The Relationship Between Attachment Styles and Willingness to Cooperate with Robots: Mediating Effects of Nursing Students' Belief About Human Nature and Trust in Robots

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ABSTRACT

Organizations providing healthcare services adopt modern technologies to improve the quality of the services they offer. Deploying the human-robot cooperation process in organizations is a challenge and organizations need to prepare their employees for the process. A single individual characteristic may be a variable that affects an employee's adoption process. To learn whether individual characteristics affect this process, this paper examined how nursing students' attachment styles have an effect on the human-robot cooperation process and whether beliefs about human nature have a mediation effect on how nursing students perceive robots. The study investigated how trust in robots affects attachment styles and the willingness to cooperate with robots. Nursing students filled out paper-based surveys in classrooms. Data were analyzed via Pearson product-moment correlations and PROCESS macro. The mediation hypotheses were supported with significant results. In human-robot cooperation, the human operator's character may affect the entire process. Therefore, studies are needed to focus on the effects of individual factors on the adoption of these technologies.

Keywords: Attachment Styles, Human-Robot Interaction, Human Nature, Robots, Trust

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Bağlanma Stilleri ile Robotlarla İşbirliği Yapma İsteği Arasındaki İlişki: Hemşirelik Öğrencilerinin İnsan Doğasına İlişkin İnançları ve Robotlara Güvenlerinin Aracı Etkileri

ÖZ

Sağlık hizmeti sunan kuruluşlar, sundukları hizmetin kalitesini artırmak için modern teknolojileri edinmektedir. Organizasyonlarda insan-robot işbirliği sürecini sağlamak zorlu bir aşamadır. Bu kuruluşların çalışanlarını bu sürece hazırlaması gerekir. Kişilik özellikleri bu teknolojileri benimseme sürecini etkileyen bir değişken olabilir. Bu çalışmada, bazı bireysel özelliklerin bu süreci etkileyip etkilemediğini öğrenmek için, hemşirelik öğrencilerinin bağlanma stillerinin nasıl bir etkiye sahip olduğunu ve insan doğasına dair inancın insanların robotlara dair algısı üzerinde aracılık etkisinin olup olmadığını incelenmiştir. Robotlara duyulan güvenin bağlanma stillerini ve robotlarla işbirliği yapma istekliliğini nasıl etkilediği de araştırılmıştır. Hemşirelik öğrencileri sınıflarda anketleri doldurmuştur. Veriler, Pearson çarpım-moment korelasyon katsayısı ve PROCESS makro ile analiz edilmiştir. Aracılık hipotezleri desteklenmiştir. İnsan-robot işbirliğinde, bireyin karakteri tüm süreci etkileyebilir. Bu nedenle, bu teknolojilerin benimsenmesinde bireysel faktörlerin etkilerine odaklanmak için yeni çalışmalara ihtiyaç vardır.

Anahtar Kelimeler: Bağlanma Stilleri, İnsan-Robot Etkileşimi, İnsan Doğası, Robotlar, Güven

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INTRODUCTION

Healthcare technologies are essential in terms of improving the speed and quality of services provided. Thanks to robots that can be used in the healthcare sector, the workload of caregivers may be reduced and the quality of life of patients may be increased. In particular, the workload of nurses may be reduced if robots do the repetitive and time-consuming tasks (Kuo et al., 2008).

Robot use in the healthcare sector has not yet progressed to the desired level (Carayon, 2006); but research and development projects are growing rapidly (International Federation of Robotics, 2019). Effective interaction between humans and robots is essential to increasing the use of robots for nursing tasks (Zhao et al., 2014). Human behavior is an important factor in the context of the service robot's ability to complete nursing tasks efficiently (Zhao et al., 2014). Communication between people and service robots is important to ensure cooperation (Zhao et al., 2014).

In order to use robots in healthcare applications, they must have the ability to interact socially with people (Kuo et al., 2008). The purpose of healthcare robots is not to replace nurses or other medical professionals, but to assist and collaborate with human users (Kuo et al., 2008). Successful outcomes may be achieved when human and robot capabilities are combined by providing human and robot cooperation. Robots have advanced sensors, computational skills, and the ability to perform repetitive tasks without fatigue in a short time. People have cognitive skills, situational awareness, and effective decision-making skills (Li et al., 2013). Therefore, with effective interaction, tasks may be accomplished with maximum efficiency.

The healthcare industry includes interpersonal relationships from various professions, as well as relationships with patients and their families (Leiter et al., 2015). The robots that will be added to this network of relationships are not alive like humans and animals, but they appear to be more alive than inanimate beings and have the capacity to communicate (Collins et al., 2013). They are therefore worthy of examination from a different perspective than other technological products; because they may have the potential to influence the social context in which they are involved.

New research may lead to understanding of potential challenges that may arise and to earlier development of solutions. For example, understanding how the characteristics of human users influence the human-robot cooperation process as a predictor may be effective in uncovering the potential success of people who are expected to work cooperatively with robots. Also, studies may be designed to predict the potential challenges driven by individual characteristics and potential ways to overcome them. For this purpose, the focus is on nursing students who will become an important share of the healthcare sector's human resources. This paper linked students' attachment styles and to their belief about human nature, their trust in robots and their willingness to cooperate with robots. Thus, this paper has pointed out that some personality traits of people who are expected to work with robots in the healthcare sector may also be taken into consideration.

Adult Attachment

A theory to develop effective social relationships in both social psychology and developmental psychology is attachment (Leiter et al., 2015). Attachment theory is an interpersonal development theory that maintains that infants' interaction with caregivers affects their relationships throughout life (Bowlby, 1969). Bowlby (1969) examined the basic process of attachment; while Ainsworth (1985) investigated how attachment-seeking efforts led to successful and unsuccessful attachment formation (Harms, 2011). Ainsworth measured the baby's reactions when left alone by the caregiver for a while and when the caregiver returned. She called this technique a "strange situation". According to attachment theory, individuals expect comfort and safety from an attachment figure from birth (Bowlby, 1969). The caregiver's responsiveness affects the individual's self-worth and his / her trust in others (Bowlby, 1969). The individual develops a working model about themselves and other people, depending on whether he or she is consistently taken care of in situations where he or she is experiencing stress. For example, individuals who consistently receive support may form a secure attachments, whereas individuals who do not consistently receive support may form insecure attachments (Hazan & Shaver, 1990).

Internal working models include one's basic beliefs about himself/herself and other people, and these beliefs affect an individual's relationships throughout his or her life (Bowlby, 1988). Attachment styles can be conceptualized into two dimensions: avoidance of intimacy and anxiety over abandonment (Bowlby, 1969). In cases where both dimensions are low, people have a secure attachment; because they have a positive working model both for themselves and for other people. These individuals are comfortable in interpersonal relationships and they have high self-efficacy, and believe that other people will support them in case of need (Mikulincer & Florian, 1995).

Individuals with high anxiety about abandonment have a negative perception of themselves. They constantly need to be close to others and are very sensitive to rejection (Mikulincer & Florian, 1995). Individuals with high avoidance of intimacy have a negative perception of other people. They have little trust in people. They don't believe people will be around when they need them. They also do not want other people to depend on them (Miller, 2007).

Adult Attachment involves four attachment style based on the combination of these two dimensions being high or low (Griffin & Bartholomew, 1994). The secure attachment style is related to one's self-confidence and trust in other people. These individuals had warm and accepting parents in childhood. The preoccupied attachment style is associated with a feeling of worthlessness, low anxiety, and high avoidance. In childhood, they had emotionally unpredictable parents (sometimes they were warm and accepting, sometimes withholding and overprotective). Fearful attachment style is associated with high anxiety and high avoidance. These individuals want intimacy; but because of fear of rejection, they avoid close relationships and have had rejecting, overly critical and uncaring parents in childhood. The dismissing attachment style is associated with low anxiety and high avoidance. In childhood, they have physically and emotionally undemonstrative parents.

Adults with a secure attachment style are confident in seeking and receiving support from other people in times of stress (Pines, 2004). Securely attached individuals show more risk-taking

and exploring behaviors because they trust their partners (Fraley & Shaver, 2008). Securely attached individuals are more likely to cope with change than insecure ones (Mikulincer et al., 1993). Insecure people place greater emphasis on autonomy and control (Collins et al., 1996).

Hazan and Shaver (1990) investigated the effect of attachment theory on workplace behavior. According to them, attachment theory may help to understand social relationships in the workplace and related emotions. Many studies show that attachment styles shape behaviors, attitudes, and emotional responses in the workplace (Harms, 2011; Richards & Schat, 2011). Attachment theory previously focused on the type of response to stress, coping mechanisms, individual differences in emotions, thoughts, and behaviors in interpersonal relationships (Mikulincer and Florian, 1995). Recently, however, this theory has been applied to the interpersonal relationships at the workplace (Leiter et al., 2015). Adult attachment styles are effective in measuring the quality of relationships adults have with other people (Collins & Read, 1990). This includes the relationships in work-life (Leiter et al., 2015) and the social relationships that individuals have in the workplace affect their well-being (Day & Leiter, 2014).

According to the research, securely attached employees experience higher satisfaction with their work and enjoy their colleagues (Hazan & Shaver, 1990). Anxious/ambivalent individuals are concerned about being rejected by their colleagues and also expect approval from their colleagues. Avoidant employees prefer to work alone so they don't have to socialize. Colleagues evaluated securely attached employees more likable than insecure ones; and while they evaluated dismissive employees as defensive, they evaluated preoccupied individuals as more anxious (Kobak & Sceery, 1988). Styles other than secure attachment are categorized as insecure (Meredith et al., 2011).

Trust in Robots

Relationships with other people are at the heart of human existence. People are born into relationships and spend their lives in relationships (Berscheid & Peplau, 1983). From the relationship between a child and his/her caregiver to the relationship between players on a football team, trust is one of the most fundamental factors for a relationship to be preserved (Ullman & Malle, 2018). For example, colleagues must trust each other to cooperate among themselves (Leiter et al., 2015).

People relate not only to other people but also to non-human beings (de Graaf, 2016). Studies have been conducted on the extent to which information from interpersonal relationships may reflect the situation on human-robot interaction (Eyssel & Hegel, 2012). Studies show that humans interact with computers (Reeves & Nass, 1996) and robots (Kerepesi et al., 2006) as they interact with other people. This tendency increases the likelihood of people making emotional ties to artificial beings (Krämer et al., 2011). Factors affecting interpersonal relationships may similarly affect a person's trust in the machine (Muir, 1987). Thus, to adopt and use robot technology, effective communication must be established between the user and the machine (Desai et al., 2009).

Trust is a key factor in our daily interactions. Being able to collaborate with others depends on it (Wu et al., 2016). Automation has led modern society to a major process of change (Yerdon

et al., 2017). Robots have also begun to do things that require trust (Ullman & Malle, 2018). Therefore, various studies have been conducted to measure and theoretically examine human trust in robots (Yang et al., 2017). In human-machine interaction, trust is how much the user trusts the machine's decisions, actions, and suggestions. People's trust in human-robot interaction is very effective in their cooperation (Haring et al., 2013). In the meta-review, Hancock et al. (2011) concluded that trust is necessary to achieve the goals of human and robot as a team. Trust is a pattern that can be interpreted according to context. In particular, as the success of the work to be carried out with the robot becomes critical, the trust becomes more important (Kessler et al., 2017; Wu et al., 2016).

Overuse or underuse of automation is closely related to trust (Parasuraman & Riley, 1997). Unauthorized trust in automation can be fatal (Parasuraman & Riley, 1997). The fact that operators do not realize this even when automation behaves incorrectly is an example of misuse by over trusting the system. Disuse is that operators do not allow automation to do their job due to a lack of trust in the automation system. People may over trust robotic systems even though these systems make mistakes (Borenstein et al., 2017; Robinette et al., 2016). Therefore, to match the intentions of the designer and the user of the robot, the trust element must be calibrated appropriately (Lee & See, 2004). Calibrating trust ensures the correct use (Parasuraman & Riley, 1997).

The trust between humans and robots may be affected by the character of the human user, environmental factors and the character of the robot (Billings et al., 2012; Xu & Dudek, 2016). For the efficient distribution of tasks between the operator and autonomous machines, human trust in the machine is one of the design issues (Xu & Dudek, 2016). Trust directly affects the autonomy given to robots (Erebak & Turgut, 2019; Sheridan and Hennessy, 1984).

The Hypotheses

The majority of researchers agree that culture has some clear characteristics (Cohen, 2009). First, culture arises from adaptive interactions between humans and the environment. Second, there are shared elements in the culture. Third, culture is transferred from period to period, from generation to generation. Kluckhohn and Strodtbeck (1961) argued that there were some common problems shared by all people, that there were various alternatives to solving these problems, but that the solution preferred by each society was related to the culture of that society. One of these problems is what is human nature? Good, evil, or a mixture of both? Taking into account individual influences, the internal working model developed by Bowlby (1988) may affect the formation of the idea of human nature. In Bowlby's theory, individuals' perception of negative or positive others constitutes an important part of the attachment. Therefore, the attachment style of people may weaken or strengthen the idea of the nature of human beings, which is a cultural phenomenon, albeit to varying degrees.

Culture is also important at the individual level (Matsumoto et al., 1999). Two individuals living in the same country may have different cultural characteristics (McCoy et al., 2005). That is, national culture may affect the individual, but it may not determine its purely cultural characteristics (Lee et al., 2007). Trust in robots may also vary by culture (Li et al., 2010; Yerdon et al., 2017). Studies have shown that trust varies in individualist or collectivist cultures (Hui & Triandis, 1986). Some theorists define social trust as a desire to trust others (Whiteley,

2000). These levels of social trust vary from country to country (Schmitt-Beck, 2008). Social trust is an adhesive that keeps people together in a society and promotes cooperation (Beilmann & Lilleoja, 2015).

The complexity and human-like nature of the relationship between humans and robotic technologies indicate the importance of psychological factors in human-robot relationships. Robots are expected not only to do their tasks but also to adapt to their social environment (de Graaf, 2016). In the future, robots are expected to take part in various social environments. These include houses, nursing homes, hospitals, and schools. Today, human-robot relationships are being shaped by taking advantage of human-to-human relationships. This may allow people to build more meaningful relationships with robots (de Graaf, 2016).

Social responses to human interaction with robots have been reported in many studies (Kahn Jr. et al., 2013; Kerepesi et al., 2006). Due to some social clues, people treat these beings differently and want to connect with them emotionally (Scheutz, 2011). Given all these studies, the attachment styles of individuals may affect the belief in the nature of the human being due to the negative/positive other perception in internal workings. The belief in human nature may also affect trust in robots because of individuals' human-like attributions to robots. Therefore, the following hypothesis was created:

Hypothesis 1: The belief about human nature has a mediation effect on the relationship between attachment styles and trust in robots.

Since robots have social characteristics and humans attribute human-like characteristics to robots, humans may see robots as part of the negative/positive others group specified in attachment theory. Therefore, the effect of attachment style may determine whether to trust others, robots. Besides, since trust in robots is essential to cooperate with them, trust in robots may have a mediation effect on the relationship between attachment styles and the willingness to cooperate with robots. Therefore, the following hypothesis was created:

Hypothesis 2: Trust in robots has a mediation effect on the relationship between attachment styles and the willingness to cooperate with robots.

METHOD

Participants and Procedures

A total of 374 nursing students answered paper-based surveys (Total number of nursing students in the university was 460). We explained the purpose of the research and received informed consent from the students and asked them to respond to surveys in the classroom in the beginning of the courses. It took them about 15 minutes to fill out the questionnaires. The mean age of the students was 21 years (SD = 2). See Table 1 for other demographic information. Ethical permission for this study was obtained from the Human Research Ethics Committee of Erzincan Binali Yıldırım University with the date of 16/01/2019 and protocol number 01/04.

Table 1. Demographic Data

		Frequency	%
Class Standing	Freshman	104	27.8
	Sophomore	106	28.3
	Junior	68	18.2
	Senior	96	25.7
	Total	374	100.0
Gender	Female	252	67.4
	Male	122	32.6
	Total	374	100.0

Measurement Tools

Adult Attachment Styles

The scale, which was created by combining various scales by Griffin and Bartholomew (1994), contains 30 items and measures the attachment styles of individuals and some dimensions related to attachment. It was adapted to Turkish by Sümer and Güngör (1999). This study was based on the model of Hazan and Shaver (1990). This model has three attachment styles: secure style (items 10, 13, 15, 23, and 30), (α = .40), dismissing style (items 1, 12, 24, and 29), (α = .45) and anxious/ambivalent style (items 4, 11, 18, 21, and 25), (α = .66). To illustrate the styles, one item in the scale for secure style was "I am comfortable depending on other people", one item for the dismissing style was "I find it difficult to depend on other people" and one item for the anxious/ambivalent style was "I want to merge completely with another person". Students scored their responses using a 6-point Likert-type scale (1 = not at all like me, 6 = very much like me). There is no consensus on whether an attachment is inherently categorical or dimensional since attachment styles have a certain effect on each person (Ravitz et al., 2010). If the standard and acceptable cutoff points are determined, categories may be obtained from dimensional scales (Ravitz et al., 2010). The three styles in the attachment model used in this study were accepted as dimensional, not categorical. A confirmatory factor analysis (CFA) was executed to confirm the compliance of the scale. After removing items 10, 15 and 30 from secure attachments style, the three-factor structure of the scale indicated acceptable fit indices, [($\chi2$ / df = 2.529, CFI = 0.91, GFI = 0.95, RMSEA = 0.064, and SRMR = 0.062), (α = .73)].

The Belief About Human Nature

We used the 6-item human nature sub-scale of the Cultural Perspectives Questionnaire-CPQ4, developed by Maznevski and Distefano (1995), to learn students' beliefs about human nature. It was adapted to Turkish by Basım (1998). Students responded using a 6-point Likert-type scale (1 = strongly disagree, 6 = strongly agree). An example of an item on the scale was "You should be suspicious of everybody". A high score indicates that the respondent perceived human nature as more evil. As a result of the CFA, acceptable goodness of fit indices were observed for this one-factor structure, [($\chi2$ / df = 3.014, CFI = 0.98, GFI = 0.98, RMSEA = 0.073 and SRMR = 0.033), (α = .77)].

Trust in Robots

The Checklist for Trust between People and Automation developed by Jian, Bisantz, and Drury (2000) was used to measure trust in robots. There are 9 items on the scale and it was adapted to

Turkish by Erebak and Turgut (2019). Students responded using a 6-point Likert-type scale ranging from 1 (strongly disagree) to 6 (strongly agree). An example of an item in the scale was "I am suspicious of robots' intent, action, or output". The CFA showed that one-factor scale had acceptable goodness of fit indices, [($\chi 2$ / df = 2.673, CFI = 0.95, GFI = 0.97, RMSEA = 0.067 and SRMR = 0.037), (α = .71)].

The Willingness to Cooperate with Robots

Two items were developed by the authors to measure students' willingness to cooperate with robots in the future. In the first step, three behavior experts were asked to report independently to develop items for cooperation with robots. The reports were examined and categorized according to similarity by the researchers. The authors organized two discussion rounds to complete the final wordings of the items. Afterward, two psychologists commented on the comprehensibility of the items. The means and standard deviations of the items indicated adequate variability. Internal consistency was provided. The first item was "I would like to cooperate with the robots in the future" and the other item was "I can easily cooperate with robots while performing my job in the future". Students responded using a 6-point Likert-type scale ranging from 1 (strongly disagree) to 6 (strongly agree). An explanatory factor analysis (EFA) was performed to examine the structure of the items, [(KMO = 0.5), (Barlett's Sphericity: $\chi 2$ = 519.698, Df = 1, p <.001)]. According to the EFA results, a single factor was obtained and all factor loadings were above .90. This one-factor accounted for 93% of the total variance (α = .93). Since, the most appropriate reliability coefficient for a scale containing two items is the Spearman-Brown coefficient which also equals to 0.93 (Eisinga et al., 2013).

RESULTS

A Shapiro-Wilk test was used to test for normality on the dependent variables such as trust to robots and cooperation with robots; and that indicated that the data was normally distributed. According to the Pearson product-moment correlation results, all three attachment styles correlated with each other as moderate positive. While there was a moderate positive relationship between the belief about human nature and dismissing attachment style, a positive but weak relationship with other attachment styles was found. Also, there was a weak and positive relationship between attachment styles and trust in robots, but there was no relationship between attachment styles and the willingness to cooperate with robots. There was a weak and positive relationship between the belief about human nature and trust in robots and the willingness to cooperate with robots (see Table 2).

Table 2. The Correlations of the Variables

	1	2	3	4	5	6	7
1 Secure Style	-	.517**	.445**	.315**	.242**	.081	-.082
2 Dismissing Style		-	.338**	.444**	.238**	.030	-.054
3 Preoccupied Style			-	.296**	.131*	.095	-.133*
4 Human Nature				-	.255**	.108*	-.045
5 Trust in Robots					-	.506**	.006
6 WillCoopRob						-	.054

Note. [a] Human Nature: The belief about human nature. [b] WillCoopRob: The willingness to cooperate with robots. [c] **Correlation is significant at the 0.01 level (2-tailed). [d] *Correlation is significant at the 0.05 level (2-tailed).

PROCESS macro was used (Hayes, 2017) to test the simple mediation hypotheses. By selecting the fourth model, this paper analyzed attachment styles as predictor variables, the belief about human nature as a mediator, and trust in robots were outcome variables. According to the results, the belief that human nature is evil showed a partial mediation effect for dismissing and secure attachment style, while it showed a full mediation effect for preoccupied attachment style (see Table 3).

Table 3. The Mediation Effect of the Belief about Human Nature

Independent Variable	Point Estimate	SE	Bootstrapping Percentile 95% CI	
			Lower	Upper
Secure Style		**Direct Effects**		
	0.1157	0.0336	0.0497	0.1817
		Indirect Effects		
	0.0402	0.0151	0.0138	0.0735
Dismissing Style		**Direct Effects**		
	0.1413	0.0506	0.0419	0.2408
		Indirect Effects		
	0.0752	0.0258	0.0247	0.1268
Preoccupied Style		**Direct Effects**		
	0.0502	0.0432	-0.0347	0.1351
		Indirect Effects		
	0.0576	0.0177	0.0253	0.0955

Note. [a] Bootstrap sample size = 5.000. [b] Dependent variable: Trust in robots.

This paper also analyzed attachment styles as predictor variables, trust in robots as a mediator, and the willingness to cooperate with robots as outcome variables. According to the results, the dismissing attachment style had a direct but negative effect on the willingness to cooperate with robots, while with the partial mediation effect of trust in robots it had a positive indirect effect on the willingness to cooperate with robots. Trust in robots had the effect of full mediation in the relationship between preoccupied and secure attachment style and the willingness to cooperate with robots (see Table 4).

Table 4. The Mediation Effect of Trust in Robots

Independent Variable	Point Estimate	SE	Bootstrapping Percentile 95% CI	
			Lower	Upper
Secure Style		**Direct Effect**		
	-0.0531	0.0563	0.0497	-0.0531
		Indirect Effect		
	0.1526	0.0366	0.0138	0.1526
Dismissing Style		**Direct Effect**		
	-0.1644	0.0792	0.0419	-0.1644
		Indirect Effect		
	0.2169	0.0554	0.0247	0.2169
Preoccupied Style		**Direct Effect**		
	0.0462	0.0704	-0.0347	0.0462
		Indirect Effect		
	0.1026	0.0400	0.0253	0.1026

Note. [a] Bootstrap sample size = 5.000. [b] Dependent variable: The willingness to cooperate with robots.

DISCUSSION

A more complex approach is required to plan the process of adapting robots with social characteristics to healthcare applications since people exhibit different behaviors when interacting with robots with human body form in comparison to other technological products. Moreover, considering the characteristics of employees, it can be expected that human-robot interaction in organizations may be influenced by many variables. Therefore, the ability of robots to operate at the most effective level depends on how well organizations are prepared for this process. An important part of this preparation is a better understanding of the employee side of the employee-robot interaction.

Personality is one of the most fundamental factors in understanding human behavior (Li et al., 2014). Additionally, the attachment style of the individual is an integral part of the individual's personality (Ainsworth, 1985). As assistive social robotics develops, people are more likely to form attachment-like bonds with robots (Collins et al., 2013). Individual factors affect various organizational outcomes as well as technology adaptation. With the involvement of robots in the work-life, the effects of these individual factors may increase even more. In this study, it is examined whether attachment styles, which are important variable that affecting nursing students' relationships with other people, reflect their trust in robots and their willingness to cooperate with them.

In the first hypothesis, it is suggested that the belief about human nature would have a meditation effect on attachment styles (secure, dismissing, and preoccupied) and the relationship to trust in robots since it is related to people's perception of other people and because people make human-like attributions to robots. This hypothesis was supported by the three-attachment style. Dismissing and secure attachment style had a direct effect on trust in robots as well. The direct effect of both the belief that human nature is evil and dismissing and a secure attachment style on trust in robots is consistent with studies on how people attribute human-like characteristics to robots (see Erebak, 2019; Eyssel & Hegel, 2012; Kahn Jr et al., 2013; Scheutz 2011; Kerepesi et., 2006). It is also noteworthy that all three attachment styles are in a positive correlation with the belief about human nature. This may indicate that culture affects the belief about human nature. Individuals with dismissing attachment style, who have positive self and negative others model in the context of attachment, have a stronger relationship with the belief that human nature is evil than others. Moreover, in the preoccupied style, which has a negative self and positive others model, the result that the belief that human nature is evil has a full mediation effect may point out that culture may be more determinative in individuals with this style.

Trust affects decisions in risky and uncertain situations (Park et al., 2008). Trust affects the extent to which a person will allow a robot to behave autonomously (Desai et al., 2009). In other words, the less the individual trusts the robot, the more he/she interferes with the work of the robot (De Visser et al., 2006). In addition, traditionally, robots are built to function in a specified place and for a specified task. However, people may work with more complex machines with the development of collaborative robots (cobots) (Palmarini et al., 2018). Therefore, employees interacting with robots must be flexible and innovative (Kagermann et al., 2013). Thus, the second hypothesis was supported that one's character could be effective in

the process of cooperation with the robot, and that trust in robots may play a mediation role in this relationship. The effect of trust in robots on the character of the individual (see Billings et al., 2012) and the support of trust in robots to the process of cooperation with robots are consistent with previous studies (see Borenstein et al., 2017; Robinette et al., 2016; Parasuraman and Riley, 1997; Wagner, 2009; Wu et al., 2016). Furthermore, the results, the direct negative effect of the dismissing attachment style on the willingness to cooperate is positively mediated by the trust in robots, and trust in robots had the full mediation effect between the secure and preoccupied styles and cooperation willingness, may emphasize that trust in robots is an important factor in human-robot interaction in the context of attachment theory.

In this study, no specific robot type was specified. However, when presenting certain types of robots to participants, these relationships may vary. For example, as the level of anthropomorphism of the robot increases, the degree of human trust in them may change. People may attribute more human-like characteristics to robots. Moreover, the willingness to collaborate with robots may also vary on a mission-by-task basis. Depending on the characteristics of the task (for example, it is repetitive, monotonous), individuals' approaches may change. Therefore, more specific connections can be achieved through studies that include these variables.

When adapting robotic technologies to healthcare organizations, it should also be taken into account which professional group the robot will work with and with whom. In this study, it is revealed that the attachment styles of nurses of next years may affect this process. For example, robots may be paired with a human operator. When choosing this human operator, the attachment style of the nurse may be learned and what kind of challenges the individual may face may be calculated based on personality traits. Also, it is possible to investigate what kind of human-like characteristics can be attributed to robots in the culture of the employees of the organization.

Conclusion: Healthcare organizations have great potential in using robotic technologies in their service applications. Therefore, the potential of cooperation with robots in the service offered by professional groups should be explored specifically for healthcare organizations. In this way, efficient and efficient service quality may be achieved with robotic technology. In this study, this paper contributed to the insight into how adult attachment styles of nursing students who will work in the healthcare sector in the coming years may affect their potential to cooperate with robots. This paper emphasized that individual characteristics and culture may influence on how one perceives robots. With the contribution of new studies, organizations may take action by taking into account the effects of individual factors on the human-robot cooperation process and may foresee potential challenges.

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