimova et al., 2016; Sánchez et al., 2006). Active users tend to be the younger ones, mostly male, and with university studies, while Passive user covers oldest people, mainly women, and with non-university studies. Moderate users are the most numerous group, and did not stand out for any specific sociodemographic profile. In this sense, age, sex and level of studies seem to be important dimensions for the more extreme profiles, but not for the average group. As Broady et al. (2010) pointed out, most older people do not reject ICT but they use them in a more selective way than younger people.

The use of the PC seems to depend, to a great extent, on older adults' attitudes toward this ICT device, and the two dimensions (attitudes and use) seem to be mutually beneficial (Broady et al., 2010; Laganà et al., 2011; Villar, 2003). In this study, the Passive users showed more negative attitudes towards the PC (in all its four components) than the rest of the subjects, while the Average and Active users coincided in a more positive attitudes, and underlined their ability to use the PC (behavioral component) and in the control component. However, these last profiles differed on more subjective questions: as an ICT device, the Active users considered (to a greater extent than the rest) the PC to be good, fun, and easy to use (affective component), and practical both for work and daily life (usefulness component).

Different studies have shown that ICT attitudinal components are modifiable (Broadly et al., 2010; González et al., 2012; Laganà et al., 2011; Slegers et al., 2009), but we do not know which one promotes more and better use of the PC in the group of older people. This work identifies the behavioral and usefulness components as key factors which may play an important role to improve ICT adoption, at least with respect to PCs. Thus, interventions allowing older people to be more active with the PC are those that include improving the perception of utility for daily life and the willingness to approach this ICT device and use it. In keeping with Villar (2003), this work demonstrates the importance of analyzing the attitudinal components in intervention programs separately: this author suggests that these components can be transformed by interventions which have interesting implications.

4.3. Limitations and recommendations

The present study has several limitations, but we consider three as especially important. On the one hand, although the sample was distributed (in terms of age and sex) and reflected its reference population (NSI, 2018), it was a convenience-selected sample. Additionally, adding a comparative group of young and/or adult people would have enriched the study. In sum, it would be beneficial for future studies to adopt a sequential methodology with a random assignment of subjects to the sample and a comparison group., Furthermore, and taking into account the percentage of the final variance explained in the regression model (59.33%), other variables (of personality, or from the social setting) should be analyzed to provide a clearer picture of why older people became move active ICT users.

5. Conclusions

Despite the limitations above described, the present study provides some interesting conclusions about the heterogeneity of older people to use of and to relate with ICT in general and PC in particular. Specifically, attitude towards PC seems to include related but different components with particular roles to promote a more active PC adoption. These results could improve interventions aimed at reducing the age-related digital divide (Agudo et al., 2012; Laganà et al., 2011; Llorente et al., 2015; Villar, 2003), according to transnational recommendations to promote and support active ageing policies (OMS, 2002; IBM Corp. Released, 2011). Thus, rather than being advisable these interventions are essential for older people in today's technological society. This is because ICT use is not just related to leisure or fun, so any problems these people may have with ICT could lead to inequality, marginalization and even social exclusion (Cabero & Ruíz, 2018; Casado & Lezcano, 2018; Ihm & Hsieh, 2015; Klimova et al., 2016; Selwyn, 2004; Zavala et al., 2016).

CRediT authorship contribution statement

Susana Menéndez Álvarez-Dardet: Conceptualization, Methodology, Formal analysis, Investigation, Resources, Writing - original draft, Writing - review & editing, Supervision, Project administration. **Bárbara Lorence Lara:** Methodology, Formal analysis, Investigation, Writing - original draft, Writing - review & editing. **Javier Pérez-Padilla:** Methodology, Formal analysis, Investigation, Writing - original draft, Writing - review & editing.

Appendix. ICT Adoption Questions

How often do you use the COMPUTER?
O never **O** occasionally **O** twice monthly **O** twice weekly **O** each day.

If you use it, What do you usually use it for? (you can choose one or more options)	If you do not use it, point out the reason (you can choose only one option)
O To read/send e-mails	**O** I don't have access to this ICT, but if I did, I'd use it.
O Social networks (Facebook, Twitter …)	**O** I don't have access to this ICT, and even if I did, I wouldn't use it.
O Paperwork	**O** I have access to this ICT, but I don't know how to use it
O To search for information	**O** I have access to this ICT, but I do not consider it useful
O To read the papers	**O** I have access to this ICT, but I find it negative/dangerous
O Others (please specify):	

Do you find it useful in your daily life?
O Very useful **O** Fairly useful **O** Slightly useful **O** Not at all useful.
Do you feel comfortable using it and feel that you control it?
O Very in control **O** Fairly in control **O** Slightly in control **O** No at all in control.

How often do you use the SMARTPHONE?
O never **O** occasionally **O** twice monthly **O** twice weekly **O** each day.

If you use it, What do you usually use it for? (you can choose one or more options)	If you do not use it, point out the reason (you can choose only one option)
O Just for phone-calls	**O** I don't have access to this ICT, but if I did, I'd use it.
O To read/send Whatsapps	**O** I don't have access to this ICT, and even if I did, I wouldn't use it.
O To read/send e-mails	**O** I have access to this ICT, but I don't know how to use it
O Social networks (Facebook, Twitter …)	**O** I have access to this ICT, but I do not consider it useful
O Paperwork	**O** I have access to this ICT, but I find it negative/dangerous
O To search for information	
O To read the papers	
O Others (please specify):	

Do you find it useful in your daily life?
O Very useful **O** Fairly useful **O** Slightly useful **O** Not at all useful.
Do you feel comfortable using it and feel that you control it?
O Very in control **O** Fairly in control **O** Slightly in control **O** No at all in control.

How often do you use the TABLET?
O never **O** occasionally **O** twice monthly **O** twice weekly **O** each day.

If you use it, What do you usually use it for? (you can choose one or more options)	If you do not use it, point out the reason (you can choose only one option)
O To read/send e-mails	**O** I don't have access to this ICT, but if I did, I'd use it.
O Social networks (Facebook, Twitter …)	**O** I don't have access to this ICT, and even if I did, I wouldn't use it.
O Paperwork	**O** I have access to this ICT, but I don't know how to use it
O To search for information	**O** I have access to this ICT, but I do not consider it useful
O To read the papers	**O** I have access to this ICT, but I find it negative/dangerous
O Others (please specify):	

Do you find it useful in your daily life?
O Very useful **O** Fairly useful **O** Slightly useful **O** Not at all useful.
Do you feel comfortable using it and feel that you control it?
O Very in control **O** Fairly in control **O** Slightly in control **O** No at all in control.

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