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"The future is ours too": A training process to enable the learning perception and increase self-efficacy in the use of tablets in the elderly

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ABSTRACT
The generational digital divide can be understood as a response to the physical and psychosocial decline of older people. Recently, there has been interest in reducing the generational digital divide because of societal costs, and several studies state that tablets seem to help the elderly due to usability and functions that easily fulfill the elderly's needs to be connected, independent, and autonomous: It could increase the elderly's well-being. This article presents a training program that increases self-efficiency and enables the learning perception and use of tablets. A qualitative-dominant co-occurrent mixed-methods design was used to assess the perception that the participants (50 participants over 65 years of age) had of their own learning process and success in the course, as well as their digital self-efficacy. The results appear to partially reflect previous research; moreover, perceived changes in self-efficacy and learning can be tied to three core themes—empowerment, integration, and autonomy.

Introduction

The increase of the elderly population is a growing trend: The most recent European demographic projections estimated that the over 65 will be 1.2 billion by 2025 (Lagiewka, 2012). If it is generally recognized that aging is connected to physical, cognitive, and psychosocial decline, many elderly people desire to be healthy and functional in a society that is becoming increasingly technological. At the same time, everyday life technology's pervasiveness impacts communication styles and modifies behaviors in purchasing, searching for information, entertainment and so on.

It is therefore important to help elder generations to access technology (Kim, 2008; Renaud & Ramsay, 2007), especially "positive" technology that can make their life easier and simpler (Riva, Baños, Botella, Wiederhold, & Gaggioli, 2012): Using information and communication technologies (hence, ICTs) can enhance the elderly's self-esteem and short-term memory and encourages them to be more social. Through the Internet, the elderly can develop new companionships with people who share the same leisure interests exactly in the moment they may experience the loss of their leisure engagement, because of physical illness or social disconnection induced by retirement (Kim, 2008). Technology is also being increasingly used in healthcare services: in-home monitoring, interactive communication (e.g., between patient and physician), getting health information, and peer support.

Many studies highlight the potential benefits of ICT's use for elderly people, allowing them to stay connected with others and to what is happening around them (Magnusson et al., 2002; Russell, Campbell, & Hughes, 2008; White & Weatherhall, 2000).

Purdie and Boulton-Lewis (2003) found that the elders have specific needs (e.g., transportation, health, and safety issues) that would be easily satisfied through the use of technology.

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There is a digital divide between the over 65 and young people (Czaja et al., 2006) due to different factors:

- External barriers: other people, educational background, finances, health, and physical abilities (Pew Internet & American Life Project, 2004).
- Internal barriers: motivation and self-confidence (Purdie & Boulton-Lewis, 2003); cognitive abilities, such as crystallized intelligence, as well as computer self-efficacy and computer anxiety (Broady, Chan, & Caputi, 2010; Kim, 2008; Mitzner et al., 2008; Tacken, Marcellini, Mollenkopf, Ruoppila, & Szeman, 2005), and attitudes toward technology (Pew Internet & American Life Project, 2004).

It is a priority to help seniors learn to adopt/use the technology; but the resistances and deficits of the elderly pose a challenge to ICT training: How can ICT learning be enabled? What methodologies, settings, and synergies allow to learn operating procedures and develop favorable attitudes to a real later life learning of ICTs? Five needs seem to be particularly relevant to support motivation in later life learning: i. managing the changes imposed by age (coping needs); ii. engaging in meaningful and developmental activities (expressive needs); iii. contributing to others and societies (contributive needs); iv. having a positive influence on people and the environment (influence needs); and v. overcoming the limitations caused by age (transcendence needs) (Tam & Chui, 2016). Intuitively, using ICTs seems to answer some of these needs.

The present study aims to test the efficacy of a digital education training program in improving self-efficacy and the perception of learning in 50 elderly over 65-year-old participants involved in learning how to use a tablet and its basic functions. In order to define the training, the literature relating to what motivates and discourages the learning of ICT in the elderly was taken into account. In particular, the learning program developed is consistent with the purpose of later life learning (Tam, 2016): to increase knowledge and to keep up to date with society; to give a chance to the elderly to enrich themselves in order to facilitate successful aging.

Self-efficacy, technology, and age

Self-efficacy is defined as the set of beliefs one has in his or her own ability to organize and carry out activities aimed to a specific objective. It is therefore situated and related to one's judgment on his or her own skills in a specific domain (Bandura, 1997). While self-efficacy is a psychological construal, it has very concrete consequences: perceiving oneself to be competent in an activity and having trust in one's skills has an effect on the performance in that peculiar task. People choose to undertake tasks, work, and responsibilities according to their perception of these beliefs of their own competence and skills (self-efficacy) (Bandura, 1997; Moore, 1990); people also regulate their effort and perseverance to reach their aim according to these beliefs: The higher the perceived self-efficacy, the more the will to pursue complex tasks and not to give up till the goal is reached.

Several studies verified the relationship between self-efficacy and use of technology (e.g., Compeau & Higgins, 1995; Igbaria & Iivari, 1995)—more specifically personal computers and the Internet—and reported how variables such as gender (Brivio & Cilento Ibarra, 2010; Durndell & Haag, 2002; Vekiri & Chronaki, 2008) and age (Ijsselsteijn et al., 2007; Lam & Lee, 2005; Marquiè et al., 2002) have an impact on self-efficacy. Regarding age, research shows that, when dealing with technology, the elderly demonstrate low levels of domain-specific self-efficacy and do not feel able to use technology adequately. This negative beliefs about oneself and negative attitudes toward ICTs may be linked to little intention to learn, adopt, and use ICTs and poorer performance when actually using technology (González, Ramírez, & Viadel, 2012; Marquié et al., 2002; Reed, Doty, & May, 2005). On the contrary, good levels of self-efficacy and positive attitudes toward ICTs may lead to willingness to learn and use technology

and to good performances with technology. Therefore, as suggested by Moore (1990) and more recently supported by Alvseike and Brønnick (2012)—both in the spirit of Bandura's teachings (1997)—it is possible to think that self-efficacy in the domain of ICT (which will be called here digital self-efficacy) may be an issue when dealing with the elderly learning technology but, at the same time, it can be improved through specific programs that can overcome the elderly's perceived obstacles and resistances in using technology.

Obstacles and resistance to ICT's learning/use by the elderly

The factors that discourage the use of technology by the elderly are traceable in this order of criticality (Vansconcelos et al., 2012):

- Perceptual and motor changes: Age-related changes affect perceptual capabilities (such as vision or hearing) and motor skills, and they are problematic when trying to interact with technology. The inability to focus effectively on near objects is a problem, as is transitioning from light to dark environments or performing visual tasks under dim light and the loss of sensitivity in the hands.
- Cognitive changes: The working memory decreases and affects many complex everyday tasks (e.g., decision-making, problem-solving, and planning goal-directed behaviors). The ability of storing and managing large amounts of new information declines, as well as attention: Seniors have problems in managing tasks that require divided attention across multiple input channels and can be distracted by irrelevant information. Also, spatial cognition, the ability to mentally manipulate images or patterns, and language comprehension are reduced by age.
- Psychosocial changes: Physical and cognitive changes affect the independence and autonomy of the elderly and can cause an identity crisis and a consequent loss of self-esteem: Seniors perceived personal vulnerability, environmental and contextual obstacles, and similar problems are worsened by the reduction in the senior's social network (e.g., death of friends) that is one of the most important aspects of well-being.

The elderly's adoption and use of technology also suffer from psychological aspects, such as emotions and beliefs connected to technology (Mitzner et al., 2011). For example, they feel a sense of inconvenience regarding the perception of physical and psychological intrusion or discomfort, created by interruptions, financial expenses, and effort in adopting and using technological devices. Dislike for technology also arises when the devices have too many or too few features or programming options, poor content or programing quality, and poor output quality, such as the quality of sound or the picture of a visual display (e.g., on a cellular phone); a final problem is connected with reliability: When technology performs inaccurately and unreliably, it generates negative attitudes that negatively impact future usage.

Hernández-Encuentra, Pousada, and Gómez-Zúñiga (2009) add that the ambivalent attitude of seniors toward ICT also arises from the contrast between the technologies' almost magical benefits highlighted by the media and the elders' experience of their lack of usefulness in everyday life; the lack of experience and knowledge of ICT, the perception of low self-efficacy in its use, and little confidence in the system's reliability together with dealing with something new and the perception of being too old to learn can cause anxiety (Czaja et al., 2006).

Facilitating and motivating factors of ICT's learning by the elderly

Literature shows that older adults are motivated to use ICTs when the latter are represented as helpful in fulfilling their needs: Buying a computer and learning new skills are not motivations per se. As shown by Melenhorst, Rogers, and Bouwhuis (2006), seniors adopt and/or use technological innovation when they expect benefits: This spurs them to make the effort to try something new.

Several studies also point out that attitude toward technology is an important predictor of use (Mitzner et al., 2008): elderly with a more positive attitude have greater propensity to use technologies such as computers, Internet, and other devices (e.g., cellular phones, ATMs, microwave ovens). The factors associated with greater use of technology by old people are as follows: younger age and high education, race (White/European-Americans and Hispanic/Latino-Americans used more types of technology than Black/African-Americans), higher fluid and crystallized intelligence, higher computer self-efficacy, and lower computer anxiety (Czaja et al., 2006).

According to Mitzner et al. (2008), there are three main reasons for technology adoption. The first is support for activities: The main motivation for adoption refers to research activities, administrative tasks and communication (e.g., emailing, calling, exchanging), leisure/entertainment, and health monitoring. The second is convenience: The elderly appreciate that technology can make their lives easier, reducing physical or mental effort. The last reason for technology adoption concerns lies in its features: Technology allows to perform specific and quick actions, while also offering many options (i.e., access to services, contact with far away relatives) to the elderly. Small size and portability are also appreciated.

This review of previous studies reveals that the design principles for an effective ICT education program are as follows:

- use of an adequate support: Tablets appear to be the best choice because they allow to manage the elderly's motor and perceptual issues;
- a modular and flexible course structure: Contents are taught little by little, alternating theory and practice to encourage gradual and informed learning; problem-solving processes are tested on limited but difficulty-crescent tasks from the very first meeting in order to overtake cognitive barriers and improve self-efficacy;
- involvement of young trainers and tutors and use of the peer group: Young age of the trainers/tutors balances out the sense of social exclusion usually felt by the elderly; the peer group instead can become a way to learn and do together and to socialize.

The aim of this study is to test the efficacy of a training program for the digital education of the elderly in improving the perception of learning and self-efficacy in technology use; particularly, this aim is structured in a quantitative hypothesis and in a qualitative research question:

H: The elderly's levels of digital self-efficacy in the use of tablet improve after attending the digital education program.

RQ: Describe what aspects the elderly perceive as effective in improving their learning of and self-efficacy of technology with a focus on group dimension (group as a learning environment and young tutors and trainers as support), specific tablet-related language, and procedural knowledge.

Methodology

A course was developed to train 50 participants over 65 years of age to use tablets. A qualitative-dominant co-occurrent mixed-methods design was used to assess the perception the participants had of their own learning process and success in the course, as well as their digital self-efficacy.

Quantitatively, a survey was used to assess digital self-efficacy before the first lesson and after the last lesson of the course. The questionnaire focused on digital self-efficacy, developed using Bandura's (Bandura, 1997) and Pastorelli, Vecchio, and Boda's (2001) indication to assess self-efficacy, was employed successfully in other digital education programs (Brivio, Serino, Galimberti, & Riva, 2016).

Table 1. Benefits in the use of tablets.

Domain	Process/features	Description/benefits	References in literature
Perceptual and motor	visual impairments and mobility problems	Tablet size promotes mobility and comfortable positions	Kim, 2008; Vansconcelos et al., 2012
		Tablets require little hand–eye coordination and have minimal spatial demands (easier on people with reduced coordination— with pathologies such as arthritis)	Wood, Willoughby, Rushing, Bechtel, & Gilbert, 2005
		Screen size and lack of tactile keyboard are problems that are easy to overcome with experience	Jayroe & Wolfram, 2012
		Possibility of increasing font size and to enlarge images in face of eyesight decline t	Czaja & Lee, 2007; Kim, 2008
Cognition	Executive function, working memory, metacognitive processes Processing speed and episodic memory	Information search, communication, entertainment, production of media content, solution of practical problems, which are activities that are identified as supportive of cognitive process and can be carried out on tablet	Hertzog, Kramer, Wilson, & Lindenberger, 2009; YingWang, Chang, & Su, 2011; Chan, Haber, Drew, & Park (2016)
		Tablets as direct input devices (touch and gesture-based interaction method) demand less training for novice users or those that cannot memorize commands	Czaja & Lee, 2007; Kim, 2008; Hernández-Encuentra et al., 2009; Rogers, Fisk, McLaughlin, & Pak, 2005; Rogers & Fisk, 2010
Psychosocial	Social interaction	Practical benefits of digital communication systems (email, chat, sms, etc.) in the face of diminished social contact: to be up to date, to keep in contact with friends and family, and to have access to a supporting network	Hernández-Encuentra et al., 2009; Van Het Reve, Silveira, Daniel, Casati, & De Bruin, 2014

For the qualitative part of the study, focused ethnography (Knoblauch, 2005), previously used in similar circumstances (Strada, Brivio, & Galimberti, 2013), was employed during the course, using two observers and a video-recording system to support their observations. After the end of the course, following a phenomenological approach, two focus groups with a selection of participants (12 participants per group) were organized, to collect the participants' direct retelling of their learning experience and evaluation of the course. A last meeting with the participants, held to share the preliminary results of the research, allowed to have a back talk session with them, which gave further insight into the perceived efficacy of the training process.

The choice of the most effective technology to support digital education and learning in the elderly was made only after careful reflection: Tablets were chosen due to the factors—highlighted by literature—that discourage/motivate the adoption of ICT by the elderly seen in the previous paragraphs. Table 1 summarizes the findings that guided this choice.

In designing the ICT training program for elders, specific indication from literature was taken into account to accommodate teaching methods preferred by this target in the domains of actors involved in the process and the methods used. Table 2 shows each indication taken from literature (with respective reference) and how it was translated in the proposed program.

The training involved 50 elderly people over 65 years of age, divided into four groups (2 groups for each trainer), and lasted 10 meetings, one meeting per week. Each meeting was 2 hours long.

Table 3 shows the design and the content of the training program. It is important to note that the first module of the course is divided over the course of four classes.

Results

Quantitative results. Given the small number of participants to the course (n = 50) and missing data, it was not possible to conduct a principal component analysis on the self-efficacy questionnaire. The two factors (general tablet self-efficacy; app-specific self-efficacy, respectively, linked to perceived

Table 2. Indication taken from literature (with respective reference) and how it was translated in the proposed program.

Domain	Indication	Reference	Translation in proposed program
Actors	Class size: max 15–20 students to offer more assistance to the elderly, who tend to have more difficulties and make more errors	Xie, 2007	Four groups of max. of 12–13 students, to allow real learning and jumpstart a collaborative help process among participants
	Participants' age: seniors-only classes reduces the sense of ineffectiveness	Kim, 2008	Only participants aged 65 and over admitted to the course
	Trainers' age: younger 'informal' teachers (such as family members and neighbors) are perceived to be impatient and not trained to deal with the elderly's learning styles and capabilities	Xie, 2007	Trainers aged 35–40, no previous acquaintance with the participants, with degree in Psychology or Education Science, professional trainers. Professional and educational background chosen to offset the difficulties in Xie, 2007
	Tutors: training courses with interaction between different generations show heightened learning of computer and interaction skills	Kolodinsky, Cranwell, & Rowe, 2002	Tutors aged 25, no previous acquaintance with the participants, with degree in Psychology or Education Science. Educational background chosen to offset the difficulties in Xie, 2007
	Tutors: constant presence of tutors helps managing group and individual work	Massimini, Baecker, & Wu, 2007	Tutors added to the course faculty to provide further assistance to the participants and help the trainers
	Institutional endorsement: preexisting sense of shared interests and responsibilities increase participation and learning	Massimini et al., 2007	Participants recruited through an association providing long-life learning courses to elderly, who were already attending together other classes
Process	Specific and procedural teachings: training has to be focused on specific tasks and procedural instruction rather conceptual training. Practical use and immediate application of the concepts support motivation, organization of procedural knowledge, and language.	Mitzner et al., 2008 Mead & Fisk, 1998	Each lesson focused on a specific tablet function (i.e., camera; upload/download); practice-based tutorials run by the tutors after a number of lessons
	Practical use: firsthand experience of the technological device from the first class lower resistance, fear of damaging the device, and the risk of dropping out.	Kim, 2008	One tablet per participant; hands-on practice with the tablet and individual and tutor-assisted exploration of the device from the first lesson
	Focus on language: lack of understanding of technology-related words hinders learning in class and prevent learning and application of gained knowledge in everyday life	Xie, 2007	Each lesson started with an in-depth explanation of the terminology to be used in the lesson of the day
	Selection of content		
	relevance for personal needs of independence	Mitzner et al., 2008	Tablet functions to be taught chosen according to relevance to everyday needs and security needs (to help putting the participants' fears to rest)
	need for security and privacy	Czaja & Lee, 2007; Hernández-Encuentra et al., 2009	
	Class management (indication to trainers and tutors)	Massimini et al., 2007	
	blend individual and group sessions: use of temporary subgroups helps overcome individual deficits and varying level of comfort with technology. Individual sessions facilitate learning and to reinforce self-confidence; group sessions give the basis for mutual help and explain concepts more clearly minimize cross talk: one person speaks at a time, assuring silence to help overcome hearing deficits and focus attention		During the training sessions, moments of individual and group work were programed to foster independent use of technology and collaboration and help among peers
	modulate speed of class: learning speed varies across groups and across participants		Trainers and tutors were instructed to follow the learning speed of the groups they taught, while trying to follow the calendar/structure of the course as much as possible
	Course and class structure		

(*Continued*)

Table 2. (Continued).

Domain	Indication	Reference	Translation in proposed program
	seniors prefer that the organizers provide the course and the class structure (they do not ask for the agenda)	Massimini et al., 2007	Structure of the course (calendar, content, activities) was decided in advance and communicated to the participants at a preliminary course presentation meeting
	repeated and predictable lesson structure, divided into well defined learning units, with sequential assignments, containing scaffolding concepts, facilitates the elderly's learning	Kim, 2008	Lessons alternated between front and active lessons on contents managed by a trainer with the presence of the tutor to provide assistance; and practical sessions held by tutor, to facilitate the effective sedimentation of contents through repetition.
	Self-training: older adults have a strong preference for self-training by reading manuals and other printed instructions and by hands-on learning through trial and error; preferred learning styles strongly rely on writing and reading as support	Mitzner, 2008; Czaja, Hammond, Blascovich, & Swede, 1989; Kim, 2008	Distribution of a leaflet containing the outline of the content for the class at the beginning of each lesson to enable the participants to follow the explanation according to their learning style, and to have the guidelines for individual exercises between classes

Table 3. Structure and content of the training program.

Training methods	a) Lecture-style, theory-focused session, managed by the trainer: • Definition of the framework (what is a tablet, what is it used for, …) • Introduction to domain-specific language (e.g., operating system, SIM, share, upload, …) • Practical application b) Practice session managed by the tutor			
Module	Meeting number	Method	Topics	Length
Basics	1	a)	Introduction to the tablet: its origin and uses	1 h
			Introduction to a new lexicon (SIM tray, touch screen, …)	
			First access	
			Home screen	
			App icons on the home screen	
		b)	Practical: Use of the camera	1 h
	2	a)	Use of 3G and Wi-Fi	1 h
			Access to the Internet	
			App Market: free or paid app	
			App: definition, use, search and download	
		b)	Practical: find, download and use a interesting app of choice (e.g., cooking recipes, …)	1 h
	3	a)	Operating systems: definition, Android and Apple	1 h
			Settings and customization of the OS	
			GPS and navigation	
		b)	Practical: definition and use of the GPS system	1 h
	4	b) (Tutor only)		2 h
Navigation	5	a)	Introduction to the services on the Internet	1 h
			Introduction to a new lexicon (www, browser, …)	
			Browsing the Internet	
		b)	Practical: creation of an email address	1 h
	6		b) (Tutor only)	2 h
Entertainment	7	a)	New way of entertainment and the importance of the "sharing culture"	1 h
			YouTube, e-book, gallery	
			Introduction to a new lexicon (sharing, upload, …)	
		b)	Practical: Upload and sharing files (photos, videos…)	1 h
	8	b) (Tutor only)		2 h
Communication	9	a)	Why to share	1 h
			Use of instant messaging apps (WhatsApp)	
			Social network sites: definition, history, use (e.g., Facebook, Twitter)	
		b)	Practical: creation of a social network account	1 h
	10	b) (Tutor only)		2 h

ability to carry out basics operation on the tablet and to use specific apps) from previous research (Brivio et al., 2016) were, however, retained and calculated, as a way to reduce data. Paired sample t-tests were conducted on these dimensions. Table 4 shows the results.

On average, participants experienced significantly greater general self-efficacy after the end of the course (M = 28,81, SD = 8,70) than before the course (M = 13,68, SD = 8,22, t(30) = −10,642, p < .001, r = 0,89). Also for app-specific self-efficacy, comparisons were significant (t(30) = −10,3, p < .001, r = 0,88), with average scores at the beginning of the course being significantly lower (M = 11,13, SD = 6,92) than at the end (M = 24,61, SD = 6,61).

Qualitative results. From ethnographic observations carried out during the training process, the focus group at the end of the training and back talk with the participants about the quantitative results of the research, learning to use a tablet emerged to be connected to the elderly's cognitive characteristics.

First, the classroom observations showed the need to devote time to the explanation of specific terminology of computer language, often consisting of English words: The lack of knowledge blocks actions or makes actions ineffective, causing irritation.

As is clear from the focus group, learning the terminology (in depth and with adequate time to assimilate it) produced varied results. First of all, as the elderly demonstrated a verbal-based leaning style, having the correct lexicon to understand the discourse greatly helped them make sense of the explanations given during class; it enabled them to better understand the discourses of everyday life, to improve the quantity (number of occasions for interaction) and quality (to talk longer and more in depth) of their relationships. This also produced positive consequences in everyday life: The possibility to help peers who did not attend the course or to be able to teach others strengthened the participants' self-esteem. Finally, knowledge of technical terms increased their self-confidence, making them feel able to control the situation.

Another cognitive factor related to the elderly's verbal-based learning style was the need to have the handouts. The ethnographic observations showed this element several times: the elderly took notes on printed slides, but when there was not an exact correspondence between printed material and the projected slides, they felt confused and lose track of what is happening; they explicitly requested a written summary with all the steps to follow; often, this need makes learning difficult: Taking notes stopped the exercise and created confusion. In general, in the focus groups, the elderly admitted that "Time of the elderly is longer": Repeating things several times to memorize them and doing things over and over again highlighted the need for time, so the elderly asked for more hours of practice in the education program, especially since the tablet was only available during the course.

The elderly were enthusiastic of having a tutor in addition to the teacher: "Doing things with someone at hand" decreased the fear of making mistakes, fed confidence, and stimulated the "learning by doing and by errors" but also the desire to open up to others.

Table 4. Results of quantitative analysis.

Paired samples test									
		Paired differences							
					95% Confidence interval of the differences				
		Mean	Std. deviation	Std. error mean	Lower	Upper	t	df	Sign. (a due code)
Pair 1	General tablet self-efficacy t1 —General tablet self-efficacy t2	−15,12903	7,91514	1,42160	−18,03233	−12,22573	−10,642	30	,000
Pair 2	App-specific self-efficacy t1—app-specific self-efficacy t2	−13,48387	7,28867	1,30908	−16,15738	−10,81036	−10,300	30	,000

Compared to the ergonomic problems that prevent the proper use of the tablet and its functions, the three categories of issues discussed previously are confirmed: physical obstacles (decrease of vision, poor gestural precision…), cognitive (hard to memorize the technical terms and actions), and psychological (lack of patience).

As the focus groups confirmed, the perceived prerequisite for the success of a training program is the availability of the participants to get involved, revealing their "ignorance," but also the willingness to learn, along with the energy put in "persevering, trying, and trying again." In addition, the level of commitment even outside the classroom is important: It helped independent study of the "theories" explained in class and the practice between classes.

The reasons that support commitment, expressed by the elderly, are psychosocial motivations related to self-esteem, as the desire to live up to the new generations, the need to be independent from the "experts": children, grandchildren, people who know how to use ICT but who lack the time or patience to respect the elderly's learning curve, as well as the need to feel in tune with the outside world. Secondly, there are also utilitarian desires: first of all seniors want to learn to use the tablet because they want to take back control over rewarding activities they performed with the computer but that led to negative consequences (e.g., loss of money). In addition, the tablet provides a more convenient and simple access to services/utilities: to read e-books, to check weather forecasts, to access digital public administration's services, to shop, and to make online reservations are some examples cited by elderly.

When, during the training, the elderly imagined or discovered some practical applications of the tablet (e.g., taking pictures, getting information about the schedules of local services), the learning motivation grew; in fact, when they experienced such features and their outcomes during the lessons, their motivation to learn grew even more: For example, they became more eager to search for information using Google (e.g., to look for daily news) but also more intrigued by the exploration of physical space through geolocation. Indeed, these activities turned out to provide a new motivation to continue to use technological devices.

The observations during the course showed that the group "reinforced" learning from three points of view. The first is the social dimension: controlling the screen of a colleague or showing their own screen to receive confirmations, specifically asking others if an action is correct, working on the same tablet were strategies widely used. It was also useful when positive feedback was provided to some participants, making the "progress" of individual learners visible to the entire group. Instead, intrusive strategies were not helpful: When help is not required (e.g., another participant touches the screen and replaces the peer in difficulty), the same frustration of which they complained when talking about the so-called experts (children, grandchildren…) arose and prevented learning. Interestingly, participants tried to help other participants in need; but when the support provided did not produce the expected results, they did not provide additional support but they left the person they were trying to help alone, possibly to safeguard their own self-esteem. The second is the emotional dimension: In the focus groups, the elderly emphasized to a greater extent that the course acted as a "transitional space." The chance to work with young trainers and tutors made materially visible that "it was possible to do it." The training took place in a "protected" context: All the participants shared the same difficulties ("aggregating ignorance") but also the same motivational drivers, and teachers and tutors had as a main goal to develop learning, and hence, they showed the necessary attitude toward listening, patience, as well as the "time" to do all this; this protection enabled the elderly to overcome the fear of judgment and then to experiment being effective, qualities that they also brought outside the course. In other words, cohesion experienced by the participants within the training groups generated involvement and complicity, essential to support the learning process and feed the collaborative process. The third is the methodology of the course based on "doing things in small groups" that fed the relationship: It was possible to exchange concerns and knowledge in a "pleasant and fun" atmosphere. This allowed some participants to start new relationships or deepen existing ones, on the contrary of what happens in the

traditional lecture ("when we are at [the Third Age] university, we listen to lessons but we do not participate; here, we did everything all together").

The opinion about the size of the classroom changed: During the training, it was a concern because each participant expressed specific needs and this caused confusion: It was difficult to harmonize the group made of people with different learning speeds. In focus groups, however, it was reported that the advantages offered by the group (mutual support, stimulation, and entertainment) were superior to the limitations represented by the different levels of knowledge and learning rhythm. Indeed, some participants argued that having different levels of knowledge enhanced learning: The "skilled" felt "gratified," while the "unskilled" provided the opportunity to enhance superficial or general knowledge of the experts. They appreciated that other participants bring knowledge, questions and answers that became a stimulus to widen and enhance the learning of the group when mediated by the trainer or tutor.

What kept the elderly from trying? First of all, it was the fear of making mistakes that lead to unfortunate consequences. Only when participants learned that most of the errors are "reversible" or may be softened thanks to a greater knowledge of the tablet, they even reported an increasing ability to "tolerate the risk of making mistakes." This fear is fueled by the lack of control over technology: Unintended consequences of their actions on the tablet ("It should not happen!") generate confusion ("I don't understand!"; "I don't know what I did!"; "I don't know what to do now!") and block the action. It is interesting to note that fear increases toward the end of the course: As the processes became more complicate, people lose awareness; perhaps they felt a diminishing need of the teachers' guide because their self-confidence had grown and they listened less. The autonomy in the use of the tablet increased with the progress of the course, and it was registered through the comments that concerned the independent exploration, recognition and correction of an error, the insight, problem-solving, and formulating hypothesis about the functioning of the tablet. It is not a coincidence that the variety and quantity of negative emotions recorded during the course are greater than positive ones. In particular, discomfort/irritation and fear were predominant and prevented the participants from independent exploration and interaction with the tablet: Participants were hampered by the fear of possible uncontrollable and unexpected consequences; despair/despondency and dissatisfaction were associated with failure of interaction with the tablet. During the lessons, the elderly expressed less positive emotions such as wonder/fun and satisfaction with themselves.

The negative aspects of the course were as follows: the lack of a handbook that summarizes, operatively, the learned functions; the difference in the operating system of the tablet used in the classroom and the one owned by some participants; some ergonomic features of the supplied tablet (e.g., on/off button, Wi-Fi problems) that fueled the anxiety of making mistakes and, above all, the perception of being under observation. The fact that the course was part of a wider research elicited some specter of judgment: Although the team made it clear that the issues under observation by questionnaires were psychosocial dimensions developed by the technology and the effectiveness of the training method and not the elderly's learning performance, the training course elicited in the participants the need to receive feedback on their performances.

Discussion

The results appear to reflect, at least in part, previous research: The course was built in compliance with recommendations found in literature and trying to avoid already reported problems, and the precautions seem to have partially worked and have supported the elderly's learning. It seems to have at least increased the participants' digital self-efficacy, especially the digital self-efficacy related to the use of specific application and activities, so the quantitative hypothesis can be considered sustained: The program is effective in improving the elderly's self-efficacy in using the tablet.

The focused ethnography revealed what aspects the elderly perceived as helpful in supporting their learning. Integration in the course of the tutor figure was enthusiastically accepted; it promotes "learning by doing and by errors" as in Xie (2007).

It is essential, however, that trainers and tutors are able to follow the learning rhythm of the elderly, to dedicate enough time to do things over and over again in order to avoid the frustration that older people experience in everyday life when comparing themselves with family members (Hernández-Encuentra et al., 2009; Czaja & Lee, 2007).

It would also be useful, as suggested by Xie (2007), to design additional sessions for those participants with a more advanced knowledge so that they become peer educators for the other participants. This role should be explicitly stated, in order to avoid that sense of discomfort observed in our training linked to the unrequired intervention by others during the interaction with the tablet; tutors and trainers should be particularly careful to block unwanted intrusions among participants. This "training device" could help stop the confusion due to the different levels of previous knowledge and speed of learning, found here and in Massimini et al. (2007). The formalization of a role of 'peer trainer' could be useful to all participants, thereby raising the perception of efficacy. Another solution would be an effective assessment of entry level or previous learning skills and split-level courses, as the participants sometimes do not seem to adequately assess their own level.

The attention to language is also positively perceived by the participants: It seems fundamental to facilitate learning. So it is necessary to start from the technical vocabulary, explain it, and reflect on its sense; the lack of understanding of vocabulary increases the feeling of being disconnected from the contemporary world and a diminishing sense of control (Kim, 2008). In this sense, opening the lessons with a focus on terminology was particularly useful: It supported the participants' immediate understanding and practice during the lesson, but it also put them in contact with the world in which they live.

Another consideration, which is only partially connected to the training process, is related to the tablet: This course employed medium–low cost tablets, due to budget constraints. These devices, although fully functional, have slow reaction times, thus causing some frustration among participants. It is important, then, that technology is able to give immediate feedback (Vasconcelos et al., 2012) that allows users to be aware of the impact of their actions and immediately check whether they are successful or not: This would enable them to improve more without becoming demotivated, attributing the slowness or lack of response to their low skills rather than to the tablet. As in Vasconcelos et al. (2012), ergonomics seriously affects the efficiency of the training, even if the ergonomic challenges of the tablet can be overcome more easily with experience than those posed by a PC (Jayroe & Wolfram, 2012). At the same time, the use of medium-to-high-end tablets within this type of course would present a problem of accessibility to technology for many potential users over 65 and poses a problem outside the course where they could use a tablet with completely different interface and response, thus creating confusion and lowering the sense of self-efficacy.

The training course has elicited in the participants the need to receive feedback on their performance, as noted previously in the literature (Vasconcelos et al., 2012). At the same time, the participants considered too intrusive the presence of observers and sometimes the completion of detailed self-report instruments. If the training program is part of a research, as in this case, it would be helpful to transform the filling-in of the questionnaire into a training exercise using the tablet, by hosting the questionnaire online and having the participants access the hosting page and filling in the questionnaire online.

Conclusions

The ultimate aim of the training course was not to teach to use all tablet's functions, but to enable the learning of a positive technology, helping participants to develop self-efficacy and facilitating attitudes toward the learning and use of technology. The course seemed to be effective in dispersing

fears and prejudice toward technology and especially toward the participants' own perceived inadequacy and lack of skills with technology.

In this sense, the conceptual horizon within which we set ourselves was to develop a type of program that increased wisdom (Ardelt, 2000), rather than mastery and full competence: That wisdom, understood as facilitation in contemplating the meaning of life, sustains the elderly in fulfilling their needs, although their functional and cognitive abilities are declining (Tam, 2016a). Results of the research seem to suggest that, of the five needs that support later life learning mentioned before, learning to use tablets seems to be based on expressive and contributive needs (Tam, 2016b): The elderly want to learn to use the tablet to keep carrying out old activities and exploring new possibilities and to connect with others in a positive and meaningful way.

Both the qualitative and the quantitative steps of the research show that the course was able to make the participants feel adequate in using tablets.

Information presented about the perceived changes can be gathered around three core themes/keywords—empowerment, integration, and autonomy:

- Empowerment: The course has produced in the participants the perception of improvement of their ability to communicate, confirming other studies (Kim, 2008). Learning to use the tablet helps them to know how to communicate more, better and in a syntonic way in the family and social reality (this aspect is connected to the second core theme—integration). The possibilities of communicating are in fact increased through greater control of both the hardware ("we know how to communicate better with other tools, other technologies") and the software (some participants claimed to have improved the use of apps, Wi-Fi, photography, etc.). They communicate better than before, and even more, because using the tablet successfully (by itself and in connection with other devices, especially smartphones) allows them to increase the number of their social links and the intensity of the relationships that they entertain. Even the perception of having bridged, at least partially, the generational digital divide, falls under the category of empowerment, if only because being able to keep up with their children and grandchildren or with online services (e.g., public administration, banks) allows them to save both mental energy and time to devote to other activities and to experience a growth from the self-efficacy point of view.
- Integration: It is the other side of empowerment, its "sociorelational" face. It consists mainly in acquiring a common terminology to refer to the tablet and showing awareness about the new skills learned (see also empowerment). This process consisted of three elements: development of new practices of use with new technologies; collaborative practices implemented within the group; and newly discovered respect and sense of connection with their families and their social environment in general.
- Autonomy: It is basically the result of the sum of empowerment and integration. More integrated, in fact, in this case does not mean more "entangled" in relationships with others, but more aware and in control of their own role in relationships. Further, this occurs precisely because of the empowerment and increased perceived self-effectiveness. To quote what was said by a participant that collected the consent of the entire group, autonomy means "not having to ask anyone anymore for clarification," not because they give up the use of the tablet or the iPhone, but because now they feel able to "do it alone," in almost full autonomy. By being able to say "at the end of the course I'm more aware of my limitations when I use the tablet," participants may recognize that among the things they have learned, there is also the "ability to tolerate these limits." This, in our opinion, is true autonomy: no dependence on others—relatives or institutional partners—or even adolescent counter dependency—"I can not, so this thing does not work, so I throw it out…"—but rather awareness of their ability and substantial realism compared to the actual use practices developed.

Table 5. Pros and cons of the training course and the research design.

	Pros	Cons
Research	Mixed methods	Description of perceived learning (not real learning) through qualitative methods and indirect measure of efficacy
	Double observers	Limited sample and missing quantitative data
	Back talk	Qualitative-dominant design: effects of the course are mainly qualitative
Course/program	Built according to literature	No real individual sessions
	Structured in modules	No tablet practice outside the course
	Presence and relationship between tutors, trainers, and participants	
	Customizable to other contents and different levels of education	

The above-described processes (empowerment + integration = autonomy) were made possible by the "group setting" that allowed participants to experience the collaboration in the actions and the sharing of emotions, as in Tam (2014). Exchange between participants, appropriately mediated by the trainers and tutors, enabled them to achieve the goals described above. From a practical point of view, the participants reported some operations that have consistently accompanied them: exercising continuously ("do homework…"), to experience trial and error, to bring out the difficulties, to maintain a high level of enthusiasm in order to overcome frustration, and to become more confident in using the tablet thanks to the group's collaboration.

It therefore confirms the initial intuition of this approach: Learning how to use a digital device is a real paradigm shift in elderly's knowledge and daily routines. It is therefore necessary to provide them with the new frame in which they are located and the new language necessary to act in this scenario.

Limitations and future developments

Both aspects of research and of the educational process presented limitations and potentials (see Table 5). As already said, the training program was planned respecting the previous researches' suggestions, and the juxtaposition of tutors to traditional trainers was particularly successful. The structure of the course and of the single lessons was particularly well received and adequately supported the learning of the participants and, it should be noted, could be adapted to different levels of knowledge and practice. For the future, it would be interesting to add a peer trainer role and sessions of individual recalls, as well as provide the tablets on extended loan to enable the participants' home practice during the course and allow the sedimentation of learnings. In addition, some elderly possessed a personal tablet with a different operating system than the one used in class: For these participants, especially in the first phase of training, it represented a confusing factor and this aspect should be taken into consideration when designing the course topics.

As far as the research process is concerned, the mixed methodology and double observers' structure were particularly useful to maintain a good level of recursive objectivity, as well as to verify the results with the participants. At the same time, the research structure should be made lighter not to weigh on the participants, and it would be interesting to have objective evidence of the participants' learning and not just their perception of it.

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References

Alvseike, H., & Brønnick, K. (2012). Feasibility of the iPad as a hub for smart house technology in the elderly; effects of cognition, self-efficacy, and technology experience. *Journal of Multidisciplinary Healthcare*, *5*, 299–306. Retrieved from https://doi.org/10.2147/JMDH.S35344

Ardelt, M. (2000). Intellectual versus wisdom-related knowledge: The case for a different kind of learning in the later years of life. *Educational Gerontology*, *26*, 771–789. doi:10.1080/036012700300001421

Bandura, A. (1997). *Self-efficacy: The exercise of control*. New York, NY: Freeman.

Brivio, E., & Cilento Ibarra, F. (2010). Nuove Tecnologie e Autoefficacia percepita: Influenze del genere e delle modalità d'uso. *Qwerty*, *5* (1), 44–59.

Brivio, E., Serino, S., Galimberti, C., & Riva, G. (2016). Efficacy of a digital education program on Life Satisfaction and digital self efficacy in older adults: A mixed method study. *Annual Review of Cybertherapy and Telemedicine*, *14*, 45–50.

Broady, T., Chan, A., & Caputi, P. (2010). Comparison of older and younger adults' attitudes towards and abilities with computers: Implications for training and learning. *British Journal of Educational Technology*, *41* (3), 473–485. doi:10.1111/bjet.2010.41.issue-3

Chan, M. Y., Haber, S., Drew, L. M., & Park, D. C. (2016). Training older adults to use tablet computers: Does it enhance cognitive function?. *The Gerontologist*, *56* (3), 475–484. doi:10.1093/geront/gnu057

Compeau, D. R., & Higgins, C. A. (1995). Computer self-efficacy: Development of a measure and intial test. *MIS Quarterly*, *19* (2), 189–211. doi:10.2307/249688

Czaja, S., Charness, N., Fisk, A., Hertzog, C., Nair, S., Rogers, W., & Sharir, J. (2006). Factors predicting the use of technology: findings from the Center for Research and Education on Aging and Technology Enhancement (CREATE). *Psychology and Aging*, *21* (2), 333–352. doi:10.1037/0882-7974.21.2.333

Czaja, S. J., & Lee, C. C. (2007). The impact of aging on access to technology. *Universal Access in the Information Society*, *5* (4), 341–349. doi:10.1007/s10209-006-0060-x

Durndell, A., & Haag, Z. (2002). Computer self efficacy, computer anxiety, attitudes towards the Internet and reported experience with the Internet, by gender, in an East European sample. *Computers in Human Behavior, 18* (5), 521–535. https://doi.org/10.1016/S0747-5632(02)00006-7

González, A., Ramírez, M. P., & Viadel, V. (2012). Attitudes of the Elderly toward Information and Communications Technologies. *Educational Gerontology*, *38* (9), 585–594. doi:10.1080/03601277.2011.595314

Hernández-Encuentra, E., Pousada, M., & Gómez-Zúñiga, B. (2009). ICT and Older People: Beyond Usability. *Educational Gerontology*, *35* (3), 226–245. doi:10.1080/03601270802466934

Hertzog, C., Kramer, A. F., Wilson, R. S., & Lindenberger, U. (2009). Enrichment effects on adult cognitive development: Can the functional capacity of older adults be preserved and enhanced? *Psychological Science in the Public Interest*, *9*, 1–65.

Igbaria, M., & Iivari, J. (1995). The effects of self-efficacy on computer usage. *Omega International Journal of Management Science*, *23* (6), 587–605.

Ijsselsteijn, W., Nap, H. H., De Kort, Y., & Poels, K. (2007). Digital game design for elderly users. In *Proceedings of the 2007 conference on future play* (pp. 17–22). https://doi.org/10.1145/1328202.1328206

Jayroe, T. J., & Wolfram, D. (2012). Internet searching, tablet technology and older adults. *Proceedings of the American Society for Information Science and Technology, 49* (1), 1–3.

Kim, Y. S. (2008). Reviewing and critiquing computer learning and usage among older adults. *Educational Gerontology*, *34* (8), 709–735. doi:10.1080/03601270802000576

Knoblauch, H. (2005). Focused Ethnography. *Forum Qualitative Sozialforschung /Forum: Qualitative Social Research*, *6* (3), Art. 44.

Kolodinsky, J., Cranwell, M., & Rowe, E. (2002). Bridging the generation gap across the digital divide: Teens teaching internet skills to senior citizens. *The Journal of Extension*, *40* (3), 3RIB2.

Lagiewka, A. K. (2012). European innovation partnership on active and healthy ageing: Triggers of setting the headline target of 2 additional healthy life years at birth at EU average by 2020. *Archives of Public Health*, *70*, 1–8. doi:10.1186/0778-7367-70-23

Lam, J., & Lee, M. (2005). Bridging the digital divide—The roles of internet self-efficacy towards learning computer and the internet among elderly in Hong Kong, China. In *Proceedings of the 38th annual Hawaii international conference on system sciences* (p. 266b). https://doi.org/10.1109/HICSS.2005.127

Magnusson, L., Hanson, E., Birto, L., Berthold, H., Chambers, M., & Daly, T. (2002). Supporting family carers through the use of information and communication technology—The EU project ACTION. *International Journal of Nursing Studies*, *39*, 369–381. doi:10.1016/S0020-7489(01)00034-7

Marquié, J. C., Jourdan-Boddaert, L., & Huet, N. (2002). Do older adults underestimate their actual computer knowledge? *Behaviour & Information Technology*, *21* (4), 273–280. Retrieved from https://doi.org/10.1080/0144929021000020998

Massimini, M., Baecker, R. M., & Wu, M. (2007). Using participatory activities with seniors to critique, build, and evaluate mobile phones, *ASSETS'07*, October 15–17, 2007, Tempe, Arizona, USA.

Mead, S. W., & Fisk, A. D. (1998). Measuring skill acquisition and retention with an ATM simulator: The need for agespecific training. *Human Factors*, *40*, 516–523. doi:10.1518/001872098779591313

Melenhorst, A. S., Rogers, W., & Bouwhuis, D. G. (2006). Older Adults' Motivated Choice for Technological Innovation: Evidence for Benefit-Driven Selectivity, Psychology and Aging. *American Psychological Association*, *21* (1), 190–195.

Mitzner, T., Fausset, C. B., Boron, J. B., Adams, A. E., Dijkstra, K., Lee, C. C. … Fisk, A. D. (2008). Older adults' training preferences for learning to use technology. In *Proceedings of the human factors and ergonomics society 52nd annual meeting*, *52* (26), 2047–2051.

Moore, E. J. (1990). Using self-efficacy in teaching self-care to the elderly. *Holistic Nursing Practice, 4* (2), 22–29.

Pastorelli, C., Vecchio, G. M., & Boda, G. (2001). Autoefficacia nelle life skills: Soluzione dei problemi e comunicazione interpersonale. In G. V. Caprara (Ed.), *La valutazione dell'autoefficacia: Interventi e contesti culturali* (pp. 137–146). Trento, Italy: Erickson.

Pew Internet & American Life Project. (2004). *Generations online in 2009*. Retrieved June 29, 2016, from http://www.pewinternet.org/~/media//Files/Reports/2009/PIP_Generations_2009.pdf

Purdie, N., & Boulton-Lewis, G. (2003). The learning needs of older adults. *Educational Gerontology*, *29*, 129–149. doi:10.1080/713844281

Reed, K., Doty, H., & May, D. (2005). The impact of aging on self-efficacy and computer skill acquisition. *Journal of Managerial Issues*, *17* (2), 212–228.

Renaud, K., & Ramsay, J. (2007). Now what was that password again? A more flexible way of identifying and authenticating our seniors. *Behaviour and Information Technology*, *26* (4), 309–322. doi:10.1080/01449290601173770

Riva, G., Baños, R. M., Botella, C., Wiederhold, B. K., & Gaggioli, A. (2012). Positive technology: Using interactive technologies to promote positive functioning. *Cyberpsychology, Behavior, and Social Networking*, *15* (2), 69–77. doi:10.1089/cyber.2011.0139

Rogers, W. A., & Fisk, A. D. (2010). Toward a psychological science of advanced technology design for older adults. *Journal of Gerontology: Psychological Sciences*, *65* (6), 645–653. doi:10.1093/geronb/gbq065

Rogers, W. A., Fisk, A. D., McLaughlin, A. C., & Pak, R. (2005). Touch a screen or turn a knob: Choosing the best device for the job. *Human Factors*, *47* (2), 271–288. doi:10.1518/0018720054679452

Russell, C., Campbell, A., & Hughes, I. (2008). Ageing, social captial and the internet: Findings from an exploratory study of Australian "silver sufers.". *Australasian Journal of Ageing*, *27* (82), 78–82. doi:10.1111/j.1741-6612.2008.00284.x

Strada, C., Brivio, E., & Galimberti, C. (2013). Digital education for older generation non native users: A focused ethnography study of a pilot project. *Qwerty - Open and Interdisciplinary Journal of Technology, Culture and Education*, *8* (2), 44–57.

Tacken, M., Marcellini, F., Mollenkopf, H., Ruoppila, I., & Szeman, Z. (2005). Use and acceptance of new technology by older people: Findings of the international MOBILATE survey "Enhancing Mobility in Later Life". *Gerontechnology*, *3*, 126–137. doi:10.4017/gt.2005.03.03.002.00

Tam, M. (2014). A distinctive theory of teaching and learning for older learners: Why and why not? *International Journal of Lifelong Education*, *33* (6), 811–820. doi:10.1080/02601370.2014.972998

Tam, M. (2016). Later life learning experiences: Listening to the voices of Chinese elders in Hong Kong. *International Journal of Lifelong Education*, *35* (5), 569–585. doi:10.1080/02601370.2016.1224042

Tam, M., & Chui, E. (2016). Ageing and learning: What do they mean to elders themselves?. *Studies in Continuing Education*, *38* (2), 195–212. doi:10.1080/0158037X.2015.1061492

van Het Reve, E., Silveira, P., Daniel, F., Casati, F., & de Bruin, E. D. (2014). Tablet-based strength-balance training to motivate and improve adherence to exercise in independently living older people: Part 2 of a PHASE II PRECLINICAL EXPLORATORY TRIAL. *Journal of Medical Internet Research*, *16* (6), 1–18. doi:10.2196/jmir.3055

Vasconcelos, A., Silva, P. A., Caseiro, J., Nunes, F., & Teixeira, L. F. (2012). Designing tablet-based games for seniors. In *Proceedings of the 4th international conference on fun and games—FnG '12* (pp. 1–10). New York, NY: ACM Press. https://doi.org/10.1145/2367616.2367617

Vekiri, I., & Chronaki, A. (2008). Gender issues in technology use: Perceived social support, computer self-efficacy and value beliefs, and computer use beyond school. *Computers and Education*, *51* (3), 1392–1404. https://doi.org/10.1016/j.compedu.2008.01.003

White, J., & Weatherhall, A. (2000). A grounded theory analysis of older adults and information technology. *Educational Gerontology*, *26*, 371–386. doi:10.1080/036012700407857

Wood, E., Willoughby, T., Rushing, A., Bechtel, L., & Gilbert, J. (2005). Use of computer input devices by older adults. *Journal of Applied Gerontology*, *24* (5), 419–438. doi:10.1177/0733464805278378

Xie, B. (2007). Information Technology education for older adults as a continuing peer-learning process: A Chinese case study. *Educational Gerontology*, *33* (5), 429–450. doi:10.1080/03601270701252872

YingWang, M., Chang, C., & Su, S. (2011). What's cooking? – Cognitive training of executive function in the elderly. *Frontiers in Psychology*, *2* (228), 1–11.