The role of Ethics, Amicability and Anthropomorphism in shaping individual's attitudes towards Artificial Intelligence

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Dissertation submitted as a requirement for the degree of BSc (Hons) in Applied Psychology, Dun Laoghaire Institute of Art, Design & Technology, 2024.

Declaration

I declare that this submission is my own work. Where I have read, consulted, and used the work of others I have acknowledged this in the text.

Word count: 4971

Signed: *Carla Fancello*

Date: 07/04/2024

Acknowledgements

First and foremost, I would like to thank my supervisor, Robert Griffin, for his support and guidance. I am grateful for the continued support you provided me throughout the development of this dissertation.

I would also like to thank my friends, particularly my friend Luca, for his encouragement and support, emotional and academic, throughout this memorable four-year journey.

Finally, I would like to express my extreme gratitude to my mother, Valentina, my father, Walter, my brother, Simone, my aunt, Stefania, and my grandparents. Although far away, they never stopped showing me their love and support, without them this would not have been possible.

Words cannot describe how much I appreciate all of you.

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Abstract

Artificial Intelligence (AI) is the ability of a computer system to perform tasks using intellectual processes that are typically associated with humans such as the ability to reason, discover meaning, generalize, and learn and adapt their behavior by analysing how the environment is affected by their previous actions. (European Commission, 2019; Copeland, 2023; Laskowski, 2023). A significant amount of research has been put towards its development, with the hypothesis that in the future these systems will be fully integrated into society. The present study aims to contribute to the body of research investigating the relationship between Attitudes towards AI and Amicability, Anthropomorphism, and Values and Ethics. The present carried multiple statistical tests (N=57) including multiple regression, Pearson's correlation, factorial 3x3x3 ANOVA, and one-way repeated measures ANOVA. Only the one-way ANOVA and Pearson's correlation have shown significant results. Overall, the present study contributes to the literature on AI technologies and highlights the importance for further research while addressing participants' concerns about the future of AI.

Introduction

The term Artificial Intelligence describes a wide range of technologies that have been developed in recent decades. Currently, AI systems coexist with humans and in many ways, help, replace and enhance human capabilities (Cismariu, 2019; Li et al., 2021). Modern AI is being employed in various fields and is often used daily, sometimes unknowingly (Fenwick et al., 2022).

History of Artificial Intelligence

Humans have shown to be intrigued by the idea of creating artificial life, as shown by popular culture, literature, and philosophy (Fenwick et al., 2022).

The origins of Artificial Intelligence date back to 1942, when Isaac Asimov published the short story "Runaround" introducing the three laws of robotics (Asimov, 1950), laying the groundwork for human-robot interaction (Haenlein & Kaplan, 2019). Simultaneously, in England, Alan Turing was making significant contributions to the development of early computers by creating a machine capable of deciphering the Enigma Code, used by German soldiers in WW2.

The term "Artificial Intelligence" was coined in 1956 (Haenlein & Kaplan, 2019), but Turing begun to explore the concept of such machines at the start of the 1950s. In his article "Computer Machinery and Intelligence" (1950), Turing argues that in the future machines will be able to read and learn, and creates the Imitation Game, more commonly known as Turing test, a method of determining whether a machine can exhibit human-like intelligence by conversing with a human without being detected as a machine, that is still being used today (Turing, 1950).

In the 1960s Joseph Weizenbaum created the Eliza program. Users could type a sentence, which Eliza would analyse for keywords, transform the sentence according to keyword-associated rules, and generated a typed response (Weizenbaum, 1966). Eliza is at the roots of Conversational Agents (CAs), programs that imitate human interactions

using spoken or written natural language (Kusal et al., 2022). CAs can be referred to as chatterbots, virtual assistants, and virtual companions, depending on their use. In the early 2010s AlphaGo was created, a computer program able to win the board game Go, which was exemplary of the difficulties faced by AI (Silver et al., 2016).

What is Artificial Intelligence

Artificial Intelligence (AI) is the ability of a computer system to perform tasks using intellectual processes that are typically associated with humans such as the ability to reason, discover meaning, generalize, and learn and adapt their behavior by analysing how the environment is affected by their previous actions (European Commission, 2019; Copeland, 2023; Laskowski, 2023). Artificial intelligence systems can be considered intelligent as they achieve "rationality" (European Commission, 2019) by collecting data, analysing it for patterns and correlations, using this information to make predictions about future states, and act accordingly, even adapting its behavior and modifying the environment (Laskowski, 2023). As a scientific discipline, AI includes machine learning, machine reasoning, and robotics (European Commission, 2019).

AI systems can be divided into three types based on the level of development. Weak AI or Artificial Narrow Intelligence (ANI) is designed to complete specific tasks and has limited information processing, examples of these machines are virtual assistants, chatbots, and most commonly used AI technologies. Strong AI or Artificial General Intelligence (AGI) aims to replicate cognitive human abilities (Copeland, 2023) and can successfully perform at the same level as a human (Huang & Peissl, 2023). Artificial Super Intelligence (ASI) (Laskowski, 2023; Huang & Peissl, 2023) aims to outperform the human mind. It is also important to note the term Generative Artificial Intelligence, which refers to AI models capable of taking information, learning from it, and producing diverse types of content when prompted (IBM, 2023).

Issues with AI

As stated by Pelau et al. (2021) “Accepting AI devices is not just about efficiency, fascination, and gratification, but also involves deeper social, emotional, and empathetic aspects”. The topic of AI technologies is often approached with fear and caution. According to a document released by the European Commission in 2019, trustworthy AI should be lawful, ethical, and robust.

Researchers, scientists, and the public expressed concern regarding the transparency of AI development, lack of clear guidelines and possible negative ethical implications (Green, 2018; Li et al., 2021; Fenwick et al., 2022). Important public figures in the field have openly shared their concerns about ASI, emphasizing the need for regulation in this field (Cismariu & Gherhes, 2019). To ease this apprehensiveness more research should be put towards exploring users’ feelings about AI, creating regulations that are human-centered.

The results of mass surveys can be influenced by many factors, often tending to show mixed or unclear results, and should be accepted acknowledging the limitations and biases that could influence the outcomes (Cormick, 2019).

Some of the factors that have an impact on participant’s attitudes towards AI include personal preferences (Kaya et al., 2022) and opinions such as values (Cormick, 2019; Machado et al., 2023), political ideology, privacy concerns, trust and ethics (Green, 2018; Yang et al., 2023), level of computer usage and level of knowledge about AI (Kaya et al., 2022), but also include specific characteristics of the AI system such as anthropomorphism, amicability, perceived Intelligence, perceived safety (Bartneck et al., 2009). Srithunge et al. (2021) analysed how the nature of conversation and the environment in which the interaction took place influenced the user’s experience and found that the human-robot interaction is also influenced by the user itself and the presence of other people in the room.

Ethics, Values and Trust

AI is fully integrated into a variety of sectors (Pelau et al., 2021), but the public's response to it has been shown to be complex (Brauner et al., 2023). A study conducted by Cismariu & Gherhes (2019) explored how AI is perceived by employees in the IT area. Results showed a tendency to think positively about AI, reasoning included prospect of new jobs, greater human comfort, health, and development, as well as benefits for the environment. The same sample of participants also noted to be concerned about the wrongful use of AI (Cismariu & Gherhes, 2019).

Decision-making process has been shown to be affected by values, acting as a criterion for judging and evaluating (Páez Gallego et al., 2020). The lack of clear guidance, including unclear ethical implications and values are some of the of the things that most affect user's Attitudes Towards AI (Green, 2018; Cormick, 2019; Machado et al., 2023; Yang et al., 2023). This phenomenon is predominant in the perception of Conversational Agents. Conversational Agents (CAs) are AI systems that can sustain a conversation with a user. Modern CAs are complex and can sustain long and intricate conversations, allowing these systems to be used for reasons ranging from information providers to advisors and virtual companions (Kusaò et al., 2022). CAs can entice social responses in users, allowing them to apply social rules and expectations, including values, that are often seen as being embodied by technologies (Görnemann & Spiekermann, 2022).

Ethics and Values seem to have the ability to influence user's feelings towards AI (Cormick, 2019), especially CAs, as individuals tend to humanise technology that shows human-like characteristics (Shah, et al., 2016; Abubshait & Wiese, 2017; Kaplan & Haenlein, 2018; Pelau et al., 2021; Görnemann & Spiekermann, 2022). If the user's values are against the ones seen as shown by the AI, the user's emotional response will likely be negative, but the same can be said if the AI is shown to have values that align with the user.

Studies show that there is a predominance of negative attitudes towards CAs (Centeno-Martín et al., 2023), some aspects affecting this are caution and fear. Li et al. (2021) suggests that AI lacks a relevant legal system and has many limitations including the inability to mimic and understand human emotions. Humanising AI could help improve performance while making the development of these systems more ethical and human centered. Additionally, increasing transparency could be a solution for the lack of trust that consumers feel. Transparency can be increased by enabling users to provide feedback and share insights into how AI systems function.

Anthropomorphism and Amicability

With the rise of CAs and Virtual Companions, it is safe to assume that in the future many human-to-human contacts will be replaced by interactions with machines. CAs can be embodied or disembodied (Arajuio, 2018). Embodied agents usually have a human-like virtual body or face and are able to engage in dialogue via language (text and speech) and nonverbal communication cues. Users' personification and anthropomorphizing of CAs has significant effects on their emotional responses (Görnemann & Spiekermann 2022). People interacting with the Eliza system showed a level of respect, appreciation, and politeness to the system, and expressed preference towards interacting with Eliza for struggles and empathy (Shah et al., 2016).

Traditional approaches usually focus on optimising AI for performance, without considering the impact on human users. Research suggests that a method of facilitating the integration and acceptance of AI technologies is to make empathetic, friendly, and human-like AI (Araujo, 2018; Fröding et al., 2020; Li et al., 2021; Fenwick et al., 2022). Humanising AI is an ambiguous concept due to the lack of universally accepted guidelines. Fenwick et al. (2022) proposes a solution, stating that an emphatic and human AI system should be able to understand human emotions and dynamics, interact in a natural, human-like manner, and process information similarly to what humans do. In social interactions, people use information from gestures, facial expressions, and

gaze, to assess feelings towards an interaction with a third party. The same strategy is used towards machines. A study conducted by Abubshait & Wiese, (2017) found that agents that resemble humans are perceived as “having a mind”, and small gestures such as nodding have a positive impact on the emotional reactions of users.

Anthropomorphic features also play a key role in the positive perception of CAs and Robots. Fenwick & Molnar (2022) also stated that embodiment and anthropomorphism are not enough to assure a positive experience for users. This study underlines the importance of humanizing AI by teaching CAs to understand human dynamics, interact in a human-like manner and process information in a way that more resembles humans. Similarly, Fröding et al. (2020) supports the theory that AI systems should be able to behave in a friendly manner to humans, but rather than proposing a value-based approach that focuses on applying human rules and principles to AI systems, Fröding et al. (2020) propose a virtue-based approach focused on moral qualities and characteristics, adding that they should be able to behave in a manner that mimics friendship.

Theoretical background

The present study is based on four theories. The first one is social response theory (SRT), which states that humans apply social rules when interacting with computers if computers display human-like characteristics (Mariani et al., 2023). The second one is the Anthropomorphism Theory, the tendency to associate the behavior of non-human agents with human-like emotions, intentions, and motivations (Epley, 2007). These interactions, as shown by previous literature, are driven by human’s capacity to relate and attribute human values to non-humans, meaning that human-computer relationship is “fundamentally social” (Nass et al. 1994). This is what the third theory, “Computers are Social Actors”, states (Nass et al. 1994).
Additionally, the present study takes into consideration a fourth theory, The Uncanny Valley Theory, which states that a user’s affinity to an object increases if its design is

human-like, until the human-likeness reaches total accuracy, in which the affinity is replaced by eeriness and uncanniness. The affinity then rises again when the object reaches true human-likeness, indicating a living person (Cordis, 2023; Kendall, 2024).

The present study

A significant amount of research has been put towards the development of AI technologies, with the speculation that in the future these systems will be fully integrated in society. The present study aims to contribute to the body of research by uncovering the dynamics underlying user perception of AI by investigating in detail the relationship between anthropomorphism, amicability, values and ethics, and attitudes towards AI.

Research questions.

RQ1: What is the relationship between values and ethics, anthropomorphism, amicability, and attitudes towards AI?

RQ2: Do personal preferences in values and ethics, anthropomorphism and amicability affect individuals' Attitudes Towards AI?

RQ3: Do individuals' Attitudes Towards AI affect personal preferences in anthropomorphism, amicability, and values and ethics?

Hypotheses

H1: There will be a significant relationship between anthropomorphism, amicability, values and ethics and attitudes towards AI.

H2: There will be a difference in the participants' attitudes towards AI score based on their level of values and ethics, and preferred anthropomorphism and amicability.

H3: There will be a difference in the participants' anthropomorphism, amicability, and values and ethics scores based on their level of attitudes towards AI.

Method

Design

The present study employed a within group quantitative mixed methods research design that incorporates elements of experimental and exploratory design. The present study was conducted through an online survey. The variables in the study were Values and Ethics (VTE), Anthropomorphism (AN), Amicability (AM), and Attitudes Towards AI (ATT).

Participant

The study sample consisted of 60 participants (25 male, 34 female, 1 non-binary), aged between 18 and 64 years. Three participants out of 60 had to be excluded due to incomplete responses. The participants were recruited through convenience sampling, the survey was shared on the researcher's personal Instagram page. The present study was approved by the Psychology Ethics Committee (PEC), participants were treated in accordance with the ethical standards of the Psychological Society of Ireland (PSI).

Apparatus

Each participant received an information sheet (Appendix A) in which the aim of the study was disclosed, as well as the possible risks and benefits of taking part in the study, requirements, and details regarding data usage and storage. Participants were provided with a consent form (Appendix B), and a debrief (Appendix C) thanking them for their participation, which provided the contact details of the researcher and the supervisor, information about data protection and withdrawal. Microsoft Forms was used for the online survey and data collection. The questionnaires used on the survey were created by the researcher. The survey was divided into four sections containing a questionnaire for each variable under scrutiny. All questionnaires follow a Likert scale

format in which participants were asked to indicate how much they agree or disagreed with a statement on a scale from 1 to 5.

Participants were first presented with the Attitudes Towards AI questionnaire (Appendix D). The questionnaire contained two multiple choice questions asking for the participant's familiarity with the topic and what factors play a role in their opinion, and the scale about Attitudes towards AI. In the second section participants were presented with a six items questionnaire related to Anthropomorphism and Embodiment (Appendix E), followed by a five items questionnaire about Amicability (Appendix F), and a six items questionnaire related to Values, Trust and Ethics (Appendix G).

Pilot study

A Pilot study was conducted prior to the experiment. The feedback received during the pilot study concerning clarity of information provided, and phrasing of the Likert scales items was taken into consideration in the development of the final questionnaire.

Procedure

Participants were invited to take part in the present study through the researcher's personal Instagram profile. Upon opening the link shared, participants were directed to the present study's questionnaire and presented the information sheet. After reading the document, participants were provided with a consent form that assured their privacy, invited to state their consent to taking part in the present study and asked to create a unique code for fata withdrawal. Demographic questions (Appendix H) regarding gender and age were asked. Participants were then directed to the questionnaire. The questionnaire presented four sections, each related to one of the variables. The first section contained the Attitudes towards AI questionnaire in which participants were also asked to state the level familiarity with AI technologies and the factors affecting the opinions about the topic. This was followed by three separate questionnaires regarding Anthropomorphism, Amicability, and Values and Ethics. Upon

completion of the questionnaire participants were given a debriefing document with contact information of the researcher and were asked to confirm their consent to participate in the present study (Appendix I).

Results

Overview

The present study investigated the relationship between Attitudes towards AI (ATT) and Amicability (AM), Anthropomorphism (AN), and Values and Ethics (VTE). Multiple statistical tests were carried out: multiple regression (Appendix J), one-way repeated measures ANOVA (Appendix K), factorial 3x3x3 ANOVA (Appendix L), and Pearson's correlation (Appendix M). Inferential statistics were used to investigate whether there is a relationship between the variables.

Descriptive statistics

For the two ANOVA tests, participants were divided into three groups (High/ Medium/ Low) for each variable, depending on their score in each questionnaire. Table 1 shows the grouping criteria. Tables 2 to 4 and Figures 1 to 4 show the distribution of the population for the variables under investigation.

Table 1: Grouping criteria

Coding table					
	maximum score	minimum score	high score range	medium score range	low score range
Attitudes towards AI (ATT)	35	1	35 to 24	23 to 13	12 to 1
Anthropomorphism (AN)	30	1	30 to 21	20 to 11	10 to 1
Amicability (AM)	25	1	25 to 17	16 to 9	8 to 1
Values and Ethics (VTE)	30	1	30 to 21	20 to 11	10 to 1

*High score = 1; Medium score =2; Low score= 3

Table 2: Summary of participants based on Attitudes Towards AI score.

Attitudes Towards AI distribution					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	High	25	43.9	43.9	43.9
	Medium	30	52.6	52.6	96.5
	Low	2	3.5	3.5	100
	Total	57	100	100	

Figure 1: Visual display of participants distribution for Attitudes towards AI

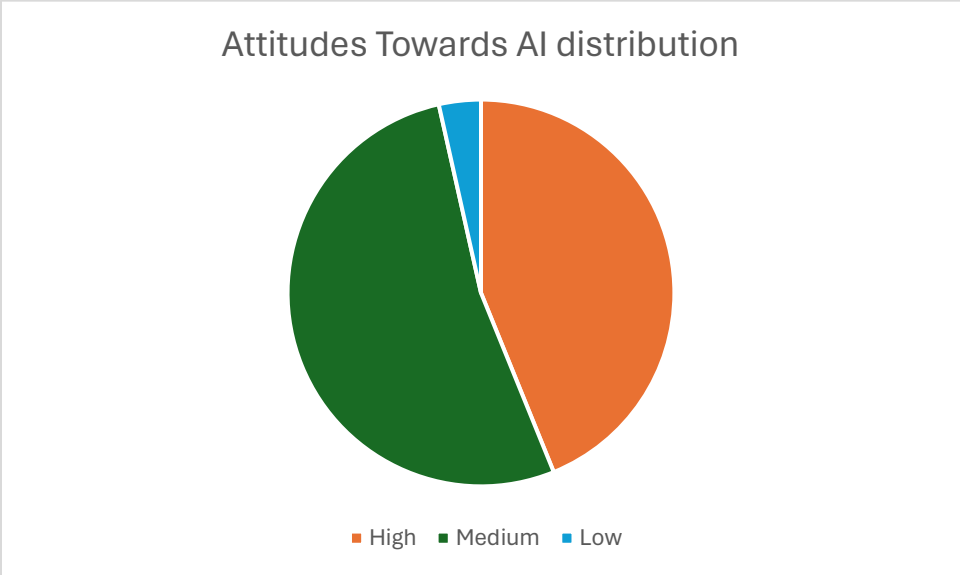


Table 3: Summary of participants based on Anthropomorphism score

Anthropomorphism distribution					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	High	6	10.5	10.5	10.5
	Medium	44	77.2	77.2	87.7
	Low	7	12.3	12.3	100
	Total	57	100	100	

Figure 2: Visual display of participants distribution for Anthropomorphism level

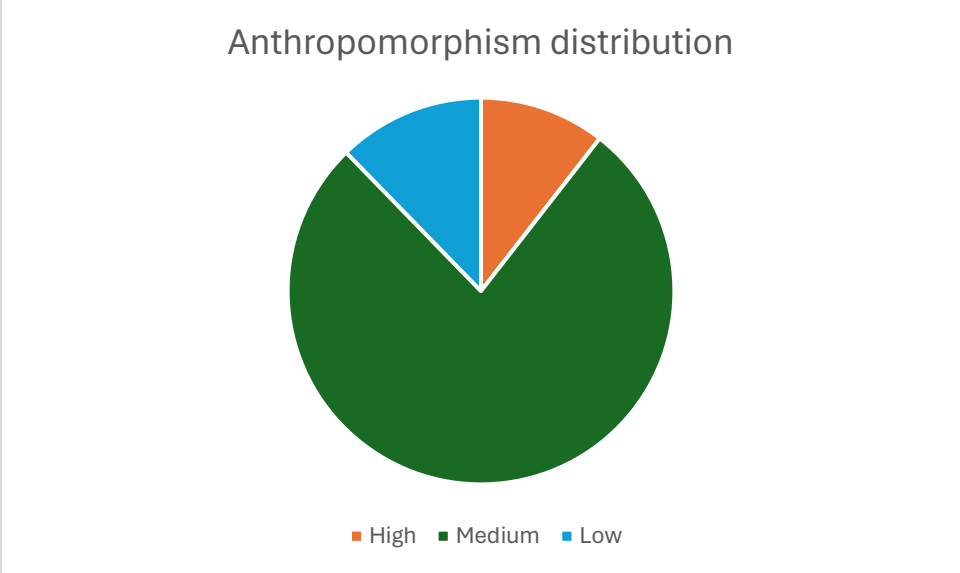


Table 4: Summary of participants based on Amicability score.

Amicability distribution					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	High	13	22.8	22.8	22.8
	Medium	39	68.4	68.4	91.2
	Low	5	8.8	8.8	100
	Total	57	100	100	

Figure 3: Visual display of participants distribution for Amicability

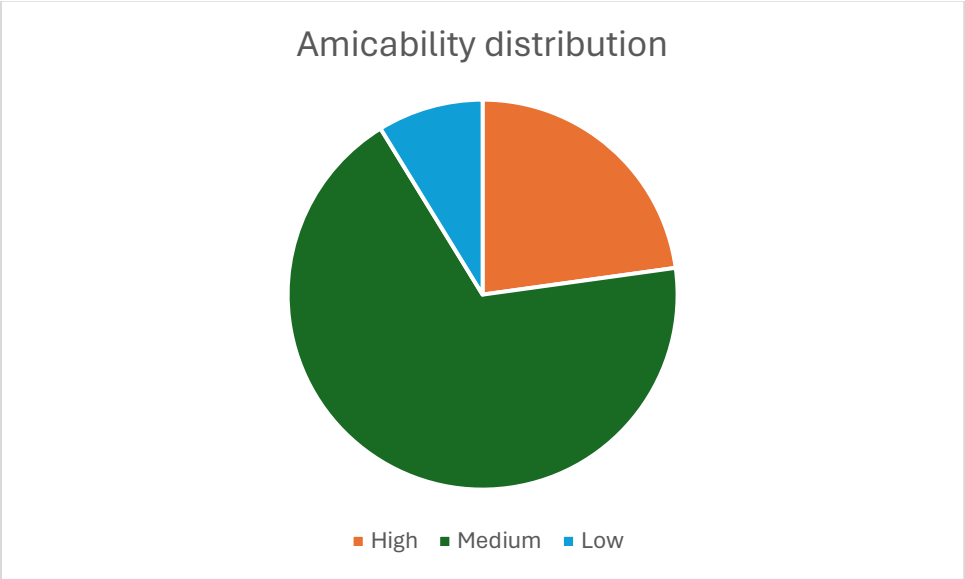
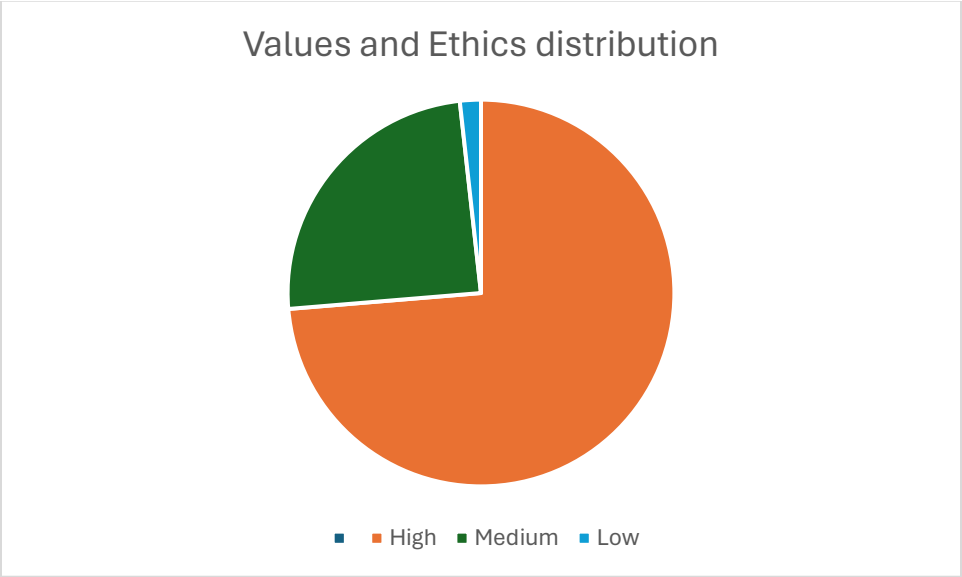


Table 5: Summary of participants based on Values and Ethics score.

Values and Ethics distribution					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	High	42	73.7	73.7	73.7
	Medium	14	24.6	24.6	98.2
	Low	1	1.8	1.8	100
	Total	57	100	100	

Figure 4: Visual display of participants distribution for Values and Ethics



Inferential statistics

Preliminary analysis was conducted to check the assumptions of the Multiple Regression, factorial ANOVA, and one-way ANOVA. Assumptions were met for all variables for the Levene's Test, all variables except for VTE passed the Shapiro-Wilk test of Normality.

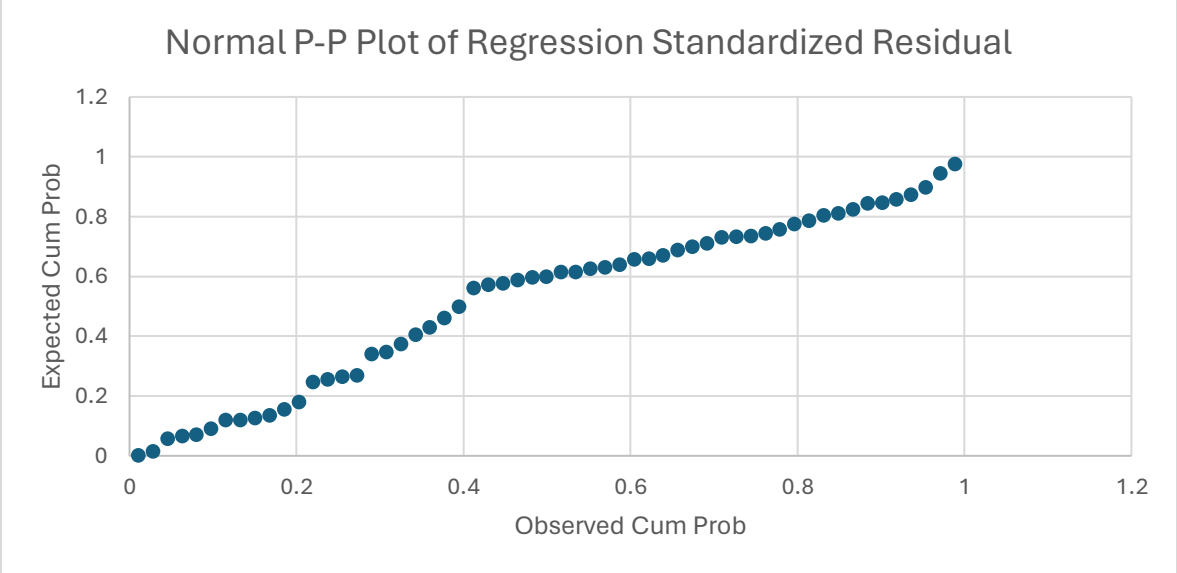
VTE did not meet the assumption of Normality due to the skewness of the data. This was taken into consideration when analysing the results of the tests, however the inclusion of the data can be justified with Central Limit Theorem, which states that the sampling distribution of the means will tend to normality as long as the sample is sufficiently large (N > 30) (Routledge, 2024).

Multiple Regression

Hypothesis 1 for Research question 1 stated that there would be a significant relationship between anthropomorphism, amicability, values and ethics and attitudes towards AI. A Multiple Regression analysis was conducted (Figure 1). The predictor variables were AM, AN and VTE, while the outcome variable was ATT. The assumptions

for the Multiple Regression were met, and the hypothesis was partially supported. The multiple regression showed a significant relationship between the predictor variables and the outcome variable [F (3, 53) =3.439, p = .023]. Among the predictor variables, none of the variables demonstrated a statistically significant result when taken individually.

Figure 5: Visual summary of Regression Analysis



3x3x3 factorial ANOVA

Hypothesis 2 for Research question two stated that there would be a difference in the participants' ATT score based on their level of VTE, AM and AN. The hypothesis was rejected, the independent variables did not affect ATT.

Table 6: Between-Subjects Factors

Between-Subjects Factors			
		Value Label	N
ANTHRO_lvl	1	High	6
	2	Medium	44
	3	Low	7
AMI_lvl	1	High	13
	2	Medium	39
	3	Low	5

VTE_lvl	1	High	42
	2	Medium	14
	3	Low	1

One-way ANOVA

Hypothesis 3 for research question 3 stated that there would be a difference in the participants' AN, AM and VTE scores based on their level of ATT. The alternative hypothesis was supported for the dependent variables AM [F (2, 54) = 3.355, p = .042. Partial eta squared = .111] and AN [F (2, 54) = 6.312, p = .003. Partial eta squared = .189], the hypothesis was rejected for VTE [F (2, 54) = .615, p= .544. Partial eta squared =.022]. The level of ATT affected the dependent variables. Table 5 below depicts the descriptive statistics for the dependent variables. Figures 6 to 8 below depict the means plots of the variables.

A Bonferroni post-hoc analysis was carried out. The results showed a significant difference between High and Medium groups for the variables AN and AM.

Table 7: Dependent Variables Descriptive statistics

Descriptives							
		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean	
						Lower Bound	Upper Bound
Anthropomorphism	High	25	17.64	3.546	0.709	16.18	19.1
	Medium	30	13.83	4.227	0.772	12.25	15.41
	Low	2	13.5	7.778	5.5	-56.38	83.38
	Total	57	15.49	4.404	0.583	14.32	16.66
Amicability	High	25	14.88	4.246	0.849	13.13	16.63
	Medium	30	12.07	3.85	0.703	10.63	13.5
	Low	2	13	2.828	2	-12.41	38.41
	Total	57	13.33	4.18	0.554	12.22	14.44
Vales and Ethics	High	25	22.36	4.618	0.924	20.45	24.27
	Medium	30	23.77	4.79	0.875	21.98	25.56
	Low	2	24	8.485	6	-52.24	100.24
	Total	57	23.16	4.776	0.633	21.89	24.43

Figure 6: Means plot for AN and ATT

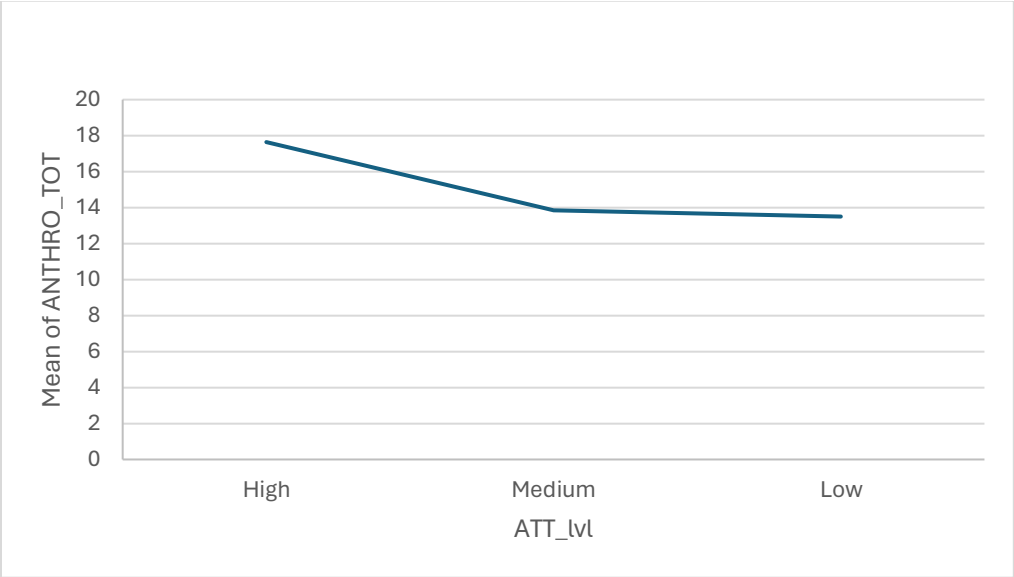


Figure 7: Means plot for AM and ATT

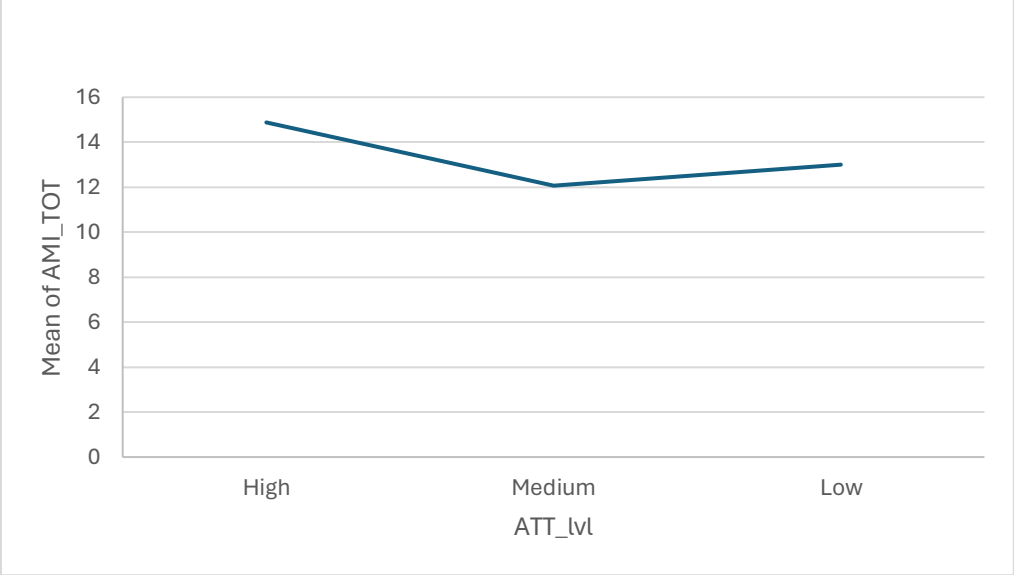
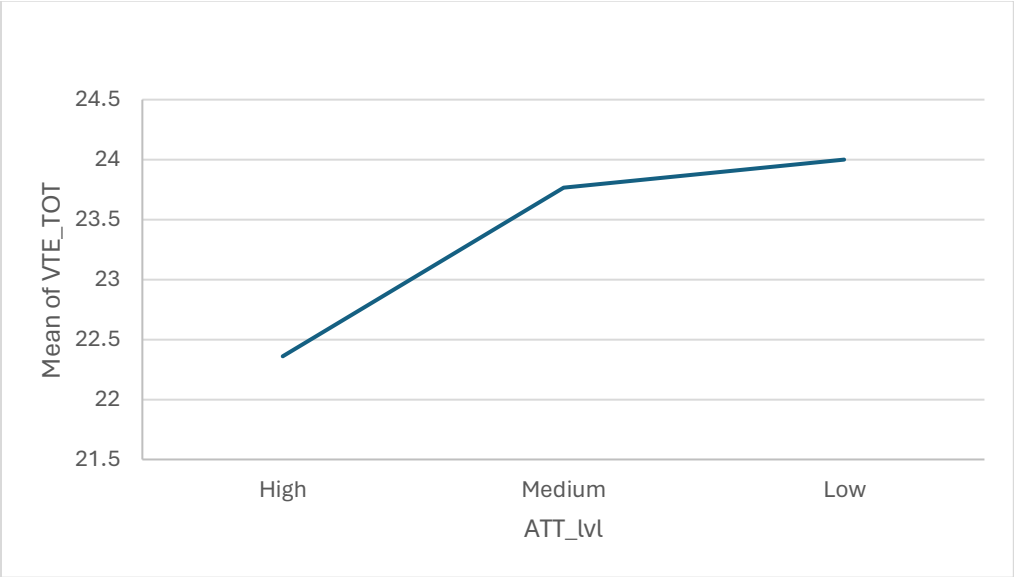


Figure 8: Means plot for VTE and ATT



Additional findings

The present study conducted Pearson's correlation analysis of the variables. The data has shown significant results. There is a significant positive correlation between Attitudes Towards AI and Anthropomorphism (r= .391, p= 0.003) (Figure 9), and Amicability (r= .332, p= 0.012) (Figure 10). Additionally, there is a significant positive correlation between Anthropomorphism and Amicability (r= .656, p= <.001) (Figure 11).

Figure 9: Scatterplot between Attitudes Towards AI and Anthropomorphism

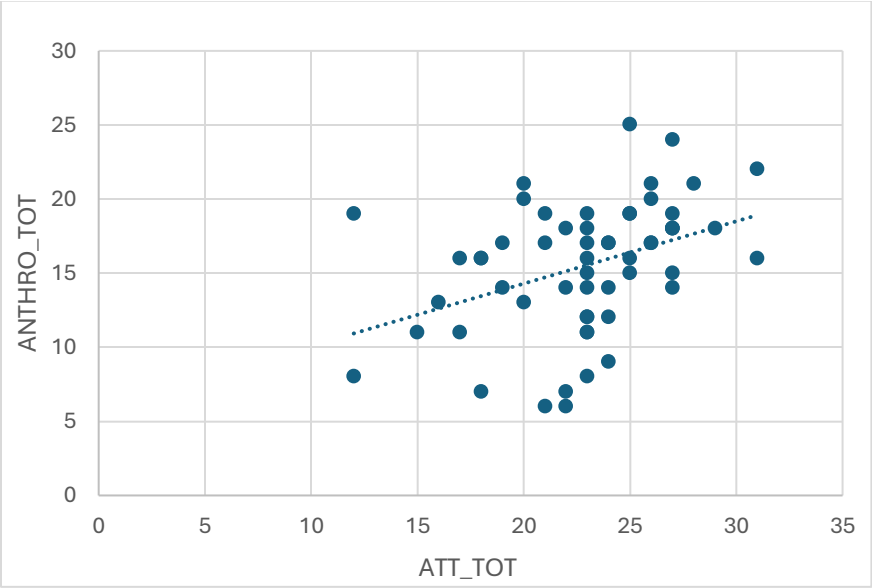


Figure 10: Scatterplot between Attitudes Towards AI and Amicability

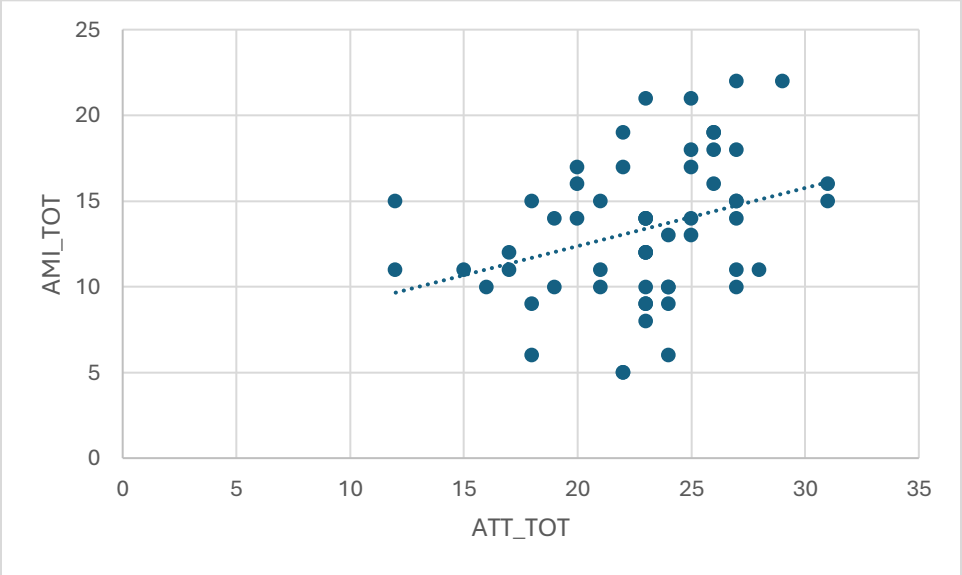
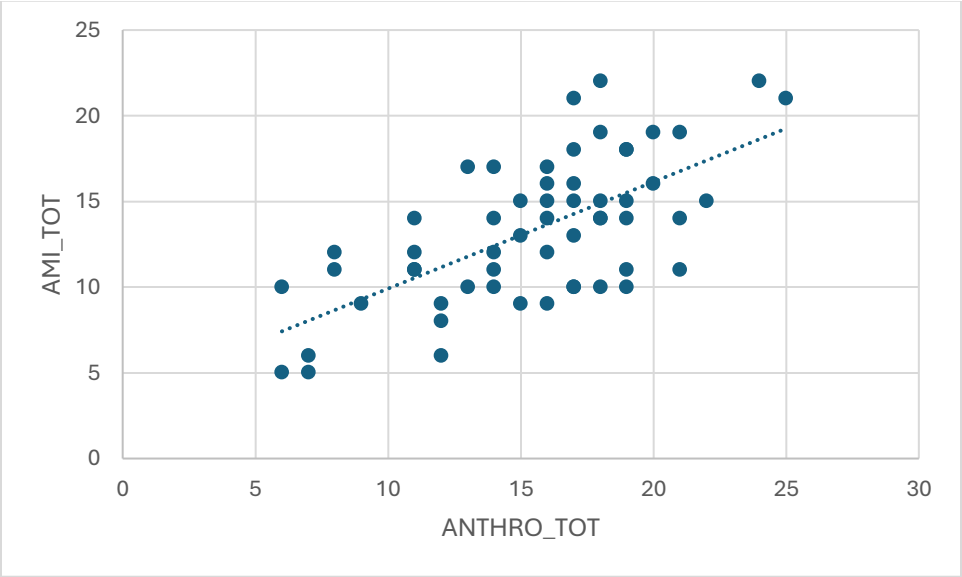


Figure 11: Scatterplot between Amicability and Anthropomorphism



Discussion

Overview

The present study aimed to explore the relationship between Amicability, Anthropomorphism, Values and Ethics and Attitudes towards AI. The present study had three hypotheses. Hypotheses 1 stated that there will be a significant relationship between anthropomorphism, amicability, values and ethics and attitudes towards AI. Hypothesis 2 stated that there would be a difference in the participants' attitudes towards AI score based on their level of values and ethics, and preferred anthropomorphism and amicability. Hypothesis 3 stated that there would be a difference in the participants' anthropomorphism, amicability, and values and ethics scores based on their level of attitudes towards AI.

Hypotheses 1 and 2 were not supported. Hypothesis 3 was supported. Results show a unidirectional relationship. Personal Attitudes Towards AI have an influence on individual preferences regarding features of AI systems, while the opposite is not true. Additionally, a correlation between the variables was found. ATT, AM and AN are significantly positively correlated, while they are negatively correlated to VTE, although not significantly. These findings show that with higher VTE, ATT lowers slightly, and with higher ATT both AM and AN rise significantly.

Theoretical and Practical implications

The present study has important theoretical and practical implications.

The present study findings support the theory that values have an effect on preferences regarding AI systems (Green, 2018; Li et al., 2021; Fenwick et al., 2022; Machado et al., 2023). It is important to note that this is a self-reported effect, that is not shown in the statistical analysis. Participants have expressed their concerns towards AI. When asked the question "What factors would you say affect your opinion towards AI technologies?", the majority of participants selected "Ethical issues" and "Potential

disadvantages". These findings support previous literature and underline how the lack of clear guidance, including unclear ethical implications, unfair use and values are strong concerns for the public (Green, 2018; Cormick, 2019; Machado et al., 2023; Yang et al., 2023). Additionally, more than half of the participants selected "Potential benefits", confirming the mixed feeling outlined by research. Particularly, these findings support the study conducted by Cismariu & Ghehes (2019), in which it was found that people tend to think positively about AI, while also being concerned about repercussions.

In the Attitudes towards AI section of the survey, participants showed a severe lack of trust that AI technology is going to be used ethically, and that the negative aspects of AI technologies outweigh the positives, while agreeing that AI could improve our society, has the potential to address and improve outcomes of complex societal challenges. Participants showed medium to high appreciation and intention to use AI systems. These findings show a possible disconnect between users' feelings and actions. This is also shown by the negative correlation, although not significant, that was found by the present research between VTE and the other variables.

The Values, Trust and Ethics section of the survey shows that participants desire AI technologies to be aligned with their values and their ethical standards. In particular it is interesting to note how most participants have expressed their willingness to sacrifice functionality and efficiency in favour of transparency, values, and ethics. This implies that, as stated by Li et al. (2021), increasing transparency and "humanizing" AI could lead to higher AI acceptance.

The present study shows that individuals are severely concerned about ethical issues and lack trust in companies. This concept has already been widely discussed by recent research, increasing transparency could lead to wider acceptance of AI systems.

Furthermore, the last question of the survey: "Do you have additional comments", gives interesting insights. Participants indicated to be concerned about the use of AI, although recognizing the advantages and potential benefits of it. In particular

the concerns are focused on legal regulations, illicit use, scams, data breaches, political use, and the substitutions of human work. This supports by previous research outlining how political ideology and privacy influence the public's opinion of AI technologies (Bartneck et al., 2009; Green, 2018; Yang et al., 2023).

Lastly, participants expressed that amicability could make the experience nicer, but it can also be used as a weapon against users. Companies usually create AI systems that are human-like. Many studies have shown how individuals tend to attribute human-like characteristics to inanimate objects (Shah et al., 2016; Görnemann & Spiekermann 2022), even developing feelings of affection. Likewise, previous research has found that a method of facilitating the integration and acceptance of AI technologies is to make empathetic, friendly, and human-like AI (Araujo, 2018; Fröding et al., 2020; Li et al., 2021; Fenwick et al., 2022). Nevertheless, participants of the present study showed a strong preference towards disembodied AI technologies, showing an effect similar to the one described by the Uncanny Valley Theory (Cordis, 2023; Kendall, 2024), in which an embodied system provokes feelings of eeriness and uncanniness.

While the benefits of creating systems that simulate humans are supported by research, the opposite effect should also be further analysed. The present study shows results that contradict the current opinions regarding how to develop AI systems, this particularly reflects on CAs. In practice, this could be applied by allowing the user to customize their experience, in particular adding features that allows for customisation.

Strengths and Limitations of the present study

The present study aimed to contribute to the body of research by exploring the relationship between Anthropomorphism, Amicability of the AI systems, and participant's Ethics, Values and Attitudes towards AI. A number of strengths and limitations can be identified.

The current study presented a number of strengths. The survey was made accessible to anyone over the age of eighteen with no other restrictions, this allowed a sample that is representative of a wide sample of people. Additionally, the variables presented were analysed from many angles to gain a deep understanding of their relationship. Lastly, the online distribution of the survey allowed to gain a wide range of participants in a short amount of time.

The present study also shows a number of limitations. The survey's questionnaires were not standardized. A standardized test would have added to the repeatability and trustworthiness of the study. Additionally, it was necessary to exclude 3 responses out of 57 due to incomplete questionnaires. Lastly, the present study would have benefitted from a larger sample size to obtain more accurate results.

Suggestions for Future Research

The present study focused on exploring the relationship between Amicability, Anthropomorphism, Values and Ethics and Attitudes towards AI, and it did so in an online setting. Future research could analyse these variables in person, allowing participants to interact with different types of AI systems with different conditions. This could be done through VR or on a computer. Additionally, an interesting topic to further analyse regarding AI is the Uncanny Valley Theory, as the present study has highlighted that it could pose as an obstacle in the acceptance of AI technologies, especially CAs.

Conclusion

The results of the present study highlight the complex relationship between amicability, anthropomorphism, values, and attitudes towards AI, and emphasise the importance of increasing transparency in the development of AI systems. Participants expressed concern towards ethical implications and indicated the need for clear guidelines and regulations in the development of AI systems, echoing the findings of previous literature. Interestingly, the results of the present study have shown to diverge from previous research in the topic of Anthropomorphism and Amicability.

In conclusion, the present study contributes to the body of research with insightful findings. Further research is suggested to analyse and address the public's concerns and preferences.

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Appendices

Appendix A: information sheet.

* Required

Infromation Sheet

Title of project: The role of Ethics, Amicability and Anthropomorphism in shaping individual's attitudes towards Artificial Intelligence

You are being invited to take part in the research "The role of Ethics, Amicability and Anthropomorphism in shaping individual's attitudes towards Artificial Intelligence". This project is being undertaken by Carla Fancello for our major research project as part of the BSc (Hons) in Applied Psychology, IADT.
Before you decide whether you wish to take part, it is important for you to understand why this research is being done and what it will involve. Please take time to read this information carefully and discuss it with someone you trust. If there is anything that is unclear or if you would like more information please ask, our contact details are at the end of this information sheet. Thank you for reading this.

What is the purpose of the project?
The term Artificial Intelligence describes a wide range of technologies that have been developed in recent decades. It has recently been popularised, yet the interest in this interdisciplinary science has been around since World War Two (WW2). In AI research, as in all types of technology research, the user should be at the centre of its development. It is imperative that more research is put towards exploring how users feel about AI and create rules and regulations to allow this technology to be ethically integrated in society. Many factors play a role in shaping attitudes towards AI, researchers must investigate what shapes the sentiments and concerns towards this important technology. Ethics, trust, transparency, values, amicability, and anthropomorphism have been shown to have a significant role in shaping attitudes towards AI, and so should be thoroughly investigated.
The present study aims to do so by carrying out exploratory research that focuses on finding out how individual preferences regarding values, amicability, and anthropomorphism vary depending on the participants' general attitude towards Artificial intelligence.

Who is being invited to take part?
This study is for anyone over the age of 18.

What is involved?
If you choose to participate, you will be asked demographic questions about your age and gender, followed by four brief questionnaires regarding Amicability, Anthropomorphism, Values and Attitudes towards Artificial Intelligence. The first section asks about your experiences and opinions about Artificial Intelligence, the following ones are brief 5-to-7-item questions that will ask you about Amicability, Anthropomorphism, and Values in the context of Artificial Intelligence. The study will take approximately 10 minutes.

Do I have to take part?
You are free to decide whether you wish to take part or not. If you do decide to take part, you will be asked to sign a consent form that lets us know you have read this information sheet and understand what is involved in the research. You are free to withdraw from this study at any time and without giving reasons.

What are the disadvantages and risks (if any) of taking part?
The questionnaires will ask your thoughts and opinions about Artificial Intelligence. There is a possibility that you may feel discomfort. You may choose not to answer some questions if you do not wish to. Your participation is voluntary, you are free to withdraw at any time and your data will not be retained.

What are the possible benefits of taking part?
We cannot promise the study will help you, but the information we get from the study will help to increase the understanding of Artificial Intelligence.

How will my information be used?
Your responses to the questionnaire will be combined with all other participants data and statistically analysed. No individual's data will be identifiable in the final report. The results of this analysis will be reported in the thesis for the BSc (Hons) in Applied Psychology in the Dun Laoghaire Institute of Art, Design & Technology. This can be requested through the library at IADT, or by emailing the researcher or supervisor at n00203048@iadt.ie and robert.griffin@iadt.ie. This study may also be published in an academic journal article and may be written about for blog posts or media articles, and these can be requested from the researcher.

Who has reviewed the study?
This study has been approved by the IADT Psychology Ethics Committee.

What if you have any questions or there is a problem?
If you have a concern about any aspect of this study, you may wish to speak to the researcher(s) who will do their best to answer your questions. You should contact Carla Fancello (n00203048@iadt.ie) or their supervisor Robert Griffin (robert.griffin@iadt.ie).

How will my data be protected?
Under the EU General Data Protection Regulation (GDPR) the legal basis for collecting data for scholarly research is that of public interest. The regulations regarding the protection of your data will be followed. Only data which is needed for analysis will be collected. By giving your consent to take part in the study you are consenting to the use of your data as detailed in this information sheet.
The data will be retained by the researcher for at least one year and may be retained for up to 7 years if the results of the study are published in certain capacities (e.g. in a journal article). There is also a possibility that the fully anonymised dataset may be submitted to a journal and made available to other researchers and academics worldwide for verification purposes, but if this occurs it will be ensured that you are not identifiable from the data.
As the supervisor on this project, I, Rober Griffin, am responsible for ensuring that all datasets will be stored in accordance with GDPR regulations and those which are not submitted to a journal will be fully deleted on or before January 2031.
The data will only be accessible to the researcher, Carla Fancello, and the supervisor of this study, Robert Griffin. The data collected will be stored securely on a password protected computer. In case of a data breach the data protection officer in IADT will be informed immediately.
The data will be anonymous. Each participant will be asked to create a unique ID code which allows participants to withdraw their answers from the study. The data will remain anonymous to the researcher. The data will be stored for 1 year and will be deleted if the study is not published. If published, the data will remain stored for a further 7 years and securely disposed of after.
You will find contact information for IADT's Data Protection Officer, Mr Bernard Mullarkey, and more information on your rights concerning your data at https://iadt.ie/about/your-rights-entitlements/gdpr/

Thank you.
The researcher would like to thank you for taking the time to read the information sheet and taking part in this study. Your contribution is highly valuable and appreciated.

Date
01/02/2024

Appendix B: Consent form.

Consent form

Title of project: The role of Ethics, Amicability and Anthropomorphism in shaping individual's attitudes towards Artificial Intelligence
Name of researcher: Carla Fancello
Please tick the boxes below.

I confirm that I have read and understand the information sheet for the above study and have had the opportunity to ask questions. *

- ◯ Yes
- ◯ No

I understand that my participation is voluntary and that I am free to withdraw at any time. *

- ◯ Yes
- ◯ No

I understand that the data collected about me during this study will not be identifiable when the research is published. *

- ◯ Yes
- ◯ No

I am over 18 years of age. *

- ◯ Yes
- ◯ No

I agree to take part in this study. *

- ◯ I agree
- ◯ I disagree

Appendix C: Debrief.

Debrief

Title of Project: The role of Ethics, Amicability and Anthropomorphism in shaping individual's attitudes towards Artificial Intelligence

Name of Researcher/s: Carla Fancello

Thank you very much for taking part in this research study.
This study is designed to investigate to what extent do factors such as personal values, transparency, anthropomorphism, and amicability shape users' feelings toward Artificial Intelligence. The present study aims to contribute to the body of research by further exploring what shapes feelings toward AI, and specifically analysing the role of anthropomorphism, amicability, values, and ethics on users' experience while interacting with AI.

Withdrawal information
If you have any questions about this study, or if you would like to withdraw your data from the study, please contact the researcher or supervisor at n00203048@iadt.ie or robert.griffin@iadt.ie. In your email let them know your unique ID code as second letters of your name and surname and the last 3 digits of phone number, as stated at the beginning of this questionnaire. If you submit a request for data removal, all data collected from you will be securely deleted. You will be able to remove your data from the study until March 2024 when the data will be combined and analysed. Data removal will not be possible after that date. Please keep a copy of this information in case you wish to remove your data after leaving this screen.

Data protection
Your data will be treated according to GDPR regulations. You will find contact information for IADT's Data Protection Officer, Mr Bernard Mullarkey, and more information on your rights concerning your data at https://iadt.ie/about/your-rights-entitlements/gdpr/

Thank you again for taking the time to participate in this research.
If you have any questions about this study, please contact the researcher or supervisor at n00203048@iadt.ie or robert.griffin@iadt.ie

Appendix D: Attitudes Towards AI questionnaire.

Attitudes towards AI

How familiar are you with AI technologies?

- ◯ Very familiar: I have a deep understanding of AI technologies, its applications and implications.
- ◯ Somewhat familiar: I have a basic knowledge of AI technologies, its applications and implications.
- ◯ Neutral: I have limited knowledge or understanding of AI technologies.
- ◯ Not very familiar: I have heard of AI technologies, but I do not have a clear understanding of it.
- ◯ Not familiar at all: I have little to no knowledge of AI technologies.

What factors would you say affect your opinion towards AI technologies?

Please select your top three choices.

Please select at most 3 options.

- ☐ Ethical issues
- ☐ Potential disadvantages. (e.g. military use, damage to other fields)
- ☐ Potential benefits (e.g. healthcare, convenience, efficiency)
- ☐ Trust
- ☐ AI technology does not align with my values
- ☐ Societal implications

Attitudes towards AI

You will be shown some statement, please select how much you agree with that statement from 1 (Strongly Disagree) to 5 (Strongly Agree)

	Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree
I believe AI can improve our society	○	○	○	○	○
I will use AI technologies if given the opportunity to do so	○	○	○	○	○
I believe AI has the potential to address and improve outcomes of complex societal challenges (healthcare, education, and environmental sustainability)	○	○	○	○	○
I think AI research can bring positive outcomes	○	○	○	○	○
I trust that AI technology is going to be used ethically	○	○	○	○	○
I believe the positive aspects of AI technologies outweigh the negatives.	○	○	○	○	○

Appendix E: Anthropomorphism and Embodiment questionnaire

Anthropomorphism and Embodiment

Anthropomorphism is the attribution of human-like characteristics to non-human entities. This includes traits such as emotions, personality and intelligence.
Embodiment refers to the rapresentation of something in a physical or virtal way. This can involve use of avatars and other forms of physical or visual representation.
Please rate how much you agree or disagree with each statement from 1 (strongly disagree) to 5 (strongly agree).

	Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly agree
When interacting with AI technology, I prefer for it to have human-like appearance	◯	◯	◯	◯	◯
I am comfortable with the idea of AI technologies exhibiting human-like personalities and emotions	◯	◯	◯	◯	◯
I prefer for AI technologies not to be embodied (e.g. avatars, robots)	◯	◯	◯	◯	◯
Interacting with an embodied AI system would make me uncomfortable	◯	◯	◯	◯	◯
It is important to me that AI systems accurately simulate and understand human-like behaviour and responses.	◯	◯	◯	◯	◯
I would be more confortable engaging with an AI system that is embodied rather then a text or voice based one.	◯	◯	◯	◯	◯

Appendix F: Amicability questionnaire.

Amicability

Amicability refers to the extent to which AI systems exhibit friendly, approchable behaviours. This might be achieved by using small talk, friendly language and humor.
Please rate how much you agree or disagree with each statement from 1 (strongly disagree) to 5 (strongly agree).

	Strongly Disagree	Somewhat Disagree	Neither Agree or Disagree	Somewhat Agree	Strongly Agree
It is important to me that AI technologies act in a friendly, human-like way	◯	◯	◯	◯	◯
I like when AI technologies make jokes and use humor during an interaction	◯	◯	◯	◯	◯
I like when AI technologies make small talk during a conversation	◯	◯	◯	◯	◯
I think the use of a conversational tone, display of empathy and light-hearted banter contribute to a positive experience with AI.	◯	◯	◯	◯	◯
I have felt uncomfortable or uneasy when interacting with an AI system that exhibited overly friendly or personified behavior.	◯	◯	◯	◯	◯

Appendix G: Values, Trust and Ethics questionnaire.

Values, Trust and Ethics

Please rate how much you agree or disagree with each statement from 1 (strongly disagree) to 5 (strongly agree).

	Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly agree
It is important for me that AI systems align with my personal values	◯	◯	◯	◯	◯
I would be willing to sacrifice some funcionality and efficiency in favour of an AI system that aligns with my values.	◯	◯	◯	◯	◯
It is important for me that AI systems are held to the same ethical standars as humans.	◯	◯	◯	◯	◯
AI systems should be programmed to prioritise ethical principle in decision/making processes.	◯	◯	◯	◯	◯
AI developers should prioritize fairness, transparency, privacy and equity over functionality and efficiency.	◯	◯	◯	◯	◯
I am concerned about AI systems' ethical implications.	◯	◯	◯	◯	◯

Appendix H: Demographic questions.

Demographic Questions.

Please provide us with an anonymised code which we can use to identify your data if you later wish to have it removed from our dataset. Please do so by answering the following two questions.

- What are the second letters of your first and last name? (For example, if your name is Jane Smith, these letters would be 'AM')
- What are the last three digits of your telephone number?

Gender: I identify as

- ◯ Male
- ◯ Female
- ◯ Non-binary
- ◯ Prefer not to say
- ◯ Other

Age: I am

- ◯ 18-24 years
- ◯ 25-34 years
- ◯ 35-44 years
- ◯ 45-54 years
- ◯ 55-64 years
- ◯ 65-73 years
- ◯ 75 years or older
- ◯ Prefer not to say

Appendix I: Confirmation of consent.

Do you have any additional comments?

Having completed the questionnaire: *

- ◯ I consent to the researchers using my answers for their research
- ◯ I wish to have my answers removed from the research

Appendix J: Output for Multiple Regression analysis.

Correlations

		ATT_TOT	ANTHRO_TOT	AMI_TOT	VTE_TOT
Pearson Correlation	ATT_TOT	1.000	.391	.332	-.093
	ANTHRO_TOT	.391	1.000	.656	-.249
	AMI_TOT	.332	.656	1.000	-.227
	VTE_TOT	-.093	-.249	-.227	1.000
Sig. (1-tailed)	ATT_TOT	.	.001	.006	.246
	ANTHRO_TOT	.001	.	.000	.031
	AMI_TOT	.006	.000	.	.045
	VTE_TOT	.246	.031	.045	.
N	ATT_TOT	57	57	57	57
	ANTHRO_TOT	57	57	57	57
	AMI_TOT	57	57	57	57
	VTE_TOT	57	57	57	57

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	VTE_TOT, AMI_TOT, ANTHRO_TOT[b]	.	Enter

a. Dependent Variable: ATT_TOT

b. All requested variables entered.

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.404[a]	.163	.116	3.848	1.643

a. Predictors: (Constant), VTE_TOT, AMI_TOT, ANTHRO_TOT

b. Dependent Variable: ATT_TOT

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	152.768	3	50.923	3.439	.023[b]
	Residual	784.811	53	14.808		
	Total	937.579	56			

a. Dependent Variable: ATT_TOT

b. Predictors: (Constant), VTE_TOT, AMI_TOT, ANTHRO_TOT

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			Correlations			Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	16.407	3.678		4.461	<.001					
	ANTHRO_TOT	.285	.156	.306	1.822	.074	.391	.243	.229	.559	1.790
	AMI_TOT	.131	.164	.134	.802	.426	.332	.110	.101	.565	1.770
	VTE_TOT	.012	.112	.014	.107	.915	-.093	.015	.013	.931	1.074

a. Dependent Variable: ATT_TOT

Collinearity Diagnostics[a]

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions			
				(Constant)	ANTHRO_TOT	AMI_TOT	VTE_TOT
1	1	3.861	1.000	.00	.00	.00	.00
	2	.099	6.256	.02	.08	.14	.17
	3	.028	11.780	.00	.76	.84	.02
	4	.013	17.233	.98	.16	.02	.81

a. Dependent Variable: ATT_TOT

Residuals Statistics[a]

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	19.12	26.59	22.84	1.652	57
Std. Predicted Value	-2.255	2.268	.000	1.000	57
Standard Error of Predicted Value	.514	1.758	.985	.265	57
Adjusted Predicted Value	18.73	26.83	22.85	1.676	57
Residual	-11.998	7.593	.000	3.744	57
Std. Residual	-3.118	1.973	.000	.973	57
Stud. Residual	-3.190	2.036	-.001	1.010	57
Deleted Residual	-12.560	8.085	-.008	4.038	57
Stud. Deleted Residual	-3.515	2.101	-.009	1.039	57
Mahal. Distance	.017	10.707	2.947	2.103	57
Cook's Distance	.000	.209	.020	.037	57
Centered Leverage Value	.000	.191	.053	.038	57

a. Dependent Variable: ATT_TOT

Appendix K: Output for one-way repeated measures ANOVA analysis.

Descriptives

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
ANTHRO_TOT	High	25	17.64	3.546	.709	16.18	19.10	9	25
	Medium	30	13.83	4.227	.772	12.25	15.41	6	21
	Low	2	13.50	7.778	5.500	-56.38	83.38	8	19
	Total	57	15.49	4.404	.583	14.32	16.66	6	25
AMI_TOT	High	25	14.88	4.246	.849	13.13	16.63	6	22
	Medium	30	12.07	3.850	.703	10.63	13.50	5	21
	Low	2	13.00	2.828	2.000	-12.41	38.41	11	15
	Total	57	13.33	4.180	.554	12.22	14.44	5	22
VTE_TOT	High	25	22.36	4.618	.924	20.45	24.27	11	30
	Medium	30	23.77	4.790	.875	21.98	25.56	10	30
	Low	2	24.00	8.485	6.000	-52.24	100.24	18	30
	Total	57	23.16	4.776	.633	21.89	24.43	10	30

Tests of Homogeneity of Variances

		Levene Statistic	df1	df2	Sig.
ANTHRO_TOT	Based on Mean	1.951	2	54	.152
	Based on Median	1.882	2	54	.162
	Based on Median and with adjusted df	1.882	2	52.999	.162
	Based on trimmed mean	1.931	2	54	.155
AMI_TOT	Based on Mean	.448	2	54	.641
	Based on Median	.433	2	54	.651
	Based on Median and with adjusted df	.433	2	52.907	.651
	Based on trimmed mean	.443	2	54	.644
VTE_TOT	Based on Mean	.712	2	54	.495
	Based on Median	.606	2	54	.549
	Based on Median and with adjusted df	.606	2	52.741	.550
	Based on trimmed mean	.685	2	54	.508

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
ANTHRO_TOT	Between Groups	205.819	2	102.909	6.312	.003
	Within Groups	880.427	54	16.304		
	Total	1086.246	56			
AMI_TOT	Between Groups	108.160	2	54.080	3.355	.042
	Within Groups	870.507	54	16.120		
	Total	978.667	56			
VTE_TOT	Between Groups	28.452	2	14.226	.615	.544
	Within Groups	1249.127	54	23.132		
	Total	1277.579	56			

Multiple Comparisons

Bonferroni

Dependent Variable	(I) ATT_lvl	(J) ATT_lvl	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
ANTHRO_TOT	High	Medium	3.807*	1.093	.003	1.10	6.51
		Low	4.140	2.967	.506	-3.19	11.47
	Medium	High	-3.807*	1.093	.003	-6.51	-1.10
		Low	.333	2.949	1.000	-6.95	7.62
	Low	High	-4.140	2.967	.506	-11.47	3.19
		Medium	-.333	2.949	1.000	-7.62	6.95
AMI_TOT	High	Medium	2.813*	1.087	.037	.13	5.50
		Low	1.880	2.950	1.000	-5.41	9.17
	Medium	High	-2.813*	1.087	.037	-5.50	-.13
		Low	-.933	2.932	1.000	-8.18	6.31
	Low	High	-1.880	2.950	1.000	-9.17	5.41
		Medium	.933	2.932	1.000	-6.31	8.18
VTE_TOT	High	Medium	-1.407	1.302	.855	-4.62	1.81
		Low	-1.640	3.534	1.000	-10.37	7.09
	Medium	High	1.407	1.302	.855	-1.81	4.62
		Low	-.233	3.512	1.000	-8.91	8.45
	Low	High	1.640	3.534	1.000	-7.09	10.37
		Medium	.233	3.512	1.000	-8.45	8.91

*. The mean difference is significant at the 0.05 level.

Appendix L: Output for factorial 3x3x3 ANOVA analysis.

Descriptive Statistics

Dependent Variable: ATT_TOT

ANTHRO_lvl	AMI_lvl	VTE_lvl	Mean	Std. Deviation	N
High	High	High	25.00	.	1
		Medium	26.50	.707	2
		Total	26.00	1.000	3
	Medium	High	24.00	5.657	2
		Medium	31.00	.	1
		Total	26.33	5.686	3
	Total	High	24.33	4.041	3
		Medium	28.00	2.646	3
		Total	26.17	3.656	6
Medium	High	High	23.88	2.475	8
		Medium	27.00	2.828	2
		Total	24.50	2.718	10
	Medium	High	22.73	3.978	22
		Medium	21.78	4.438	9
		Low	15.00	.	1
		Total	22.22	4.210	32
	Low	High	23.50	.707	2
		Total	23.50	.707	2
	Total	High	23.06	3.519	32
		Medium	22.73	4.585	11
		Low	15.00	.	1
		Total	22.80	3.909	44
Low	Medium	High	20.00	5.477	4
		Total	20.00	5.477	4
	Low	High	20.67	2.309	3
		Total	20.67	2.309	3
	Total	High	20.29	4.112	7
		Total	20.29	4.112	7
Total	High	High	24.00	2.345	9
		Medium	26.75	1.708	4
		Total	24.85	2.478	13
	Medium	High	22.43	4.238	28
		Medium	22.70	5.100	10
		Low	15.00	.	1
		Total	22.31	4.514	39
	Low	High	21.80	2.280	5
		Total	21.80	2.280	5
	Total	High	22.69	3.732	42
		Medium	23.86	4.721	14
		Low	15.00	.	1
		Total	22.84	4.092	57

Between-Subjects Factors

		Value Label	N
ANTHRO_lvl	1	High	6
	2	Medium	44
	3	Low	7
AMI_lvl	1	High	13
	2	Medium	39
	3	Low	5
VTE_lvl	1	High	42
	2	Medium	14
	3	Low	1

Levene's Test of Equality of Error Variances[a,b]

		Levene Statistic	df1	df2	Sig.
ATT_TOT	Based on Mean	1.117	8	45	.370
	Based on Median	.707	8	45	.684
	Based on Median and with adjusted df	.707	8	28.412	.683
	Based on trimmed mean	1.054	8	45	.411

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

a. Dependent variable: ATT_TOT

b. Design: Intercept + ANTHRO_lvl + AMI_lvl + VTE_lvl + ANTHRO_lvl * AMI_lvl + ANTHRO_lvl * VTE_lvl + AMI_lvl * VTE_lvl + ANTHRO_lvl * AMI_lvl * VTE_lvl

Tests of Between-Subjects Effects

Dependent Variable: ATT_TOT

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	263.118[a]	11	23.920	1.596	.133
Intercept	7298.739	1	7298.739	486.972	<.001
ANTHRO_lvl	57.990	2	28.995	1.935	.156
AMI_lvl	2.716	2	1.358	.091	.914
VTE_lvl	79.483	2	39.742	2.652	.082
ANTHRO_lvl * AMI_lvl	26.683	2	13.341	.890	.418
ANTHRO_lvl * VTE_lvl	10.577	1	10.577	.706	.405
AMI_lvl * VTE_lvl	.537	1	.537	.036	.851
ANTHRO_lvl * AMI_lvl * VTE_lvl	24.242	1	24.242	1.617	.210
Error	674.461	45	14.988		
Total	30678.000	57			
Corrected Total	937.579	56			

a. R Squared = .281 (Adjusted R Squared = .105)

Appendix M: Output for Pearson's correlation analysis.

Correlations

		ATT_TOT	ANTHRO_TOT	AMI_TOT	VTE_TOT
ATT_TOT	Pearson Correlation	1	.391**	.332*	-.093
	Sig. (2-tailed)		.003	.012	.492
	N	57	57	57	57
ANTHRO_TOT	Pearson Correlation	.391**	1	.656**	-.249
	Sig. (2-tailed)	.003		<.001	.062
	N	57	57	57	57
AMI_TOT	Pearson Correlation	.332*	.656**	1	-.227
	Sig. (2-tailed)	.012	<.001		.089
	N	57	57	57	57
VTE_TOT	Pearson Correlation	-.093	-.249	-.227	1
	Sig. (2-tailed)	.492	.062	.089	
	N	57	57	57	57

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Appendix N: Dissemination of findings