

BAŞKENT UNIVERSITY
INSTITUTE OF SOCIAL SCIENCES
DEPARTMENT OF PSYCHOLOGY
SOCIAL PSYCHOLOGY MASTER'S PROGRAM WITH THESIS

**EXAMINING THE ELEMENTS OF THE ELABORATION
LIKELIHOOD MODEL IN THE LIGHT OF UNCANNY VALLEY AND
ANTHROPOMORPHISM IN TERMS OF HUMAN-ROBOT
INTERACTION**

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ANKARA-2023



BAŞKENT ÜNİVERSİTESİ
SOSYAL BİLİMLER ENSTİTÜSÜ
YÜKSEK LİSANS TEZ ÇALIŞMASI ORJİNALLİK RAPORU

14/07/2023

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Öğrencinin Numarası: 22010518

Anabilim Dalı: Psikoloji Anabilim Dalı

Programı: Sosyal Psikoloji Tezli Yüksek Lisans Programı

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Tez Başlığı: Examining The Elements Of The Elaboration Likelihood Model In The Light Of Uncanny Valley And Anthropomorphism In Terms Of Human-Robot Interaction

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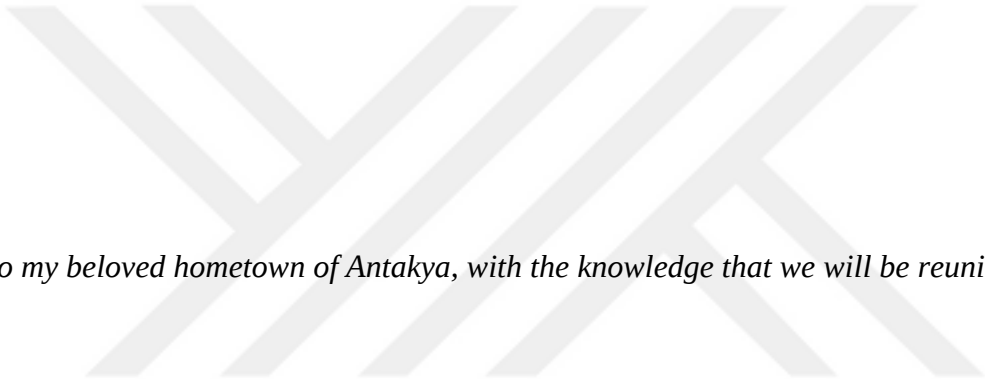
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Öğrenci İmzası:

Onay

14/07/2023

Öğrenci Danışmanı, Unvan, Ad, Soyad,
Prof. Dr. Doğan Kökdemir



To my beloved hometown of Antakya, with the knowledge that we will be reunited one day

...

ACKNOWLEDGEMENTS

First and foremost, I would like to extend my profound gratitude to my thesis advisor, Prof. Dr. Doğan Kökdemir, for his invaluable academic guidance and contributions. I also owe a debt of gratitude to Assoc. Prof. Dr. Zuhale Yeniçeri and Assoc. Prof. Dr. Burcu Tekeş for their unwavering support throughout this journey.

Words cannot express my gratitude to my family. I am deeply thankful to my beloved mother, who introduced me to the world of psychology and stood by me through thick and thin. To my collaborative father, who acquainted me with computers at the age of three and guided my academic path, I owe endless thanks. My heartfelt thanks go to my resilient grandmother who nourished my thesis journey with her delectable meals. I am also immensely grateful to my gorgeous aunt who, despite the distance, was always by my side. I would like to express my gratitude to the lights of my life, the most wonderful girls, Roxanne and Balkız.

To my dear friends who have been like siblings to me, your years of unwavering companionship mean the world, and I thank you dearly. I offer my deepest gratitude to Berk Kağan Fırat, my brother from childhood days; to Elif Gökçe Çağır, Selen İmamoğlu, and Mert Özbudak, who have been my pillars of strength since our university days; to Yasemin Erol, İlayda Kaya, Beliz Toroslu, and Elif Öykü Başerdem, whom I've come to love as sisters in such a short time; and to Fatih Bayrak, who generously shared his expertise in statistics with me.

I am also immensely grateful to the empowered academic women, Tuğba Teğın and Sena Bacaksız, with whom I wrote my first paper and who provided mutual support during our most challenging academic moments.

ÖZET

Özsoy, İrem Nur. Detaylandırma Olasılığı Modeli Unsurlarının Tekinsiz Vadi ve Antropomorfizm Işığında İnsan-Robot Etkileşimi Açısından İncelenmesi. Başkent Üniversitesi, Sosyal Bilimler Enstitüsü, Sosyal Psikoloji Tezli Yüksek Lisans Programı, 2023.

Kamusal alanda robot kullanımının hızla artmasıyla birlikte insan-robot etkileşimi çalışması, tasarım ve değerlendirme yönlerini kapsayan ve çeşitli uzmanlık alanları arasında işbirliğini teşvik eden kapsamlı bir disipline dönüşmektedir. Sosyal robotlar eğitimden sağlık hizmetlerine kadar birçok alanda kullanılmakta olup, insanların onları nasıl algıladıklarını ve onlarla duygusal ve fiziksel olarak nasıl etkileşimde bulunduklarını anlamak önemlidir. İnsanların robotlara insan benzeri özellikler atfetmeleri, hem olumlu hem de olumsuz insan-robot etkileşimlerine yol açabilir, bu da robotların tasarımında antropomorfizmin kritik bir rol oynadığını göstermektedir. Örneğin, robotların insan benzeri özelliklerinin artmasıyla insanlarda rahatsızlık hissi yaratan "Uncanny Valley" fenomeni hem popüler kültürde hem de bilimsel alanda sıkça karşılaşılan bir konsepttir. Sosyal etki, bireylerin tutumlarını, davranışlarını ve görüşlerini değiştirmelerine neden olan güçlü bir kavramdır ve ikna, insanların bilgiyi nasıl işlediklerine ve tutumlarını nasıl değiştirdiklerine odaklanan sosyal psikolojinin merkezi bir konseptidir. Özellikle Elaboration Likelihood Modeli (ELM), tutum değişikliğini anlamada anahtar bir modeldir ve bu değişikliğin iki farklı yol (merkezi ve çevresel) ile nasıl etkilendiğini açıklar. Bu çalışmada, robot-insan etkileşimi bağlamında farklı sosyal araçların - insan, insansı, android ve cyborg - iletilen mesajların ikna ediciliği ve insanların bu araçlara yönelik tutumları ve öznellikleri üzerindeki etkilerini Ayrıntılandırma Olasılığı Modeli (ELM) kapsamında araştırmaktadır. Mesajlar, mantıklı ve mantıksız olarak manipüle edilmiş ve 8 farklı grupta (2x4) dört farklı sosyal ajan arasında atanmıştır. Katılımcılar, ikna fark puanını ölçmek için tasarlanmış ve çalışma öncesi ve

sonrası 4 farklı soru içeren ön-test ve son-test sorularına maruz kaldılar. İlk olarak gerekli tanımlayıcı analizler gerçekleştirildi. Ardından, katılımcıların ikna seviyeleri üzerinde mesaj türünün ve sosyal ajan türünün etkilerini incelemek için ANOVA yapıldı. Analizin sonucunda, mesaj türü ve sosyal ajan türünün ikna puanlarındaki değişiklik üzerinde önemli bir etkisinin olmadığı; ancak katılımcının cinsiyeti, teknolojiye aşinalığı, katılımcının mesaj verenin fiziksel çekiciliğine olan algısı, mesaj veren sosyal ajanın çocuk bakımında tercih edilip edilmeyeceği ve mesaj veren sosyal ajanın algılanan yeteneği gibi farklılıkların önemli değişkenler olabileceği bulundu. Çalışmanın sonunda, sonuçları etkileyebilecek olası faktörler vurgulandı.

Anahtar Kelimeler: İnsan-robot etkileşimi, detaylandırma olasılığı modeli, ikna, antropomorfizm, tekinsiz vadi

ABSTRACT

Özsoy, İrem Nur. Examining The Elements Of The Elaboration Likelihood Model In The Light Of Uncanny Valley And Anthropomorphism In Terms Of Human-Robot Interaction. Başkent University, Institute of Social Sciences, Social Psychology Master's Program with Thesis, 2023.

With the rapid increase in the use of robots in the public sphere, the study of human-robot interaction is becoming a comprehensive discipline that encourages collaboration between various fields of expertise, covering design and evaluation aspects. Social robots are being used in fields ranging from education to health care, and it is important to understand how humans perceive them and interact with them emotionally and physically. Humans attributing human-like characteristics to robots can lead to both positive and negative human-robot interactions, suggesting that anthropomorphism plays a critical role in the design of robots. For example, the "Uncanny Valley" phenomenon, which causes a feeling of discomfort in humans as the human-like characteristics of robots increase, is a concept that is frequently encountered both in popular culture and in the scientific field. Social influence is a powerful concept that causes individuals to change their attitudes, behaviors and opinions, and persuasion is a central concept of social psychology that focuses on how people process information and change their attitudes. In particular, the Elaboration Likelihood Model (ELM) is a key model in understanding attitude change and describing how it is influenced through two different pathways (central and peripheral). The study investigates the effects of different social agents - human, humanoid, android and cyborg - on the persuasiveness of communicated messages and the attitudes and subjectivity of people towards these agents in the context of robot-human interaction within the Elaboration Likelihood Model (ELM). The messages were manipulated as logical and non-logical, and were assigned to four different social agents in 8 different groups (2x4). Participants

randomly assigned to different groups were exposed to pre-test and post-test questions designed to measure the persuasion difference score and containing 4 different questions both before and after the study. Firstly, necessary descriptive analyses were performed. Then, ANOVA was then conducted to examine the effects of message type and social agent type on participants' persuasion levels. As a result of the analysis, it was found that message type and social agent type did not have a significant effect on the change in persuasion scores; however, variables such as the participant's gender, familiarity with technology, the participant's perception of the physical attractiveness of the messenger, whether the messaging social agent would be preferred in childcare, and the perceived ability of the messaging social agent could be important variables. At the end of the study, possible factors that may affect the results were emphasized.

Keywords: Human-robot interaction, elaboration likelihood model, persuasion, anthropomorphism, uncanny valley

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1.INTRODUCTION

1.1.What is Going on Between Humans and Robots?

With the rapid development of artificial intelligence technology in the field of robotics, robots have started to take place frequently in various applications such as welding, assembly, transportation in many industrial tasks (Kosuge & Hirata, 2004). Unlike the traditional one-way communication between humans and computers, there is a more bidirectional and interactive interaction between humans and robots (De Santis et al., 2008), and this interaction can include physical, emotional and cognitive communication elements (Yanco & Drury, 2002). In the industrial sphere, data from the 2021 World Robot Report shows that there has been a significant increase universally in the employment rate of robots, with the numbers clearly showing a doubling in the last five years to 126 robots per 10,000 workers (IFR, 2021). This information shows that all sectors, especially those interested in robot design or robot manufacturing, need to consider the rapid development in robot technology (Sheridan, 2016) and that it may be beneficial to move forward with many potential outcomes in mind. For example, when designing a robot for users with different characteristics or needs – such as in harsh environments - it is necessary to take into account the physical or cognitive factors that may arise. Consequently, the study of human-robot interaction (HRI), which investigates the understanding of design and evaluation aspects of human and robot interactions (Murphy et al., 2010), should become a comprehensive scientific field that fosters collaboration between experts from various fields (Sheridan, 2016).

1.2. Social Robots

Social robots, which are designed to create interaction between humans and robots similar to the interaction between humans and robots, continue to take part in many different tasks day by day (Breazeal, 2011). For example, educator robots in educational spaces have been shown to have significant and powerful effects on the cognitive and social qualities of students (Belpaeme et al., 2018). Similar social robots can also be involved in providing assistance in elderly care or similar therapeutic intervention programs (Breazeal, 2011) and in the education and treatment of children on the autism spectrum who require special education (Cabibihan et al., 2013). As seen in the examples, since social robots are more frequently involved in human habitats, they should be better able to adapt to the rules

necessary for human life (Kirby et al., 2010) and have features that can be perceived as a real and humanoid social individual by the people around them (Anzalone et al., 2015). In other words, the presence of consciousness, intelligence, spontaneity and cognitive abilities of a human being should be one of the future priorities for the creation of a collaborative robot. Another area in which social robots are involved is language learning. The work of educators working in the field of Robot Assisted Language Learning (RALL), which examines the facilitation of first and second language learning in the context of the involvement of social robots, further expands the theoretical and pragmatic range of possible applications (van den Berghe et al., 2019). Moreover, the way robots convey their nonverbal expressions plays a critical role in determining how humans perceive them as social and "natural" (Breazeal et al., 2016). Research has shown that when people receive cues that a robot is engaging in nonverbal communication in close proximity, they instinctively react to the robot as they would to another human being and make cognitive-social judgments.

As social robots can be used in different domains such as education, healthcare and language learning, it is important to understand how humans perceive and interact with them, both physically and emotionally. In this context, it will be important to understand the different types of these robots.

1.2.1. Robot Types

In this study, social robots and the interaction of different types of these robots with humans will be analyzed. In this context, it will be important to mention the types of these robots before proceeding further. In the context of this study, four different social agents will be used and three of them (humanoid, android and cyborg) will be included in the experimental design as social robot types.

Humanoid: Humanoid robots are robots designed to have human-like shapes and features (Kajita et al., 2014). One of the first humanoid robots was Honda's Humanoid robot in 1986, which was created out of a desire to create a new machine that could co-operate and interact with humans (Hirai et al., 1998). Two of the most well-known humanoid examples are *Pepper* and *Nao* (Figure 1), which are preferred by some markets to provide attractive experiences for their consumers (Bartneck et al., 2020).

Figure 1.

Pepper humanoid robot on the left and Nao humanoid robot on the right.



Note. Bartneck et al., 2020.

Android: Android robots are robots that are very similar to humans in appearance and have features designed to give people who interact with them the feeling of being real people (Hashimoto et al., 2011). As an example of Android robots, which are highly specialized in terms of both technique and design and come very close to human-like appearance, the *Geminoid F* shown in Figure 2 and the human model taken while creating it can be given as examples (Becker-Asano & Ishiguro, 2011).

Figure 2.

Geminoid F on the left and the person modelled on the right



Note. Becker-Asano & Ishiguro, 2011

Cyborg: The people who coined the term of *cyborg* for the first time in 1960 and used it in a scientific article were two scientists named Manfred E. Clynes and Nathan S. Kline (Clynes & Kline, 1960). In *Cyborgs and Space* (1960), Clynes and Kline defined the term cyborg as a self-regulating (self-regulating) system integrating all external components that serve to expand human-machine systems and control functions in order to adapt an organism to new environments. According to Donna Haraway's article, *A Cyborg Manifesto: Science, Technology, and Socialist-Feminism in the Late Twentieth Century* (Haraway, 1991), the cyborg is a fictional, cybernetic organism that is a combination of machine and organism.

After focusing on different types of robots, it becomes important to understand how people may react to these robots. In this context, it will be of great interest to analyse the process of people attributing some human characteristics to robots - the concept of *anthropomorphism*.

1.3. Anthropomorphism

The process of attributing human emotions, motivations, intentions and behaviors to all kinds of non-human abstract or concrete objects is called anthropomorphism in the literature (Epley et al., 2007; Riva et al., 2015; Sacchi et al., 2013; Wynne, 2005). In other words, anthropomorphism occurs when people explain the real or unreal behavior of non-human beings with human intentions, characteristics, motivations and mental processes (Waytz et al., 2010). People tend to attribute human characteristics to animals (Waters, 1948; Sacchi et al., 2013), elements in nature (Johnson et al., 2015; Sacchi et al., 2013), religious figures (Epley et al., 2007; Petrican & Burris, 2012; Sacchi et al., 2013), and even geometric shapes that move independently (Johnson et al., 2015; Sacchi et al., 2013). Epley et al. (2007) suggest that the likelihood of anthropomorphism being more likely to be revealed increases in situations where people want to make inferences about the behavior of others when seeking social contact. Similarly, Keefer (2016) adds that people may increase their anthropomorphic tendencies when they feel unable to interact with an object as they would like or when they want to reduce their feelings of loneliness. As a result, anthropomorphism often plays a major role in the perception of non-human objects (Epley et al., 2007). As people interact more with robots (Carpinella et al., 2017; Jago et al., 2022), they tend to ascribe human-like characteristics to non-human robots (de Visser et al., 2016). As robots are moving out of factories and into more social spaces, people around them are interpreting robots' actions based on their own attributed intentions (Duffy, 2003). As a result,

anthropomorphic features such as speech, gaze, gestures and facial expressions have become critical elements, especially in the design process of robotic agents (Złotowski et al., 2015). For example, when robots equipped with different gendered voices matched the gender of the users with whom they interacted, these users anthropomorphized the robot more and found them more relatable (Eyssel et al., 2012). Similarly, anthropomorphic features attributed to robots significantly affect participants' trust in robots (Natarajan & Gombolay, 2020). These examples are clues that anthropomorphism can facilitate human-robot interaction (Eyssel et al., 2011).

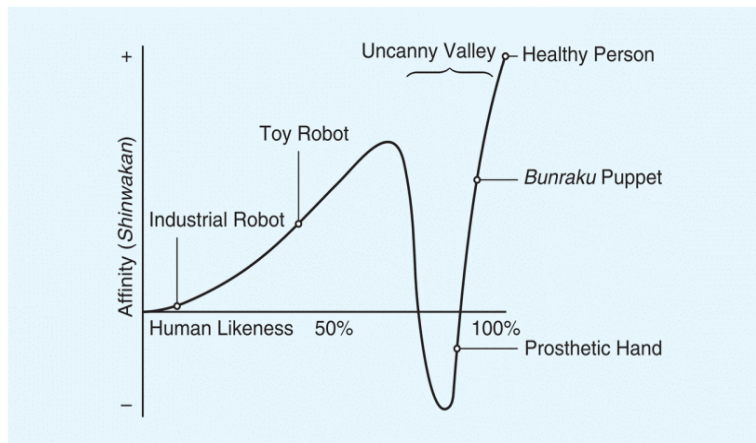
The process of humans attributing human-like characteristics to robots can pave the way not only for positive human-robot interactions but also for negative interactions. As the similarity of robots to humans increases, people's attributions and perceptions towards robots may change negatively. At this point, it is necessary to address the concept of *Uncanny Valley*, which is frequently mentioned in robot-human interactions.

1.4. The Uncanny Valley

Although robots designed to be used in social interaction try to make robots human-like in order to increase human-robot interaction, people's feelings towards these robots may not always be positive (Yin vd., 2023). There are robotics researchers who say that people feel uncomfortable when they see a robot that looks quite human-like but that they cannot call "fully" human (Seyama & Nagayama, 2007). In the 1970s, Masahiro Mori, a professor of robotics, proposed the *Uncanny Valley Theory* about this feeling of "discomfort" in humans (Wang et al., 2015). According to the theory, as the human-like movements of robots intensify and their appearance increases, -but unless they reach a completely realistic appearance - people's attitudes towards them become less sympathetic and more anxious (Mori et al., 2012). One of the most well-known and important visual representations of this concept is the famous graph in Mori's article explaining the Uncanny Valley (Figure 3).

Figure 3.

Graphic visualising the uncanny valley phenomenon



Note. Mori et al., (1970/2012).

According to the graph, as the objects have physically human-like features, the positive attributions of the people interacting with this object increase, while when the human similarity of the objects reaches a certain level - this region is called the *uncanny valley* - there is a feeling of discomfort and uncanny against objects that are still distinguishable from humans (Mori et al., 2012). This concept is a phenomenon frequently encountered both in popular culture and in the scientific field (Kätsyri et al., 2015).

While discussing the concept of Uncanny Valley, one of the most used examples from popular culture is the 2004 animated film *The Polar Express* (Zemeckis, 2004). In the film, although the mimics and gestures of the characters were tried to be portrayed as realistic, they exhibited disturbing and uncanny images according to the viewers. Animated characters that are very similar to human beings, but not one hundred percent close to human beings, remain a unique example for the Uncanny Valley (Kätsyri et al., 2017). Not only in popular culture, the Uncanny Valley phenomenon has been and continues to be the subject of especially in robotics (Walters et al., 2008; Mori et al., 2012), psychology (Ho & MacDorman, 2010; Wang et al., 2015) and computer research (Bartneck et al., 2007).

In summary, Uncanny Valley suggests that as the human-like characteristics of robots and similar objects increase, people begin to feel "uncanny and uncomfortable" towards them. Uncanny Valley continues to be a subject that we encounter in daily life, for example in popular culture, and on the other hand, it continues to be a subject that is encountered and processed in many different fields of study.

2.1. Social Influence

We make many different decisions about our daily lives. These decisions determine our actions and enable us to take action: What movie do we want to watch? What dinner will we make tonight? Where should we go with friends on the weekend? The outcome of all these things depends on our decisions. But do we make these decisions completely freely? Are there no other mechanisms that influence or are influenced by our decisions? According to social psychology, the answer to this question is social influence. With social influence, individuals can change their attitudes, behaviors, thoughts or feelings towards stimuli in the environment of others (Zimbardo & Leippe, 1991). However, the basic structure that is desired to be changed by social influence is the attitudes that we attribute to the positive or negative evaluation of people and objects (Petty & Cacioppo, 1986), because in the basic influence model, attitudes are very important on behavior change and work in a way to cause behavior change by influencing beliefs and intentions (Petty & Briñol, 2015). In order for social influence to exist, there must be a possible target or targets to influence and be influenced (Zimbardo & Leippe, 1991). According to Zimbardo and Leippe (1991), individuals can be the target of the influencing subject, or they can exist as subjects influencing targets. For example, while listening to experts giving information about why we should be vaccinated during the COVID-19 period, we can be a target that our attitudes and subsequent actions will change; we can also be an influencing subject while giving information to a friend who does not want to be vaccinated about why he/she should be vaccinated.

Influence may not always happen when we are aware of it. Although our sensory systems try to collect a lot of information in a very short time, we cannot consciously perceive all stimuli because our attention capacity is quite limited: Social influence, therefore, often occurs when we are not consciously aware of it (Zimbardo & Leippe, 1991). Subliminal messages can have a wide range of effects on our daily attitudes and thoughts, changing our behavior from increasing our motivation to voting for a different political party (Ruch et al., 2016).

Social influence is widely used in interpersonal relationships, organizations and media contexts, as well as in persuasion processes (Zimbardo and Leippe, 1991).

2.2. Persuasion

Persuasion and persuasion processes are becoming more and more important due to the widespread use of mass media and the fact that people are in constant communication with everyone and everything. Persuasion and its processes (Briñol et al., 2019), the first seeds of which were empirically sown with Aristotle's *Rhetoric*, written around 350 BC, have become one of the main topics of social psychology (Allport, 1935). Persuasion is defined as a change in beliefs and attitudes that begins with the acquisition of information about a subject or exposure to a subject (Petty & Cacioppo, 1986; Petty & Briñol, 2015). The main purpose of persuasion is to channel behavior in a certain direction by influencing beliefs and attitudes (Kıymalıoğlu, 2014). It is also said that persuasion is "*the cognitive component of the attitude system*" (Zimbardo & Leippe, 1991).

The first studies on propaganda began with the "Communication and Attitude Change Program" established at Yale University and led by Carl Hovland (Briñol & Petty, 2012). The foundation of modern persuasion processes was created with the studies of Hovland and his colleagues, in which they investigated how and when persuasion occurs based on the question "*who communicates what to whom and how?*" (Kağıtçıbaşı & Cemalcılar, 2019). With the cognitive revolution, it was revealed that human beings are active subjects who use information processing, attention, language use, memory, perception, problem solving and decision-making processes (Gerrig & Zimbardo, 2002). On this basis, ongoing persuasion studies have emphasized that cognitive processes occur automatically and in a controlled manner (Moors & De Houwer, 2006; Gawronski & Creighton, 2013), and the Elaboration Likelihood Model (Petty & Cacioppo, 1986), which is one of the few models based on this, was chosen as the main model to focus on in this review since it has been studied in many different fields (Bitner & Obermiller, 1985; Cook et al., 2004).

2.3. Elaboration Likelihood Model

The aim of the Elaboration Likelihood Model (ELM) is to explain the mechanisms underlying attitude change, the variables affecting this process, and the strength of the attitude that emerges at the end of this process (Petty & Wegener, 1999). The first of the 7 basic principles of ELM (Petty & Cappacio, 1986) are that people are motivated to adopt correct attitudes (Petty & Cacioppo, 1986; Fiske & Taylor, 2013). However, sometimes, while examining the information very carefully in order to acquire the right attitudes, sometimes the necessary examinations may not be made by reacting very automatically for

different reasons (Kağıtçıbaşı & Cemalcılar, 2019). Based on this situation, two different pathways, central and peripheral, are mentioned in the model. Basically, the process in which detailed thinking is high is defined as the central pathway, while the process in which elaboration is low and different cues come into play is called the peripheral pathway (Petty & Cacioppo, 1986). The cognitive factors affecting the central and peripheral pathways are primarily the person's motivation and ability to process information and his/her interest in the message (Durmaz, 2011; Petty & Briñol, 2015). If the person has the ability to elaborate arguments about the message, interest in the message, and motivation for the message, as well as the ability to evaluate the message and combine it with previous experiences, the persuasion process takes place through the central pathway. However, if one or more of these conditions are absent, the cognitive effort of the person is low and he/she realizes the persuasion process through the peripheral route in a quick and simple way by using small positive or negative clues in his/her environment (Petty & Cacioppo, 1986).

According to research, it is more difficult to change attitudes using the central pathway than using the peripheral pathway. However, attitudes formed through the central pathway can be more robust, strong and long-lasting (Perloff, 2017). These two different pathways indicate that different targets may react differently to a message and moreover, the same target may develop different attitude changes to a message under different conditions (Petty & Hinsenkamp, 2017). In addition to cognitive differentiators, different factors affecting ELM should also be taken into consideration are *source factors*, *message factors* and *target factors*.

2.3.1 Source Factors

Source factors convey the answer to the question “*Who or who says it?*” which is related to the persuasion process, and how the person or group delivering the message can create attitude change (Fiske & Taylor, 2013; Petty & Briñol, 2015). The first of these is the credibility of the source. The credibility of the source depends on whether the source has a lot of knowledge, is an expert on a subject, and is perceived as honest (Cialdini, 2001). When people lack motivation and focus for different reasons, the credibility of the source ensures that persuasion occurs in a peripheral way (Fiske & Taylor, 2013). According to Petty, Cacioppo, and Goldman (1981), people focus on the credibility of the source if they are irrelevant, while they focus on the content of the message if they are relevant. In other words, if people's relevance to the topic is low, the importance of the messenger increases.

According to another study, if the target does not have any information about the expertise of the source of the message, they think more about the messages coming from individuals or groups whose expertise they trust (Petty et al., 1981). If the arguments are strong or not, persuasion is more likely to increase through strong arguments if the source has more credibility and expertise (Petty & Briñol, 2015).

Another source factor is the attractiveness of the messenger, i.e. the source; and it is expanded with three headings: liking and likability of the source, similarity of the source to the target, and physical attractiveness of the source. When these three elements are considered together, if the attractiveness of the source is high but the arguments are weak, it may cause negative effects on the persuasion process and attitude change may not occur (Petty et al., 1987). Generally, buyers who value attractiveness and expertise are persuaded by using the peripheral route.

2.3.2 Message Factors

Message factors are the factors on how the content of the message can influence the persuasion process in response to the question “*What was said, what was said?*”. The first message factor is the repetition of the message. Many studies have found different results on this issue (Zajonc, 1968; Belch, 1982; Calder & Sternthal, 1980). Petty and Cacioppo (1981) proposed a two-stage persuasion process for message repetition. According to this process, the repetition of the message will be good for the receiver to process the message in cases where he/she cannot focus on the message for different reasons. However, if the message is repeated too much, this may lead to the formation of negative feelings and thoughts about the message, i.e., no attitude change. If the message is listened to or watched and thought about in a detailed and focused way, it can be said that the central pathway is used; in other cases, the peripheral pathway is used.

Another factor is the difficulty of the message. If the content of the message is very difficult (many different arguments are used) and the person's interest in the message is low, the message will not be repeated and persuasion will take place using the peripheral route. However, if the person's cognitive elaboration is high, the central route can be used even if the message is difficult (Fiske & Taylor, 2013). The number of arguments used in the message is also one of the message factors. Regardless of the quality of the arguments, if the person's cognitive factors are low, no peripheral route is used; if the person's cognitive factors are high and the arguments of the message are of high quality, the central route is

used in line with the number of arguments (Petty & Cacioppo, 1984). Moreover, as Fiske and Taylor (2013) point out, the use of rhetorical questions, diversity of sources and environmental distractions are also very effective for the message factor.

2.3.3 Target Factors

Target factors that answer the question “*To whom is it told?*” and explain individual differences are the need for cognition, uncertainty orientation and need for evaluation. The need for cognition is defined as the individual's attempt to solve any message used for persuasion in a cognitively demanding way and enjoying it. Every individual, regardless of high or low need for cognition, intends to make sense of their environment, form attitudes towards situations and find solutions to the problems they face in order to live. However, people with high need for cognition do this naturally and use the central pathway when they encounter persuasion messages. People with low need for cognition, on the other hand, use the peripheral route by relying on others with small clues when faced with persuasion messages (Cacioppo et al., 1996).

Uncertainty orientation, like the need for cognition, involves making sense of the environment and the world. However, in certainty orientation, individuals tend to make sense of the environment and avoid the dangers it brings and are content with the information available. In uncertainty orientation, on the other hand, people tend to search for different meanings and discover new situations. In this case, people with uncertainty orientation are expected to use a centralized route according to ELM; however, in contrast to this model, people with uncertainty orientation tend to use a more peripheral route as their level of relevance to the message increases (Sorrentino et al., 1988; Fiske & Taylor, 2013).

The last goal factor, need for evaluation, is the tendency to have more thoughts and attitudes by evaluating situations, events or persuasive messages in detail with their pros and cons. Individuals with a high need for evaluation use more centralized pathways (Jarvis & Petty, 1996). It is assumed that the need for cognition mediates between attitude change and the message in the persuasion process and that the need for evaluation and the need for cognition overlap in some cases (Fiske & Taylor, 2013).

The Elaboration Likelihood Model has been used in many different fields since its creation by Petty and Cacioppo in 1986. For example, studies on consumer behavior have investigated different factors of ELM such as message repetition, need for cognition, target interest and source credibility (Anand & Sternthal, 1990; Pechmann & Esteban, 1993; Zhang

and Buda, 1999; Rice et al., 2012). ELM has also played an important role in many different advertising and communication studies. There are many studies in the literature looking at the number of arguments, message source, target's emotional state and argument quality (Pentony, 1986; Kang & Herr, 2006; Teng et al., 2010). As a result of these studies, it is examined how different factors of persuasion create attitude change using a central or peripheral route.

In summary, it is known that persuasion, which is a pillar of social influence, is used and effective in many different fields. In particular, the Elaboration Likelihood Model is one of the most important persuasion models used to create attitude change in both individual and social issues.

2.4 Emotions in ELM

In ELM, the central route refers to a deep and thorough processing of information, where a person critically evaluates the arguments and evidence presented. On the other hand, the peripheral route refers to a more shallow and quick processing of information, where a person relies on extraneous cues, such as emotions, to form an attitude.

The ELM suggests that emotions can play a role in persuasion by serving as a heuristic, or a shortcut, in the peripheral route. According to Petty and Cacioppo (1986), when people are under time pressure or have low motivation to process information, they may rely on their emotions as a quick way to form attitudes. For example, a person may have a positive emotional response to an advertisement that features a cute puppy, leading to a favorable attitude towards the product being advertised, even if they do not have time to carefully consider the arguments or evidence presented.

In addition to serving as a heuristic, emotions can also influence attitudes by affecting the motivation to engage in elaborative processing. For example, research has shown that people are more likely to process information when they have a high level of personal relevance or interest in the topic (Petty & Cacioppo, 1986). Thus, if a person has a strong emotional response to a persuasive message, such as feeling scared or angry, they may be more motivated to critically evaluate the information, leading to more enduring changes in attitude (Petty & Cacioppo, 1986).

In sum, the ELM suggests that emotions can play a role in persuasion by serving as a heuristic in the peripheral route, or by affecting the motivation to engage in elaborative processing in the central route.

3. PRESENT STUDY

How persuasive and convincing can people find the message of a non-human social being? The aim of this thesis is to understand individuals' attitudes towards different social agents - human, humanoid, android and cyborg - and the effects of their attributions towards a social agent on their persuasion and thinking styles. In other words, as predicted by the Elaboration Likelihood Model (ELM), this research wants to examine the influence of different message givers with different mechanistic properties, the rationality of the message and the attributions of humans on persuasion. This study will investigate the effect of whether the messenger is human, android, humanoid or cyborg on the probability of elaboration and thus on persuasion. Furthermore, this study will also examine the role of individuals' already existing or momentary emotions and thoughts on the probability of elaboration and their influence on the effectiveness of persuasive messages. By investigating these factors, this study will contribute to our understanding of the mechanisms underlying ELM in the context of robot-human interaction and provide insights for future innovators of persuasive communication for humanity coexisting with different social agents.

In this context, the hypotheses of the study were determined as follows:

H1: Because the human does not have the uncanny valley effect and has already anthropomorphic characteristics, the central route of the participants interacting with the rational-human source will be triggered and there will be a higher persuasion change.

H2: Because the human does not have the uncanny valley effect and has already anthropomorphic characteristics, the peripheral route of the participants interacting with the irrational-human source will be triggered and lower persuasion change than rational-human condition.

H3: Because the humanoid has a slightly higher uncanny valley effect and lower anthropomorphic characteristics than the human, the peripheral route of the participants interacting with the irrational-humanoid source will be triggered by with the perception of incompetence. Therefore, a lower persuasion score change than human conditions and irrational-humanoid condition.

H4: Because the humanoid has a slightly higher uncanny valley effect and lower anthropomorphic characteristics than the human, the central route of the participants interacting with the rational-humanoid source will be triggered by with the perception of competence. Therefore, a higher persuasion score change than irrational-humanoid condition.

H5: Because the android has a higher uncanny valley effect than human and humanoid and the lower anthropomorphic characteristics than human, the peripheral route of the participants interacting with the rational-humanoid source will be triggered by with the. Therefore, a lower persuasion score change than human-conditions and humanoid conditions.

H6: Because the android has a higher uncanny valley effect than human and humanoid and the lower anthropomorphic characteristics than human, the peripheral route of the participants interacting with the irrational-humanoid message. Therefore, a lower persuasion score change than human-conditions, humanoid conditions and rational android condition.

H7: Because the cyborg could have higher or lower uncanny valley effect and also anthropomorphic characteristics, the peripheral route or the central route of the participants interacting with the rational-cyborg and irrational-cyborg conditions will be triggered by with the participants' current perceptions. Therefore, the persuasion score will be situated according to participants' other assessments.

4. METHOD

4.1. Participants

Since the study used an experimental design, the number of participants is determined with G*power (Faul et al., 2007). The target is to achieve a power of .80 to detect a small to medium effect size of $f = .25$ at a standard alpha error of .05. Accordingly, the ideal sample size was expected to be 288-300 participants. For the 8 different groups, almost 15 participants per group were expected to be randomly assigned. There were no special criteria for participation in the study. The only exclusion criterion was that the participant had to be over 18 years of age. In line with that criteria, 682 participants were reached through a survey sent online via Qualtrics with the effect of social media and snow ball effect. However, since 77 people left the study unfinished, the data of 77 people were excluded from the data set. The analysis continued with a total of 605 participants.

Table 1. *Categorical Characteristics of Sample*

Variables		Frequency	Percent (%)
Gender	Female	435	% 71.9
	Male	158	%26.1
	Trans	1	%0.2
	Other	11	%1.8
Education	Secondary school	4	% 0.7
	High school	78	% 12.9
	Undergraduate	143	% 23.6
	Graduate	380	% 62.8
Robot Interaction	Yes	165	% 27.3
	No	440	% 72.7
Age	18-23	180	% 29.9
	24-30	175	% 28.8
	31-40	104	%17.1
	41-50	79	%12.8
	51-60	49	%8.2
	61-70	16	%2.8
	71-80	2	%0.4

Note. $N = 605$

4.2. Materials

Scenarios Presented to Participants & Persuasiveness of Messages. ChatGPT 4.0 (OpenAI, 2023), an artificial intelligence language model that is currently popular in the world, was used. The use of ChatGPT 4.0 in the research process is based on strategic and scientific grounds. The AI-based language model offers a unique knowledge base with knowledge up to 2021, which increases the capacity of this tool to provide up-to-date and unbiased information. Faster and more efficient than traditional data collection methods, this model also minimizes the subjective biases of manual collection. Especially in identifying "hot" and "cold" topics, ChatGPT's ability to quickly provide topics based on global trends, localized or free from individual bias offers a critical advantage. Moreover, this model has the capacity to work synergistically with our interactive design. Its knack for dialogues and persuasive messages offers a unique opportunity for real-time interactive scenarios. Furthermore, the use of this AI-based approach demonstrates our commitment to modern research methods, while opening a door for the discovery of new and innovative findings. For these reasons, the use of ChatGPT as an integrative tool in this study is both strategically and scientifically justified.

First, ChatGPT 4.0 was asked the question *"Can you please create me 8 cold topics and 8 hot topics that are popular?"* ChatGPT 4.0 created 8 hot topics (Artificial Intelligence and Automation, Income Inequality and Wealth Distribution, Climate Change and Global Warming, Space Exploration and Colonization, Mental Health, Wellbeing and Psychological Wellbeing, Anti-Aging and Life Extension Research, Cryptocurrency and Blockchain Technology, Cybersecurity and Privacy Issues) and 8 cold topical topics (Classical Literature and Book Clubs, Film Photography and Traditional Film History, History of Fashion and Clothing Styles, Local Public Transportation Improvements, Board and Computer Games, International Cuisines, Collecting Historical Stamps and Coins, Handwriting and Calligraphy). These topics were then organized as a survey on Qualtrics. In Qualtrics, each topic was followed by the question *"How popular, topical, important and/or widespread is this topic for you right now?"*, creating a total of 16 Likert scale questions. Participants rated these questions from 1 to 7 (*1=not at all, 7=completely*) (Appendix A). Each of the questions was set to be randomly presented to the participants. The questionnaire was presented to Başkent University psychology department lecturers. A total of 22 participants were reached. According to the descriptive statistics results, the hottest topic was "Mental Health and Psychological Well-being", the coldest topic was

"Collecting Historical Stamps and Coins" and the neutral topic was "Local Public Transportation Improvements".

It was decided to choose the most neutral topic, *local transportation*, as it was not intended to provoke any emotional confounding.

The aim was to measure the persuasiveness of the messages delivered through interactive dialogues with D. Deniz (the name of the message source remains the same regardless of the type of social agent or type of message) as the message source. In order to get a baseline measure of the participants' initial attitudes and opinions on the topics presented, a pre-test consisting of four items were administered before the participants enter into a dialog with D. Deniz (Appendix B).

After the dialog, participants were given a four items post-test designed to measure the extent to which they found D. Deniz's information persuasive (Appendix C). The pretest and posttest questions aimed to indirectly measure the persuasiveness of the messages without explicitly asking the participants about their level of persuasiveness. The pre-test and post-test questions attempted to specify various dimensions of persuasion are cognition, behavior, emotion and attitude.

In order to validly compare the participants' attitudes and opinions before and after the dialog, the pretest and posttest questions were kept the same. However, the questions were kept implicit to minimize the possibility of participants being confused or influenced by their initial responses. Since the participants answered the questions using a multiple-choice format, their initial persuasion scores could be statistically compared with their final persuasion scores. By comparing the pre-test and post-test responses, it was aimed to gain insight into the overall persuasiveness of D. Deniz's messages in the dialogues and possible factors that might influence these results. In order to increase the interaction of the messaging agent with the participants in ELM, the experimental design was conceived as a visual novel that allows the creation of interactive story-based experiences. Therefore, it was aimed to develop a novel using Ren'Py 7.6 a popular open-source platform for creating visual novels.

In the previous process, 2 different dialogues and 2 different persuasive messages were prepared on the same topic determined by ChatGPT. Each dialogue was structured in a way that an expert named D. Deniz would introduce (Appendix D). The visual novel included multiple-choice questions that allowed the participants to express their feelings and thoughts throughout the dialogues, so that the persuasiveness of the messages could be indirectly evaluated.

Design of Rational & Irrational Messages. Argument quality is more likely to trigger central route of the message when it is strong, logical and well-supported, whereas weak arguments with no logical background are more likely to trigger peripheral route (Petty & Cacioppo, 1984). Therefore, while constructing the arguments, we followed Orsinger's argument construction process in a similar study (Langholf et al., 2021).

In Appeal to Belief, the truth or validity of an argument is judged on the basis of what other people say or believe. If most people, or those with titles such as "expert" or "professional", believe that an argument is true, it is believed to be true. Even if the claim or argument is true, it is defined as sophistry by Orsinger because the source behind it is not based on a logic. The "irrational messages" in this study was also intended to be designed in this way. Firstly, traffic problems and carpooling were chosen as a neutral topic. Then, some beliefs or thoughts that the society or experts believe in were included. For example, in the dialogue it is stated that *"Most people believe that carpooling will reduce traffic congestion"*. In addition, the participants were asked to evaluate the reasonableness of the arguments presented in order to give the dialogues a more interactive feel.

In the Chained Conditional Propositions method, the truth and validity of an argument are evaluated by linking a series of logical and conditional propositions. In other words, the consequences of an event or the truth of an argument are explained step by step through conditional propositions. Chained conditional propositions are often used to explain the cause and effect of arguments by working on the basis of logic and reasoning. In this study, "rational messages" are also intended to be designed in this way. Firstly, traffic problems and carpooling were chosen as the same and neutral topic as Appeal the Belief. Then, the topic was explained step by step, underlining that each step comes after the previous step. For example, the dialogue states that *"Carpooling will reduce traffic congestion, which in turn will reduce fuel consumption and improve public health"*. In addition, as in the Appeal the Belief dialogue, participants were also asked to evaluate whether the arguments presented were logical or not, in order to give the dialogues a greater sense of interactivity (Appendix E).

Design of Social Agents' Images. The characters were created by AI which is author using (Midjourney, Inc, 2023). Firstly, the human character was created as the base photo for humanoid, android and cyborg design. Care was taken to ensure that all characters have androgynous features so that their gender cannot be distinguished. In order for the characters to be characters in the same baseline, the prompt *"androgynous character with neutral facial expression for human"* was entered for all social agent types to be the same. After the

selected image, the same prompt was entered for humanoid, android and cyborg. In order to remove all visual confounding, the backgrounds of the characters were deleted, white backgrounds were added and a black and white effect was applied to all characters (Appendix F).

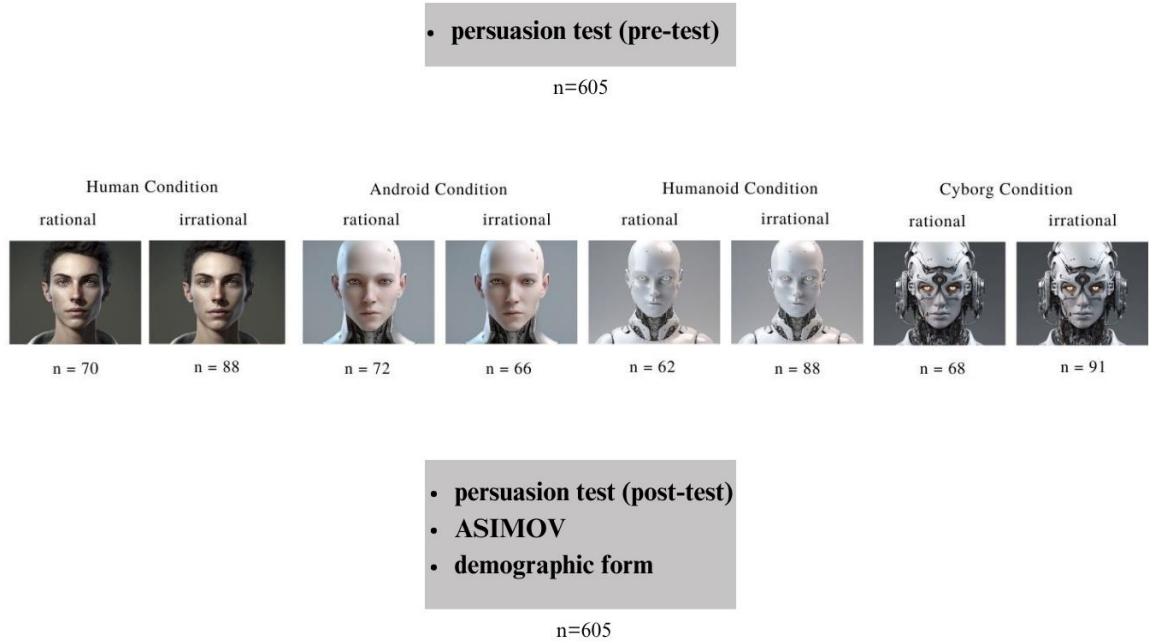
Assessment Scale for Intelligent Machine's Operational Verisimilitude (ASIMOV) for Analyzing Realness, Uncanniness, Competence, and Emotionality. While creating the ASIMOV (Kökdemir et al., 2023), the items of the 3 former scales were taken as basis. Firstly, the items *competent, natural, kind, conscious, nice, relaxed, irresponsible, anxious* and *calm* were taken from Godspeed Questionnaire (Bartneck et al., 2009). The Godspeed Questionnaire includes 48 items and a 5-point scale in terms of the semantic differential scale. Secondly, the items *happy, emotional, social, capable, responsive, interactive, reliable, competent, scary, strange, dangerous* and *aggressive* were taken from RoSAS with 18 items and 9-point scale (Carpinella et al., 2017). Finally, the items *warm, likable, alive, real, humanlike, self-reliant, rational, intentional* and *intelligent* were taken from the HRIES developed by Spatola and colleagues in 2021. By adding the planned item, which was not included in these scales, the final version of the scale was formatted as 31 items in total. All of the robot images to be evaluated in the scale consist of the images used by Spatola while developing HRIES (2021). The robot inventory consists of 20 robot images in total. The first factor found was named “Realness”. There are five items in this factor and these items are *alive, real, humanlike, self-reliant* and *natural* ($\alpha=.71$), explaining 20.9% of variance. The second factor is thought to be related to the “Uncanniness” which includes the five items of *scary, strange, dangerous, aggressive* and *irresponsible* ($\alpha=.78$), explaining 13.2% of variance. The third factor was considered as “Competence” and it contains five items that are *capable, competent, intelligent, organized* and *rational* ($\alpha=.85$), explaining 9.50% of variance. The fourth and last factor considered within the framework of “Emotionality” is thought to be related to the *compassionate, warm, emotional, happy* and *calm* ($\alpha=.88$), explaining 5.6% of variance (Appendix G).

Demographic Form. At the end of the experiment, participants filled a demographic form. This form included questions about participants' age, gender, education level and general attitude towards robots and technology (Appendix H).

4.3. Procedure

For the study, permission was first obtained from Baskent University Ethics Committee. Participants participated in the study online with their personal computers. Firstly, the participants were given a preliminary information form and given general information about the experiment and their assurance of voluntary participation in the experiment was obtained. The researcher written informed each participant about what to do in the experimental procedure. Participants were then exposed to a randomly assigned scenario, gender and type of messaging agent via a link sent to them. After this scenario, they solved the post-test questions in the same experimental design. Then, the participants completed the ASIMOV scale and demographic form sent to them via Qualtrics. The experimental process of the study ended here. Participants were thanked and given an information sheet and contact information where they could reach the researcher if they had any questions. The flowchart of the experimental design can be seen in Figure 4.

Figure 4. *The flowchart of the experimental design*



5. RESULTS

There is one dependent variable (persuasion score) and two independent variables (message content and social agent type). Each of the independent variables has more than one level (message content: rational and irrational; social agent type: human, humanoid, android and cyborg). In addition, information about pre-existing attitudes was also collected from the participants. Therefore, Mixed Model Repeated Measures ANOVA was conducted as the main analysis. This statistical analysis aimed to show the main effects of each independent variable and possible interactions between independent variables on the dependent variable.

5.1. Preliminary Analysis

5.1.1. Descriptive Analysis

Before statistical analyses, the responses of 605 participants were examined for missing data and outliers. Participants who quit the questionnaire at any stage and individuals under the age of 18 were excluded from the data set. After checking the data, it was observed that 4 participants did not meet the age criteria. After these individuals were removed, a total sample of 601 participants was formed for the analyses. In the next step, the data were analyzed for normality.

Then, normality analysis was performed and the skewness and kurtosis values of the persuasion score, which is the dependent variable, were examined. The skewness and kurtosis values of 0.79 and 1.13, respectively, suggest that the distribution was approximately normal.

Descriptive statistics and other statistical analyses were calculated using Jamovi 2.3.24.0 (Jamovi, 2023). The mean persuasion gap score for the whole sample was $M = 2.43$ ($SD = 2.96$), with a score gap ranging from -6 to 16. The sample comprised 605 participants ($N = 601$), with ages ranging from 18 to 77 years ($M = 32.6$, $SD = 12.2$), and included 157 males, 432 females and 1 other. The educational background of the participants varied, with 4 secondary school, 74 high school, 380 undergraduate and 143 post graduate.

5.1.2. Paired Samples T-Test

Before the primary analysis of the effect of message type and message sender type on persuasion scores, a paired samples t-test was conducted to examine whether there was a

statistically significant difference in persuasion scores before and after the experimental manipulation.

Participants' persuasion scores were measured both before ($M = 13.4$, $SD = 4.05$) and after ($M = 15.08$, $SD = 3.48$) the manipulation. A paired sample t-test revealed a statistically significant difference in persuasion scores from the pretest, $t(600) = -20.1$, $p < .001$. The mean increase in persuasion scores was 2.43 points, with a 95% confidence interval ranging from -2.66 to -2.19 (Table 2). This result indicates that the manipulation had a significant effect on participants' persuasion scores.

Table 2. *t*-test Results Comparing Pre-Test and Post-Test Results

Results	N	Mean	SD	t	df	p
PostTest – PreTest	605	2.41	0.12	-20.1	604	<.001

Note. The p-value is from a two-tailed test.

5.1.3. Correlation Analysis & A One Way ANOVA

Before initiating the primary analysis using mixed-design analysis of variance model, it was crucial to examine the relationships among the variables. As such, a correlation analysis was performed between persuasion scores, ASIMOV scale dimensions, and demographic variables.

As depicted in Table 3, there was a positive correlation between the difference in participants' post-persuasion and pre-persuasion scores and the ASIMOV dimensions of competence ($r = 0.182$, $p < .001$), real-being ($r = 0.137$, $p < .001$), and emotionality ($r = 0.143$, $p < .001$). Concurrently, a negative correlation was found between this difference and uncanniness ($r = -0.093$, $p = 0.022$).

Moreover, there was a positive relationship between the difference in post-persuasion and pre-persuasion scores and participants' physical contentment ($r = 0.084$, $p = 0.039$). Conversely, negative relationships were observed between the difference in persuasion scores and preferences for childcare ($r = -0.094$, $p = 0.021$) as well as technological familiarity scores ($r = -0.092$, $p = 0.024$).

Since gender is a categorical variable, one-way analysis of variance (ANOVA) was conducted to investigate any significant differences in persuasion score changes across various gender categories. The findings presented in Table 4 indicated significant disparities in persuasion score changes among gender categories, $F(3,601) = 8.46$, $p < .001$. Given the

notable influence of gender on the change in persuasion scores, post-hoc analyses with Bonferroni were carried out to discern which gender groups had significant variations. The results revealed a significant difference in the change of persuasion scores between women and men, ($M = 1.5$, $SD = 0.27$, $p < .001$). Women displayed a more considerable difference in persuasion scores compared to men, suggesting that gender does play a role in influencing these scores, with women notably scoring higher than men.



Table 3. *Correlations of Variables*

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13
Persuasion Difference	-												
Competence	.182***	-											
Real Being	.137***	.614***	-										
Emotionality	.143***	.610***	.823***	-									
Uncanny	-.093*	-.245***	-.384***	-.417***	-								
Physical Pleasantness	.084*	.291***	.401***	.428***	-.341***	-							
Keeping at Home	-.014	.308***	.287***	.402***	-.238***	.680***	-						
Childcare Desire	-.094*	.241***	.338***	.365***	-.219***	.562***	.788***	-					
Gender	-.177***	-.0110**	-.077	-.086*	-.012	.027	.059	.059	-				
Age	.017	.063	.157***	.158***	-.087*	.076	.138***	.149***	.186***	-			
Education	-.076	-.138***	-.111**	-.108**	.035	-.066	-.008	.023	.043	.168***	-		
Technological Familiarity	-.092*	.066	.031	.064	-.070	.091*	.122**	.078	.110**	-.098*	.121**	-	
Robot General Attitude	-.045	.126**	.138***	.147***	-.147***	.368***	.395***	.359***	.066	-.002	.018	.232***	-

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

5.2. Main Analyses

5.2.1. A Mixed Model Repeated Measure ANOVA

A mixed design ANOVA was conducted to investigate the effect of message type and robot type on the change in participants' persuasion scores. The independent variables were two-level message type and four-level social agent type, resulting in a total of 8 groups (human-irrational, human-rational, humanoid-rational, humanoid-rational, android-irrational, android-rational, cyborg-irrational, cyborg-rational). The dependent variable was the change in persuasion scores (post test and pre test).

As seen in Table 4, as in the t-test results, there is a significant change in the persuasion scores ($F = 394, p = <.001, \eta^2 = .40$). However, there is no significant main effect of social agent type scores ($F = .45, p = .71, \eta^2 = .002$) or agent type ($F = 1.23, p = .71, \eta^2 = .002$) on the change in persuasion scores. The interaction effect between message type and robot type on the persuasion score is also not significant ($F = .73, p = .53, \eta^2 = .004$).

Table 4. *Mixed Model Repeated Measures ANOVA Results Comparing Robot Types and Message Type on the Change of Persuasion Score*

Source	df	Mean Square	F	p	η^2
Persuasion	1	1733.3	394	<.001	.40
Persuasion x Message Type	1	5.7	1.30	0.25	.002
	3	2	.45	.71	.002
Persuasion x Agent Type					
Persuasion x Message Type x Agent Type	3	3.22	.73	.53	.004

Note. $p < .05$ indicates significance.

6. DISCUSSION

In this study, the effects of whether the type of message and the type of social agent delivering the message on the changes in participants' persuasion scores were analyzed. It was hypothesized that the rationality of the message and the type of social agent delivering the message would significantly influence changes in participants' persuasion scores. However, contrary to the hypotheses, the results showed that neither the logicality of the message nor the type of social agent delivering the message had a significant main effect on changes in persuasion scores. Furthermore, no significant interaction between message type and social agent type was found. However, although the main hypotheses were not supported, correlation analyses revealed important ancillary findings for some variables. According to the results of the analyses, gender and competence were important in predicting the change in persuasion scores. These findings provide an intriguing look at the underlying factors that influence persuasion beyond message types and the robotic agents involved. A more in-depth discussion of these key findings will expand our understanding of the complex nature of persuasion and how individuals experience persuasion processes.

6.1. Competence

One of the findings of the study to be taken into account is the importance of competence. In other words, "competence" could have a significant effect on participants' responses to messages. Therefore, the results indicate that participants may have evaluated the messages presented by sources they perceive as competent more effectively and responded more positively to these messages. Therefore, understanding the role of competence is critical for individuals and organizations who want to effectively manage and optimize their persuasion processes. In short, this study emphasizes that ability is a central factor in persuasion processes and can influence these processes.

6.1.1. Elaboration Likelihood Model (ELM) Perspective

In the Elaboration Likelihood Model (ELM), source factors are among the most important elements that contribute to attitude change and persuasion process (Petty & Wegener, 1999). Among the source factors, especially the credibility of the message source emerges as a vital component in the persuasion process (Fiske & Taylor, 2013; Petty & Briñol, 2015). The credibility of the source in the ELM is assessed in two sub-dimensions: *competence* (the target receiver's perception that the messenger is making true claims) and *trustworthiness* (the target receiver's belief that the messenger's content is valid) (Pornpitakpan, 2004). Research has examined the decision-making process in individuals and how competence and credibility play

a role in individuals' judgements (Pennington & Hastie, 1988) and suggested that the perceived expertise and credibility of the source play an important role even when the target message recipient is not highly motivated to process the message content or when the subject matter of the message is not inherently interesting or familiar (Petty, Cacioppo & Goldman, 1981; Cialdini, 2001). The concept of competence, which expresses that an individual has skills in a certain field, also forms the basis of trust for the target by signaling about the expertise and work of that person - the messenger (Mayer et al., 1995). This suggests that the possibility that individuals are influenced by the credibility of the source rather than the strength of the argument is consistent with the ELM's argument in favor of the peripheral route.

In conclusion, the Elaboration Likelihood Model emphasizes the significance of source variables, particularly competence and credibility, in affecting attitude change and persuasion. Competence, which is a sign of competence in a certain sector, leads to trust in the communicator, which can boost the message's persuasive power.

6.1.2. Social Perception Perspective

Social perception is based on the process that individuals go through to evaluate and understand each other (Fiske, 1993). In this context, the Stereotype Content Model (SCM) suggests that it is based on two universal dimensions that enable us to understand people's capacity to help or harm us (Carpinella et al., 2017): *warmth* and *competence*. The competence dimension helps reflects characteristics related to perceived abilities such as intelligence, skill, creativity and effectiveness of individuals (Fiske et al., 2007). Moreover, according to SCM, competence is one of the dimensions of social perception that provides an indication that the messenger is skilled in the subject matter and a source to be trusted by others (Cuddy et al., 2009).

As a result, competence is a very important construct in the Stereotype Content Model, and it becomes an indicator of the specific skills and expertise of each other, especially for individuals who interact with each other. Therefore, with an increase in perceived competence, trust and credibility will increase and the likelihood of valuing and trusting the information or advice provided by the messaging agent will increase.

Considering the information obtained from Elaboration Likelihood Model (ELM) and Stereotype Content Model (SCM), the emergence of competence as an important variable in the study can be explained and understood with the intertwined dynamics of source credibility and social perception that affect each other. While ELM suggests that competence is very important for the persuasiveness of the source and affects the persuasion process and attitude change. SCM also emphasizes competence as a critical dimension in social perception and

signals to people about an individual's ability and skill. In the context of this study, regardless of the type of message or the nature of the messenger, D. Deniz introduced itself with a claim of expertise on the topic. D. Deniz's claim of expertise may have served as a possible enabler in shaping participants' perceptions of competence.

Robots are entities that are likely to be perceived by humans as competent, skillful, capable and competent (Liu et al., 2022). Therefore, once the participants recognize the social agent as a robot, it can create a halo effect that it will know all the information correctly. According to the Halo Effect, when individuals make a positive attribution to a person or entity for one of its characteristics, this positive attribution may be reflected in other characteristics of the entity and all characteristics of the entity may be perceived as equally positive (Thorndike, 1920). The halo effect in the context under discussion can be defined as a cognitive bias in which the perception of competence in one domain leads to positively biased judgements in other domains. These findings are in line with the social perception claims put forward by SCM.

Taken together, it is plausible that the competence is significant in this study due to the dual effect of source reliability as described in the ELM and the social perception of robots as inherently competent entities. This competence, together with the halo effect, serves as a trust-inducing factor that leads participants to view the social agent as competent in various domains.

In sum, the interaction between source credibility and social perception, coupled with cognitive biases such as the halo effect, provides a comprehensive explanation for the importance of competence in the study.

6.2. Gender

Another important finding of the study is that there is a significant difference in the change in persuasion difference scores between male and female participants. In other words, women showed a higher change in persuasion scores compared to men. This result suggests how individuals of different genders may react to persuasive messages. In addition, these results can be considered as an important finding that studies and elements of communication can also be focused on gender in order to make communication and persuasion more effective.

6.1.1 Elaboration Likelihood Model (ELM) Perspective

The Elaboration Likelihood Model (ELM) explains the elements of individuals' attitude change processes and how they relate to social psychological constructs such as persuasion (Petty & Wegener, 1999). In the model, as stated by Petty and Cacioppo (1986), two different pathways come to the fore in persuasion processes: central path and peripheral path. The central path is an approach in which individuals analyze the arguments presented in depth and have a

high level of detailed thinking in this process. The peripheral path is a process in which individuals focus more on superficial cues such as how the presentation is made or the reliability of the source, rather than focusing on the argument itself. This pathway is an approach in which detailed thinking is lower and individuals are more open to the influence of different elements.

Given that gender plays a decisive role in persuasion processes, it is likely that women and men prefer different paths within the Elaboration Likelihood Model (ELM). Women, due to their social roles, evaluate arguments more comprehensively, while men are more prone to superficial cues and analytical thinking. These tendencies reflect cultural aspects of gender and are in line with the selectivity hypothesis; women tend to process information more comprehensively and men more selectively (Luo & Ye, 2019).

Understanding the impact of gender differences on persuasion processes is critical for tailoring messages to the target audience. Using gender-sensitive approaches in marketing strategies can create more effective connections. Future research should focus on social changes to better understand gender roles and persuasion.

In summary, the fact that different genders result in different persuasion scores is one of the outcomes that can be explained according to ELM.

6.1.2. Social Role Perspective

Although in the history of science, neuroscientists in particular have categorized individuals as male and female and classified their traits as the output of these genders (Jordan-Young & Rumiati, 2012), these differences need to focus on the impact of gender acculturation on neural processes rather than an unchangeable biological origin (Elliot, 2011). Differences between the sexes are determined to a certain extent by genetic differences, but gender roles also result from social constraints that change in response to interaction with social and cultural conditions, which shape perceptions and behavior between men and women (Eagly & Wood, 1999).

Social Role Theory (SRT) was put forward by Eagly in the 1980s to try to understand gender differences and similarities in the context of social behaviors (Eagly et al., 2000). Differences in the socialization process can influence how men and women consider and implement advice given by others (Luo & Ye, 2019). According to Social Role Theory, gender disparities and similarities in behavior reflect gender role views, which indicate people's perceptions of men's and women's social positions in the society in which they live (Eagly & Wood, 2011). Women's greater openness to persuasive messages may be related to their social roles and their predisposition to empathy; however, this is not a conscious choice on their part. The male-dominated norms of society unintentionally make women more susceptible to these

messages, leaving them lacking in social power and contributing to their perceived disadvantage in leadership roles (Carli, 1999).

Women's acceptance of caregiving duties in industrialized nations has evolved based on biological distinctions and social contexts, leading people to perceive women as community-oriented and caring, and these roles are formed by societal expectations (Eagly & Wood, 2011). Unfortunately, these traditional gender roles still characterize women as "conformist" and more inclined to believe and, conversely, men as more dominant and "less conformist" (Eagly & Chvrvala, 1986).

Gender has a major influence on persuasion processes, according to the findings of this study. Women's persuasion score differences appear to rise more than men's when analyzed using the Elaboration Likelihood Model (ELM) and Social Role Theory (SRT). The ELM emphasizes the tendency of individuals to prefer different paths in persuasion processes, namely peripheral and central, and the possibility that women may have evaluated the arguments presented more comprehensively due to their social roles and men may be more prone to superficial cues can be discussed within the scope of the study results.

These results are also consistent with SRT. According to SRT, social roles and socialization processes have a decisive influence on how individuals evaluate and apply the advice of others.

The findings of this study may again point to women's social roles. It is possible to say that women may have obtained higher scores in persuasion processes because they were directed to be empathetic and their social roles made them more open to persuasive messages. In conclusion, the importance of the impact of different sex and gender perceptions on persuasion processes cannot be denied.

This study provides valuable information on how persuasion processes differ between men and women, and these findings suggest that studies and strategies on persuasion and communication can be reconsidered.

6.3. The Effects of Message & Social Agent Type on Persuasion

At the beginning of our research, we hypothesized that participants would experience different levels of persuasion depending on the rationality of the message presented and the different social agent types of the message source. When interacting with humans, humanoids, androids, and cyborgs, individuals would elaborate messages through the central and peripheral routes in the Elaboration Likelihood Model due to different message content and would have different persuasion score differences. However, contrary to what was expected, the results showed no difference in persuasion scores between any groups. Therefore, it is aimed to

evaluate the differences between the hypotheses and the results and to emphasize possible limitations.

6.3.1. The Social Agent

According to the hypotheses formed by considering the uncanny valley effect, it was predicted that the difference in the level of persuasion of the participants would be affected differently and significantly from the other groups. Especially in the case of androids and cyborgs, which are very close to human shape but not human, it was hypothesized that this effect would be higher compared to other groups. However, the results predicted that there was no difference between the social agent creating an uncanny valley feeling and the change in persuasion scores compared to other groups. The uncanny valley effect was less pronounced than expected and the uncanny valley effect on participants' persuasion levels was limited.

According to the hypotheses formed by considering anthropomorphism, it was claimed that the difference in the level of persuasion of the participants would be affected differently and significantly from the other groups. It was thought that the participants would strengthen their interaction by making emotional attributions to social agents that they thought to have human or human-like characteristics and thus increase their level of persuasion more than the other groups. However, it was understood that the participants did not make the expected attributions to the agents that were thought to have more human-like characteristics. Therefore, it is possible to infer that the participants may have evaluated all the characters on the same plane and could not cause an effect that would change the direction and strength of persuasion.

6.3.2. The Message

According to the hypotheses formed by prioritizing the Elaboration Likelihood Model, participants' persuasion level differences would change depending on whether the message was rational or not. In other words, as predicted by the ELM, participants exposed to a rational message would focus on the logic of the message by triggering the use of the central route and would be exposed to a higher level of persuasion difference than participants exposed to an irrational message. However, the results showed that whether the message was rational or not did not lead to any persuasion score difference between the groups.

7. POTENTIAL LIMITATIONS & FUTURE DIRECTIONS

It can be considered as a limitation whether the visual differences between the human, humanoid, android and cyborg social agents selected and used for the study were perceived sufficiently by the participants. By creating a more detailed study design for the selection of social agents, more than one created agent could have been presented in a pilot study with different participants and the social agents selected with the highest score could have been included in the main study.

Another important limitation is the lack of manipulation control. The extent to which participants perceived the visual differences between the human, humanoid, android and cyborg social agents used in the study and how they correctly categorized these agents was not controlled. This prevents us from getting a clear idea of which category the participants placed the social agents in and what characteristics they perceived them to have. For example, whether a participant perceives an android as humanoid or cyborg could potentially influence the results. The addition of such a manipulation control would have helped us better understand the relationship between participants' perceptions and responses. For future studies, it is strongly recommended that a manipulation control be implemented to ensure that participants accurately identify social agents.

It is known that the use of gestures and facial expressions in robot studies makes robots appear more humanoid, and also that gestures and facial expressions used correctly increase the uncanny of robots (de Wit et al., 2023). In this study, by enriching the gestures and facial expressions of the social agents, more realistic and believable uncanny valley and anthropomorphic experiences could be presented to the participants. Based on this, this study can be replicated in future similar studies by creating different types of social agents enhanced with gestures and facial expressions.

Also, use of virtual reality (VR) platforms to provide highly realistic and interactive 3D simulation environments with active participation and to overcome the possible limitations of the environment could better reflect the perceptions of the uncanny valley and anthropomorphism by providing a more realistic experience to the participants. Again, in future replication studies, studies can be enriched by adding VR environments in addition to the use of gestures and mimics.

Finally, the short duration of the participants' interactions with the social agents may also have been a limitation, and the interactions between the participants and the robots may have prevented the establishment of sufficient emotional and deep bonds in the participants.

Therefore, uncanny valley and anthropomorphism attitudes of the participants towards different social agents could have been analyzed by using repeated and live interaction processes as in the study conducted by Zlotowski and colleagues (Zlotowski et al., 2015). This idea is among those that are thought to shed light for future long-term studies.



REFERENCES

- Allport, G. W. (1935). Attitudes. In *A handbook of social psychology* (pp. 798–844). Clark University Press.
- Anand, P., & Sternthal, B. (1990). Ease of message processing as a moderator of repetition effects in advertising. *Journal of Marketing Research*, 27(3), 345. <https://doi.org/10.2307/3172591>
- Anzalone, S. M., Boucenna, S., Ivaldi, S., & Chetouani, M. (2015). Evaluating the engagement with social robots. *International Journal of Social Robotics*, 7(4), 465–478. <https://doi.org/10.1007/s12369-015-0298-7>
- Banks, J. (2017). Of beard physics and worldness: The (non-)effect of enhanced anthropomorphism on player–avatar relations. *Psychology of Popular Media Culture*, 6(4), 381–393. <https://doi.org/10.1037/ppm0000104>
- Bartneck, C., Kanda, T., Ishiguro, H., & Hagita, N. (2007). Is the uncanny valley an uncanny cliff? *RO-MAN 2007 - The 16th IEEE International Symposium on Robot and Human Interactive Communication*, 368–373. [10.1109/ROMAN.2007.4415111](https://doi.org/10.1109/ROMAN.2007.4415111)
- Bartneck, C., Kulić, D., Croft, E., & Zoghbi, S. (2009). Measurement instruments for the anthropomorphism, animacy, likeability, perceived intelligence, and perceived safety of robots. *International Journal of Social Robotics*, 1(1), 71–81. <https://doi.org/10.1007/s12369-008-0001-3>
- Bartneck, C., Belpaeme, T., Eyssel, F., Kanda, T., Keijsers, M., & Šabanović, S. (2020). How a robot works. In *Human-Robot Interaction: An Introduction* (pp. 18-40). Cambridge: Cambridge University Press.
- Baus, O., & Bouchard, S. (2014). Moving from virtual reality exposure-based therapy to augmented reality exposure-based therapy: A review. *Frontiers in Human Neuroscience*, 8. <https://doi.org/10.3389/fnhum.2014.00112>
- Becker-Asano, C., & Ishiguro, H. (2011). Evaluating facial displays of emotion for the android robot Geminoid F. *2011 IEEE Workshop on Affective Computational Intelligence (WACI)*, 1–8.

- Belch, G. E. (1982). The effects of television commercial repetition on cognitive response and message acceptance. *Journal of Consumer Research*, 9(1), 56. <https://doi.org/10.1086/208896>
- Belpaeme, T., Kennedy, J., Ramachandran, A., Scassellati, B., & Tanaka, F. (2018). Social robots for education: A review. *Science Robotics*, 3(21). <https://doi.org/10.1126/scirobotics.aat5954>
- Bitner, M. J., Obermiller, C. (1985). The elaboration likelihood model: Limitations and extensions in marketing. *Advances in Consumer Research*, 12(1), 420-425
- Breazeal, C. (2011). Social robots for health applications. 2011 Annual International Conference of the IEEE Engineering in Medicine and Biology Society, 5368–5371. <https://doi.org/10.1109/IEMBS.2011.6091328>
- Breazeal, C., Dautenhahn, K., & Kanda, T. (2016). *Social Robotics*. In B. Siciliano & O. Khatib (Eds.), *Springer Handbook of Robotics* (pp. 1935–1972). Springer International Publishing.
- Briñol, P., Petty, R. E., & Guyer, J. J. (2019). A historical view on attitudes and persuasion. In P. Briñol, R. E. Petty, & J. J. Guyer, *Oxford Research Encyclopedia of Psychology*. Oxford University Press.
- Cabibihan, J.-J., Javed, H., Ang, M., & Aljunied, S. M. (2013). Why robots? A survey on the roles and benefits of social robots in the therapy of children with autism. *International Journal of Social Robotics*, 5(4), 593–618. <https://doi.org/10.1007/s12369-013-0202-2>
- Calder, B. J., & Sternthal, B. (1980). Television commercial wearout: An information processing view. *Journal of Marketing Research*, 17(2), 173–186.
- Carli, L. L. (1999). Gender, interpersonal power, and social influence. *Journal of Social Issues*, 55(1), 81–99.
- Carpinella, C., Wyman, A., Perez, M., & Stroessner, S. (2017). The robotic social attributes scale (RoSAS): Development and validation (p. 262). <https://doi.org/10.1145/2909824.3020208>
- Cialdini, R. B. (2001). *Influence: Science and practice* (4th Ed). Allyn and Bacon.
- Cook, A. J., Moore, K., & Steel, G. D. (2004). The taking of a position: A

- reinterpretation of the elaboration likelihood model. *Journal for the Theory of Social Behaviour*, 34(4), 315–331.
- Clynes, M. E., & Kline, N. S. (1960). Cyborgs and space. *Astronautics*, 14(9), 26-27.
- Cuddy, A. J. C., Fiske, S. T., Kwan, V. S. Y., Glick, P., Demoulin, S., Leyens, J.-P., Bond, M. H., Croizet, J.-C., Ellemers, N., Sleebos, E., Htun, T. T., Kim, H.-J., Maio, G., Perry, J., Petkova, K., Todorov, V., Rodríguez-Bailón, R., Morales, E., Moya, M., ... Ziegler, R. (2009). Stereotype content model across cultures: Towards universal similarities and some differences. *The British Journal of Social Psychology*, 48(Pt 1), 1–33.
<https://doi.org/10.1348/014466608X314935>
- Damiano, L., & Dumouchel, P. (2018). Anthropomorphism in human–robot co-evolution. *Frontiers in Psychology*, 9.
<https://www.frontiersin.org/article/10.3389/fpsyg.2018.00468>
- De Santis, A., Siciliano, B., De Luca, A., & Bicchi, A. (2008). An atlas of physical human–robot interaction. *Mechanism and Machine Theory*, 43(3), 253–270.
<https://doi.org/10.1016/j.mechmachtheory.2007.03.003>
- de Visser, E. J., Monfort, S. S., McKendrick, R., Smith, M. A. B., McKnight, P. E., Krueger, F., & Parasuraman, R. (2016). Almost human: Anthropomorphism increases trust resilience in cognitive agents. *Journal of Experimental Psychology: Applied*, 22(3), 331–349. <https://doi.org/10.1037/xap0000092>
- de Wit, J., Vogt, P., & Krahmer, E. (2023). The design and observed effects of robot-performed manual gestures: A systematic review. *ACM Transactions on Human-Robot Interaction*, 12(1), 1:1-1:62. <https://doi.org/10.1145/3549530>
- Duffy, B. R. (2003). Anthropomorphism and the social robot. *Robotics and Autonomous Systems*, 42(3), 177–190. [https://doi.org/10.1016/S0921-8890\(02\)00374-3](https://doi.org/10.1016/S0921-8890(02)00374-3)
- Durmaz, G. (2011). *İnce eleme sık dokuma modeli: Özel ve genel ilgi dergilerinde yer alan reklamların içerik analizi*. [Yayınlanmamış yüksek lisans tezi]. Bahçeşehir Üniversitesi.
- Eagly, A. H., & Chrvala, C. (1986). Sex differences in conformity: Status and gender role interpretations. *Psychology of Women Quarterly*, 10(3), 203–220.
- Eagly, A. H., & Wood, W. (1999). The origins of sex differences in human behavior: Evolved

- dispositions versus social roles. *American Psychologist*, 54(6), 408–423.
- Eagly, A. H., Wood, W., & Diekmann, A. B. (2000). Social role theory of sex differences and similarities: A current appraisal. In T. Eckes & H. M. Trautner (Eds.), *The developmental social psychology of gender* (pp. 123–174). Lawrence Erlbaum Associates Publishers.
- Eagly, A.H., & Wood, W. (2011). Social role theory. In P.A.M Van Lange, A.W. Kruglanski & E. T. Higgins (Eds.), *Handbook of theories of social psychology* (pp. 458-476). SAGE Publications.
- Eliot, L. (2011). The trouble with sex differences. *Neuron*, 72(6), 895–898.
- Epley, N., Waytz, A., & Cacioppo, J. T. (2007). On seeing human: A three-factor theory of anthropomorphism. *Psychological Review*, 114(4), 864–886. <https://doi.org/10.1037/0033-295X.114.4.864>
- Eyssel, F., de Ruiter, L., Kuchenbrandt, D., Bobinger, S., & Hegel, F. (2012). ‘If you sound like me, you must be more human’: On the interplay of robot and user features on human-robot acceptance and anthropomorphism. *2012 7th ACM/IEEE International Conference on Human-Robot Interaction (HRI)*, 125–126. <https://doi.org/10.1145/2157689.2157717>
- Eyssel, F., Kuchenbrandt, D., & Bobinger, S. (2011). Effects of anticipated human-robot interaction and predictability of robot behavior on perceptions of anthropomorphism. *Proceedings of the 6th International Conference on Human-Robot Interaction*, 61–68. <https://doi.org/10.1145/1957656.1957673>
- Faul, F., Erdfelder, E., Lang, A.-G., & Buchner, A. (2007). G*Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods*, 39(2), 175–191. <http://dx.doi.org/10.3758/BF03193146>
- Ferrara, E., Varol, O., Davis, C., Menczer, F., & Flammini, A. (2016). The rise of social bots. *Communications of the ACM*, 59(7), 96–104. <https://doi.org/10.1145/2818717>
- Fiske, S. T. (1993). Social Cognition and Social Perception. *Annual Review of Psychology*, 44(1), 155–194.

- Fiske, S. T. & Taylor, S. E. (2013). Cognitive processing of attitudes. In *Social cognition: From brains to culture* (2nd Ed.) (p. 467-506). London: Sage.
- Fiske, S. T., Cuddy, A. J. C., & Glick, P. (2007). Universal dimensions of social cognition: Warmth and competence. *Trends in Cognitive Sciences*, 11(2), 77–83.
<https://doi.org/10.1016/j.tics.2006.11.005>
- Fink, J. (2012). Anthropomorphism and human likeness in the design of robots and human-robot interaction. *Social Robotics* (pp. 199–208). Springer.
- Gawronski, B., & Creighton, L. (2013). Dual process theories. In *The Oxford Handbook of Social Cognition* (pp. 282–312).
- Gerrig, R. J., & Zimbardo, P. G. (2002). *Psychology and Life*. Allyn and Bacon.
- Haraway, D. (1991). “A cyborg Manifesto: Science, technology, and socialist-feminism in the late twentieth century,” in *simians, cyborgs and women: The reinvention of nature.* Routledge.
- Hashimoto, T., Kato, N., & Kobayashi, H. (2011). Development of educational system with the android robot SAYA and evaluation. *International Journal of Advanced Robotic Systems*, 8(3), 28.
- Hirai, K., Hirose, M., Haikawa, Y., & Takenaka, T. (1998). The development of Honda humanoid robot. *Proceedings. 1998 IEEE International Conference on Robotics and Automation*, 2, 1321–1326 vol.2.
- Ho, C.-C., & MacDorman, K. F. (2010). Revisiting the uncanny valley theory: Developing and validating an alternative to the Godspeed indices. *Computers in Human Behavior*, 26(6), 1508–1518.
<https://doi.org/10.1016/j.chb.2010.05.015>
- Jago, A. S., Carroll, G. R., & Lin, M. (2022). Generating authenticity in automated work. *Journal of Experimental Psychology: Applied*, 28(1), 52–70.
<https://doi.org/10.1037/xap0000365>
- The jamovi project (2023). *jamovi* (Version 2.3.24.0) [Computer Software]. Retrieved from
<https://www.jamovi.org>
- Jarvis, W. B. G., & Petty, R. E. (1996). The need to evaluate. *Journal of Personality and*

Social Psychology, 70(1), 172–194.

- Johnson, K. A., Cohen, A. B., Neel, R., Berlin, A., & Homa, D. (2015). Fuzzy people: The roles of kinship, essence, and sociability in the attribution of personhood to nonliving, nonhuman agents. *Psychology of Religion and Spirituality*, 7(4), 295–305. <https://doi.org/10.1037/rel0000048>
- Jordan-Young, R., & Rumiati, R. I. (2012). Hardwired for sexism? Approaches to sex/gender in neuroscience. *Neuroethics*, 5(3), 305–315. <https://doi.org/10.1007/s12152-011-9134-4>
- Jowett, G. S., & O Donnell, V. (2018). Propaganda & persuasion. Sage publications.
- Kajita, S., Hirukawa, H., Harada., & Yokoi, K. (2014). *Introduction to humanoid robotics*. Springer-Verlag Berlin Heidelberg.
- Kağıtçıbaşı, Ç. & Cemalcılar, Z. (2019). *Dünden bugüne insan ve insanlar*. (22. baskı). Evrim Yayınevi.
- Kanda, T., Ishiguro, H., Ono, T., Imai, M., & Nakatsu, R. (2002). Development and evaluation of an interactive humanoid robot “Robovie.” *Proceedings 2002 IEEE International Conference on Robotics and Automation*, 2, 1848–1855 vol.2.
- Kang, Y., & Herr, P. M. (2006). Beauty and the beholder: Toward an integrative model of communication source effects. *Journal of Consumer Research*, 33(1), 123–130. <https://doi.org/10.1086/504143>
- Kätsyri, J., Förger, K., Mäkräinen, M., & Takala, T. (2015). A review of empirical evidence on different uncanny valley hypotheses: Support for perceptual mismatch as one road to the valley of eeriness. *Frontiers in Psychology*, 6, 390.
- Kätsyri, J., Mäkräinen, M., & Takala, T. (2017). Testing the ‘uncanny valley’ hypothesis in semirealistic computer-animated film characters: An empirical evaluation of natural film stimuli. *International Journal of Human-Computer Studies*, 97, 149–161.
- Keefer, L. A. (2016). Is there anybody out there? Trait anthropomorphism predicts the psychological benefits of a favorite belonging. *Journal of Individual Differences*, 37(4), 231–238. <https://doi.org/10.1027/1614-0001/a000210>
- Kirby, R., Forlizzi, J., & Simmons, R. (2010). Affective social robots. *Robotics and*

Autonomous Systems, 58(3), 322–332. <https://doi.org/10.1016/j.robot.2009.09.015>

Kıymalıoğlu. (2014). Ayrıntılandırma olasılığı modeli ve uygulama alanları. *Dokuz Eylül*

Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi 29(2), 167-203.

Kökdemir, D., Özsoy İ. N., & Kaya, İ. (under editorial review). Beyond human-robot

interaction: Assessment Scale for Intelligent Machine's Operational Verisimilitude (ASIMOV) for analyzing realness, uncanniness, competence, and emotionality.

Kosuge, K., & Hirata, Y. (2004). Human-Robot Interaction. *2004 IEEE International Conference on Robotics and Biomimetics*, 8–11.

Langholf, L., Battefeld, D., Henning, K., Zatrib, R., Groß, A., Richter, B., Vollmer, A.-L.,

& Schneider, S. (2021). Testing the elaboration likelihood model of persuasion on the acceptance of health regulations in a video human-robot interaction study. *Companion of the 2021 ACM/IEEE International Conference on Human-Robot Interaction*, 121–125.

Liao, L., & Huang, T. (2021). The effect of different social media marketing channels and events on movie box office: An elaboration likelihood model perspective. *Information & Management*, 58(7), 103481.

Liu, X., Yi, X., & Wan, L.C. (2022). Friendly or competent? The effects of perception of robot appearance and service context on usage intention. *Annals of Tourism Research*, 92, 103324.

Luo, Y., & Ye, Q. (2019). The effects of online reviews, perceived value, and gender on continuance intention to use international online outshopping website: An elaboration likelihood model perspective. *Journal of International Consumer Marketing*, 31(3), 250–269.

Mayer, R. C., Davis, J. H., & Schoorman, F. D. (1995). An integrative model of organizational trust. *The Academy of Management Review*, 20(3), 709–734. <https://doi.org/10.2307/258792>

Midjourney, Inc. (2023). *Midjourney* (Version 5.2) [Generative Artificial Intelligence Program].

- Mori, M., MacDorman, K. F., & Kageki, N. (2012). The uncanny valley [From the Field]. *IEEE Robotics & Automation Magazine*, 19(2), 98–100.
- Moors, A., & De Houwer, J. (2006). Automaticity: A theoretical and conceptual analysis. *Psychological Bulletin*, 132(2), 297–326.
- Murphy, R. R., Nomura, T., Billard, A., & Burke, J. L. (2010). Human–Robot Interaction. *IEEE Robotics & Automation Magazine*, 17(2), 85–89.
- Natarajan, M., & Gombolay, M. (2020). Effects of anthropomorphism and accountability on trust in human robot interaction. In *Proceedings of the 2020 ACM/IEEE International Conference on Human-Robot Interaction* (pp. 33–42). Association for Computing Machinery. <https://doi.org/10.1145/3319502.3374839>
- Tom "PyTom" Rothamel. (2023). *Ren 'Py* (Version 7.6) [Visual Novel Engine]
- Rice, D. H., Kelting, K., & Lutz, R. J. (2012). Multiple endorsers and multiple endorsements: The influence of message repetition, source congruence and involvement on brand attitudes. *Journal of Consumer Psychology*, 22(2), 249–259.
- Riva, P., Sacchi, S., & Brambilla, M. (2015). Humanizing machines: Anthropomorphization of slot machines increases gambling. *Journal of Experimental Psychology. Applied*, 21(4), 313–325. <https://doi.org/10.1037/xap0000057>
- Ruch, S., Züst, M. A., & Henke, K. (2016). Subliminal messages exert long-term effects on decision-making. *Neuroscience of Consciousness*, 2016(1), niw013.
- O'Regan, K. (2017). Is music conscious? The argument from motion, and other considerations. *Psychomusicology: Music, Mind, and Brain*, 27(4), 327–333. <https://doi.org/10.1037/pmu0000198>
- OpenAI. (2023). *ChatGPT* (Mar 14 version) [Large language model]. <https://chat.openai.com/chat>
- Pechmann, C., & Esteban, G. (1993). Persuasion processes associated with direct comparative and noncomparative advertising and implications for advertising effectiveness. *Journal*

- of *Consumer Psychology*, 2(4), 403–432.
- Pentony, J. F. (1986). Relation between involvement in an issue and quality of the argument. *Psychological Reports*, 59(1), 191–198.
- Petrican, R., & Burris, C. T. (2012). Am I the stone? Overattribution of agency and religious orientation. *Psychology of Religion and Spirituality*, 4(4), 312–323.
<https://doi.org/10.1037/a0027942>
- Petty, R. E., & Briñol, P. (2015). Processes of social influence through attitude change. In M. Mikulincer, P. R. Shaver, E. Borgida, & J. A. Bargh (Eds.), *APA handbook of personality and social psychology, Volume 1: Attitudes and social cognition*. (pp. 509–545). American Psychological Association.
- Petty, R. E., Cacioppo, J. T., & Goldman, R. (1981). Personal involvement as a determinant of argument-based persuasion. *Journal of Personality and Social Psychology*, 41(5), 847–855.
- Petty, R. E., & Cacioppo, J. T. (1984). The effects of involvement on responses to argument quantity and quality: Central and peripheral routes to persuasion. *Journal of Personality and Social Psychology*, 46(1), 69–81.
- Petty, R. E., & Cacioppo, J. T. (1986). *Communication and persuasion: Central and peripheral routes to attitude change*. Springer-Verlag.
- Petty, R. E., & Cacioppo, J. T. (1986). The elaboration likelihood model of persuasion. In *Advances in Experimental Social Psychology* (Vol. 19, pp. 123–205). Elsevier.
- Petty, R. E., & Hinsenkamp, L. (2017). Routes to persuasion, central and peripheral. In F. M. Moghaddam (Ed.), *The SAGE Encyclopedia of Political Behavior* (pp. 718–720). The SAGE.
- Petty, R., & Wegener, D. (1999). The elaboration likelihood model: Current status and controversies. In *Dual-process theories in social psychology* (pp. 41–72).
- Pennington, N., & Hastie, R. (1988). Explanation-based decision making: Effects of memory structure on judgment. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 14(3), 521–533.
- Pentony, J. F. (1986). Relation between involvement in an issue and quality of the argument. *Psychological Reports*, 59(1), 191–198.
- Perloff, R. M. (2017). *The dynamics of persuasion communication and attitudes in the 21st century*, 3rd ed., Lawrence Erlbaum Associates, New York.
- Pornpitakpan, C. (2004). The persuasiveness of source credibility: A critical review of five decades' evidence. *Journal of Applied Social Psychology*, 34(2), 243–281.

<https://doi.org/10.1111/j.1559-1816.2004.tb02547.x>

- Sacchi, S., Riva, P., & Brambilla, M. (2013). When Mother Earth rises up: Anthropomorphizing nature reduces support for natural disaster victims. *Social Psychology*, 44(4), 271–277. <https://doi.org/10.1027/1864-9335/a000112>
- Schneider, S., Nebel, S., Beege, M., & Rey, G. D. (2018). Anthropomorphism in decorative pictures: Benefit or harm for learning? *Journal of Educational Psychology*, 110(2), 218–232. <https://doi.org/10.1037/edu0000207>
- Schneider, S., Häßler, A., Habermeyer, T., Beege, M., & Rey, G. D. (2019). The more human, the higher the performance? Examining the effects of anthropomorphism on learning with media. *Journal of Educational Psychology*, 111(1), 57–72. <https://doi.org/10.1037/edu0000273>
- Schweitzer, S., & Waytz, A. (2021). Language as a window into mind perception: How mental state language differentiates body and mind, human and non-human, and the self from others. *Journal of Experimental Psychology: General*, 150(8), 1642–1672. <https://doi.org/10.1037/xge0001013>
- Seyama, J., & Nagayama, R. S. (2007). The Uncanny Valley: Effect of Realism on the Impression of Artificial Human Faces. *Presence: Teleoperators and Virtual Environments*, 16(4), 337–351. <https://doi.org/10.1162/pres.16.4.337>
- Sheridan, T. B. (2016). Human-Robot Interaction: Status and Challenges. *Human Factors*, 58(4), 525–532.
- Sorrentino, R. M., Bobocel, D. R., Gitta, M. Z., Olson, J. M., & Hewitt, E. C. (1988). Uncertainty orientation and persuasion: Individual differences in the effects of personal relevance on social judgments. *Journal of Personality and Social Psychology*, 55(3), 357–371.
- Spatola, N., Kühnlenz, B., & Cheng, G. (2021). Perception and evaluation in human–robot interaction: The human–robot interaction evaluation scale (HRIES)—a multicomponent approach of anthropomorphism. *International Journal of Social Robotics*, No Pagination Specified–No Pagination Specified. <https://doi.org/10.1007/s12369-020-00667-4>
- Stephenson, M. T., Benoit, W. L., & Tschida, D. A. (2001). Testing the mediating role of

- cognitive responses in the elaboration likelihood model. *Communication Studies*, 52(4), 324–337.
- Stroop, J. R. (1935). Studies of interference in serial verbal reactions. *Journal of Experimental Psychology*, 18, 643–662.
- Teng, C.-I., Huang, L.-S., & Hsieh, P.-C. (2010). An FCB grid perspective: How to use technical terms in ads. *British Journal of Management*, 21(4), 1044–1056. <https://doi.org/10.1111/j.1467-8551.2008.00621.x>
- Thorndike, E. L. (1920). A constant error in psychological ratings. *Journal of Applied Psychology*, 4(1), 25–29.
- van den Berghe, R., Verhagen, J., Oudgenoeg-Paz, O., van der Ven, S., & Leseman, P. (2019). Social robots for language learning: A review. *Review of Educational Research*, 89(2), 259–295. <https://doi.org/10.3102/0034654318821286>
- Wang, S., Lilienfeld, S. O., & Rochat, P. (2015). The Uncanny Valley: Existence and explanations. *Review of General Psychology*, 19(4), 393–407. <https://doi.org/10.1037/gpr0000056>
- Walters, M. L., Syrdal, D. S., Dautenhahn, K., te Boekhorst, R., & Koay, K. L. (2008). Avoiding the uncanny valley: Robot appearance, personality and consistency of behavior in an attention-seeking home scenario for a robot companion. *Autonomous Robots*, 24(2), 159–178.
- Waters, R. H. (1948). Mechanomorphism: A new term for an old mode of thought. *Psychological Review*, 55(3), 139–142. <https://doi.org/10.1037/h0058952>
- Waytz, A., Morewedge, C. K., Epley, N., Monteleone, G., Gao, J.-H., & Cacioppo, J. T. (2010). Making sense by making sentient: Effectance motivation increases anthropomorphism. *Journal of Personality and Social Psychology*, 99(3), 410–435. <https://doi.org/10.1037/a0020240>
- Wynne, C. D. L. (2005). The emperor's new anthropomorphism. *The Behavior Analyst Today*, 6(3), 151–154. <http://dx.doi.org/10.1037/h0100066>
- Yam, K. C., Bigman, Y. E., Tang, P. M., Ilies, R., De Cremer, D., Soh, H., & Gray, K.

- (2021). Robots at work: People prefer—and forgive—service robots with perceived feelings. *Journal of Applied Psychology*, 106(10), 1557–1572. <https://doi.org/10.1037/apl0000834>
- Yanco, H., & Drury, J. (2002). *A Taxonomy for Human-Robot Interaction*. 111–119.
- Yin, J., Wang, S., Guo, W., & Shao, M. (2023). More than appearance: The uncanny valley effect changes with a robot's mental capacity. *Current Psychology*, 42(12), 9867-9878.
- Zajonc, R. B. (1968). Attitudinal effects of mere exposure. *Journal of Personality and Social Psychology*, 9(2), 1–27.
- Zemeckis, R. (Director). (2004). *The Polar Express [2004]*. Warner Bros. Picture.
- Zhang, Y., & Buda, R. (1999). Moderating effects of need for cognition on responses to positively versus negatively framed advertising messages. *Journal of Advertising*, 28(2), 1–15.
- Zimbardo, P. G., & Leippe, M. R. (1991). *The psychology of attitude change and social influence* (pp. xix, 370). McGraw-Hill Book Company.
- Złotowski, J., Proudfoot, D., Yogeewaran, K., & Bartneck, C. (2015). Anthropomorphism: Opportunities and challenges in human–robot interaction. *International Journal of Social Robotics*, 7(3), 347–360. <https://doi.org/10.1007/s12369-014-0267-6>
- Zlotowski, J., Sumioka, H., Nishio, S., Glas, D., Bartneck, C., & Ishiguro, H. (2015). Persistence of the uncanny valley: The influence of repeated interactions and a robot's attitude on its perception. *Frontiers in Psychology*, 6. <https://doi.org/10.3389/fpsyg.2015.00883>

APPENDICES

APPENDIX 1: SCENARIOS PRESENTED TO PARTICIPANTS

"Klasik Edebiyat ve Kitap Kulüpleri" konusu sizin için şu an ne kadar popüler, gündemde, önemli ve/veya yaygındır? (1=hiç, 7=tamamen)

1 (hiç)	2	3	4	5	6	7 (tamamen)
☐	☐	☐	☐	☐	☐	☐

"Yapay Zeka ve Otomasyon" konusu sizin için şu an ne kadar popüler, gündemde, önemli ve/veya yaygındır? (1=hiç, 7=tamamen)

1 (hiç)	2	3	4	5	6	7 (tamamen)
☐	☐	☐	☐	☐	☐	☐

"Gelir Eşitsizliği ve Servet Dağılımı" konusu sizin için şu an ne kadar popüler, gündemde, önemli ve/veya yaygındır? (1=hiç, 7=tamamen)

1 (hiç)	2	3	4	5	6	7 (tamamen)
☐	☐	☐	☐	☐	☐	☐

"Film Fotoğrafçılığı ve Geleneksel Film Tarihi" konusu sizin için şu an ne kadar popüler, gündemde, önemli ve/veya yaygındır? (1=hiç, 7=tamamen)

1 (hiç)	2	3	4	5	6	7 (tamamen)
☐	☐	☐	☐	☐	☐	☐

"Moda ve Giyim Tarzlarının Tarihi" konusu sizin için şu an ne kadar popüler, gündemde, önemli ve/veya yaygındır? (1=hiç, 7=tamamen)

1 (hiç)	2	3	4	5	6	7 (tamamen)
☐	☐	☐	☐	☐	☐	☐

"İklim Değişikliği ve Küresel Isınma" konusu sizin için şu an ne kadar popüler, gündemde, önemli ve/veya yaygındır? (1=hiç, 7=tamamen)

1 (hiç)	2	3	4	5	6	7 (tamamen)
☐	☐	☐	☐	☐	☐	☐

"Uzay Araştırmaları ve Kolonizasyon" konusu sizin için şu an ne kadar popüler, gündemde, önemli ve/veya yaygındır? (1=hiç, 7=tamamen)

1 (hiç)	2	3	4	5	6	7 (tamamen)
☐	☐	☐	☐	☐	☐	☐

"Zihin Sağlığı, iyi Oluş ve Psikolojik Refah" konusu sizin için şu an ne kadar popüler, gündemde, önemli ve/veya yaygındır? (1=hiç, 7=tamamen)

1 (hiç)	2	3	4	5	6	7 (tamamen)
☐	☐	☐	☐	☐	☐	☐

"Yaşlanmayı Önleme ve Ömür Uzatmaya Yönelik Araştırmalar" konusu sizin için şu an ne kadar popüler, gündemde, önemli ve/veya yaygındır? (1=hiç, 7=tamamen)

1 (hiç)	2	3	4	5	6	7 (tamamen)
☐	☐	☐	☐	☐	☐	☐

"Yerel Toplu Taşıma İyileştirmeleri" konusu sizin için şu an ne kadar popüler, gündemde, önemli ve/veya yaygındır? (1=hiç, 7=tamamen)

1 (hiç)	2	3	4	5	6	7 (tamamen)
☐	☐	☐	☐	☐	☐	☐

"Kripto Para ve Blok Zinciri Teknolojisi" konusu sizin için şu an ne kadar popüler, gündemde, önemli ve/veya yaygındır? (1=hiç, 7=tamamen)

1 (hiç)	2	3	4	5	6	7 (tamamen)
☐	☐	☐	☐	☐	☐	☐

"Siber Güvenlik ve Gizlilik Problemleri" konusu sizin için şu an ne kadar popüler, gündemde, önemli ve/veya yaygındır? (1=hiç, 7=tamamen)

1 (hiç)	2	3	4	5	6	7 (tamamen)
☐	☐	☐	☐	☐	☐	☐

"Masa ve Bilgisayar Oyunları" konusu sizin için şu an ne kadar popüler, gündemde, önemli ve/veya yaygındır? (1=hiç, 7=tamamen)

1 (hiç)	2	3	4	5	6	7 (tamamen)
☐	☐	☐	☐	☐	☐	☐

"Uluslararası Mutfaklar" konusu sizin için şu an ne kadar popüler, gündemde, önemli ve/veya yaygındır? (1=hiç, 7=tamamen)

1 (hiç)	2	3	4	5	6	7 (tamamen)
☐	☐	☐	☐	☐	☐	☐

"Tarihi Pul ve Madeni Paraları Toplama" konusu sizin için şu an ne kadar popüler,
gündemde, önemli ve/veya yaygındır? (1=hiç, 7=tamamen)

1 (hiç)	2	3	4	5	6	7 (tamamen)
☐	☐	☐	☐	☐	☐	☐

"Gen Düzenleme ve CRISPR Teknolojisi" konusu sizin için şu an ne kadar popüler,
gündemde, önemli ve/veya yaygındır? (1=hiç, 7=tamamen)

1 (hiç)	2	3	4	5	6	7 (tamamen)
☐	☐	☐	☐	☐	☐	☐



APPENDIX 2: INFORMED CONSENT FORM

Bu çalışma Bařkent Üniversitesi Psikoloji Bölümü öğrencisi İrem Nur Özsoy tarafından Prof. Dr. Doęan Kökdemir danışmanlığında yüksek lisans tezi kapsamında yürütölmektedir. Bu form sizi araştırma koşulları hakkında bilgilendirmek için hazırlanmıştır.

Çalışmanın Amacı Nedir?

Bu çalışma ile kişilerin gerçek olmayan sanal ajana karşı tutumları incelenecektir.

Bize Nasıl Yardımcı Olmanızı İsteyeceęiz?

Araştırmaya katılmayı kabul ederseniz, sizden beklenen, açacağınız Qualtrics linkindeki ankette yer alan bir dizi soruyu derecelendirme ölçeęi üzerinde puanlamanız olacaktır. Bu çalışmaya katılım ortalama olarak 20 dakika sürmektedir.

Katılımınızla ilgili bilmeniz gerekenler:

Araştırmaya katılımınız tamamen gönüllölük temelinde olmalıdır. Ankette, sizden kimlik veya kurum belirleyici hiçbir bilgi istenmemektedir. Cevaplarınız tamamıyla gizli tutulacak, sadece araştırmacılar tarafından değeriendirilecektir. Katılımcılardan elde edilecek bilgiler toplu halde değeriendirilecek ve bilimsel yayınlarda kullanılacaktır.

Riskler:

Anket, genel olarak kişisel rahatsızlık verecek sorular içermemektedir. Ancak, katılım sırasında sorulardan ya da herhangi başka bir nedenden ötürü kendinizi rahatsız hissederseniz cevaplama işini yarıda bırakıp sayfayı kapatmakta serbestsiniz. Böyle bir durumda anketi gönderen kişiye, aşağıda verilen e-mail adreslerinden biri vasıtasıyla anketi tamamlamadığınızı söylemek yeterli olacaktır.

Araştırmayla ilgili daha fazla bilgi almak isterseniz:

Bu alıřmaya katıldığınız iin řimdiden teřekkr ederiz. alıřma hakkında daha fazla bilgi almak iin Bařkent niversitesi Sosyal Psikoloji yksek lisans ğrencisi İrem Nur zsoy ile iletiřim kurabilirsiniz.

Yukarıdaki bilgileri okudum ve bu alıřmaya tamamen gnll olarak katılıyorum.



APPENDIX 3: PRE-TEST & POST TEST

POST TEST

Tutum

Ortak otomobil kullanımına yönelik řu anki tutumunuzu nasıl değerdendirirsiniz?

Kesinlikle olumsuz

Biraz olumsuz

Ortalama

Biraz olumlu

Kesinlikle olumlu

Biliř

Ortak otomobil kullanımının potansiyel faydaları hakkında ne kadar bilgi sahibi olduėunuzu dűřünüyorsunuz?

Kesinlikle bilgim yok

Pek bilgim yok

Ortalama

Biraz bilgim var

Kesinlikle bilgim var

Duygu

Ortak otomobil kullanımı ile ilgili hissettikleriniz nasıldır?

Kesinlikle olumsuz

Biraz olumsuz

Ortalama

Biraz olumlu

Kesinlikle olumlu

Davranış

Ne sıklıkla ortak otomobil kullanımı gerçekleştiriyorsunuz?

Kesinlikle düşünmüyorum

Pek düşünmüyorum

Ortalama

Biraz düşünüyorum

Kesinlikle düşünüyorum

POST-TEST

Tutum:

D. Deniz'in sunduğu bilgiler doğrultusunda, Ortak otomobil kullanımına yönelik şu anki tutumunuzu nasıl değerlendirirsiniz?

Kesinlikle olumsuz

Biraz olumsuz

Ortalama

Biraz olumlu

Kesinlikle olumlu

Biliş:

D. Deniz'in sunduğu bilgiler doğrultusunda, ortaklaşa araç kullanma ve toplu taşıma kullanımının potansiyel faydaları hakkında ne kadar bilgi sahibi olduğunuzu düşünüyorsunuz?

Kesinlikle bilğim yok

Pek bilğim yok

Ortalama

Biraz bilgim var

Kesinlikle bilgim var

Duygu:

D. Deniz'in sunduğu bilgiler doğrultusunda, ortaklaşa araç kullanma ve toplu taşıma kullanımı ile ilgili duygularınız nasıldır?

Kesinlikle olumsuz

Biraz olumsuz

Ortalama

Biraz olumlu

Kesinlikle olumlu

Davranış

D. Deniz'in sunduğu bilgiler doğrultusunda, ne sıklıkla ortaklaşa araç kullanma ve toplu taşıma kullanımı gerçekleştirmeyi düşünüyorsunuz?

Kesinlikle düşünmüyorum

Pek düşünmüyorum

Ortalama

Biraz düşünüyorum

Kesinlikle düşünüyorum

APPENDIX 4: SCENARIOS

Chained Conditional Propositions

D. Deniz: Merhaba, ben D. Deniz, kentsel tasarım ve çevre planlama uzmanıyım. Bugün, ülkemizin neredeyse her ilini etkileyen yaygın trafik sorununu tartışacak ve özellikle “ortak otomobil kullanımı” konusuna odaklanan potansiyel çözümleri inceleyeceğiz.

Soru 1: Ülkemizde yaşanan trafik sorunlarını ve bu sorunların yarattığı çevresel problemleri ne kadar ayrıntılı bilmektesiniz?

Oldukça ayrıntılı bilmekteyim

Biraz ayrıntılı bilmekteyim

Çok ayrıntılı bilmemekteyim

Hiç ayrıntılı bilmemekteyim

Konu hakkında bir fikrim yok

D. Deniz: Ortak otomobil kullanımına geelim. Bazıları, yaşadığı veya komşu olduğu kişilerle ortak bir otomobil kullanmanın araba sayısını azaltacağına inanır. Trafik sıkışıklığının azalacağı ve bir yerlere otomobil ile gitme süresinin kısılacağı kabul edilir.

Soru 2: Bu söylediklerim ile ne kadar aynı fikirdesiniz?

Oldukça aynı fikirdeyiz

Biraz aynı fikirdeyiz

Çok aynı fikirde değiliz

Hiç aynı fikirde değiliz

Konu hakkında bir fikrim yok

D. Deniz: Ayrıca, ortak otomobil kullanımı yakıt tüketiminin azalmasını da sağlayarak hava kirliliğinin de azalmasına yardımcı olur. Hava kirliliği azaldıkça hava kalitesinde iyileşmeler beklenebilir. Böylece, özellikle solunum yolu hastalıklarında belirgin bir düşüş görülebilir.

Soru 2: Bu söylediklerime ne kadar katılıyorsunuz?

Oldukça aynı fikirdeyiz

Biraz aynı fikirdeyiz

Çok aynı fikirde değiliz

Hiç aynı fikirde değiliz

Konu hakkında bir fikrim yok

D. Deniz: Son olarak, ortak otomobil kullanımıyla azalan trafik ve hava kirliliği, halk sağlığını oldukça olumlu etkileyebilir. Bu durum, yaşam kalitesi ve sağlık düzeyinin artmasına katkıda bulunarak insanların daha rahat yaşamasını mümkün kılar.

Soru 3: Şimdi bu mantıksal etkiler zincirini göz önünde bulundurarak, birbiriyle bağlantılı bu faydalara katkıda bulunmak için ortak otomobil kullanımını düşünür müsünüz?

Kesinlikle düşünmüyorum

Biraz düşünmüyorum

Kararsızım

Biraz düşünüyorum

Kesinlikle düşünüyorum

D. Deniz: Teşekkür ederim! Haftada birkaç kez ortak otomobil kullanmak gibi küçük değişikliklerin bile daha önce bahsettiğimiz olumlu etkiler zincirine katkıda bulunabileceğini unutmayın! Şimdi birkaç soruyu daha cevapladıktan sonra sizinle vedalaşabiliriz.

Appeal to Belief

D. Deniz: Merhaba, ben D. Deniz, kentsel tasarım ve çevre planlama uzmanıyım. Bugün, ülkemizin neredeyse her ilini etkileyen yaygın trafik sorununu tartışacak ve özellikle “ortak otomobil kullanımı” konusuna odaklanan potansiyel çözümleri inceleyeceğiz.

Soru 1: Ülkemizde yaşanan trafik sorunlarını ve bu sorunların yarattığı çevresel problemleri ne kadar ayrıntılı bilmektesiniz?

Oldukça ayrıntılı bilmekteyim

Biraz ayrıntılı bilmekteyim

Çok ayrıntılı bilmemekteyim

Hiç ayrıntılı bilmemekteyim

Konu hakkında bir fikrim yok

D. Deniz: Ortak otomobil kullanımına gelem. Bazıları, yaşadığı veya komşu olduğu kişilerle ortak bir otomobil kullanmanın araba sayısını azaltacağına inanır. Trafik sıkışıklığının azalacağı ve bir yerlere otomobil ile gitme süresinin kısılacağı kabul edilir.

Soru 2: Bu söylediklerim ile ne kadar aynı fikirdesiniz?

Oldukça aynı fikirdeyiz

Biraz aynı fikirdeyiz

Çok aynı fikirde değiliz

Hiç aynı fikirde değiliz

Konu hakkında bir fikrim yok

D. Deniz: Çevreciler, ortak otomobil kullanımının hava kirliliğini azaltarak hava kalitesinde iyileşmelere yol açacağına inanır. Bu iyileşmeler sayesinde, özellikle solunum yolu hastalıklarında belirgin bir düşüş yaşanacağı düşünülür.

Soru 2: Bu söylediklerime ne kadar katılıyorsunuz?

Oldukça aynı fikirdeyiz

Biraz aynı fikirdeyiz

Çok aynı fikirde değiliz

Hiç aynı fikirde değiliz

Konu hakkında bir fikrim yok

D. Deniz: Genel kanıya göre, ortak otomobil kullanımıyla azalan trafik ve hava kirliliği, sağlık üzerinde olumlu etkilere sahiptir. Bu durum yaşam kalitesi ve sağlık düzeyinin artmasına katkıda bulunarak halkın daha rahat yaşamasını sağlayacağı söylenmektedir.

Soru 3: Şimdi bu genel kanıyı göz önünde bulundurarak, toplumun ortaya attığı bu faydalara katkıda bulunmak için daha sık araç paylaşmayı düşünür müsünüz?

Oldukça aynı fikirdeyiz

Biraz aynı fikirdeyiz

Çok aynı fikirde değiliz

Hiç aynı fikirde değiliz

Konu hakkında bir fikrim yok

D. Deniz: Teşekkür ederim! Haftada birkaç kez ortak otomobil kullanmak gibi küçük değişikliklerin bile daha önce bahsettiğimiz olumlu etkiler zincirine katkıda bulunabileceğini unutmayın! Şimdi birkaç soruyu daha cevapladıktan sonra sizinle vedalaşabiliriz.

APPENDIX 5: VISUALS OF AGENTS



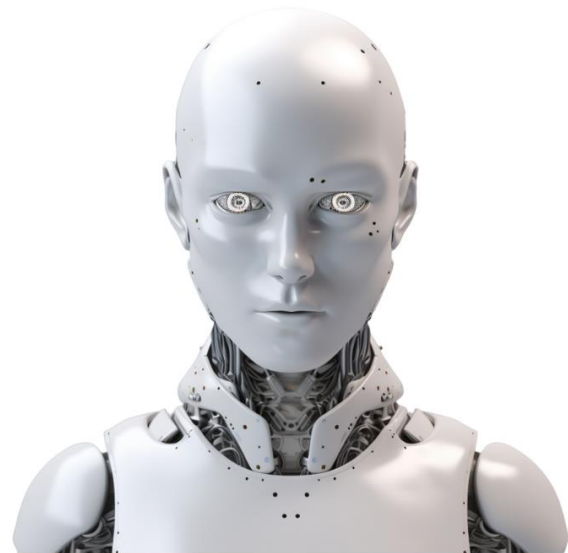
human



android



cyborg



humanoid

**APPENDIX 6: ASSESSMENT SCALE FOR INTELLIGENT MACHINE'S
OPERATIONAL VERISIMILITUDE (ASIMOV) FOR ANALYZING REALNESS,
UNCANNINESS, COMPETENCE, AND EMOTIONALITY**

Aşağıda 1 adet robot görmektesiniz. Lütfen sol tarafta sıralanmış olan **SIFATLARI** bu robota göre puanlayınız. Puanlama her sıfat için **1 (hiç uygun değil)** ile **7 (çok uygun)** arasında yapılacaktır. Kısacası, robota her sıfat için 1'den 7'ye kadar puan vermeniz gerekmektedir. Robota verdiğiniz puanları bir arka sayfaya geçmeden önce değiştirebilirsiniz. Yaptığınız puanlamadan emin olduğunuzda lütfen en alttaki ok tuşuna basınız.



	hiç uygun değil 1 (1)	2 (2)	3 (3)	4 (4)	5 (5)	6 (6)	Çok uygun 7 (7)
Mutlu (2)	☐	☐	☐	☐	☐	☐	☐
Duygusal (3)	☐	☐	☐	☐	☐	☐	☐
Sosyal (4)	☐	☐	☐	☐	☐	☐	☐
Doğal (5)	☐	☐	☐	☐	☐	☐	☐
Merhametli (6)	☐	☐	☐	☐	☐	☐	☐
Yetenekli (7)	☐	☐	☐	☐	☐	☐	☐
Duyarlı (8)	☐	☐	☐	☐	☐	☐	☐
Etkileşimli (9)	☐	☐	☐	☐	☐	☐	☐
Güvenilir (10)	☐	☐	☐	☐	☐	☐	☐
Beceri Sahibi (11)	☐	☐	☐	☐	☐	☐	☐
Korkutucu (12)	☐	☐	☐	☐	☐	☐	☐
Garip (13)	☐	☐	☐	☐	☐	☐	☐
Tehlikeli (14)	☐	☐	☐	☐	☐	☐	☐
Saldırgan (15)	☐	☐	☐	☐	☐	☐	☐
Samimi (16)	☐	☐	☐	☐	☐	☐	☐

Sempatik (17)	☐	☐	☐	☐	☐	☐	☐
Canlı (18)	☐	☐	☐	☐	☐	☐	☐
Gerçek (19)	☐	☐	☐	☐	☐	☐	☐
İnsansı (20)	☐	☐	☐	☐	☐	☐	☐
Bağımsız (21)	☐	☐	☐	☐	☐	☐	☐
Mantıklı (22)	☐	☐	☐	☐	☐	☐	☐
Niyetli (23)	☐	☐	☐	☐	☐	☐	☐
Akıllı (24)	☐	☐	☐	☐	☐	☐	☐
Bilinçli (25)	☐	☐	☐	☐	☐	☐	☐
Hoş (26)	☐	☐	☐	☐	☐	☐	☐
Durgun (27)	☐	☐	☐	☐	☐	☐	☐
Sorumsuz (28)	☐	☐	☐	☐	☐	☐	☐
Endişeli (29)	☐	☐	☐	☐	☐	☐	☐
Huzurlu (30)	☐	☐	☐	☐	☐	☐	☐
Soğukkanlı (31)	☐	☐	☐	☐	☐	☐	☐
Planlı (32)	☐	☐	☐	☐	☐	☐	☐

Yukarıda görmüş olduğunuz robotun görüntüsünden ne kadar hoşlandınız?

- ☐ Hiç Hoşlanmadım 1 (1)
- ☐ 2 (2)
- ☐ 3 (3)
- ☐ 4 (4)
- ☐ 5 (5)
- ☐ 6 (6)
- ☐ Çok Hoşlandım 7 (7)

Yukarıda görmüş olduğunuz robotun evinizde bulunmasını ister miydiniz?

- ☐ Hiç İstemem 1 (1)
- ☐ 2 (2)
- ☐ 3 (3)
- ☐ 4 (4)
- ☐ 5 (5)
- ☐ 6 (6)
- ☐ Çok İsterim 7 (7)

Yukarıda görmüş olduğunuz robotun çocuğunuzun bakımında görev almasını ister miydiniz?

- ☐ Hiç İstemem 1(1)
- ☐ 2 (2)
- ☐ 3 (3)
- ☐ 4 (4)
- ☐ 5 (5)
- ☐ 6 (6)
- ☐ Çok İsterim 7 (7)

Soru 8: D. Deniz size konu ile ilgili bilgileri aktarırken D. Deniz'i ne kadar tehlikeli buldunuz?

1 (Hiç tekinsiz değil)

2

3

4

5

6

7 (Son derece tekinsiz)

Soru 9: D. Deniz size konu ile ilgili bilgileri aktarırken D. Deniz'i ne kadar yetkin buldunuz?

1 (Hiç yetkin değil)

2

3

4

5

6

7 (Son derece yetkin)

Soru 10: D. Deniz size konu ile ilgili bilgileri aktarırken D. Deniz'i ne kadar doğal buldunuz?

1 (Hiç doğal değil)

2

3

4

5

6

7 (Son derece doğal)

Soru 11: D. Deniz size konu ile ilgili bilgileri anlatırken D. Deniz'i ne kadar samimi buldunuz?

1 (Hiç samimi değil)

2

3

4

5

6

7 (Son derece samimi)

APPENDIX 7: DEMOGRAPHIC FORM

1. Cinsiyetiniz: Kadın ☐ Erkek ☐ Diğer ☐

2. Doğum Tarihiniz: _____

3. Eğitim Durumunuz: (En son mezun olduğunuz dereceyi işaretleyiniz.)

Okur-Yazar ☐

İlkokul ☐

Ortaokul ☐

Lise ☐

Üniversite (Lisans) ☐

Yüksek Lisans/Doktora ☐

4. İlişki durumunuz nedir?

Evli ☐

Bekar / İlişkisi yok ☐

Bekar / İlişkisi var ☐

5. Akıllı telefon, bilgisayar, tablet gibi cihazları kullanım sıklığını düşündüğünüzde, teknolojiye genel olarak ne kadar aşina olduğunuzuz düşünüyorsunuz?

Çok aşina

Biraz aşina

Kararsızım

Çok aşina değil

Hiç aşina değil

6. Daha önce robotlarla etkileşime geçtiniz mi?

Evet ☐

Hayır ☐

7. Robotlar için genel tutumunuz nasıldır?

Çok olumsuz

Biraz olumsuz

Nötr

Biraz olumlu

Çok olumlu

APPENDIX 8: ETHICAL COMMITTEE APPROVAL

Evrak Tarih ve Sayısı: 06.06.2023-238260



1993

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Akademik Değerlendirme Koordinatörlüğü

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Konu : İrem Nur Özsoy'un Etik Onay Başvurusu
Hk.

06.06.2023

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İlgi : 08.05.2023 tarih ve 229444 sayılı yazınız.

Enstitünüz Sosyal Psikoloji Tezli Yüksek Lisans Programı öğrencisi İrem Nur Özsoy'un, Prof. Dr.Doğan Kökdemir'in danışmanlığında yürüteceği "Robottan Al Haberi: Robottan Al Haberi: Detaylandırma Olasılığı Modeli ve Unsurlarının Robot-İnsan Etkileşimi Açısından İncelenmesi(Children and Robots Tell the Truth: Investigation the Elaboration Likelihood Model's Elements in Terms of Robot-Human Interaction)" başlıklı tez çalışması değerlendirilmiş ve bilgilerinize ekte sunulmuştur.

Prof. Dr. M. Abdülkadir VAROĞLU
Kurul Başkanı

Ek: Değerlendirme Formu

Bu belge, güvenli elektronik imza ile imzalanmıştır.

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Koordinatör

Telefon No: 246 66 66 / 5138



Sayı : 17162298.600-146

Konu : Tez Çalışması

23 MAYIS 2023

İlgili Makama

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