Technology in Society 75 (2023) 102386

Contents lists available at ScienceDirect

Technology in Society

journal homepage: www.elsevier.com/locate/techsoc

Attitudes of Israelis toward family caregivers assisted by a robot in the delivery of care to older people: The roles of collectivism and individualism

Hanan AboJabel [a,*], Liat Ayalon [b]

[a] The Paul Baerwald School of Social Work and Social Welfare, The Hebrew University of Jerusalem, Israel
[b] Louis and Gabi Weisfeld School of Social Work, Bar Ilan University, Israel

ARTICLE INFO

Keywords:
Collectivism
Family caregivers
Individualism
Older people
Robot

ABSTRACT

The provision of care to older people by robots is accompanied not only by negative attitudes about the implications of using robots for their care (e.g., increasing their loneliness or compromising their safety), but also negative attitudes toward family caregivers, as by transferring care to technological entities, they may be perceived as doing something inconsistent with family morals. These attitudes, which may hinder the adoption of robots for elder care, may be shaped by cultural factors – namely, a collectivistic vs. an individualistic orientation. The purpose of the current study was to examine for the first time: 1) the attitudes of the Israeli public toward family caregivers assisted by a robot in their care of an older person vs. family caregivers who provide care without a robot's assistance; and 2) whether horizontal and vertical dimensions of individualism and collectivism might explain these attitudes. An experimental study was conducted among a nationwide sample of 618 Israelis who were 18 years of age or older, using two vignettes that were randomly administered to respondents. Nearly half of the sample (49.5 %) received the first vignette, which assessed attitudes toward providing care for older people with the help of a robot. The remainder received the second vignette, assessing attitudes toward providing such care solely by their children. Participants reported significantly more perceived negative impacts on the caregiving recipient as a result of the use of a robot (mean/SD = 2.71/0.83) compared to the provision of care solely by family caregivers (mean/SD = 1.96/0.72), and they also had more negative perceptions toward family caregivers who used a robot (mean/SD = 3.49/0.86) compared to family caregivers who did not use a robot (mean/SD = 2.46/0.91). Vertical individualism/collectivism and background variables (i.e., age, education, gender, marital status) played a role in determining these attitudes. The research results provide important insights for the development of culturally appropriate intervention programs for the use of robots in elder care.

1. Introduction

The world is aging at a rapid pace. From 2020 to 2022 alone, the number of older people in the world (i.e., 60 years and over) increased from 1 million to 1.4 billion, and by 2050 this number is expected to reach 2.1 billion [1]. The aging population is more likely than younger populations to be associated with morbidity and a decline in physical, cognitive, and psychological functioning [1–5]. As a result, the healthcare system as well as family caregivers face various challenges related to the care of older people. Technology, including robotics, may provide a solution to these challenges [6–8].

1.1. Delivery of care to older people by robots

Robotics is the science and practice of designing, manufacturing, and applying robots. A robot is a machine designed to perform specific tasks, with a degree of autonomy, without human intervention [9]. Based on a recent systematic review [8], robots in the context of caring for older people can be classified into nine main categories according to their intended purpose: (1) Companion robots designed to provide companionship to older people; (2) Telepresence robots designed for two-way communication; (3) Manipulator service robots designed to complete objectives on demand; (4) Rehabilitation robots designed to provide physical assistance, such as walking aids and walking chairs; (5) Health-monitoring robots designed to monitor health indicators such as

* Corresponding author.
E-mail addresses: hanan.abo-jabel@mail.huji.ac.il (H. AboJabel), liat.ayalon@biu.ac.il (L. Ayalon).

https://doi.org/10.1016/j.techsoc.2023.102386
Received 7 May 2023; Received in revised form 20 September 2023; Accepted 4 October 2023
Available online 6 October 2023

sleep patterns and blood pressure; (6) Reminder robots designed to provide reminders about, for instance, taking medication or keeping appointments; (7) Domestic robots designed to assist in daily household tasks such as cleaning and cooking; (8) Entertainment robots designed to provide various entertainment activities; and (9) Prevention robots designed to prevent or detect falls. Although some robots are still in the research and development phase, and are not yet on the market, some robots are indeed available, such as Care-*O*-bot (a domestic robot assistant), the seal-like robot Paro (a social companion robot), and Cutii (a telepresence robot for older people) [10,11]. Robots have the potential to empower older people and promote aging in place by enabling them to live in their own homes while maintaining their independence, autonomy, and safety. In addition, robots may empower family members by reducing the negative consequences of caregiving [8,12–15]. Despite these expected benefits, the use of available robotics and technology in general for elder care is still very limited. Indeed, as mentioned above, some robots are still in the evaluation and development stages, and cultural and social barriers such as negative attitudes toward robots and non-adoption of technology are being investigated [10,16–18]. Studies have indicated that using robots for elder care may involve several moral and ethical concerns. These concerns include older people feeling less in control of their lives as a result of relying on technology and/or feeling lonely as a result of replacing human care with technology. In addition, older people could be injured or harmed due to the unreliability of existing robots to perform tasks autonomously and independently without malfunctions in the system, potentially increasing people's levels of fear, anxiety, and mistrust toward technology [19–22]; [17,18,23–29].

1.2. Moral ideas around care responsibility

People may also have negative attitudes toward family caregivers who use such technologies to help them care for their loved ones. Traditional and moral notions of family responsibility toward elder family members include physically visiting them and providing them with instrumental and emotional care [30–32], and caregiving with the help of technology may not accord with such notions. In addtion, technology can be perceived as serving the interests of the family caregivers over the interests of the older people by transferring caregiving responsibilities to technological entities. Specifically, people might assume that family caregivers use technology to reduce their own care burden; that technology allows caregivers to care for their relatives remotely (e.g., family members may visit their older relatives less often due to the use of monitoring technologies); and that people use technology to soothe their consciences [33]. To date, no study has purported to examine the attitudes of the public toward family caregivers who provide care to older people with the help of technology. Indeed, various factors can shape the public's attitudes toward family caregivers assisted by a robot in their care of an older person. Among these factors are cultural factors – namely, a collectivistic vs. an individualistic orientation.

1.3. Collectivism–individualism orientation

Researchers who address the role of culture in shaping perceptions about technology and decisions related to caregiving usually point to the differences between societies typified by individualism vs. collectivism [34–37]. People who are part of individualistic societies tend to prefer acting independently, and their personal goals are at the top of their list of priorities [38]. It is customary to distinguish between two types of individualism [39]: 1) Vertical individualism represents people's perceptions of the self as completely autonomous and their acceptance of the inequality between individuals; and 2) Horizontal individualism represents people's perceptions of the self as completely autonomous and their acceptance of all individuals as equal. By contrast, people who belong to a collectivist society give priority to the needs and goals of the group and are more oriented toward conformity and maintaining harmony within their society and family [38]. It is also customary to distinguish between two types of collectivism [39]: (1) Vertical collectivism indicates people's perceptions of the self as part of a collective and their acceptance of the inequality within that collective; and (2) Horizontal collectivism indicates people's perceptions of the self as part of a collective and their belief that all members of this collective are equal.

In terms of culture's influence on attitudes toward technology, it has been found that people who belong to individualistic societies tend to hold more positive attitudes toward technology, as well as to adopt and accept new technology faster than do people characterized by a collectivist approach [40,41]. Acceptance of technology among collectivist/individualist groups can be explained by the concept of uncertainty avoidance – that is, the level at which a person feels threatened by uncertain and incomprehensible situations – which is one of the dimensions of Hofstede's cultural model [42]. Namely, collectivist societies, which are typified by a high level of uncertainty avoidance, are less likely to accept change and innovation, such as new technologies, than are individualist societies, which are typified by a low level of uncertainty avoidance [43,44,45]. In the context of culture and decisions related to caregiving, people who belong to collectivist societies, compared to people who belong to individualistic societies, seem to feel a greater sense of obligation and responsibility toward providing care for family members, especially older people. When care is handed over to parties outside the family, the perception may be that doing so harms the values of the family, as well as the harmony and solidarity within it [36,46].

1.4. The current study

Israeli society is an "intermediate" society; that is, it lies on a continuum somewhere between being an individualistic and a collectivist culture [47]. Israeli society is characterized by strong family values and a high commitment to caring for older people [48]. Older people, even those who have difficulty in performing basic daily operations (e.g., household tasks; personal tasks such as bathing and getting dressed; and walking or climbing stairs), usually continue to remain in the community and to live in their own homes, receiving a reasonable level of family assistance by children and/or spouses [49]. According to estimates in Israel, one and a half million family caregivers (about 15 % of the general population in Israel) provide care to an older person or a person with a disability [50]. Moreover, there is a growing shortage of available caregivers [51], stressing the need to identify other potential care outlets.

These facts make the Israeli public a relevant sample for examining the research questions, which were as follows: 1) What are the attitudes of the Israeli public toward family caregivers who use robots in the care of older people, and how do they perceive the impact of the care provided? and 2) Does a collectivistic/individualistic orientation play a role in explaining these attitudes?

We answered these questions by comparing two vignettes. The first vignette described family caregivers who used a robot in the care of their older mother. The second described family caregivers who provided care for their older mother solely by themselves (the process of developing the vignettes is described later in the Methods section). We hypothesized that a collectivistic/individualistic orientation would explain attitudes about the provision of elder care solely by family caregivers vs. by family caregivers with a robot's assistance, above and beyond background variables that have previously been associated with attitudes regarding

technology including age, gender, education, marital status, religiosity, and being a family caregiver of an older person [52–58].

Specifically, we expected differences in the responses to the two vignettes with more positive attitudes expressed toward care by family members compared with care assisted by a robot. We also hypothesized that a high level of collectivism would be associated with more negative attitudes toward the delivery of elder care by a robot and more positive attitudes toward delivery of care solely by family caregivers. Conversely, a higher level of individualism would be associated with more positive attitudes toward the delivery of elder care by a robot and more negative attitudes toward delivery of care solely by family caregivers.

2. Methods

2.1. Participants and procedure

An experimental study was conducted among a nationwide sample of 618 Israelis who were 18 years of age or older. The data were collected by iPanel, an Israeli internet panel that was established more than a decade ago to provide a wide variety of online data collection services for the Israeli and global market. Potential respondents were invited by email to participate in an anonymous online survey during February 2023. Before answering the survey, participants were asked to read the instructions regarding their participation in the study, including the study's purpose and procedure, after which they were asked to confirm their consent to participate. In return for their participation, they received points for purchasing shopping vouchers. Similar to other studies in Israel, as well as studies in other countries where national surveys have been conducted [59,60], once quotas by gender and age were reached for each parameter, the survey was closed.

2.2. Measures

Dependent variables: We used two vignettes that were randomly administered to respondents. One vignette assessed attitudes toward providing care for an older person with the assistance of a robot. The other vignette assessed attitudes toward the provision of care solely by the older person's children, without the help of a robot. In the survey, almost half of the participants (49.5 %) randomly received the first vignette, and the rest received the second vignette.

The vignettes and the items developed by the authors were based on a recent qualitative study, the purpose of which was to explore the attitudes of Israeli experts in the field of dementia/aging regarding the use of smart assistive technology in dementia care [33]. In addition, we relied on the existing literature about social and ethical issues surrounding the use of smart technology in elder care [19,21,22]; [17,18,23,25–27]; as well as literature about shared caregiving responsibilities/duties among family caregivers [61,62].

Attitudes regarding the provision of care to older people with the help of a robot were assessed by a hypothetical vignette, which included a description of three children using a robot to provide care for their mother Dahlia. Dahlia was described as a 70-year-old widow with three children, living alone in a large apartment, and having high blood pressure and diabetes. The robot in the vignette was designed to provide the following functions: assistance with daily household tasks, entertainment, reminder to take medications, and two-way communication. Although to date a robot that can perform these tasks independently and autonomously is not available for commercial use, it is common in research to present such vignettes with the aim of examining and understanding the public's attitudes in the context being studied [63,64]. After reading the vignette, participants were asked to report the extent to which they agreed/disagreed with seven statements related to the provision of care by a robot (see Appendix 1). Each statement was rated on a 5-point Likert-type scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*).

Table 1
Exploratory factor analysis (EFA) for caregiving using the robot vignette (n = 307).

		Factor 1 Impact on older care recipient	Factor 2 Perceptions toward the children
1	Using a robot will help Dahlia maintain her independence[a]	0.739	
2	Using a robot could endanger Dahlia's safety	0.783	
3	Using a robot may make Dahlia feel lonely	0.657	
4	Using a robot might negatively affect Dahlia's relationship with her children	0.658	
5	The children do not take responsibility for the care of their mother as they should		0.687
6	Using a robot is more helpful to the children (reduces caregiver burden and concerns related to caregiving) than to Dahlia herself		0.751
7	The children could have taken care of their mother in a better way		0.801
R^2		45.658 %	

[a] Reversing an item.

An exploratory factor analysis (EFA) conducted among participants (n = 307) who responded to the first vignette (i.e., providing care via use of a robot) revealed two main factors (see Table 1). The first factor, "the impact on the older care recipient," included four items whose factor loadings were higher than 0.657. The second, "perceptions toward the children," included three items whose factor loadings were higher than 0.751. The two factors accounted for 45 % of the variance of the scale. Based on these results, two indices were calculated by averaging the items. A higher average indicated a higher level of negative attitudes toward providing care for an older person using a robot – that is, participants perceived a more negative impact on the older care recipient, and they also perceived the family caregivers in a more negative way. Cronbach's alphas were 0.76 and 0.68 for impact on the care recipient and views toward the children, respectively. The variables did not deviate from normal distribution (skewness = 0.05 and −0.22 for impact on the older care recipient and views toward the children, respectively; SE = 0.13).

Attitudes toward providing care to older people solely by family caregivers (i.e., without the use of a robot) were assessed by a hypothetical vignette, which included a description of three children who, between them, shared the care for their mother Dahlia. Similar to the first vignette, Dahlia was described as a 70-year-old widow with three children, living alone in a large apartment, and having high blood pressure and diabetes. After reading the vignette, participants were asked to report the extent to which they agreed/disagreed with seven statements similar to the statements that examined the use of a robot in the caregiving of older people, but in this case as related to the provision of care solely by the children (see Appendix 2). Each statement was rated on a 5-point Likert-type scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). A confirmatory factor analysis (CFA) was calculated to verify whether the two-factor structure obtained in the EFA calculated in the scale of the attitudes regarding the provision of care to older people using a robot was replicated in the current scale as well. The CFA results supported the two-factor structure that was obtained in the CFA analysis of the previous scale, as we obtained an acceptable factor loading for the two factors (i.e., the impact of caregiving by the children on the older

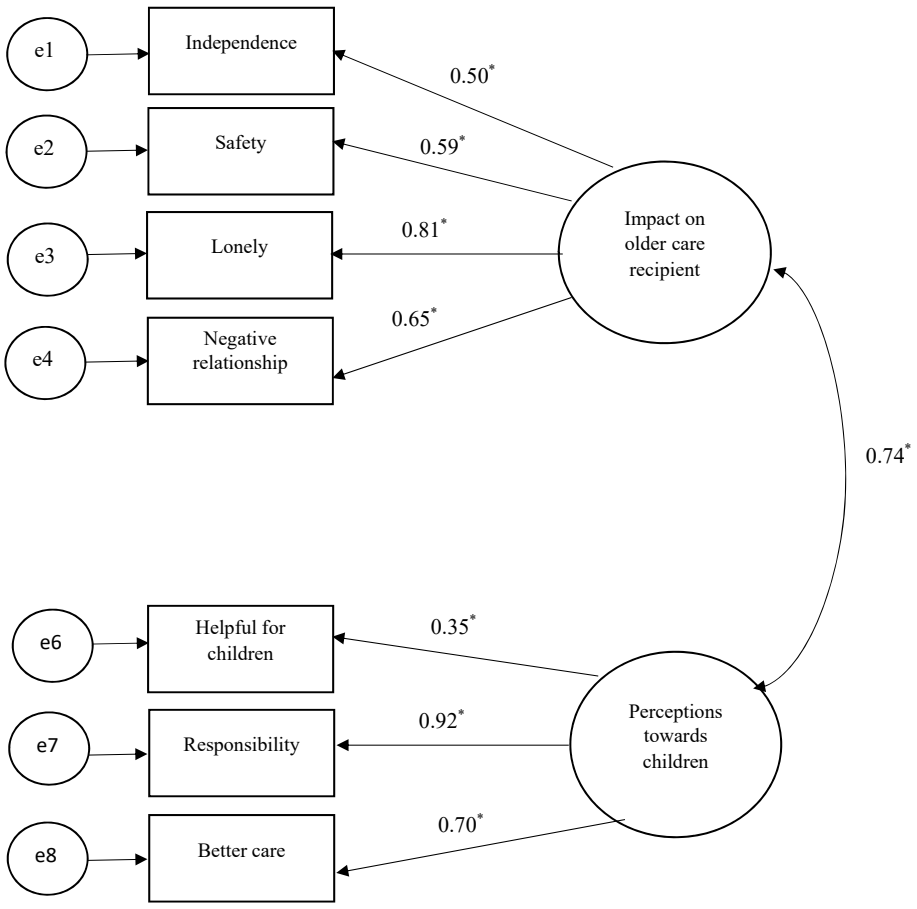

Fig. 1. Confirmatory factor analysis of the attitudes towards provision care solely by family caregivers scale (n = 313).

care recipient and perceptions toward the children - see Fig. 1) and acceptable goodness of fit (χ^2/df = 1.77, p < 0.05, CFI = 0.982, TLI = 0.973, SRMR = 0.072, RMSEA = 0.050 (CI 90 % = 0.013–0.081). Two indices were calculated for each factor by averaging the items. A higher average indicated a higher level of negative attitudes toward caregiving solely via family caregivers – that is, participants perceived a more negative impact on the older care recipient and perceived the family caregivers in a more negative way as well. Cronbach's alphas were 0.71 and 0.67 for impact on the older care recipient and perceptions toward the children, respectively. The variables did not deviate from normal distribution (skewness = 0.72 and 0.47 for impact on the older care recipient and perceptions towards the children, respectively; SE = 0.13).

Independent variables: The entire sample answered questions about having an individualistic vs. a collectivistic orientation and provided their background information.

Individualistic and collectivistic orientations were assessed by the individualism and collectivism scale developed by Ref. [39]. The scale consists of 16 items examining four dimensions of collectivism and individualism, with four items for each dimension: (1) Vertical collectivism; (2) Horizontal collectivism; (3) Vertical individualism; and (4) Horizontal individualism. Based on previous studies [65–70], each item was rated on a 5-point Likert-type scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). Four indices were calculated for the four elements, with a higher average indicating a higher level of collectivism/individualism. We translated the scale from English into Hebrew using back-translation. Cronbach's alphas were 0.65, 0.67, 0.50, and 0.57 for vertical collectivism, horizontal collectivism, vertical individualism, and horizontal individualism, respectively. Variables did not deviate from normal distribution (skewness range: −0.10 to −0.49; SE = 0.09).

Background information included participants' gender (man/woman), age, education (primary school or below, middle school, high school, bachelor's degree, master's degree or higher), marital status (married/unmarried), religiosity (secular/traditional/religious/Ultraorthodox), and whether they provided (in the past) or were providing (currently) caregiving for an older person in the family (yes/no).

2.3. Data analysis

Descriptive statistics (frequencies, means, standard deviations, and ranges) were used to describe the sample and the main variables. Pearson/Spearman correlations and t-tests were used to test relations between the dependent variables (i.e., questions posed regarding the vignette with the robot vs. the vignette with the family caregivers as sole care providers) and the independent variables (i.e., individualist/collectivist orientation and background variables). A linear regression was used to assess the variables that explained each of the dependent variables. For each of the regressions, the independent variables that were found to be statistically significant for each dependent variable were included. To examine potential multi-collinearity effects, a variance inflation factor (VIF) analysis was used. Traditionally, a VIF higher than 5 is indicative of a level of multi-collinearity that can be problematic for modeling [71]. Our results suggested that in the current study, VIF values were smaller than 2 for all independent variables in the four regressions. All analyses were conducted using SPSS version 25.

2.4. Ethical considerations

The study's protocol was approved by the Ethics Committee of "Bar-

Table 2
Descriptive statistics of the study's variables (n = 620).

	All sample (n = 620)	Caregiving using a robot (n = 307)	Caregiving solely by family caregivers (n = 313)	t/χ2
Participants' characteristics				
Mean Age (SD, Range)	51.93 (19.47, 18.00–89.00)	52.03 (19.15, 19–88)	51.83 (19.80, 18, 89)	$t = 0.13_{(618)}$; NS
Gender (%)	50.5	49.2	52.8	$\chi^2 = 0.41_{(df=1)}$; NS
Male	49.5	50.8	48.2	
Female				
Education (%)	4.0	3.3	4.8	$\chi^2 = 1.03_{(df=1)}$; NS
Primary school and below	2.7	2.9	2.6	
Middle school	41.0	41.4	40.6	
High school	33.9	34.2	33.5	
Bachelor's degree	18.4	18.2	18.5	
Master's degree or higher				
Marital status (%)	70.0	70.0	70	$\chi^2 = 0.01_{(df=1)}$; NS
Married	30.0	30.0	30.0	
Unmarried				
Religiosity (%)	59.2	61.9	56.5	$\chi^2 = 1.82_{(df=1)}$; NS
Secular	40.8	38.1	43.5	
Traditional + Religious + Ultraorthodox				
Providing care for family older person (%)	52.6	53.4	57.8	$\chi^2 = 0.17_{(df=1)}$; NS
	47.4	46.6	48.2	
No				
Yes				
Individualism and collectivism				
Mean horizontal individualism (SD, Range)	4.01 (0.54, 2.50–5.00)	4.00 (0.54)	4.01 (0.54)	$t = -0.32_{(618)}$; NS
Mean vertical individualism (SD, Range)	3.15 (0.61, 1.25–4.75)	3.12 (0.64)	3.17 (0.56)	$t = -0.89_{(618)}$; NS
Mean horizontal collectivism (SD, Range)	3.99 (0.52, 2.00–5.00)	4.00 (0.54)	3.98 (0.51)	$t = 0.43_{(618)}$; NS
Mean vertical collectivism (SD, Range)	3.93 (0.61, 2.00–5.00)	3.89 (0.62)	3.95 (0.60)	$t = -1.17_{(618)}$; NS

NS: Not Significant.

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3. Results

3.1. Descriptive statistics of participants' characteristics and the study variables

As can be seen in Table 2, the average age of the study participants (n = 618) was 51 (SD = 19.47). Almost half of the sample (52 %) reported having a bachelor's degree or higher. The majority of the participants were married (70 %) and secular (59.2 %). In addition, the participants reported moderate-high to high levels on the four dimensions of the individualism/collectivism scale (mean range = 3.15–4.01).

No statistically significant differences were found in the background characteristics or in the reported individualism/collectivism dimensions between the participants who responded to the vignette about caregiving with the help of a robot (n = 307) and those who responded to the vignette about caregiving solely via family caregivers (i.e., the children) (n = 311).

3.2. Participants' attitudes regarding the provision of care to older people with the help of a robot vs. solely by family caregivers

Impact on the older person of care provision by robot vs. family caregivers: Participants perceived a significantly more negative impact on the older care recipient when receiving care via the use of a robot (mean = 2.71; SD = 0.83) than via the children alone (mean = 1.96; SD = 0.72 ($t = 12.01_{(618)}$, $p < 0.0001$) (see Fig. 2).

Perceiving a negative impact on the older care recipient when care

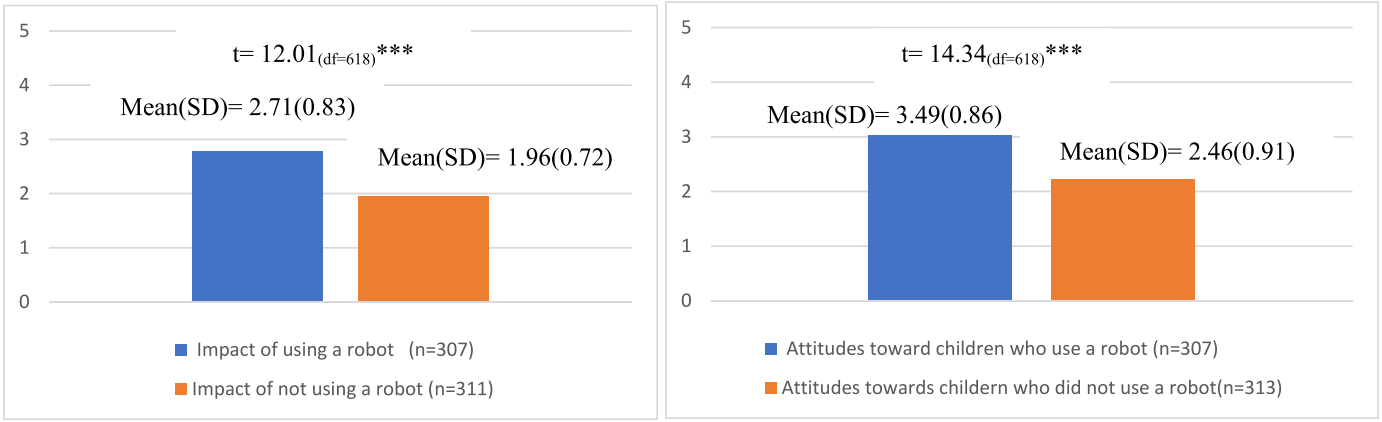

Fig. 2. Participants' attitudes toward provision care by a robot vs. family caregivers (n = 618).

Table 3
Pearson/Spearman correlations and t tests were used to test correlations between the dependent and independent variables.

	Attitudes toward provision care by a robot (n = 307)				Attitudes towards provision care solely by family caregivers (n = 313)			
	Impact on older care recipient		Perceptions towards children		Impact on care recipient		Perceptions towards the children	
Age	$r = -0.19^{**}$		$r = -0.05$		$r = -0.02$		$r = 0.03$	
Gender	2.67	$t = -0.89_{(df = 305)}$	3.42	$t = -1.29_{(df = 305)}$	1.97	$t = 0.22_{(df = 311)}$	2.57	$t = 2.15_{(df = 311)}^{*}$
Mean male (SD)	(0.78)		(0.80)		(0.71)		(0.89)	
Mean female (SD)	2.76		3.55		1.95		2.35	
	(0.88)		(0.92)		(0.74)		(0.92)	
Education	rs = -0.02		$r_s = -0.03$		$r_s = 0.16^{**}$		$r_s = -0.05$	
Marital status	2.80	$t = -2.70_{(df = 305)}^{**}$	3.53	$t = -1.40_{(df = 305)}$	1.99	$t = -1.02_{(df = 311)}$	2.50	$t = -1.09_{(df = 311)}$
Mean married (SD)	(0.82)		(0.86)		(0.75)		(0.93)	
Mean unmarried (SD)	2.51		3.38		1.89		2.37	
	(0.84)		(0.83)		(0.63)		(0.88)	
Religiosity	2.61	$t = -2.92_{(df = 305)}^{**}$	3.40	$t = -2.38_{(df = 305)}^{*}$	1.93	$t = -0.66_{(df = 311)}$	2.44	$t = -0.55_{(df = 311)}$
Mean secular (SD)	(0.81)		(0.84)		(0.74)		(0.87)	
Mean Traditional + Religious + Ultraorthodox (SD)	2.89		3.64		1.99		2.50	
	(0.84)		(0.87)		(0.70)		(0.97)	
Providing care for family older person	2.72	$t = -0.11_{(df = 305)}$	3.43	$t = 1.22_{(df = 305)}$	2.03	$t = -1.83_{(df = 3011)}$	2.44	$t = 0.43_{(df = 31)}$
Mean no (SD)	(0.80)		(0.91)		(0.66)		(0.88)	
Mean yes (SD)	2.71		3.55		1.88		2.49	
	(0.88)		(0.79)		(0.77)		(0.95)	
Individualism and collectivism								
Horizontal individualism	$r = -0.17^{**}$		$r = 0.03$		$r = -0.05$		$r = -0.03$	
Vertical individualism	$r = -0.14^{**}$		$r = 0.03$		$r = .01$		$r = 0.11^{*}$	
Horizontal collectivism	$r = -0.04$		$r = 0.03$		$r = -0.13^{*}$		$r = -006$	
Vertical collectivism	$r = 0.01$		$r = 0.15^{**}$		$r = -0.19^{**}$		$r = 0.02$	

*P < 0.05, **p < 0.01.

was provided via a robot was significantly higher among participants who were younger ($r = -0.19$, $p < 0.01$), married ($t = -2.70_{(df = 305)}$, $p < 0$ 0.01), and traditional/religious/Ultraorthodox ($t = -2.29_{(df = 305)}$, $p < 0.01$), and among those who reported lower levels of horizontal individualism ($r = -0.17$, $p < 0.01$) and vertical individualism ($r = -0.14$, $p < 0.01$). In contrast, perceiving a positive impact on the older care recipient when care was provided solely by the children was statistically significantly associated with lower education ($r = 0.16$, $p < 0.001$) and higher levels of horizontal collectivism ($r = -0.13$, $p < 0.05$) and vertical collectivism ($r = -0.19$, $p < 0.01$) (see Table 3).

Perceptions toward family caregivers who used a robot compared to those who did not use a robot: Participants reported a significantly higher negative perception toward children because of their use of a robot in caregiving (mean/SD = 3.49/0.86) than toward children who did not use a robot (mean/SD = 2.46/0.91) ($t = 14.34_{(df = 618)}$, $p < 0.0001$) (see Fig. 2).

Higher levels of negative perceptions toward children who used a robot for caregiving were statistically significantly associated with being traditional/religious/Ultraorthodox ($t = -2.38_{(df = 305)}$, $p < 0.05$) and with having a higher level of vertical collectivism ($r = 0.15$, $p < 0.01$). In contrast, a higher level of positive perceptions toward children who did not use a robot were significantly associated with being women ($t = 2.15_{(df = 311)}$, $P < 0.05$) and lower levels of vertical individualism ($r = 0.11$, $p < 0.05$) (see Table 3).

3.3. Linear regression analysis

Hierarchical regression results (see Table 4) show that, first, perceiving a higher negative impact on the older care recipient when care was provided via a robot was attributed to younger age ($\beta = -0.19$, $p < 0.01$), being married ($\beta = 0.16$, $p < 0.01$), and lower vertical individualism ($\beta = -0.12$, $p < 0.05$), explaining 12 % of the variance. In contrast, perceiving a higher positive impact on the older care recipient when care was provided solely by the children was attributed to lower education ($\beta = 0.11$, $p < 0.05$) and a higher reported level of vertical collectivism ($\beta = -0.14$, $p < 0.05$), explaining 5 % of the variance. Second, a higher negative perception toward children who used a robot in caregiving was attributed to a higher level of vertical collectivism ($\beta = 0.12$, $p < 0.05$), explaining 3 % of the variance. In contrast, a higher positive perception toward children who provided caregiving without a

Table 4
Linear regression analysis results.

	Attitudes toward provision care by a robot (n = 307)		Attitudes towards provision care solely by family caregivers (n = 313)	
	Impact on older care recipient	**perceptions towards caregiving**	**Impact on care recipient**	**perceptions towards children**
	β	β	β	β
Age	−0.19**	–	–	–
Gender	–	–	–	−0.12*
Education	–	–	0.11*	–
Marital status	0.16**	–	–	–
Religiosity	0.10	0.03	–	–
Horizontal individualism	−0.11	–	–	−0.02
Vertical individualism	−0.12*	–	–	–
Horizontal collectivism	–	–	−0.09	–
Vertical collectivism	–	0.12*	−0.14*	–
R^2	0.12***	0.03**	0.05***	0.02**

*p < 0.05, **p < 0.01, ***p < 0.001.

robot was attributed to being a woman ($\beta = 0.13$, $p < 0.05$), explaining only 2 % of the variance.

4. Discussion

The present study had two aims. The first was to examine the attitudes of the Israeli public toward family caregivers' provision of care to older people with the assistance of a robot and how they perceived the impact of this care on the older care recipient. We conducted this examination by comparing the attitudes of the Israeli public toward family caregivers who used a robot in the delivery of elder care vs. family caregivers who provided elder care solely by themselves, without the use of a robot. In addition, we also aimed to understand the role of collectivism/individualism dimensions, factors which according to the literature may explain the shaping of these attitudes [34,35,37]. The growing need for elder care, in light of current demographics and shortages of such care by family members, and the fact that robots are currently being developed as a possible solution to address such shortages [72], make the current study a valuable one in the field.

The results of the study show that participants reported more negative attitudes toward the delivery of care with the assistance of a robot than when care was delivered solely by family caregivers, without the use of a robot. That is, participants perceived more negative impacts on the older person as a result of the use of a robot in the provision of care, and they also had more negative perceptions toward family caregivers who used robots in the care of their older relative.

Conflicting results have emerged from studies in which the public's preferences regarding the receipt of care by a human caregiver versus by a robot caregiver were examined. A recent experimental study showed that people who were in a care-needing situation tended to choose care delivered by care robots rather than by human caregivers [63]. However, in another experimental study, people were shown to prefer human caregivers over robots [64]. To account for this discrepancy, previous studies have shown that attitudes about robots depend on a variety of factors, including the context of the robot's use [29]. In previous studies, for example, the participants were asked to choose between human caregivers and robot caregivers *for themselves*. In the current study, the issue at hand was about the provision of elder care by family members, either with or without the assistance of a robot, and questions about the family's moral responsibility to take care of older parents. Our results show that using a robot can result in poorly perceived care outcomes as well as labeling of family caregivers with stigma and negative stereotypes. Family members may be aware of and/or internalize these stereotypes, which can lead to technology rejection by potential users (i.e., family caregivers).

In accordance with our hypotheses, collectivism/individualism orientations did indeed play a significant role in explaining participants' attitudes. We found that those participants who perceived a more positive impact on the older care recipient as a result of using a robot were those who had a high level of vertical individualism. On the other hand, participants who perceived a more positive effect on the older person as a result of family caregivers providing sole care, and participants who had a more negative perception about family caregivers who used a robot in the care of their loved ones, were those who had a higher level of vertical collectivism. People with more vertical individualism tend to perceive themselves as being completely autonomous and strive to be independent of others [39]. Therefore, they may prefer to provide care to their parents using robots so that they can be independent, and devote most of their time to promoting personal goals and ambitions. It is not surprising that people with higher levels of vertical collectivism, who perceive themselves as part of a collective and who are willing to sacrifice personal desires to maintain family harmony [39], would prefer that family members provide sole care for their older family members rather than have such care be provided by an external factor, such as a robot, the use of which may be considered a violation of family values. In addition, a collectivist/individualist orientation affects a person's level of uncertainty. People from collective societies tend to greet change and innovation (such as new technologies) with more uncertainty than do people from individualistic societies [45]. Therefore, uncertainty around technology may increase one's uncertainty toward care provided via the use of a robot and lead to negative perceptions of family caregivers who use one.

It is important to address the background factors that were significantly related to participants' attitudes. We found that more positive attitudes toward the provision of care by a robot were associated with being older and being non-married. In addition, more positive attitudes toward the provision of care by family caregivers were associated with lower education and being a woman. Older people are likely to be contending with chronic diseases and are more often physically disabled than are younger people [4,5]. It is thus possible that older people perceive the use of robots as a way to contend with health issues, allowing them and other people in their age bracket to live more independently, as opposed to younger people who experience fewer illnesses and disabilities and do not need to use technological tools at their stage of life. These results are in line with a new study showing that people who are dependent on care are less opposed to receiving care via a robot [64] than are people who are not dependent on such care. In general, older people do not want to become a burden on others [73], especially their children. Therefore, when we asked them about their attitudes regarding the provision of care to an older woman who was dependent on others to carry out her daily activities, they had more positive attitudes toward her receiving care via a robot. Similarly, unmarried participants, who did not have the support and assistance of a partner, believed that robots could help compensate for this lack. Previous studies have shown that older people who live alone tend to accept home care robots more readily [74], and indeed older unmarried participants in the current study reported more positive attitudes toward the use of a robot in the care of the old woman who was also described as unmarried.

The finding that women had more positive attitudes toward the care of older people by family caregivers alone (i.e., without the use of a robot) could be attributed to the fact that women traditionally assume more caregiving responsibilities than do men, and they are ready to invest more time in providing emotional and instrumental care [75]. The finding that participants who had lower levels of education also reported more positive evaluations of providing care for older people by family caregivers alone could potentially be attributed to their lower exposure to and awareness of new approaches to caregiving for older people, including technology. Studies have shown that a lower level of education is related to a lower level of technological literacy [76], including both the understanding of technology and the appreciation of its advantages. This lack of knowledge can also affect one's ability to use technology and cope with the triggers associated with its use [77].

4.1. Limitations and conclusions

The present study had a few limitations. First, although the sample was relatively large, only Jewish-Israeli participants were included, not Arab-Israeli participants. In addition, given that we conducted an online survey, it is possible that people with low levels of digital literacy, or those who did not have a computer or cell phone, did not have the opportunity to participate in the study. Therefore, caution must be used when generalizing the results to the wider Israeli population. Second, in the current study we examined specific robot functions (i.e., assistance with daily household tasks, entertainment, reminders to take medication, and two-way communication). Undoubtedly there are other relevant functions worthy of examination (e.g., health monitoring and rehabilitation). Third, in the description of the first vignette we emphasized the importance of the robot compared to family caregivers; however, it is likely that even in the hypothetical description we presented, the family caregivers would still have been involved to a certain extent. Fourth, the internal reliabilities of the individualist and collectivist orientation indices were not strong. However, an internal

reliability equal to or greater than 0.5 indicates an acceptable internal reliability [78–80]. Finally, the individualism-collectivism orientations explained only a small percentage of the variance of the attitudes toward the delivery of care via the use of a robot vs. via family caregivers solely. That said, the percentage of the explained variance was still statistically significant and provides a new angle on the subject – namely, the role of collectivism and individualism in shaping the attitudes toward family caregivers assisted by a robot in their care as well as the perception of the impact of the care provided. In addition, it should be noted that one reason the percentage of explained variance was low was that only a small number of independent variables were examined in the framework of the current study (a small number of sociodemographic variables as well as the individualism/collectivism orientation). If we had included more independent variables in the regression, the variance explained would likely have increased [81]. Therefore, to overcome some of these limitations, we would suggest that going forward, researchers should investigate other factors that might better explain these attitudes, such as knowledge and/or familiarity with technology [82–85], as well as financial issues such as the high cost of robots, which is one of the main barriers preventing people from acquiring them [22,86].

Despite these limitations, the present study makes both a theoretical and practical contribution to the field. Theoretically, the study provides preliminary results according to which the public may have negative attitudes toward family caregivers who use robots in the care of older people. These negative attitudes can be explained in part by one's collectivism/individualism orientation as well as by certain demographic variables. Specifically, people who have an individualistic orientation tend to have positive attitudes toward family caregivers who are assisted by robots in their care of older people. Conversely, people with a collectivist orientation tend to have negative attitudes toward family caregivers who are assisted by robots in their care of older people. From a practical point of view, robotics is a field that is expected to develop exponentially in the coming years, with expectations of promoting an "aging in place approach," reducing fatigue and burden among family caregivers as well as care professionals, and minimizing expenses and caregiving costs for the healthcare system [8,87–89]. However, without understanding the public's attitudes and concerns toward these technological tools, such technologies will not be implemented, and thus their development will be stalled [10]. The current research provides important insights for policymakers and caregiving providers that may help them understand the concerns of the Israeli public in the context of using robots in elder care, and as such may help them develop relevant programs. These programs should focus on providing explanations of the robots, including the tasks they can perform, as well as addressing their potential benefits and risks. In this way, negative attitudes and stigma toward robots and family caregivers who use them could be minimized [90]. found that receiving pertinent information about robots could change negative attitudes and make people more open to the idea of using them. Our intention is not to suggest that a care robot is superior to a human caregiver; however, it is crucial that the public, older people, and formal and non-formal caregivers have accurate knowledge about the innovative caregiving options that are available for use. These programs should be aimed at society as a whole. However, given the significant role played by collectivism/individualism in shaping attitudes toward robots, it is important that such programs pay special attention to cultural groups that are characterized by a high level of collectivism – in the case of Israel, the Israeli-Arab population – whom we would expect to report more negative attitudes toward robots, given the moral obligation in their society to take care of older parents [91]. These programs should be carried out in a culturally competent manner [92], so as not to harm cultural values and thus increase the rejection of the technology. The current study also makes a contribution on an international level, as it presents a point of view and new insights regarding the perception of family caregivers who use robots in their care of older people, as well as the influence of culture on these perceptions. Such insights are expected to have strong implications for the wider application of robots throughout the world in the coming years, taking into account collectivist/individualist orientations.

Disclosure of interest

No potential conflict of interest was reported by the authors.

Funding

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Declaration of competing interest

None.

Data availability

Data will be made available on request.

Appendix 1

First vignette: Providing care for Dahlia using a robot

Dahlia is 70 years old, a widow with three children who lives alone in a large apartment. Dahlia has high blood pressure and diabetes. A few months ago, Dahlia fell at home, and since then she has difficulty moving in the house (e.g., moving from the bed to a chair), performing daily activities (e.g., taking a shower) and household chores (e.g., cleaning or cooking). In order to help, her children decided to buy a robot. Dahlia can communicate with the robot by voice, and she can ask the robot to lift her onto the bed or a chair, bring her water or food from the refrigerator, put the dishes in the dishwasher, turn on the washing machine, and open the door. In addition, the robot can remind Dahlia to take her medication, and offer her various types of activities for pleasure, such as listening to music or watching movies. Also, the children can communicate with Dahlia through the robot and ask how she is. They can talk to her and see her through a camera installed in it.

To what extent do you agree or disagree with the following statements.

1) Using a robot will help Dahlia maintain her independence

   12 3 4 5
   strongly disagree Strongly agree.

2) Using a robot could endanger Dahlia's safety

   1 2 3 4 5.
   Strongly disagree Strongly agree.

3) Using a robot may make Dahlia feel lonely

   1 2 3 4 5.
   Strongly disagree Strongly agree.

4) Using a robot might negatively affect Dahlia's relationship with her children

   1 2 3 4 5.
   Strongly disagree Strongly agree.

5) Using a robot is more helpful to the children (reduces caregiver burden and concerns related to caregiving) than to Dahlia herself

1 2 3 4 5.
Strongly disagree Strongly agree.

6) The children do not take responsibility for the care of their mother as they should

1 2 3 4 5.
Strongly disagree Strongly agree.

7) The children could have taken care of their mother in a better way

1 2 3 4 5.
Strongly disagree Strongly agree.

Appendix 2

Second vignette: Providing care for Dahlia by family caregivers (i.e., without robot)

Dahlia is 70 years old, a widow with three children who lives alone in a large apartment. Dahlia has high blood pressure and diabetes. A few months ago, Dahlia fell at home, and since then she has difficulty moving in the house (e.g., moving from the bed to a chair), performing daily activities (e.g., taking a shower), and household chores (e.g., cleaning or cooking). In order to help, her children decided to divide the caregiving tasks between them. Each child comes to her for 2 h a day and helps her to take a shower, prepare food, put the dishes in the dishwasher, run the washing machine, and more. The eldest child is responsible for giving Dahlia her medicine; every Sunday this child comes over and arranges her weekly pill organizer. In addition, the children call Dahlia during the day to ask how she is doing.

To what extent do you agree or disagree with the following statements.

1) The care provided by the children will help Dahlia maintain her independence

1 2 3 4 5.
Strongly disagree Strongly agree.

2) The care provided by the children could jeopardize Dahlia's safety

1 2 3 4 5.
Strongly disagree Strongly agree.

3) The care provided by the children may make Dahlia feel lonely

1 2 3 4 5.
Strongly disagree Strongly agree.

4) The care provided by the children might have a negative effect on Dahlia's relationship with her children

1 2 3 4 5.
Strongly disagree Strongly agree.

5) The care provided by the children is more helpful to the children (reduces caregiver burden and concerns related to caregiving) than to Dahlia herself

1 2 3 4 5.
Strongly disagree Strongly agree.

6) The children do not take responsibility for the care of their mother as they should

1 2 3 4 5.
Strongly disagree Strongly agree.

7) The children could have taken care of their mother in a better way

1 2 3 4 5.
Strongly disagree Strongly agree.

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