

ICT volunteering as a protective factor for older adults: investigating motives of internet use, internet self-efficacy and perceived obsolescence

Mario R. Jokisch, Linda Göbl, Joshua Schlichting, David Leopold & Michael Doh

To cite this article: Mario R. Jokisch, Linda Göbl, Joshua Schlichting, David Leopold & Michael Doh (2023) ICT volunteering as a protective factor for older adults: investigating motives of internet use, internet self-efficacy and perceived obsolescence, Educational Gerontology, 49:5, 387-399, DOI: [10.1080/03601277.2023.2201763](https://doi.org/10.1080/03601277.2023.2201763)

To link to this article: <https://doi.org/10.1080/03601277.2023.2201763>



© 2023 The Author(s). Published with license by Taylor & Francis Group, LLC.



Published online: 16 May 2023.



Submit your article to this journal [↗](#)



Article views: 15



View related articles [↗](#)



View Crossmark data [↗](#)

ICT volunteering as a protective factor for older adults: investigating motives of internet use, internet self-efficacy and perceived obsolescence

Mario R. Jokisch , Linda Göbl, Joshua Schlichting, David Leopold, and Michael Doh

Institute for Applied Research IAF, Catholic University of Applied Sciences Freiburg, Freiburg, Germany

ABSTRACT

To successfully use information and communication technologies (ICT) for aging processes, older adults need to have a variety of skills. This study examined whether volunteering is a critical resource for older adults in dealing with the motives for internet use, higher internet self-efficacy, and lower obsolescence. For this purpose, a distinction was made between older adults who perform voluntary work in the ICT field, voluntary work outside the ICT field, and older non-volunteers. In the study, 331 older adults (mean, 70 years; range, 60–90 years; 39% female) participated in an online questionnaire and were subsequently divided into three groups (ICT volunteers, non-ICT volunteers, and non-volunteers) based on the replies. As expected, ICT volunteers were characterized by more motives for using the internet, higher internet self-efficacy, and lower perceived obsolescence, and significant variance in the components of these constructs were explained by volunteer status. Interactions indicated a buffer effect, according to which ICT volunteering compensates for higher age and educational disadvantages in the context of internet self-efficacy. References to social support, age and cohort effects, and training programs are discussed.

Introduction

Rapidly advancing digitalization and the dissemination of information and communication technologies (ICT) offer many opportunities to support the lives of older adults. However, older adults in particular often do not have access to these new technologies or are unable to use them (Seifert & Cotten, 2022). As a result, they are at greater risk of feeling excluded from a digitally dominated society (Hunsaker & Hargittai, 2018; Jokisch & Göbl, 2022; Seifert et al., 2018). Out of this situation arises the responsibility to better understand the consequences of the digital divide for aging and how it can be reduced (Charness & Boot, 2022).

Older adults still have the least access to the internet: While 81% of Germans over the age of 60 years use the internet, only 51% of those over 80 years do so (first stage of the digital divide). Many more do not have sufficient skills to cope with the demands of modern technologies (second stage of the digital divide; Rathgeb et al., 2022). Moreover, older adults are more likely to use outdated ICT, so many digital services could not be used in practice even if access and skills were provided (Gray & Charness, 2022).

However, older adults are a very heterogeneous group that also includes experts with many resources to overcome various challenges, such as social relationships and meaningful social engagement, which are important components of successful aging (Kahana & Kahana, 1996; Rowe & Kahn,

CONTACT Mario R. Jokisch  mario.jokisch@gero.uni-heidelberg.de  Catholic University of Applied Sciences Freiburg, Karlstraße 63, 79104 Freiburg, Germany

© 2023 The Author(s). Published with license by Taylor & Francis Group, LLC.

This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0/>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited. The terms on which this article has been published allow the posting of the Accepted Manuscript in a repository by the author(s) or with their consent.

1997). Voluntary activities, which are defined as activities ‘undertaken for a non-profit cause, benefiting the personal development of the volunteer, who commits their time and energy for the general good without financial reward’ (European Youth Forum, 2012, p. 7), are an expression of these resources in older age. Volunteering is associated with many positive effects, such as better cognitive performance and well-being (Anderson et al., 2014; Proulx et al., 2018), as well as less hospitalization and lower mortality (Anderson et al., 2014; Okun et al., 2010; Yuen et al., 2004), access to greater social support and networking (Anderson et al., 2014), and higher self-efficacy (Müller et al., 2014).

The benefits associated with volunteering can presumably be transferred to the use of digital technologies and the adaptation to the digital transformation of society, especially when volunteering takes place in an ICT context. To better understand the protective potential of ICT volunteering, this study examined three groups (ICT volunteers, non-ICT volunteers, non-volunteers) of older adults (at least 60 years old) in Germany with regard to their motives for internet use, internet self-efficacy, and perceived obsolescence.

Potentials of ICT volunteering

The general benefits associated with volunteering also seem to be relevant for the ICT field and the use of the internet. Filsinger et al. describe the mutual influence of volunteering and internet use as a ‘positive, reciprocal relationship inducing a virtuous circle’ (Erhardt & Freitag, 2019, as cited in Filsinger et al., 2019, p. 19). This means that there are two effect directions. First, the internet promotes volunteering and encourages less educated or unemployed people or those living in rural areas to volunteer (Filsinger et al., 2019). Second, volunteering could help support better coping with the challenges of digitalization, as the internet is used by the majority of volunteers for their engagement, which allows usage to be started or intensified (Simonson et al., 2021). The first studies on this subject have suggested, for example, that people use digital health information more often when volunteering in the ICT field (Choi & Dinitto, 2013). By volunteering in the ICT field, we mean volunteers who teach others how to use ICT (e.g., technology companions, ICT teachers, and peer tutors). In the following sections, the relevance and possible benefits of volunteering for the motives of internet use, internet self-efficacy, and perceived obsolescence are presented.

Motives for internet use in old age

Use and Gratification theory states that people actively use media to strategically pursue individual goals, and based on this, they choose appropriate media to achieve these goals (Rosengren, 1985). A greater number of for using a technology indicates that a person sees more meaningful applications for the technology in his or her daily life. The main motives for internet use among older adults are seeking information, finding out useful things for everyday life, and having fun (Breunig & Engel, 2015; Camilleri & Falzon, 2021). In the representative Senior Citizens Information Media Study of people over 60 years, 81% of respondents in Germany said they use search engines at least weekly and 75% use WhatsApp or other messaging services at least weekly (Rathgeb et al., 2022). Nevertheless, it can be seen that, especially in old age, the internet is used less and fewer basic activities (e.g., e-mail and shopping) are used compared to older age (van Deursen & Helsper, 2015). This implies that older adults still see fewer areas in which they can meaningfully integrate digital technologies into their everyday life. However, it must also be taken into account that for some applications (e.g., digital health services), a high level of interest exists, but some functions are not available or are available only for a short period of time (Jokisch et al., 2022).

According to this, developing motives for using the internet is a major challenge among older adults. Volunteers should have an advantage in this respect, especially if the volunteering takes place in the ICT context. There are indications that this contributes to higher digital skills and also to a better understanding of digital technologies (Pihlainen et al., 2021; Raiziene et al., 2022). In addition, volunteering related to health-related issues has been shown to increase the likelihood of using the internet for health-related purposes (Choi & Dinitto, 2013).

Self-efficacy as a crucial resource for overcoming digital challenges

Self-efficacy was introduced in the framework of *social cognitive theories* and can be trained for different domains of life (Bandura, 1977). It has been shown that computer and internet-related self-efficacy is an important factor for the use of technologies and is more pronounced in younger than in older adults (Czaja et al., 2006). In the *technology acceptance model* (Davis, 1989), internet self-efficacy was shown to be the decisive factor for the acceptance of the internet and dominated the model, especially for people above the age of 75 years (Jokisch et al., 2022).

Research has shown that older volunteers in the field of ICT have a more positive technology biography and higher internet self-efficacy compared to non-volunteers (Jokisch et al., 2020). This can be explained through two mechanisms: First, higher self-efficacy increases the likelihood of volunteering, and second, volunteering in the field of ICT brings up many opportunities to increase self-efficacy (Jokisch, 2022). According to Bandura (1977), mastery experience is the most important source of self-efficacy, which is promoted by working as a knowledge mediator in the ICT field.

Perceived obsolescence and the subjective consequences of digital exclusion

The concept of *perceived obsolescence* originates from life span psychology and is defined as a gradual loss of social integration and perceived lack of competence to deal with the demands of modern society (Brandtstädter & Wentura, 1994). Perceived obsolescence is a part of older adults' future time perspective and captures whether the person feels able to plan their future in the context of current societal change. Evidence that this concept is related to the use of technology and the internet has emerged in the last decade. Research related to the technology acceptance model (Davis, 1989) has shown a negative correlation between perceived obsolescence and the perceived usefulness of a cleaning robot (Claßen, 2012). Moreover, perceived obsolescence has proven to contribute significantly to the time required and the number of errors made when working on a technological task (Schmidt & Wahl, 2019).

Previous studies have found that training as a volunteer in the ICT field can reduce perceived obsolescence (Jokisch, 2022), but it is still unclear whether this is due to volunteering in general or to the combination of volunteering and ICT. In this respect, perceived obsolescence can be seen as a facet of subjective digital exclusion.

Research questions

The literature review points out the first evidence that volunteering and ICT use are related among older adults. This study therefore sought to quantitatively examine whether volunteer status (volunteering in the ICT field, volunteering outside the ICT field, and no volunteering) is related to the motives for using the internet, internet self-efficacy, and perceived obsolescence among older adults in Germany. We predicted that volunteering in the ICT field, compared to volunteering outside the ICT field and non-volunteering, would be associated with higher and more diverse motives for using the internet, higher internet self-efficacy, and lower perceived obsolescence. Similarly, volunteers outside the ICT field were expected to have higher and more varied motives for using the internet, higher internet self-efficacy, and lower perceived obsolescence compared to non-volunteers. Furthermore, we predicted that volunteering in the field of ICT and volunteering outside the field of ICT would be important predictors of motives for using the internet, internet self-efficacy, and perceived obsolescence beyond sociodemographic variables, and that they would explain significant proportions of the variance within the three constructs. Figure 1 depicts a schematic representation of this framework.

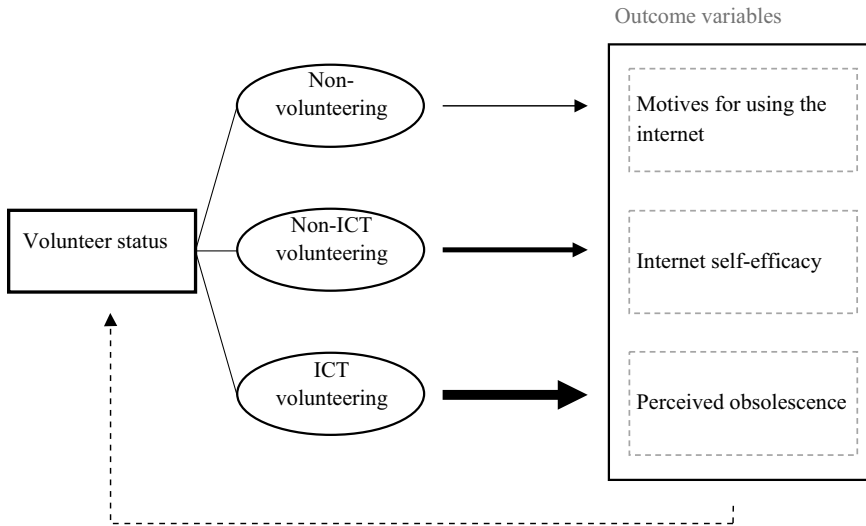


Figure 1. Schematic framework of the study. Volunteer status (on the left) is expected to predict the outcome variables (on the right), with the size of the arrow indicating the strength of the relationship. The reciprocal effect of the outcome variables on volunteer status (dotted arrow) is assumed, but not tested in the study.

Methods

Study design and sample

The cross-sectional study was conducted as part of the DiBiWohn project (short for: Digital educational processes for older residents in assisted living arrangements and care facilities), which is funded by the Federal Ministry of Education and Research in Germany and aims to provide digital educational services for older adults. This online-based survey took place online from May to June 2021 as part of a baseline survey to capture media-related gerontological aspects of older adults, but also to include topics such as volunteering, educational activities, and participation in the community. The questions used were taken from or based on established constructs (see the Measures section); furthermore, the target group can be classified as having an affinity to education and the internet, which is why the questionnaire was not piloted. The questionnaire was disseminated through senior citizen and volunteer networks throughout Germany, but is thus not to be considered representative. Participants did not receive any financial compensation and agreed to the data protection guidelines in accordance with the General Data Protection Regulation and the voluntary nature of participation in the survey.

A total of 331 individuals finished the survey. Participants who stopped answering the survey before completion were not included in the sample. The participants ranged in age from 60 to 90 years, with an average age of 70.4 years; 39% of the respondents were female, 82.2% had a high level of education (as indicated by a university entrance qualification or higher), 10.6% had a medium level (secondary school diploma), and 7.3% had a low level (no school-leaving certificate or lower secondary education with or without apprenticeship). Among the older adults, $n = 171$ reported being actively engaged as volunteers in the field of ICT (ICT volunteers), $n = 95$ were generally active as volunteers (non-ICT volunteers), and $n = 65$ were not engaged in voluntary work (non-volunteers). A socio-demographic description of the three groups is shown in Table 1. While the average age was similar across the three groups, the high proportion of men among ICT volunteers is striking (66.7%), compared to volunteers outside the field of ICT (55.8%) and those who do not volunteer (53.9%).

Table 1. Sample characteristics of the entire group and ICT volunteering, Non-ICT Volunteering, and non-volunteering subgroups.

Variable	Total sample N = 331	ICT volunteering n = 171	Non-ICT volunteering n = 95	Non- volunteering n = 65	Comparison		
					F-/ χ^2 -test	p value	Effect size
Age (M, SD)	70.44 (5.76)	70.43 (5.75)	71.52 (5.98)	68.88 (5.12)	F(2, 328) = 4.133	.017	$\eta^2 = .025$
Gender (male)	61%	66.7%	55.8%	53.9%	$\chi^2(2) = 4.792$.091	V = .120
Education level ^a					F(2, 167.219) = 8.342	.001	$\omega^2 = .042$
Low	1.5%	2.3%	0%	1.5%			
Medium	16.3%	19.9%	12.6%	12.3%			
High	82.2%	77.8%	87.4%	86.2%			
Income					F(2, 258) = 0.933	.001	$\eta^2 = .007$
<€1,000	1.5%	2.2%	1.3%	0%			
€1,000–€3,000	36.8%	38.5%	36.4%	32.7%			
>€3,000	61.7%	59.3%	62.3%	67.4%			
Volunteering Amount per month (in hours) ^b		25.08 (31.29)	14.71 (24.38)		F(1, 235.684) = 8.968	.003	$\omega^2 = .47$

^aLow = no school-leaving certificate or lower secondary education with or without apprenticeship; Medium = secondary school diploma; High = university entrance qualification and higher.

^bTime is written as a decimal fraction of hours. The decimals can be converted to minutes by multiplying by 60.

Measures

The three outcome variables – internet usage motives, internet self-efficacy and perceived obsolescence – were measured by presenting the participants with statements and asking them to rate their agreement on a 5-point Likert scale ranging from 1 ('do not agree at all') to 5 ('fully agree'). [Appendix A](#) gives an overview of all of the items and their sources. *Internet usage motives* were measured with 14 items that completed the sentence 'I use the internet . . .' Ten items were taken from the ARD/ZDF long-term mass communication study (Breunig & Engel, 2015; Breunig et al., 2020), which thematically comprised information- (e.g., 'because I want to get information') and entertainment-oriented motives (e.g., 'because I enjoy it') as well as usage mood (e.g., 'because it allows me to relax') and the exclusivity of the internet (e.g., 'because there is content there that I can only find there'). Four additional items were self-developed to include communication- and network-related motives (e.g., 'because I can exchange with others'). A high mean value across the items indicates a large number of motives. *Internet self-efficacy*, as conceptualized by Eastin and LaRose (2000), was assessed with a 6-item scale based on instruments used by Schenk and Scheiko (2011) and Rathgeb et al. (2022). Respondents were asked about the extent to which they feel confident in tackling various challenges (e.g., 'using the internet to research information'). The 5-item scale to measure *perceived obsolescence* was based on Brandtstädter and Wentura (1994). It assesses how the individual perceives the present time (e.g., 'Life is getting more complicated and harder for me to understand'). The internal consistency of the three outcome variables was good to excellent (usage motives: $\alpha = .86$; internet self-efficacy: $\alpha = .77$; obsolescence: $\alpha = .78$; Kline, 2013).

The predictor variable *volunteer status* was determined with two questions. ICT volunteering was assessed with the question 'Are you engaged in the field of ICT (e.g., tablet, smartphone, internet, etc.) as a mediator?' Non-ICT volunteering was surveyed with the question 'Do you do any other volunteering or community work?' Participants who responded 'no' to both questions were classified as non-volunteers.

Statistical procedure

The statistical analyses were carried out with IBM SPSS Statistics version 27. Discrete variables were tested for group differences with χ^2 tests. Cramer's *V* was used as a measure of effect size,

quantifying the strength of differences (small effect: $V = .01$; medium effect: $V = .03$; large effect: $V = .05$; Cohen, 2013). For metric variables, ANOVAs were used, employing η^2 to quantify the effect size (small effect: $\eta^2 = .01$; medium effect: $\eta^2 = .06$; large effect: $\eta^2 = .14$; Cohen, 2013). Education did not meet the ANOVA assumption of variance homogeneity. Therefore, a robust Welch-ANOVA was used for this variable, with the effect size measure ω^2 , which can be interpreted in the same way as η^2 .

The hypotheses were addressed in two stages. First, group differences in the three outcome variables internet usage motives, internet self-efficacy, and perceived obsolescence were examined, using independent t-tests with Cohen's d as a measure of effect size (small effect: $d = .20$; medium effect: $d = .50$; large effect: $d = .80$; Cohen, 2013). Second, hierarchical linear regressions were calculated for each outcome variable to examine the predictive strength and the variance explained by volunteer status beyond socio-demographic variables. For this purpose, volunteer status was dummy coded: The dummy variable 'volunteering ICT' represents ICT volunteers with the value 1 and other groups with the value 0. The variable 'non-ICT volunteering' represents non-ICT volunteers with the value 1 and other groups with the value 0. Thus, non-volunteers were assigned the value 0 for both dummy variables. The adjusted R^2 indicates how much variance in the dependent variable each model explains, which is tested for significance against the prediction of the regression constant.

Results

Comparison of ICT volunteers, non-ICT volunteers and non-volunteers

Looking at the demographic variables, the age distribution among ICT volunteers ($n = 171$, $M = 70.43$, $SD = 5.75$), non-ICT volunteers ($n = 95$, $M = 71.52$, $SD = 5.98$), and non-volunteers ($n = 65$, $M = 68.88$, $SD = 5.12$) differed slightly but significantly ($F(2, 328) = 4.13$, $p = .017$, $\eta^2 = 0.02$). Further, the groups had significantly different education levels ($F(2, 167.22) = 8.34$, $p < .001$, $\omega^2 = 0.04$). However, the groups showed no differences regarding gender ($\chi^2(2) = 4.79$, $p = .091$, $V = 0.12$) or household income ($F(2, 258) = 0.93$, $p = .395$, $\eta^2 < 0.01$). ICT volunteers invested significantly more time into volunteering ($M = 25.08$ hours per month, $SD = 31.29$) than non-ICT volunteers ($M = 14.71$, $SD = 24.38$; $F(1, 235.684) = 8.968$, $p = .003$, $\omega^2 = .47$; Table 1). It is important to note that 84% of ICT volunteers also volunteered outside of the ICT field, with a mean engagement of 9.92 hours per month ($SD = 14.16$) in the ICT field and 18.13 hours ($SD = 26.19$) outside the ICT field.

The groups differed significantly in the three outcome variables (Table 2). ICT volunteers reported the highest mean value for usage motives ($M = 3.34$, $SD = 0.63$), which was significantly higher in comparison to non-ICT volunteers ($M = 3.00$, $SD = 0.59$, $t(264) = -4.35$, $p < .001$, $d = 0.56$) and non-volunteers ($M = 2.99$, $SD = 0.71$, $t(234) = -3.68$, $p < .001$, $d = 0.54$). Non-ICT volunteers and non-volunteers did not differ significantly in their motives for using the internet ($t(158) = -0.06$, $p = .952$, $d = 0.01$).

Table 2. Group differences in all study variables.

	ICT volunteering		Non-ICT volunteering		Non-volunteering		Comparison	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>F</i> -test	η^2/ω^2
Motives for internet use ^a	3.34	2.99	3.00	0.59	2.99	0.71	12.229***	.069
Internet self-efficacy ^a	4.50	0.53	4.15	0.65	4.12	0.77	13.959***	.073
Perceived obsolescence ^a	1.90	0.65	1.96	0.57	2.10	0.73	2.372	.014

^aScale range 1 (lowest) to 5 (highest).

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

A similar pattern was found for internet self-efficacy: ICT volunteers had the highest mean internet self-efficacy ($M = 4.50, SD = 0.53$), which was also significantly higher than the internet self-efficacy of non-ICT volunteers ($M = 4.15, SD = 0.65, t(163.38) = -4.46, p < .001, d = 0.61$) and non-volunteers ($M = 4.12, SD = 0.77, t(87.538) = -3.69, p < .001, d = 0.64$). Again, the difference between non-ICT volunteers and non-volunteers was nonsignificant ($t(158) = -0.33, p = .742, d = 0.05$).

The lowest mean perceived obsolescence was reported by the ICT volunteers ($M = 1.90, SD = 0.65$). This was significantly lower than the ratings of non-volunteers ($M = 2.10, SD = 0.73, t(234) = 2.09, p = .038, d = 0.30$), but there was no difference with non-ICT volunteers ($M = 1.96, SD = 0.57, t(264) = 0.75, p = .456, d = 0.10$). Further, non-ICT volunteers did not differ in perceived obsolescence from non-volunteers ($t(158) = 1.41, p = .146, d = 0.23$).

Regression analyses: relations with motives, internet self-efficacy, and perceived obsolescence

Multiple regression analysis are depicted in Table 3. For the motives for using the internet, ICT volunteering was the strongest predictor ($\beta = 0.28, p < .001$). Non-ICT volunteering did not predict higher usage motives than non-volunteering. Among the demographic variables, gender was the only significant predictor ($\beta = -0.11, p = .045$). No significant interactions were found. The full model accounts for 6.9% of the variance in usage motives.

For internet self-efficacy, lower age ($\beta = -0.16, p = .009$), male gender ($\beta = 0.15, p = .002$), and higher levels of education ($\beta = 0.35, p < .001$) predicted higher self-efficacy. While non-ICT volunteering was not significant, ICT volunteering was the strongest predictor of internet self-efficacy ($\beta = 0.69, p < .001$). In addition, the interactions of age with non-ICT volunteering ($\beta = -0.15, p = .011$) and education with ICT volunteering ($\beta = -0.44, p = .001$) further predicted internet self-efficacy, leading to a total explained variance of 20.9%.

Two figures were created to illustrate this effect between the two volunteer groups with regard to internet self-efficacy. Figure 2 illustrates how the internet self-efficacy among ICT volunteers remains stable across low, medium, and high education, whereas among non-ICT volunteers, internet self-efficacy decreased as the level of education declined. Figure 3 illustrates how the internet self-efficacy of ICT volunteers decreased less with increasing age than it did for non-ICT volunteers.

In the regression analysis for perceived obsolescence, ICT volunteering again emerged as the strongest predictor ($\beta = -0.18, p = .012$). Higher age was associated with higher perceived obsolescence ($\beta = 0.18, p = .002$). No interactions between socio-demographic variables and volunteering group were significant. The full model explained 3.8% of variance in perceived obsolescence.

Table 3. Linear regression model for the outcome variables motives for internet use, internet self-efficacy, and perceived obsolescence.

	Motives for internet use		Internet self-efficacy		Perceived obsolescence	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
Age ^a	-.036	-.036	-.241***	-.159**	.160**	.175**
Gender (f = 0, m = 1)	-.075	-.108*	.196***	.153**	-.060	-.048
Education level (low/medium = 0, high = 1)	-.064	-.032	.092	.338***	-.053	-.063
Volunteering (no = 0, yes = 1)		.014		.075		-.136
ICT volunteering (no = 0, yes = 1)		.282***		.688***		-.182*
Age*ICT volunteering		n.s.		-.154*		n.s.
Education level*ICT volunteering		n.s.		-.442**		n.s.
Adjusted R ²	.002	.069	.096	.209	.023	.036
F-Test of model prediction	1.208	5.900***	12.706***	13.467***	3.611*	3.480**

^az-standardized.

$N = 331$ for all models. Further interactions were tested but were not significant.

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

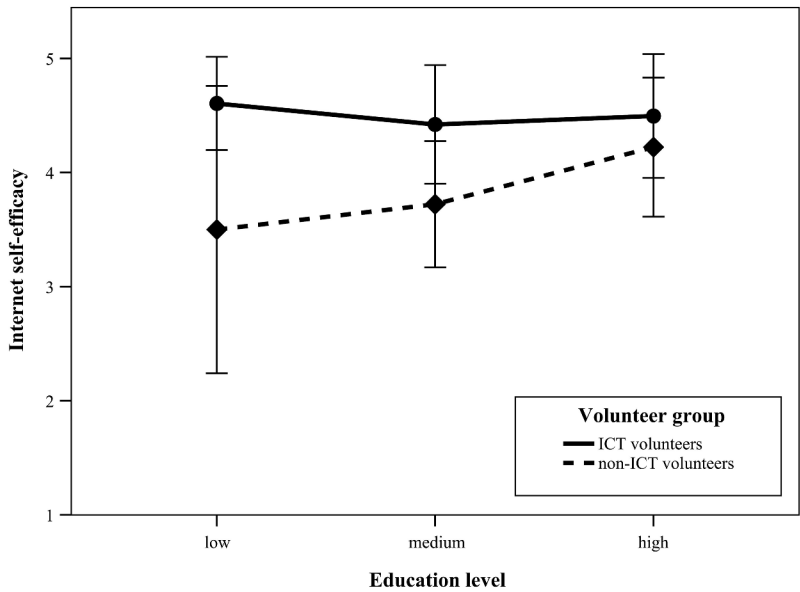


Figure 2. Education differences in mean reported Internet self-efficacy for the two volunteer groups. Error bars represent one standard error. Education level is grouped into low (no school-leaving certificate or lower secondary education with or without apprenticeship), medium (secondary school diploma), and high (university entrance qualification and higher).

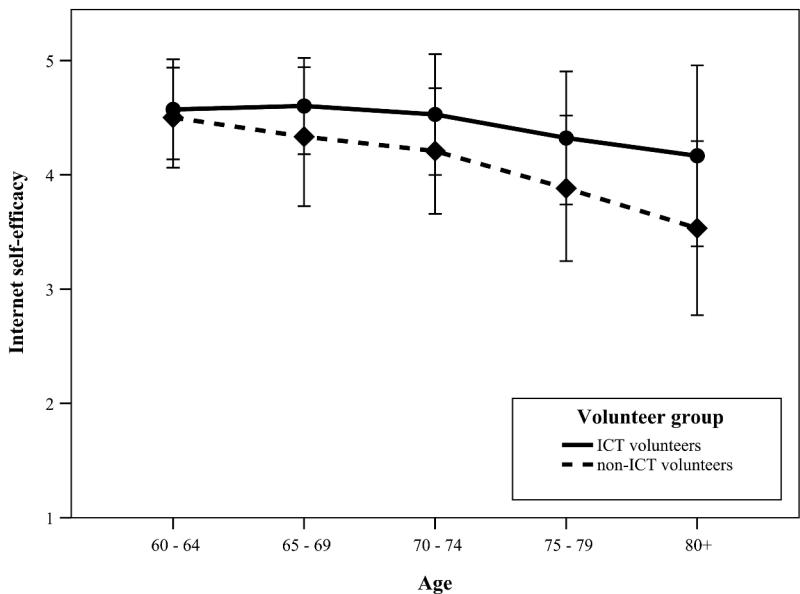


Figure 3. Age difference in mean reported Internet self-efficacy for the two volunteer groups. Error bars represent one standard error. Age is grouped as indicated.

Discussion

The purpose of the study was to investigate whether volunteering in older age can help older adults to cope better with the demands of digitalization. To this end, three groups of older adults who differed in

volunteer status were compared in terms of their motives for using the internet, internet self-efficacy, and perceived obsolescence.

As expected, comparing the three groups showed that older adults volunteering in the ICT field had the most motives for using digital technologies, the highest internet self-efficacy, and the lowest perceived obsolescence. Contrary to the assumptions, no difference was found between non-ICT volunteers and non-volunteers. The regression analyses examined this relationship in more detail and confirmed that non-ICT volunteering did not significantly predict motives, internet self-efficacy, and perceived obsolescence. In contrast, ICT volunteering was able to explain significant variance beyond the socio-demographic variables.

This indicates that ICT volunteering not only improves the understanding of digital technologies, as found in previous studies (Pihlainen et al., 2021; Raiziene et al., 2022), but also leads to more motives for and thus more areas of application for internet use. It can be assumed that this results from both the increased ICT competencies and from the volunteering context. The latter often involves an intensive exchange with other ICT volunteers, which can support the development of motives for using the internet.

The results further indicated that a characteristic feature of ICT volunteers is their higher internet self-efficacy. This is important in view of previous findings that computer and internet self-efficacy tends to be lower in older age and at lower levels of education (Jokisch et al., 2022). The interactions of internet self-efficacy with age and education found in this study suggest that ICT volunteering could represent a buffer that reduces the negative effect of high age and low education on internet self-efficacy. This result can probably be traced back to two essential processes: First, volunteering requires volunteers to identify barriers and uses for technologies at an early stage. Second, other volunteers can provide social support and serve as role models. This kind of vicarious experience can continuously increase self-efficacy (Bandura, 1977).

With regard to perceived obsolescence, it was found that ICT volunteers had significantly lower scores. This may indicate that volunteering in the ICT field not only contributes to the use of digital technologies, but also that it enhances older adults' self-perception of being part of modern society in general. The small size of the differences could be attributed to the features of the comparison groups: The non-volunteering group, in particular, was characterized by above-average education, income, self-efficacy, and number of motives for using the internet.

Finally, the nonsignificant differences between non-ICT volunteers and non-volunteers have to be interpreted with caution. There is considerable evidence in the literature as to why volunteers in general use ICT more intensively to carry out their activities (Simonson et al., 2021). The lack of a difference in this study could thus be due to a selection bias, as indicated by the high socio-economic resources of the comparison group of non-volunteers.

Limitations

The study is associated with a number of limitations. First, it was a cross-sectional study, which means that the effect directions of all relationships are only theoretically informed and cannot be causally interpreted. Accordingly, it is not possible to differentiate more precisely whether older adults who already have strong self-efficacy and motives for using the internet engage in voluntary work due to these existing resources, or whether self-efficacy and motives are increased through volunteering. Nevertheless, we assumed a reciprocal process, which needs to be investigated in more detail in the future. Second, older adults are an extremely heterogeneous population, which could not be covered representatively in the present study. In particular, older adults who do not use the internet or who have very few skills in using it are not represented in the group of non-volunteers, as the study was conducted online. This also implies that the groups surveyed had more motives for using the internet, as it was only possible to take part in the survey online. Third, volunteering could be studied in more detail, taking into account the organizational structures in which the volunteers operate, the type of support provided therein, and the differing levels of expertise among the volunteers.

Theoretical implications

In our rapidly changing world, dealing with digitalization is an ongoing process in which new knowledge and skills have to be acquired constantly. Simultaneously, knowledge and skills that have been built up through training sooner or later become obsolete. It is therefore necessary to create structures that enable permanent learning. For example, in the instance of the adoption of new digital health services among older adults, more support is associated with higher self-efficacy in using digital health services and more frequent adoption of this new technology (Jokisch et al., 2022). We believe that ICT volunteers have already built these learning structures and that this is accompanied by high levels of adaptability, allowing for a quicker and more efficient adoption of new technologies. We would define this as connected ICT competence.

It is still unclear to what extent age and cohort effects are responsible for the negative relation between increasing age and decreasing use of digital technologies or self-efficacy (Czaja et al., 2006). Age effects could be buffered by ICT volunteering, because volunteering creates a stimulating environment and could positively influence cognitive factors. In addition, volunteering gives access to more support. This can help maintain technology use longer, even in the context of risk factors such as incipient mild cognitive impairment, which has been shown to have a negative impact on technology use (Schmidt & Wahl, 2019).

Practical implications

Aside from the discussed potential positive effects of volunteering for the volunteer, these activities could help to reduce the digital divide among different groups of older adults, and particularly among older adults who do not use the internet to this day and have not been reached by traditional course-based educational opportunities. For this target group, peer-mentoring concepts can create new access routes to educational opportunities and build ICT skills (Doh et al., 2017, 2015). Peer-mentoring is particularly promising when combined with a train-the-trainer approach. Here, older adults with no specific prior ICT knowledge are trained in the use of ICT and taught basic pedagogical skills, enabling them to pass on this knowledge in the role of teachers (Jokisch et al., 2022). Simultaneously, this concept creates and strengthens social networks, which can provide a resource for overcoming future challenges.

The Germany-wide Senior Technology Ambassadors initiative followed these approaches and trained 300 older ICT volunteers, who then mentored up to 1,500 technically inexperienced older adults in their neighborhoods. The following factors were decisive for the success of peer-mentoring concepts: (a) individualized learning settings that respect individual competencies and learning speeds, (b) sufficient time for practice and repetition, (c) small groups with direct contact between teachers and learners, (d) teachers and learners of similar age, (e) use of own mobile devices, (f) use of both paper-based and digital handouts, and (g) institutionalized educational opportunities complemented by informal support settings (regular and informal meetings and home visits; Doh et al., 2017, 2016).

Disclosure statement

No potential conflict of interest was reported by the author(s).

Funding

This work was funded by the Federal Ministry of Education and Research in Germany.

ORCID

Mario R. Jokisch  <http://orcid.org/0000-0003-2066-9281>

Data availability statement

Data analyzed during this study are available from the corresponding author upon reasonable request.

References

- Anderson, N. D., Damianakis, T., Kröger, E., Wagner, L. M., Dawson, D. R., Binns, M. A., Bernstein, S., Caspi, E., & Cook, S. L. (2014). The benefits associated with volunteering among seniors: A critical review and recommendations for future research. *Psychological Bulletin*, *140*(6), 1505–1533. <https://doi.org/10.1037/a0037610>
- Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review*, *84*(2), 191–215. <https://doi.org/10.1037/0033-295X.84.2.191>
- Brandtstädter, J., & Wentura, D. (1994). Veränderungen der Zeit- und Zukunftsperspektive im Übergang zum höheren Erwachsenenalter: Entwicklungspsychologische und differentielle Aspekte [Changes in time and future perspectives in the transition to older adulthood: Developmental psychology and differential aspects]. *Zeitschrift für Entwicklungspsychologie und Pädagogische Psychologie*, *26*(1), 2–21.
- Breunig, C., & Engel, B. (Eds.). (2015). Massenkommunikation 2015: Funktionen und images der Medien im Vergleich [Mass communication 2015: Comparison of media functions and images]. *Media Perspektiven*, 7–8, 323–341. https://www.ard-media.de/fileadmin/user_upload/media-perspektiven/pdf/2015/07082015_Breunig_Engel.pdf
- Breunig, C., Handel, M., & Kessler, B. (2020). Massenkommunikation 2020: Nutzungsmotive und Leistungsbewertung der Medien [Mass communication 2020: Usage motives and performance ratings of the media]. *Media Perspektiven*, *12*, 602–625. https://www.ard-media.de/fileadmin/user_upload/media-perspektiven/pdf/2020/1220_Breunig_Handel_Kessler.pdf
- Camilleri, M. A., & Falzon, L. (2021). Understanding motivations to use online streaming services: Integrating the technology acceptance model (TAM) and the uses and gratifications theory (UGT). *Spanish Journal of Marketing-ESIC*, *25*(2), 217–238. <https://doi.org/10.1108/SJME-04-2020-0074>
- Charness, N., & Boot, W. R. (2022). A grand challenge for psychology: Reducing the age-related digital divide. *Current Directions in Psychological Science*, *31*(2), 187–193. <https://doi.org/10.1177/09637214211068144>
- Choi, N. G., & Dinitto, D. M. (2013). Internet use among older adults: Association with health needs, psychological capital, and social capital. *Journal of Medical Internet Research*, *15*(5), e97. <https://doi.org/10.2196/jmir.2333>
- Claßen, K. (2012). Zur Psychologie von Technikakzeptanz im höheren Lebensalter: Die Rolle von *Technikgenerationen* [Psychological factors and technology acceptance in older age: The role of technology generations] [Doctoral dissertation]. Heidelberg University. <https://doi.org/10.11588/heidok.00014295>
- Cohen, J. (2013). *Statistical power analysis for the behavioral sciences*. Routledge. <https://doi.org/10.4324/9780203771587>
- Czaja, S. J., Charness, N., Fisk, A. D., Hertzog, C., Nair, S. N., Rogers, W. A., & Sharit, 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. <https://doi.org/10.1037/0882-7974.21.2.333>
- Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, *13*(3), 319. <https://doi.org/10.2307/249008>
- Doh, M., Jokisch, M., Rupperecht, F., Schmidt, L., & Wahl, H. W. (2017). Förderliche und hinderliche Faktoren im Umgang mit neuen Informations- und Kommunikations-Technologien im Alter – Befunde aus der Initiative der „Senioren-Technik-Botschafter“ [Supporting and limiting factors for the exposure to new information and communication technologies by older adults – Findings from the initiative of the “Senior Technology Ambassadors”]. In C. Kuttner & C. Schwender (Eds.), *Mediale Lernkulturen im höheren Erwachsenenalter* (Vol. 12, pp. 223–242). kopaed.
- Doh, M., Schmidt, L., Herbolsheimer, F., Jokisch, M., Schoch, J., Dutt, A., Rupperecht, F., & Wahl, H.-W. (2016). Neue Technologien im Alter Ergebnisbericht zum Forschungsprojekt “FUTA” Förderliche und hinderliche Faktoren im Umgang mit neuen Informations- und Kommunikationstechnologien im Alter. Psychological Institute of the University of Heidelberg. <https://doi.org/10.13140/RG.2.2.12304.35846>
- Doh, M., Schmidt, L. I., Herbolsheimer, F., Jokisch, M., & Wahl, H. W. (2015). Patterns of modern ICT use among “senior technology experts”: The role of demographic variables, subjective beliefs and attitudes. In J. Zhou & G. Salvendy. (Eds.), *Human aspects of IT for the aged population* (pp. 177–188). Design for aging. Springer. <https://doi.org/10.1007/978-3-319-20892-3>
- Eastin, M. S., & LaRose, R. (2000). Internet self-efficacy and the psychology of the digital divide. *Journal of Computer-Mediated Communication*, *6*(1), JCMC611. <https://doi.org/10.1111/j.1083-6101.2000.tb00110.x>

- Erhardt, J., & Freitag, M. (2019). "The Janus-face of digitalization: The relation between internet use and civic engagement reconsidered," *Social Science Computer Review Online* first. *Journal of Gerontological Social Work*, 63(5), 428–446. <https://doi.org/10.1177/0894439319861966>
- European Youth Forum. (2012). *Volunteering charter: European charter on the rights and responsibilities of volunteers*. European Youth Forum.
- Filsinger, M., Ackermann, K., & Freitag, M. (2019). Surfing to help? An empirical analysis of internet use and volunteering in 27 European societies. *European Societies*, 22(3), 368–389. <https://doi.org/10.1080/14616696.2019.1663895>
- Gray, N., & Charness, N. (2022). Technology obsolescence across the adult lifespan in a USA internet sample. *Frontiers in Public Health*, 10. <https://doi.org/10.3389/fpubh.2022.1005822>
- Hunsaker, A., & Hargittai, E. (2018). A review of internet use among older adults. *New Media & Society*, 20(10), 3937–3954. <https://doi.org/10.1177/1461444818787348>
- Jokisch, M. R. (2022). *Altern in einer digitalisierten Gesellschaft: Studien zur Selbstwirksamkeit, Technikakzeptanz und dem Obsoleszenzerleben bei älteren Erwachsenen* [Aging in a digitalized society: Studies on self-efficacy, technology acceptance and perceived obsolescence among older adults] [Doctoral dissertation]. Ruprecht-Karls-Universität Heidelberg]. <https://doi.org/10.11588/heidok.00032076>
- Jokisch, M. R., Doh, M., Brehm, M., & Tatsch, I. (2022). Digitales Ehrenamt im Alter – Ein Schulungskonzept für ältere Begleitende. [Digital Volunteering in old age – A training concept for older volunteers]. In Schramek, J. Steinfort-Diedenhofen, & C. Kricheldorf (Eds.), *Diversität der Altersbildung - Geragogische Handlungsfelder, Konzepte und Settings* (pp. 201–213). Kohlhammer Verlag.
- Jokisch, M. R., & Göbl, L. (2022). *Leben Ohne Internet - Geht's noch? [Life without internet - Is it still going on?]: Erlebnisbericht im Auftrag der Bundesarbeitsgemeinschaft der Seniorenorganisationen (BAGSO)*. BAGSO.
- Jokisch, M. R., Scheling, L., Doh, M., & Wahl, H. W. (2022). Contrasting internet adoption in early and advanced old age: Does internet self-efficacy matter? *The Journals of Gerontology. Series B, Psychological Sciences and Social Sciences*, 77(2), 312–320. <https://doi.org/10.1093/geronb/gbab096>
- Jokisch, M. R., Schmidt, L. I., & Doh, M. (2022). Acceptance of digital health services among older adults: Findings on perceived usefulness, self-efficacy, privacy concerns, ICT knowledge, and support seeking. *Frontiers in Public Health*, 10. <https://doi.org/10.3389/fpubh.2022.1073756>
- Jokisch, M. R., Schmidt, L. I., Doh, M., Marquard, M., & Wahl, H.-W. (2020). The role of internet self-efficacy, innovativeness and technology avoidance in breadth of internet use: Comparing older technology experts and non-experts. *Computers in Human Behavior*, 111, 106408. <https://doi.org/10.1016/j.chb.2020.106408>
- Kahana, E., & Kahana, B. (Ed.). (1996). *Conceptual and empirical advances in understanding aging well through proactive adaptation*. Springer.
- Kline, P. (2013). *Handbook of psychological testing*. Routledge. <https://doi.org/10.4324/9781315812274>
- Müller, D., Ziegelmann, J. P., Simonson, J., Tesch-Römer, C., & Huxhold, O. (2014). Volunteering and subjective well-being in later adulthood: Is self-efficacy the key? *International Journal of Developmental Science*, 8(3–4), 125–135. <https://doi.org/10.3233/DEV-14140>
- Okun, M. A., August, K. J., Rook, K. S., & Newsom, J. T. (2010). Does volunteering moderate the relation between functional limitations and mortality? *Social Science & Medicine* (1982), 71(9), 1662–1668. <https://doi.org/10.1016/j.socscimed.2010.07.034>
- Pihlainen, K., Korjonen-Kuusipuro, K., & Kärnä, E. (2021). Perceived benefits from non-formal digital training sessions in later life: Views of older adult learners, peer tutors, and teachers. *International Journal of Lifelong Education*, 40(2), 155–169. <https://doi.org/10.1080/02601370.2021.1919768>
- Proulx, C. M., Curl, A. L., & Ermer, A. E. (2018). Longitudinal associations between formal volunteering and cognitive functioning. *The Journals of Gerontology. Series B, Psychological Sciences and Social Sciences*, 73(3), 522–531. <https://doi.org/10.1093/geronb/gbx110>
- Raiziene, S., Erentaite, R., Pakalniskiene, V., Grigutyte, N., & Crocetti, E. (2022). Identity Formation patterns and online activities in adolescence. *Identity*, 22(2), 150–165. <https://doi.org/10.1080/15283488.2021.1960839>
- Rathgeb, T., Doh, M., Tremmel, F., Jokisch, M. R., & Groß, A.-K. (2022). *SIM-Studie 2021: Senior*innen, Information, Medien. Basisuntersuchung zum Medienumgang von Personen ab 60 Jahren in Deutschland* [Seniors, Information, Media. Basic study on media use by people aged 60 and over in Germany]. Medienpädagogischer Forschungsverbund Südwest.
- Rosengren, K. E. (Ed.). (1985). *Media gratifications research: Current perspectives (1st print ed.)*. Sage.
- Rowe, J. W., & Kahn, R. L. (1997). Successful aging. *The Gerontologist*, 37(4), 433–440. <https://doi.org/10.1093/geront/37.4.433>
- Schenk, M., & Scheiko, L. (2011). Meinungsführer als Innovatoren und frühe Übernehmer des Web 2.0 [Opinion leaders as innovators and early adopters of Web 2.0]. *Media Perspektiven*, 2011(9), 423–431. https://www.ard-media.de/fileadmin/user_upload/media-perspektiven/pdf/2011/09-11_Schenk_Scheiko.pdf
- Schmidt, L. I., & Wahl, H.-W. (2019). Predictors of performance in everyday technology tasks in older adults with and without mild cognitive impairment. *The Gerontologist*, 59(1), 90–100. <https://doi.org/10.1093/geront/gny062>

Seifert, A., & Cotten, S. R. (2022). Use of information and communication technologies among older adults. In D. A. Rohlinger & S. Sobieraj (Eds.), *The Oxford handbook of digital media sociology* (pp. 291–315). Oxford University Press. <https://doi.org/10.1093/oxfordhb/9780197510636.013.12>

Seifert, A., Hofer, M., & Rössel, J. (2018). Older adults' perceived sense of social exclusion from the digital world. *Educational Gerontology, 44*(12), 775–785. <https://doi.org/10.1080/03601277.2019.1574415>

Simonson, J., Nadiya, K., Kausmann, C., & Tesch-Römer, C. (2021). *Freiwilliges Engagement in Deutschland: Der Deutsche Freiwilligensurvey 2019. Empirische Studien Zum Bürgerschaftlichen Engagement* [Volunteering in Germany: The German Volunteer Survey 2019. Empirical studies on civic engagement]. Springer Fachmedien Wiesbaden GmbH.

van Deursen, A. J., & Helsper, E. J. (2015). A nuanced understanding of internet use and non-use among the elderly. *European Journal of Communication, 30*(2), 171–187. <https://doi.org/10.1177/0267323115578059>

Yuen, H. K., Burik, J., & Krause, J. (2004). Physical and psychosocial well-being among adults with spinal cord injury: The role of volunteer activities. *Topics in Spinal Cord Injury Rehabilitation, 9*(4), 19–25. <https://doi.org/10.1310/CKWU-XNMC-C6AA-P2VM>

Appendix A. Overview of Constructs and Items Used in This Study

Construct	Item (translated from German)	Item source
Internet usage motives (based on the ARD/ZDF long-term mass communication study) <i>I use the internet ...</i>	<i>... because I want to get information.</i>	Breunig and Engel (2015)
	<i>... because I enjoy it.</i>	"
	<i>... because it allows me to relax.</i>	"
	<i>... to know what it's all about.</i>	"
	<i>... because I get food for thought.</i>	"
	<i>... out of habit.</i>	"
	<i>... because it helps me navigate my everyday life.</i>	"
	<i>... because then I don't feel alone.</i>	"
	<i>... because it lets me to forget about everyday life.</i>	"
	<i>... because I can exchange with others.</i>	self-developed
	<i>... because I can communicate myself.</i>	"
	<i>... because it lets me maintain social contacts.</i>	"
	<i>... because my personal environment (friends/family) uses it.</i>	"
	<i>... because there is content that I can only find there.</i>	Breunig et al. (2020)
Internet self-efficacy <i>I feel confident ...</i>	<i>... using the internet to research information.</i>	Schenk and Scheiko (2011)
	<i>... understanding words and terms relating to the internet.</i>	"
	<i>... getting in touch with family/friends using video communication.</i>	"
	<i>... troubleshooting internet problems.</i>	"
	<i>... using the internet to research information relevant to my health.</i>	Rathgeb et al. (2022)
	<i>... getting in touch with a physician using video communication/telemedicine.</i>	"
Perceived obsolescence (based on Brandtstädter & Wentura, 1994)	<i>Life is getting more complicated and harder for me to understand.</i>	Brandtstädter and Wentura (1994)
	<i>My understanding of the opinions of the younger generation is constantly decreasing.</i>	"
	<i>I increasingly feel like I lag behind the present age.</i>	"
	<i>I fully keep pace with the times. (inverted)</i>	"
	<i>I find it increasingly difficult to manage today's way of living.</i>	"