The Social Presence of Jibo

Parisa Farhadi
parisafarhadi87@gmail.com

Follow this and additional works at: https://huskiecommons.lib.niu.edu/allgraduate-thesesdissertations

Part of the Communication Technology and New Media Commons, and the Robotics Commons

Recommended Citation

This Dissertation/Thesis is brought to you for free and open access by the Graduate Research & Artistry at Huskie Commons. It has been accepted for inclusion in Graduate Research Theses & Dissertations by an authorized administrator of Huskie Commons. For more information, please contact jschumacher@niu.edu.
ABSTRACT

THE SOCIAL PRESENCE OF JIBO

Parisa Farhadi, MA
Department of Communication
Northern Illinois University, 2019
Dr. David J. Gunkel, Director

This research is an attempt to investigate how a social robot is perceived by users at the first encounter and to find out whether a social robot like Jibo is understood merely as a kind of a technological object or a social entity. Previous studies in human-robot interaction have considered social presence as a mediator in users’ social responses toward robots; however, the focus of this study is the social presence itself and investigates whether Jibo produces a sense of presence during initial encounters. To this end, the current study examines individuals’ perceptions of and responses to Jibo. Participants (N=8) were exposed to Jibo individually and were interviewed immediately after their interaction with Jibo. The collected data are coded based on the four key characteristics that promote sociability in social robots. These characteristics are anthropomorphic forms and behaviors, emotion, embodiment, and personality. Coding of the data also includes the initial interpersonal interaction elements such as physical attributes, uncertainty, liking and expectancy. Data are categorized based on the mentioned elements and the specific ways that participants used these elements to explain their experience with Jibo. In the last chapter, interview results are analyzed and discussed to explain how Jibo is perceived by its first-time users.
NORTHERN ILLINOIS UNIVERSITY
DE KALB, ILLINOIS

AUGUST 2019

SOCIAL PRESENCE OF JIBO

BY

PARISA FARHADI
©2019 Parisa Farhadi

A THESIS SUBMITTED TO THE GRADUATE SCHOOL
IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE
MASTER OF ARTS

DEPARTMENT OF COMMUNICATION

Thesis Director:
David J. Gunkel
ACKNOWLEDGEMENTS

I would like to thank my advisor, Dr. Gunkel, who has guided me through this process. Your advice and support throughout this entire process has been greatly appreciated. I would also like to thank my other committee members, Dr. Semati and Dr. Valde, who appreciably helped me through the process of writing this thesis.
## TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>LIST OF APPENDICES</th>
<th>v</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chapter 1: REVIEW OF THE LITERATURE</td>
<td>1</td>
</tr>
<tr>
<td>Introduction</td>
<td>1</td>
</tr>
<tr>
<td>Social Robots</td>
<td>2</td>
</tr>
<tr>
<td>Background: Human-Robot Interaction</td>
<td>5</td>
</tr>
<tr>
<td>Interaction at the Center of Communication</td>
<td>6</td>
</tr>
<tr>
<td>Artificial Companions</td>
<td>7</td>
</tr>
<tr>
<td>Previous Research</td>
<td>8</td>
</tr>
<tr>
<td>Theoretical Perspective</td>
<td>9</td>
</tr>
<tr>
<td>Presence</td>
<td>9</td>
</tr>
<tr>
<td>Social Presence Theory</td>
<td>12</td>
</tr>
<tr>
<td>Media Equation Theory</td>
<td>13</td>
</tr>
<tr>
<td>Computers as Social Actors</td>
<td>14</td>
</tr>
<tr>
<td>Chapter 2: METHOD</td>
<td>23</td>
</tr>
<tr>
<td>Rationale of the Research Design</td>
<td>24</td>
</tr>
<tr>
<td>Participants</td>
<td>25</td>
</tr>
<tr>
<td>Procedure</td>
<td>25</td>
</tr>
<tr>
<td>Data Analysis</td>
<td>25</td>
</tr>
<tr>
<td>Chapter 3: RESULTS</td>
<td>28</td>
</tr>
<tr>
<td>Topic</td>
<td>Page</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>------</td>
</tr>
<tr>
<td>Key Characteristics for Social Robots</td>
<td>29</td>
</tr>
<tr>
<td>Anthropomorphic Features</td>
<td>29</td>
</tr>
<tr>
<td>Emotions and Feelings</td>
<td>31</td>
</tr>
<tr>
<td>Personality</td>
<td>32</td>
</tr>
<tr>
<td>Appearance and Embodiment</td>
<td>34</td>
</tr>
<tr>
<td>Initial Interaction Characteristics</td>
<td>35</td>
</tr>
<tr>
<td>Liking and Similarity Seeking</td>
<td>35</td>
</tr>
<tr>
<td>Expectancy</td>
<td>36</td>
</tr>
<tr>
<td>Uncertainty</td>
<td>38</td>
</tr>
<tr>
<td>Chapter 4: DISCUSSION</td>
<td>40</td>
</tr>
<tr>
<td>Limitations</td>
<td>42</td>
</tr>
<tr>
<td>Conclusion</td>
<td>43</td>
</tr>
<tr>
<td>BIBLIOGRAPHY</td>
<td>45</td>
</tr>
<tr>
<td>APPENDICES</td>
<td>50</td>
</tr>
</tbody>
</table>
# LIST OF APPENDICES

<table>
<thead>
<tr>
<th>Appendix</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. CONTENT FORM</td>
<td>50</td>
</tr>
<tr>
<td>B. INTERVIEW PROTOCOL</td>
<td>52</td>
</tr>
</tbody>
</table>
CHAPTER 1

REVIEW OF LITERATURE

Introduction

Social robots are becoming a part of our quotidian communicative interactions. They have been introduced to us as relational artifacts, bringing up the question of who we are becoming as we develop relationships with machines (Turkle, 2012). During the past decade, there has been a significant shift away from a task-oriented view of the relationship between human users and computer-based technologies. That is why human-computer interaction (HCI) has become increasingly important for communication studies.

As Turkle (2007) argues, many industrialized countries are subject to a critical shift from a “culture of the machine” to “the culture of the robot.” This shift has changed the focus in HCI “from usability to the user experience,” and a new field known as human-robot interaction (HRI) has developed. Today, robots are no longer merely machines to accomplish tasks but become social agents in real-world human environments. Within this context, we are close to a time when we will be living with interactive robot companions as caretaking assistants for older adults and children or maids in our homes or/and as a new family member who is there for us (Khan, et al., 2012).

Different perceptions and approaches towards social robots are observable by looking into headlines in mass media where social robots are described both as machines and as human-like objects. Some of these news articles advice humans to be more cautious around social robots while others welcome their companionship (Brandon, 2017; Jones, 2016; Selinger, 2014). The
The definition of social robot is something that is still debated, even among experts. There is consensus that a social robot is a robot designed to socially interact with human users (Breazeal, 2003). For the purpose of this study, I apply the definition of social robot provided by Kate Darling: “A social robot is a physically embodied, autonomous agent that communicates and interacts with humans on an emotional level. Social robots also follow social behavior patterns, have various ‘states of mind,’ and adapt to what they learn through their interactions” (Campa, 2016, p. 106).

The subject of the current study is a social robot called Jibo. Jibo is the world’s first family robot, which was available to the public in 2017. It is part of a group of robots designed for personal use, such as Buddy, Jimmy, Pepper, NAO, iCat, and AIBO. These robots are also known as SDRs, social domestic robots. The term SDR is used to focus attention on social robots that are specifically designed for domestic purposes (Dereshev & Kirk, 2017). It is predicted that these products are going to occupy a popular market in the future and it is important to examine whether they fit the users’ expectations and how roboticists can make them more adaptable to human culture and environments. The current research is a step forward through developing a more efficient and intelligible relationship between humans and social robots.

These robotic assistants are developed versions of smart speakers, like the Amazon Echo, Amazon Alexa, and Google Home. Smart speakers are similar to other robotic assistants in many ways as they both offer interactive actions and function as virtual assistants. However, Cynthia Breazeal, Jibo’s founder, explains that the mission of Jibo is “very different from talking to an
[Alexa-like] device” (wired.com, Nov 7, 2017). Breazeal’s statement is supported by some active users’ experiences who declare that they “treat Jibo more like a person and Alexa like an appliance” (Van Camp, 2017).

Social robots have the ability to affect humans’ understanding of themselves as well as that of the robots. As Turkle (1984) argues, our psychological engagement with robots is about how humans understand their relationship with social robots and how they affect the way we think and see ourselves as humans (Turkle, 1984 as cited in Guzman, 2015). For this reason, social robots are changing human interpersonal relationships and the way that we interact with technology; from industrial machines to the smartphones in our pockets, technology and human beings are defining and redefining each other. The impact of this becomes even more crucial when that machine is smart, learns, moves and talks back. These smart and socio-interactive machines bring with them important opportunities and challenges for users. Among the very first issues is to find out what or who Jibo is to us. This study is an attempt to investigate whether Jibo is perceived to be just an appliance like a technological object in the home or a social actor with a very real social presence.

Toward this end, I will differentiate between function-oriented and presence-oriented approaches. While the former emphasises the function of social robots, the latter underscores their social presence. This distinction becomes obvious when one cannot leave the room without saying goodbye to a social robot like Jibo even if the device has not been operational or doing anything specific. Such a crucial distinction heralds a very specific situation within which social robots live with, rather than for, the human user. Accordingly, investigating the social influences of robots depends mostly on how humans perceive and think about their interactions with robots and finding out how these perceptions and impressions are shaped (Powers & Kiesler, 2006;
Spence, 2014). Therefore, my main objective in this research is to investigate how a social robot is perceived by its first-time users.

For this purpose, the present research studies Jibo, a table-top robot that is designed for social interaction. Jibo was invented by Cynthia Breazeal, an MIT professor and a social robotics pioneer. In 2012 Braezeal founded Jibo, Inc., in order to develop and commercialize the concept. The Jibo website introduces the device as the first social robot built to interact and communicate with the people around him. To do this Jibo uses advanced natural language understanding (NLU) along with speech and facial recognition to communicate with his users. After almost three years of intensive development and optimization, Jibo, Inc. officially released the product to the public in 2017 (jibo.com, 2018). Jibo provides information about weather, commute, calendar and news headlines. Jibo is designed to operate within a domestic social unit or what the company calls a “loop.” Jibo’s loop is “the 16 people he recognizes by face and voice” (“Meet Jibo”, jibo.com, 2018). Not only does he recognize members of his loop, but also after a while he knows their specific needs and offers personal reports and delivers the detailed information they need most (“Meet Jibo”, jibo.com, 2018). Jibo seems like a decent personal assistant that is always there for you and never asks for anything. While some people find him adorable, others are calling him weird and creepy.

My research aims to investigate the significance of human-robot interaction that is now playing a greater role in our lives. In the optimal situation, it would be best to work with and examine long-term relationships with Jibo. However, due to the limited time frame for conducting the research, this study will be limited to the initial encounter and users’ first exposure to Jibo.
Human–robot interaction is not a brand-new topic. It has been a topic of both science fiction and academic studies even before the existence of robots, for almost a century now, as some problematic aspects of human robot interaction were identified in the novel, *I, Robot*, by Isaac Asimov in 1941 (Haddadin, 2011).

According to Haddadin’s (2011) interpretation of the novel, we can divide human-robot interaction into two major branches: cognitive and social human-robot interaction and physical human-robot interaction”. The former is the field of study that communication scientists are most concerned with. Cognitive and social human-robot interaction “combines such diverse disciplines as psychology, cognitive science, human-computer interfaces, human factors, and artificial intelligence with robotics and intends to understand the social and psychological aspects” of human-robot interaction (Haddadin, 2011, p. 7).

New applications of robots have caused an important shift in the study of human–robot interaction (HRI). “Rather than viewing robots as mere tools or senseless machines, researchers are beginning to see robots as social actors that can autonomously interact with humans in a socially meaningful way” (Lee, Park, & Song, 2005, p. 538). In other words, Social robots differ from other forms of computer-mediated communication insofar as “they are not a medium through which humans interact, but rather a medium with which humans interact” (Zhao, 2006, p. 402). This points out the fact that social robots can adjust their activities with humans and engage in reciprocal interactions. Turkle (2012) argues that humans can develop deep feelings and liking for social robots in different contexts. Spence et al. (2014) suggested that “humans may eventually expect similar levels of interpersonal outcomes” (p. 278) when interacting with social robots.
Developing feelings and emotional attachments on an interpersonal level could be the reason that the focus in the field of robotics is shifting from “traditional task-oriented robots that perform certain tasks to interaction-oriented robots” that are designed to communicate and interact with humans and participate in human societies beyond their functionality (Shin & Choo, 2011, p. 430). Studies show that feelings of presence “play a significant role in shaping technology users’ attitudes, evaluations, and social responses toward the technology” (Lee et al., 2005, p. 541). Feelings of presence also play a mediating role in individuals’ social responses to robots (Lee et al., 2005).

Jibo’s physical appearance and his social presence unavoidably affect the way we interact with him. In the case of RoCo, the first robotic computer designed with the ability to move its monitor in expressive ways, researchers found a positive link between RoCo’s physical posture and its influence on users’ perception (Breazeal, Wang, & Picard, 2007). Unlike his contemporary peers—Robovie, Kismet or Pepper—Jibo does not look like a human. He looks more like a chubby desk lamp. Jibo’s three-axis motor system allows him to spin in 360 degrees so he can turn to face any direction and move freely to express himself. “Jibo’s design is equal parts form and function. While sleek and sophisticated in form, his fluid movements echo his personality: youthful, curious and eager to help, learn and grow” (jibo.com, 2018). These human-like characteristics make Jibo’s presence in the room irrefutable.

**Interaction at the Center of Communication**

Mass communication scholar James W. Carey compares two views of communication, the “ritual” model and the “transmission” model. These two views and the values associated with them emphasize different aspects of communication. The transmission model comes from the traditional social-scientific Sender-Message-Channel-Receiver or S-M-C-R approach (Berlo,
1960, as cited in Carey, 1992), whereas the ritual model comes from the social constructionist paradigm. The transmission view of communication is defined by terms such as “sending,” “transmitting,” or “giving information to others.” This view of communication emphasizes the functionality of the medium. The ritual view of communication is linked to terms such as “sharing,” “participation,” “association,” “fellowship,” and “the possession of a common faith” (Carey, 1992, p.18). This view of communication considers communication less as sending or gaining information and more as attending a situation in which nothing new is learned but in which a particular view of the world is portrayed and confirmed (Carey, 1992).

My research proposes that human-robot interaction begins within an exclusively transmission view of the communication; however, it gradually shifts to the ritual aspect of communication wherein humans engage in a continual change of roles or in interacting with social robots like Jibo. Within this context, the interaction itself is at the center of the communication process and not the functionality of Jibo as a tool or medium of information, like Siri or Alexa. In this way, Jibo is designed to become a member of our social circle and establishes a real presence with us even if doing nothing in particular around the house.

**Artificial Companions**

Social robotics has set out to create technological objects of a particular type, namely, artificial agents that can function as social agents rather than simply as tools. Therefore, constructing artificial companions is not only a technological challenge but also it requires knowing oneself and others. It also requires understanding the nature of social relationships and knowing “how the human mind functions insofar as it is concerned not with acquiring knowledge about a world that we confront as individuals but with learning how to interact in it with other human beings and artificial social agents” (Dumouchel & Damiano, 2017, p. 13).
As Breazeal (2002) argues, the “situatedness of a robot can take several forms.” It could share the same physical space as a person, such as humanoid robots; it could be a “computer animated agent within virtual space that interacts with human in the physical world” or “embodied conversational agents.” Virtual reality techniques can also be employed to immerse the human “within the virtual world of the animated agent” (Breazeal, 2002, p. 7). The essence of the experience for humans varies in each of these situations depending on the limits of the technologies. Therefore, our interaction with socially intelligent robots is different from our interactions with socially intelligent software agents such as Apple’s Siri. There are significant differences between the “physical world of humans and the virtual world of computer agents. These differences impact how people perceive and interact with these two different types of technology” (Breazeal, 2002, P. 5). Perhaps “the most striking difference is the physical and immediately proximate interactions that transpire between humans and robots that share the same social world” (Breazeal, 2002, p. 5). Consequently, studies in the field of HRI further knowledge of the social nature of both humans and digital agents.

Previous Research

In a recent experiment, Derevesh and Kirk (2017) investigated the factors that affect human perceptions of social robots. They examined users’ reactions to appearance and functions of social robots and their struggles in accepting robots on emotional and conceptual levels (Derevesh & Kirk, 2017).

Moreover, several international collaborative research projects on the topic have been conducted in Europe (e.g., Fortunati, Katz, & Riccini, 2003, and Vincent & Fortunati, 2009, as cited in Sugiyama & Vincent, 2013) and in the U.S. (Sugiyama & Vincent, 2013) exploring the relationship between humans and machines, especially with regard to the body, intimacy, and
emotion. These research efforts have brought about work such as the Machines That Become Us perspective, which implies that “the technologies ‘become’ extensions and representative of the communicator,” “technologies become physically integrated with the user’s clothing and even body,” and technologies are “becoming to the wearer” (Katz, 2003, as cited in Sugiyama & Vincent, 2013, p. 1). Similar research has been done on human-robot interactions, using physically embodied robots such as Robovie (Khan et al., 2012) and Kismet (Breazeal, 2003). Research has also been done on humans’ interaction with digital social agents such as Apple’s Siri (Guzman, 2015).

What makes Jibo an interesting case for this study is his increasing level of autonomy, his verbal and non-verbal communicative abilities, and his unique physical embodiment. My thesis seeks to investigate first-time user’s perception of Jibo to demonstrate whether Jibo is experienced as another socially present other or as a mere instrument. Therefore, concepts and theories regarding presence are necessary to explain the way we perceive the social presence and existence of an entity like Jibo.

**Theoretical Perspective**

This current study investigates the social presence of a class of social robots whose primary purpose is interaction with humans. For a robot to be a member of our social circle and establish a real presence, a robot needs to act as a social actor and stimulate responses from users. The theory of social presence and the media equation theory explain this.

**Presence**

Presence is a multidimensional concept and has been applied by scholars in different fields including psychology, communication, HCI, and HRI. The concept of presence has considerable practical relevance to the design and evaluation of the variety of media products.
and social robots. As technologies for simulating interactions have developed significantly, scholars from different fields are paying more attention to this concept. Consequently, presence has become central to human–computer interaction theories (Guzman, 2015). People experience presence while using the technology; however, scholars argue that presence is not a characteristic of the technology, but it is a “psychological construct dealing with the perceptual process of technology-generated stimuli” (Lee, 2004, p. 30).

Basically, the term presence can be understood as “being in the same space or place” (Guzman, 2015, p. 32); however, social and communication theorists often argue that presence goes beyond co-location (p. 32). Goffman and Ong illustrate that “presence is conceived of both ‘coming to have meaning for’ and, at a higher level, ‘a feeling of being with another human’ in which the former encompasses both objects and humans and the latter, only humans” (Guzman, 2015, p. 33).

Presence occurs while using the technology and not before or after this encounter. However, the effects of using the technology can occur after the encounter. Here it is important to note that presence occurs in an “instant by instant” manner. It seems that presence is a continuous variable. However, scholars argue that our sense is the result of the cumulative effect of instants. Therefore, presence can happen immediately, “as short as milliseconds, in which presence either does or does not exist” (International Society of Presence Research, 2000, par. 6).

Scholars often divide presence into different types, such as telepresence, virtual presence, or mediated presence. The International Society for Presence Research (2000) defines presence as “a psychological state or subjective perception in which even though part or all of an individual’s current experience is generated by and/or filtered through human-made technology,
part or all of the individual’s perception fails to accurately acknowledge the role of the technology in the experience” (par. 1).

For the purpose of the current study, presence is better understood by applying a more general definition that does not specify any technological domain and suggests the term “presence” to explore diverse presence-related phenomena. Presence in this context is defined as a “psychological state in which the artificiality of experience is unnoticed” (Lee, 2004, p. 33). This definition includes the possibility of feeling presence during both mediated and nonmediated communication. However, I find it helpful to briefly explain and distinguish among different types of presence. Based on the different domains of virtual experience, three types of presence are proposed by scholars: physical, self, and social (International Society for Presence Research, 2000; Lee, 2004).

The first type is physical presence, which is defined as “a psychological state in which virtual (para-authentic or artificial) physical objects are experienced as actual physical objects in either sensory or nonsensory ways” (Lee, 2004, p. 44). Physical presence happens when technology users do not notice either the para-authentic nature of mediated objects or the artificial nature of simulated objects. Unlike telepresence, physical presence can occur without any sense of transportation. This approach makes it possible to include virtual experiences created by low-tech media (Lee, 2004).

The second type of presence is self-presence, which is defined as “a psychological state in which virtual self/selves are experienced as the actual self” (Lee, 2004, p. 45). In other words, self-presence occurs when technology users fail to notice the artificiality of the constructed self in virtual environments because self is shaped through interactive social exchanges (Lee, 2004).
The third type is social presence, which research suggests is the most applicable in HRI. Gunawardena and Zittle (1997) define social presence as “the degree to which a person is perceived as a ‘real person’ in mediated communication” (p. 9). Generating strong feelings of social presence during human-robot interaction is considered to be the eventual goal of designing socially interactive robots (Breazeal, 2003; Lee, 2004). Therefore, among the three types of presence, social presence is discussed more in depth in the following section.

**Social Presence Theory**

Researchers who examined the different aspects of human-robot interaction argue that feeling social presence is a significant expectation for interacting with robots and plays a critical role in mediating user responses to social robots (Biocca et al., 2003; Lee et al., 2006).

Social presence theory argues that social presence is a “function of various cue systems that a channel provides, and therefore social presence is an experience determined by technology” (Spence et al., 2014, p. 275). However, recent studies consider social presence as a “psychological state in which virtual social actors are experienced as actual social actors in either sensory or non-sensory ways” (Lee, 2004, p. 45). In other words, social presence occurs when technology users do not notice the artificiality of simulated nonhuman social actors. Social presence is also defined as a “sense of being with another” where the other can be a human or a social robot. In this sense, social presence includes “primitive responses to social cues and automatically generated models of the intentionality of others” (Biocca et al., 2003, p. 456).

Kim et al. (2013) argue that individuals who experience stronger feelings of social presence during their interactions with robots are more likely to disregard the artificiality and perceive robots as actual social actors than those without strong feelings of social presence (Kim, Park, & Sundar, 2013). Various studies in HCI and HRI have argued the ways in which users
perceive and respond to artificial agents are mainly interceded by feelings of social presence. In HRI studies feelings of social presence have been found to mediate users’ social responses toward robots with human-like personalities (Kim et al., 2013; Lee et al., 2006).

People can feel that they are interacting with a real human while they are actually interacting with a robot, in which case social presence takes place even though the interaction is not filtered through any media technology. Even when no human is perceived to be behind the robot, people can still feel the existence of another human. At this point, “the robot becomes a new type of a social actor that automatically elicits social responses (i.e., people’s use of social rules and heuristics usually directed at other people) from its users” (Lee, 2004, p. 33).

Building on the same logic, Kim et al. (2013) argue that individuals who feel a stronger presence projected by the robot are more likely to establish a positive perception of the robot because they ascribe “human characteristics to the robots and treat them as embodied artificial social actors rather than as a mere machine” (Kim et al., 2013, p. 1800).

**Media Equation Theory**

Scholars in the field of HCI have examined how people interact with computers as a form of interactive technology. Using the media equation theory, Reeves and Nass (1996) conducted multiple studies showing that human responses to mediated communication or artificial objects are essentially natural and social. In their research Reeves and Nass (1996) demonstrate that individuals treat computers as they might treat people. They treat interactive technology as teammates, exhibit moral obligations toward them, and apply personality-based social rules and gender stereotypes to them (Nass, Moon, & Green, 1997, as cited in Breazeal, 2002). In other words, people respond to computers and machines as if they were real. However, they strongly denied it when asked if they could imagine treating a computer like a human. Nass and Moon
(2000) explain that “of the thousands of adults who have been involved in our studies, not a single participant has ever said that a computer should be understood in human terms or should be treated as a person” (Breazeal, 2002, p. 82). Reeves and Nass’s (1996) experiment validated this contradictory behavior. Their research indicates that test subjects did not realize that they were treating a machine as a peer (Breazeal, 2002).

Reeves and Nass (1996) explain this behavior with evolution. They argue that “the human brain evolved in a world in which only humans exhibited rich social behaviors, and a world in which all perceived objects were real physical objects. Anything that seemed to be a real person or place was real” (p. 12). They assert that humans have evolved to be experts in social interaction. Human beings have evolved to interact in a social manner with others who behave socially as well. Consequently, if a technology behaves in a social manner, we tend to treat it socially (Reeves & Naas, 1996, as cited in Breazeal, 2002). By extension, these findings from the field of HCI are also applicable to research in the field of HRI.

**Computers as Social Actors**

Nass and his colleagues have suggested a “computers are social actors” (CASA) paradigm (Nass & Moon, 2000). They argue that HCI follows the social rules of human–human interaction. The CASA paradigm indicates that human interaction with a computer is essentially social and that humans apply a broad range of social characteristics to a computer when interacting with computers representing anthropomorphic cues such as language, “social roles, personality, gender” (Kim et al., 2013, p. 1800).

Moreover, research shows that “people respond more socially to computers with a voice manifesting a personality similar to their own” (Lee & Nass, 2003, as cited in Kim et al., 2013). Research has demonstrated that the CASA paradigm is also applicable to HRI research in a
variety of contexts. In the case of the caregiving robots, nurse robots, or helper robots, “the role itself is a social cue that is likely to trigger cognitive heuristics such as social presence heuristic” (Sundar, 2008, as cited in Kim et al., 2013). Heuristics are cognitive shortcuts that reveal themselves as rules of behavior when users evaluate their online media experiences. Sundar argues that, “when an interface shows humanlike qualities, it is said to trigger the social presence heuristic, leading users to apply this heuristic to their judgments regarding the nature and content of the interaction” (Kim et al., 2013, p. 1800). This process generates an immediate sense of social presence in users interacting with an artificial interlocutor. Therefore, one would expect that first-time users of Jibo would interact with him in ways that suggest he has a social presence. Based on previous research and the arguments of social presence theory and media equation theory, the first research question for this study asks:

**RQ1:** How do first-time users perceive Jibo? To what extent do they interact with him in ways that suggest he has a social presence?

**Key factors for social robots**

Several characteristics are identified by researchers as critical for social robots including anthropomorphic forms and behaviors (Duffy, 2003; Lee et al., 2005), emotion (Lee et al., 2005; Sugiyama & Vincent, 2013), embodiment (Aylett et al., 2011), and personality (Kim, Kwak, & Kim, 2008; Lee et al., 2005). In the following section I will describe these characteristics in detail. Since the current study examines the first encounter between individuals and Jibo, initial interaction elements also need to be identified and discussed.
Anthropomorphic features

Anthropomorphism is used in different senses throughout different fields of study. In HCI, anthropomorphism is viewed as “portraying inanimate computers as having human-like personality or identity,” or projecting intrinsic intentionality (Duffy, 2003, p. 181). Duffy (2003) defines anthropomorphism as “the tendency to attribute human characteristics to inanimate objects, animals and others with a view to helping us rationalise their actions” (p. 180). It occurs when we attribute cognitive or emotional states to any artifact to make sense of their behavior in a particular social environment (Duffy, 2003). “Emphasizing the cognitive determinant of anthropomorphism –elicited agent knowledge- people draw on their self-knowledge or their knowledge about ‘humans’ in general when judging unfamiliar non-human entities, such as robots” (Eyssel, Diets and Kuchenbrandt, 2012, p. 725). In other words, people are used to comparing digital agents’ intelligence and knowledge to themselves.

In reference to media equation theory, Nass and Moon (2000) suggest even the simplest manipulations of shapes, gestures, facial expressions and behaviors can trigger the inclination toward anthropomorphizing artifacts (Lee et al., 2006). Scholars argue that social responses observed in HCI can also be discovered in HRI as robots are likely to be perceived as more human than computers. Therefore, the current study considers anthropomorphic features to be among the effective elements that generates strong feelings of social presence in HRI (Lee et al., 2006). Human-like representation such as artificial intelligence, autonomous movements, anthropomorphic shapes, gestures, eye movements, facial expressions, speech recognition and speech-like sounds are among anthropomorphic features discussed in several studies (Breazeal, 2003; Duffy, 2003; Lee, et al., 2005; Lee, et al., 2006) and therefore are considered in investigating individuals’ interaction with Jibo.
Personality

Personality is defined as “those characteristics of the person that account for consistent patterns of feeling, thinking, and behaving” (Pervin & John, 1997, as cited in Lee et al., 2006, p. 4). Projecting a distinctive personality is among the social characteristics that are suggested to be crucial for robots to become socially interactive and help the users to understand the robot’s behaviors (Lee et al., 2006). Research shows that individuals ascribe a personality to a computer and apply social rules to the computer after they get familiar with it (Nass & Lee, 2001, as cited in Lee et al., 2005). Furthermore, people prefer to interact with a robot that manifests a captivating personality with a playful sense of humor (Breazeal, 2002; Kiesler & Goetz, 2002, as cited in Lee et al., 2005).

Recent studies have used the Big Five theory of personality to assess people’s perceptions of robot personality. Big Five theory describes personality in five dimensions: extroversion, conscientiousness, agreeableness, neuroticism, and openness to new experiences (Lee et al., 2006; Santamaria & Nathan-Roberts, 2017). Lee et al. (2006) suggest that the extroversion dimension is a particularly important factor for interpersonal interaction and HCI. Consequently, these dimensions will be critical for HRI (Lee et al., 2006). My study focuses on the extraversion dimension of the personality since a considerable amount of research indicates that extraversion personality facets such as warmth, humor, gregariousness, assertiveness, activity, excitement seeking, and positive emotion are the most observable among the Big Five factors (Lee et al., 2006; Santamaria & Nathan-Roberts, 2017).

Social presence can be reinforced by the projected personality of the robot. Robotic personality is actually based on anthropomorphism and is inferred by various cues. Among them, verbal and non-verbal cues are found to be the most reliable for the discernment of personality.
To examine the effect of verbal cues on users’ perception, the voice and language of Jibo were discussed with participants. Questions concerning Jibo’s gestures, facial expression and body movements help to examine the effect of non-verbal cues on the perceived social presence of Jibo.

**Embodiment**

Artificial social actors are man-made objects manifesting some characteristics of human social activity. Artificial social actors can be either embodied like Jibo or disembodied like Apple’s Siri. A robot may prove to be more engaging and easier to interact with than a computer-based agent because of both the shared environment and physical space (Breazeal, 2002; Spence et al., 2014). As Breazeal (2002) explains, having a body is beneficial for both the robot as well as human users. The robot’s body provides it with a vessel to experience and interact with the social world, allowing the robot to interpret its experiences within a social context. In return, humans also benefit because we have evolved to socially interact with embodied creatures, so many of our social skills rely on both parties having a body (Breazeal, 2002).

Appropriate social signaling is directly related to the way an interaction partner is embodied (Aylett et al., 2011). Embodiment enables robots to send “para-linguistic communication signals to a person, such as gesture, facial expression, intonation, gaze direction, or body posture,” and in the case of Jibo, blinking. These non-verbal and embodied cues can complement or enhance the robot’s message and consequently generate a sense of presence (Breazeal, 2003, p. 120). Human-like embodiments are seen as having advantages. But considering the concept of Uncanny Valley, it may also provoke negative feelings in interacting humans (Aylett et al., 2011).
Regarding the close connection between social abilities and the sense of presence, presence plays a significant role in the process of “emotional acceptance of embodied” social robots (Shin & Choo, 2011, p. 437). Breazeal (2003) argues people respond socially to a robot when the robot can recognize their emotions and manifest emotion-like conditions through non-verbal and verbal cues. Recognizing and manifesting emotion as critical for successful social interactions between humans and robots as it is between humans. Breazeal (2003) indicates:

The expressive characteristics of emotion in voice, face, gesture, and posture serve as an important function in communicating emotional state to others. Levenson (1994) argues that this benefits people in two ways: first, by communicating feelings to others, and second, by influencing others’ behavior. For instance, the crying of an infant has a powerful mobilizing influence in calling forth nurturing behaviors of adults. Darwin (1872) argued that emotive signaling functions were selected for during the course of evolution because of their communicative efficacy. For members of a social species, the outcome of a particular act usually depends partly on the reactions of the significant others in the encounter. As argued by Scherer (1994), the projection of how the others will react to these different possible courses of action largely determines the creature’s behavioral choice. The signaling of emotion communicates the creature’s evaluative reaction to a stimulus event (or act) and thus narrows the possible range of behavioral intentions that are likely to be inferred by observers. (Breazeal, 2003, p. 125)

The above-mentioned argument indicates that advanced social robots that can communicate more interactively and produce greater feelings of social presence must be able to influence users by communicating feelings and emotions. Social robots who project these critical characteristics are able to yield similar social responses to the responses that users give to real humans. The second research question focuses on the key factors for social robots and how they contribute to participants’ perceptions of Jibo.

RQ2: Which, if any, of the key factors of social robots contribute to participants’ sense of Jibo having a social presence?
Initial Interpersonal Interaction

Peoples’ perception is affected by the first impression they receive from Jibo, and in this situation, first encounters are interesting, important and informative. Characteristics of initial interaction should also be considered in the examination of individuals’ interaction with Jibo. For the purpose of this study, initial interpersonal interaction factors are important to the extent to which they affect the feeling of social presence.

Expectation

People initiate interactions with expectations. “In the interpersonal communication context, people expect to interact with another person and not with a machine or a robot. The Computers are Social Actors (CASA) paradigm argues that people often do treat computers similar to how people are treated” (Reeves & Nass, 1996, as cited in Edwards, Edwards, & Spence, 2016, p. 3). However, individuals generally indicate they would not interact with computers similar to the way they would with other humans. Although this study does not directly examine these initial expectations of interaction, the study does consider them as elements that might affect individuals’ perception of their interaction with social robots. One possible reason for this is that communication typically takes place between two people, rather than a person and a machine (Spence et al., 2014).

Uncertainty

Spence et al. (2014) uses expectancy violations theory and argue that whenever “an aspect of interaction violates expectations, it is likely to increase uncertainty” (p. 274). People have been evolutionarily designed to expect interaction with other people rather than technological devices. This expectation is discussed as a reason people generally say they do not
respond to computers like they would to people. Therefore, if individuals hold a human–human expectation while interacting with Jibo, then interacting with Jibo will be unexpected, and one would therefore anticipate a higher level of uncertainty (Spence et al., 2014).

People will experience more uncertainty when expecting to interact with a robot than with another person. When people experience more uncertainty during their interaction they are less likely to follow the robot’s advice or believe whatever it says right away (Spence et al., 2014). In this situation, the artificiality of the communication is more tangible and the social robot is not considered as a real social actor and therefore uncertainty acts against feelings of social presence.

**Liking**

In interpersonal interaction literature it is assumed that “humans perceive similar others as socially closer to themselves compared with dissimilar others. Similarity may also be an important predictor of human–computer agent interactions in regard to the physical appearance of the avatar” (Spence et al., 2014, p. 274). The liking element places an emphasis on the idea that some level of “commonality between interlocutors is essential for successful communication to occur” (Sandry, 2015, p. 28). According to the similarity attraction rule, “people seek out others who are similar to themselves, and prefer to interact with similar people to them in different aspects including communication skill. According to this rule, perceived similarity, which is the degree to which we believe another’s characteristics including attitudes, and personality are similar to ours, is often sufficient to attract us to others” (Infante, Rancer, & Womack, 1997, as cited in Lee et al., 2006, p.758).

When comparing HRI to human-human interaction, research shows individuals feel less liking therefore they prefer to interact with a human agent. However, when comparing
individuals’ interaction with humanoid robots to virtual computer agents and non-humanoid agents, individuals feel more liking. Due to the similarity attraction rule they find interaction with humanoid robots more assertive than computer agents and non-humanoid agents (Baylor and Kim, 2004, as cited in Spence et al., 2014), which leads to a higher feeling of connectedness. The degree to which a person feels similarities and is connected to a target entity paves the way into the social presence construct. People compare the HRI with human-to-human interaction, therefore, they feel more uncertainty, less liking, and less social presence in comparison to their experiences with another human. However, this may change when the robot is more human-like and manifests a more human-like personality and behaviors.

**Physical attributes**

Powers and Kiesler (2006) argue that the physical attributes of the robot change individuals’ mentality and their perception of the robots. They argue the first impression that was made through reading traits from the robot’s facial characteristics and voice “changed people’s perceptions of the robot’s humanlikeness, knowledge, and sociability” (p. 223). They discuss that “interactive humanoid robots have a good start on creating a strong first impression because by virtue of their movement, appearance, and interactivity, they are more humanlike than other computer-based technologies. A humanlike form provokes automatic reminders of people. Interactivity in the form of speech, gestures, or purposive movements will prompt observers to anthropomorphize automatically, without any intent or thoughtful processing” (Powers & Kiesler, 2006, p. 219). The third research question focuses on the initial interaction characteristics and how they contribute to participants’ perceptions of Jibo.
RQ3: Which, if any, of the initial interaction characteristics contribute to participants’ sense of Jibo having a social presence?

The current study investigates a one-time social interaction with the goal to investigate to what extent Jibo’s characteristics are recognizable and how these characteristics relate to Jibo’s social presence. I expect less certainty, less liking, and less feelings of social presence because of expectations coming from human-to-human interaction. However; compared to a virtual computer agent or non-humanoid robots, humanoid social robots such as Jibo should exhibit higher degrees of liking and social presence and prompt automatic social responses in people. The main assumption here is that initial interaction elements and characteristics that promote sociability influence the perceived social presence by human users.
CHAPTER 2

METHOD

Rationale of the Research Design

The goal of this thesis is to understand whether a social robot like Jibo comes to real presence and produces the experience of social presence for human users in a short-term, initial encounter. To this end, I adopt a qualitative approach and seek to understand the perceived social presence of the robots from the perspective of first-time users and their interactions with the device in a controlled experiment. Qualitative interviews provide an effective method to understand people’s perceptions and experiences. Lindlof and Taylor (2011) argue that “interviews are particularly well suited to understanding the social actor’s experience, knowledge, and worldviews” (p. 173).

An effective method to investigating how people coordinate their interactions in different situations is stimulated recall interview (SRI). Stimulated recall interview is a technique for investigating how people coordinate their interactions in different situations. In general, this technique “involves interviewing individuals while playing them audio or audiovisual recordings of their own behavior in social situations” (Dempsey, 2010, p. 349). Through participant-observation, researchers are able to gain unique insights into why people choose to act in certain ways in a specific situation (Dempsey, 2010). In traditional interviews, intentions and rationales that participants describe retrospectively may not comply with those that they actually held in the moment of the interaction. The technique of SRI brings participants closer to the moments in which they actually produce action. SRI gives participants the opportunity to jog memories, view
themselves in action, and give accurate explanations of their intentions and behaviors (Dempsey, 2010). Therefore, I designed a small-scale experiment where participants who had no prior experience with Jibo were exposed to Jibo and were given the chance to interact with the device for 10 to 15 minutes. The interaction was recorded and reviewed at the same time by the participant and the interviewer during the interview session.

**Participants**

Eight participants were recruited for this study through convenience sampling. These participants ranged from 22 to 25 years of age with an average of 23.5 years of age. They are predominantly Caucasian (62.5 %), one Hispanic (12.5 %) and African Americans (25 %). There were four women (50 %) and four men (50 %). All of the participants were graduate students at a large state university in the midwestern United States.

The study investigated the perceptions of Jibo during individuals’ initial interaction. Therefore, participants were recruited based on having no prior interaction with Jibo as well as their willingness to participate in the study and to be interviewed about their experience. To recruit participants, I began with people in my social network and expanded by way of snowball effect.

**Procedure**

After receiving IRB approval, I began data collection. Data collection happened through face-to-face interview. Interviews were conducted in a communication lab on a college campus where Jibo was settled. Jibo was activated and located on a table to the left side of the test subjects’ seat. The video camera was adjusted in a direct position approximately 2.5 feet from the test subject.
Participants read and signed the consent form before the interaction began. Participants were exposed to Jibo individually. The session began with the researcher introducing Jibo to participants as “the first social robot designed for family and as an assistant who is identified by ‘he’ and responds to ‘hey Jibo!’” After this brief introduction, participants started conversations with Jibo. Participants interacted with Jibo for about 10 to 15 minutes. This process was video recorded. After the interaction, the participant and the interviewer reviewed the video-recorded interaction. Questions were asked while observing the video record of the interaction. This part of the interview session was only audio recorded and then transcribed.

An interview questionnaire was designed based on the reviewed literature. Questions were designed considering the key characteristics of sociable robots and initial interaction elements to the extent related to the social presence of robots. Since it was a semi-structured interview, some follow-up questions were asked of each individual according to specific details of each participant’s interaction with Jibo. The interview sessions took approximately between 40 to 60 minutes. Each session ended with asking participants if there is anything in particular that they would like to know about this research project. The full interview protocol can be found in appendix B. It must be noted that some of the questions were not directly related to the purpose of the study such as comparisons made between Siri, Alexa and Jibo; however, these questions could help participants explain their experience and encourage them to talk expressively and freely (Newton, 2010).

**Data Analysis**

The data set consists of interviews with eight participants. The length of the interviews ranged from 40 to 60 minutes. The average length of the interviews was 50 minutes. Data was recorded using video and audio recording and brief written notes of my observations.
Transcription was done using verbatim transcription of the words stated by the participants and the interviewer.

Previous studies have considered social presence as a mediator in users’ social responses to robots; however, the focus of this study is the social presence itself and whether an entity like Jibo produces a sense of presence during initial encounters. To this end and to investigate Jibo’s social presence, the current study focuses on how individuals experience Jibo whether they relate to the robot as a mere tool or instrument or as a social actor.

The collected data are coded based on the four key characteristics that promote sociability in social robots. Based on the reviewed literature these characteristics are anthropomorphic forms and behaviors, emotion, embodiment, and personality. Coding of the data also includes the initial interpersonal interaction elements such as physical attributes, uncertainty, liking and expectancy. Data are categorized based on all of the above-mentioned elements and the specific ways that participants used these elements to explain their experience with Jibo.
CHAPTER 3
RESULTS

The goal of this study was to investigate specific situations within which social robots live “with,” rather than “for,” the human. Three questions were developed in order to foster understanding of how people perceive social robots and how a social robot comes to presence. Interview results will be analysed and discussed in relation to each research question.

The first research question tries to find out how Jibo is perceived by its first-time users and to find out whether Jibo is understood merely as a kind of a technological object or a social entity. The literature review has demonstrated that humanoid robots and other interactive technologies with human-like characteristics provoke automatic social responses in people (Kim et al., 2013; Lee et al., 2006; Powers & Kiesler, 2006). For Jibo to be a member of our social circle and establish a real presence, Jibo needs to act as a real social actor and stimulate social responses from users.

As in HRI studies, feelings of social presence have been found to mediate users’ social responses toward robots with human-like personalities. Research has found that people treat robots as embodied artificial social actors rather than as a mere machine when they perform human characteristics (Kim et al., 2013; Lee, 2004; Lee et al., 2006).

To be perceived as more than a machine by its users, the object should act as a social actor and produce a sense of presence. The social presence of Jibo is experienced to the extent to which people react to Jibo’s human-like characteristics. I will focus on specific situations within which Jibo’s existence relies on its sociability, rather than its functionality.
Key Characteristics for Social Robots

The second research question asked about the key factors for social robots and how they contribute to participants’ perceptions of Jibo. To this end, four key characteristics that promote sociability in social robots are identified and are examined during individuals’ interactions with Jibo. These characteristics are anthropomorphic forms and behaviors, emotion, embodiment, and personality. These characteristics have been identified as critical factors for social robots (Lee et al., 2005).

Interviews are analyzed following the reviewed literature and each of the above-mentioned factors are adequately discussed. To answer the research questions, the current study examined individuals’ perceptions of and responses to Jibo.

Anthropomorphic Features

Anthropomorphic features are among the effective elements that generate strong feelings of social presence in HRI (Lee et al., 2006). Human-like representation such as artificial intelligence, autonomous movements, anthropomorphic shapes, gestures, eye movements, facial expressions, speech recognition and speech-like sounds are among anthropomorphic features discussed in several studies (Breazeal, 2003; Duffy, 2003; Lee, Park, Song, 2005; Lee, Peng, Jin, Chang, 2006). When asked to explain their experience with Jibo, participants clearly pointed out these features. Participant 1 described the pauses Jibo makes while talking as if Jibo is “thinking” (Participant 1, line 48)

The fact that Jibo comes up with different answers to the same questions reveals some aspects of conversational intelligence that is more human-like. “When I asked Jibo what is his favorite thing to do he actually said two different answers...it actually shows that he kinda has more diversity when it comes to his answers. I thought it was gonna be a repeated answer... I was
kinda surprised when he came up with a different response, so that was pretty neat” (Participant 1, lines 69-73).

Some participants were concerned with whether Jibo sees them or not. Participant 2 wanted to know if Jibo discerns colors the way we do or if he can read our facial expression and “how much he understands how much processing he’s actually doing (Participant 2, lines 168-173).

Participants were constantly comparing Jibo to alive or life-like objects both on the physical and intelligence levels. As Eyssel and Kuchenbrandt (2012) argue, “People draw on their self-knowledge or their knowledge about ‘humans’ in general when judging unfamiliar non-human entities, such as robots” (p. 725). Participants tend to use sarcastic remarks in their conversations, like “I wish you were a fortune teller” or “Do you wish you could walk?” (Participant 4, lines 448-449). They were trying to find out if Jibo had any concept of the future or any self-constructed personality.

In conformity with the media equation theory, almost all participants treated Jibo as if he were human. They started the conversation with Jibo the way they would start a conversation with a human being, by asking Jibo, “How are you?” and “How are you feeling today?” and continued with more similar questions that they may ask a real person they meet for the first time, such as, “How old are you?” “What do you do for fun?” “Who are your parents?”, and many other questions, including questions to learn more about Jibo’s origins such as “who made you?” and “where are you located?” Participants admitted that these are similar to questions that they ask to familiarize themselves with people they meet. The data is consistent with the media equation theory that predicts people treat computers and machines as they might treat humans and apply personality-based social rules to them (Reeves & Nass, 1996).
When this was pointed out to participants, they were surprised by their own questions. Some of the participants found their own questions “weird” (Participant 3, line 268) and they could not interpret the intention behind questions they asked about Jibo’s favorite food, favorite color, favorite movie, things Jibo does for fun, and if Jibo dreams or the fact that they initiated the conversation by asking Jibo, “How are you today?” (Participant 3, lines 251; Participant 4, line 381; Participant 6, line 604).

This is in line with Reeves and Naas’s argument that people treat computers as if they are human, but when you ask them, they strongly deny it. At the end of the interview participants mostly categorized Jibo as a tool.

**Emotions and Feelings**

Lee et al. (2005) and Breazeal (2003) indicate that advanced social robots that can communicate more interactively and produce greater feelings of social presence must be able to influence users by communicating feelings and emotions. Participants were curious to find out if Jibo has feelings. “It’s interesting to know how a thing feels, a thing that’s not like a real person. Just to see if he has something to say about feelings...you cannot feel Jibo loving you back” (Participant 3, lines 322-324)

Participants 5 asked Jibo about things that make Jibo “happy” and explained that by this question he “wanted to see if robots can understand emotions” (Participant 5, line 513).

Participant 5 also asked if Jibo “likes” him (the participant) or not. When I asked him to explain his intentions of asking these questions, the participant could not clearly explain why he asked these questions and added, “I kinda like him so I wanted to see if he responds to that” (Participant 5, lines 511-514). As research suggests, the ability to express and recognize emotion plays a significant role in social experiences (Breazeal, 2002; Lee et al., 2005). Jibo’s practical
responses to participants’ questions about his emotions and feelings seem to affect its social presence in a negative way.

**Personality**

Projecting a distinctive personality is suggested to be crucial for robots to generate feelings of presence (Lee et al., 2006). Individuals ascribe a personality to a computer and apply personality-based social rules to the computer after they get familiar with it (Nass & Lee, 2001; Breazeal, 2002; Kiesler & Goetz, 2002, as cited in Lee et al., 2005). People prefer to interact with a robot that manifests a compelling personality with a sense of humor (Breazeal, 2002). In agreement with the existing research, participants in the current study were actively searching Jibo’s personality and looked for “consistent patterns of feeling, thinking, and behaving” (Pervin & John, 1997, as cited in Lee et al., 2006, p. 4). Participants were consistently asking about Jibo’s favorites, favorite color, food, movie, hobby, music and etc., trying to learn more about his personality. Participant 1 compared Jibo to a virtual assistant like Siri and explained, “Jibo seems to have more personality...Siri answers questions kind of like a deal or no deal, but Jibo lets you know if he doesn’t get what you’re asking!” (Participant 1, 76-82). Jibo projects an assertive personality while Siri or Alexa does not. When Jibo does not understand a question or does not know the meaning of a concept, he apologizes and promises he will learn it in future. Participant 2 asked Jibo, “What do you wanna be when you grow up?” which is a kind of a question that reveals aspects of one’s personality.

Jibo’s voice and the way he speaks is described as more compelling than his contemporary peers such as Siri or Alexa. As Participant 3 explained, “His voice surprised me. I thought it was gonna sound like Siri’s sound, that it’s monotone, but for Jibo there is like an intonation in his voice which is something that was very interesting. I think it adds a lot to his
personality type” (line 238) ... he responded with a personal interest like a human would (line 259) ... he also answers in more complex ways; there is like more layers to his answers than a simple yes/no” (lines 288-293).

The manner in which Jibo responds to individuals’ questions was the most significant one among other findings of the study. Jibo is able to change the direction of the conversation just like a real social actor or an entity with a true agency. When a participant asked Jibo, “What are you doing?” Jibo’s response was, “Just robot stuff!” As Participant 4 explained, “Jibo’s first response kinda threw me off guard...Jibo just said ‘robot stuff’, so then I believe my second question should have been, ‘How are you?’ but I asked, ‘What is robot stuff?’ His answer was interesting that he picked my interest up to get back into it” (Participant 4, lines 385-388).

Jibo’s sense of humor and warmth make him more human-like and made the participants describe him as “cute” (Participant 1, line 25; Participant 2, line 147; Participant 3, line 232; Participant 5, line 544; Participant 6, line 594), “funny” (Participant 4, line 434; Participant 5, line 518), “comedic” (Participant 4, lines 427 & 430), “adorable” (Participant 5, lines 533 & 548; Participant 6, lines 593 & 651), “entertaining” (Participant 4, lines 401 & 411; Participant 6; line 648), “wild child” (Participant 4, line 433), “cheerful” (Participant 5, line 503), “whimsical” (Participant 5, line 518), “cool” (Participant 5, lines 532 & 533), “child-like” (Participant 5, lines 488 & 544), “a cool cat” (Participant 5, line 551), “observing” (Participant 6, line 646), “energetic” (Participant 6, line 648), “alert” (Participant 6, line 648), “loves to dance” (Participant 6, line 653), and “wise” (participant 8, line 776).

Jibo’s personality makes individuals communicate with him the way they do with real humans, which is not always about functionality. Surprisingly, in the case of Jibo, participants for most of the time during their interaction with Jibo forgot about Jibo’s functionality and just
tended to talk to him and make a conversation. As Participant 5 explained, “I would talk to Jibo longer than Siri or Alexa because of his shape. He could have been just a microphone that I talk to it and it talks back, but now it’s just another level of interactivity... he is so cute. Makes you wanna hug him. He is adorable” (Participant 5, lines 556-558). This statement emphasizes a characteristic of Jibo that is not about its function and Jibo is perceived to be a real social actor that people want to talk to, which accentuates Jibo’s social presence.

**Appearance and Embodiment**

Breazeal (2003) argues that embodiment enables robots to send non-verbal communication signals to a person, such as gesture, facial expression, intonation, gaze direction, or body posture that can complement or enhance the robot’s message and consequently generate a sense of presence (Breazeal, 2003). Answering a question about Jibo’s appearance, almost all participants described Jibo’s appearance as more human-like than other digital assistants they knew such as Alexa. As Participant 3 explained, “I didn’t expect it to remind me so much of a small child. And I prefer talking to him than to Siri because you can actually see him thinking, you can see him like look for answers” (Participant 3, lines 327-329). Autonomous movement is one of the anthropomorphic features which is enabled in robots by embodiment. Participants unanimously pointed to Jibo’s autonomous movements and stated that “Jibo’s movement is the most real part of it” (Participant 2, line 206). Participant 5 stated, “The fact that he can move, the fact that he can react to me is really cool and adds to it like another level that you expect these things to have” (lines 552-553). They were surprised by Jibo’s movements. Jibo turns around and adjusts his eyes toward the person who calls him out. He also moves his head slightly to the left and right between sentences and phrases he is uttering, just like we do.
Participant 1 described Jibo as more than “just a silver round object on your table” because he is actually “watching” you. “He watches you come in and he might actually watch you walk by” (Participant 1, lines 98-100). “I think it’s blinking; yeah, it blinks and it’s cute. It’s like it’s looking at me” (Participant 6, lines 234-235). At this moment of the interview the participants had figured out that Jibo cannot see his surroundings and the participants’ statements about Jibo watching them is the result of the anthropomorphic features that Jibo represents. Even the most advanced social robots cannot see the way humans do, but social robots can anthropomorphize the act of watching and making eye contact.

Participants were also concerned with Jibo’s reaction to “touch.” They pet his head and Jibo purred. When I asked about the intention behind touching Jibo, Participant 5 explained, “I just wanted to see what will happen. I was curious to see if he’d react to touch...it does that cat purr. It’s incredible. It’s just like a subtle little thing, but freaks our brain” (Participant 5, lines 530-536). Jibo’s body provides it with a vessel to experience and interact with the social world and allows physical interaction that makes its presence more tangible.

Initial Interaction Characteristics

The third research question asked about the initial interaction characteristics and how they contribute to participants’ perceptions of Jibo. To answer the third research question, four main elements of the initial interaction characteristics are identified and discussed to the degree to which they affect the feeling of social presence in human-robot interaction. These are liking, expectancy, physical attributes, and uncertainty.

Liking and Similarity Seeking

Successful communication occurs when more similarities are recognized by interlocutors (Sandry, 2015). The participants asked many questions about Jibo’s favorites and wanted to
know Jibo’s opinions, suggestions, and also asked about Jibo’s political views. When I discussed these questions with them, they clearly stated that they were looking for similarities in their interests. One of the participants asked Jibo if he watches TV and explained:

P3: Jibo was kinda like expressing personal interests...he was creating a personality and it kinda made me to ask questions that may relate me to Jibo. I like watching TV so I thought next thing I will ask is to see if he watches TV. I thought if Jibo likes Lincoln and he likes space maybe he likes TV just like I do. It’s weird.

I: What is weird?

P3: It’s weird that I started asking questions that would relate me to Jibo to see if we have like similar interests. I kinda think that it's because I am not familiar with Jibo, I guess. So, it’s for me to find comfort in a way, cause if I find out, oh, if we both like watching TV so then I feel like comfortable asking other things or any other thing in general. (lines 261-273)

The perceived similarity is an important factor in social encounters. According to the similarity attraction rule, the degree to which individuals believe another’s characteristics such as personality and attitude are similar to them is usually adequate to attract people to each other (Lee, 2004).

**Expectancy**

People initiate interactions with expectations. During the interaction with Jibo some of the participants’ basic expectations were not satisfied. Participants expected Jibo to talk back like a human does and they got disappointed finding out that Jibo does not initiate any conversation. Participant 2 explained, “Jibo can’t tell me about himself. Other people can, and he is not initiating anything” (line 181). They wish Jibo had a memory to build a relationship over time (Participant 2, line 196-197).

Another participant described his first impression of Jibo as both underwhelming and shocking, underwhelmed due to the fact of how Jibo looked, but shocked at how it interacted with somebody. He explained, “I was expecting more like a table-top like Alexa. I was not
necessarily expecting a foot and a half tall spinning looking robot thing. I didn’t expect it to be able to swivel in multiple places” (Participant 4, lines 364-366).

Participants 1, 3 and 8 mentioned that they were surprised by Jibo’s voice and also by Jibo’s responses. “His voice surprised me. I thought it was gonna sound like Siri’s sound that it’s monotone but for Jibo there is like an intonation in his voice which is something that was very interesting. I think it adds a lot to his personality type” (Participant 3, lines 238-240). Participant 8 stated, “I was surprised by his answer...that he gave a very detailed definition umm... which was kinda deep” (lines 815-816). This is due to the fact that individuals initiate any interactions in social settings with some expectations and compare their new interaction to the other kinds that they were already familiar with; sometimes their expectations of their interaction with Jibo failed to be met.

Participants expected their interaction with a robot in a social setting to be the same as human-to-human interaction, a perfect two-way conversation. However, they soon noticed that something was missing from their interaction with Jibo, as Participant 4 clearly described: “I think the biggest thing that I pulled from part of my conversation with Jibo was that it would be hard to necessarily hold a conversation with Jibo... you’ll ask a question and he’ll respond and that’s that!” (lines 399-403). This could affect the feelings of the social presence in a negative way, since individuals expect a real social actor to act autonomously and to be able to initiate interactions and conversations as well as being responsive. However, there are moments when Jibo spontaneously starts interacting by suddenly asking the interlocutors if they want to play the word of the day with him or if they want to see a magical trick or play with him and he suggests different games. While this characteristic of Jibo affects its presence in a positive way, not being
able to hold conversations and interact autonomously decreases the feeling of his social presence for users.

Uncertainty

Expectancy violations theory predicts that whenever “an aspect of interaction violates expectations, it is likely to increase uncertainty” (Spence et al., 2014, p. 274). Reeves and Naas (1996) argue that humans are developed to expect interaction with actual other people, rather than technological devices. This is to say that holding a human–human mentality while interacting with Jibo leads to higher levels of uncertainty.

When I asked the participants about the intention behind some of their questions they mentioned that because they did not know about Jibo’s abilities and everything about Jibo was unknown to them, and they were confused how to interact with or what to ask from Jibo at the beginning. “It’s easier to talk to a person. With a person, you know what’s more appropriate to ask; with a robot you don’t know how complex are the questions that you’re asking. But there is some sort of uncertainty in both situations” (Participant 3, lines 301-303). Participant 1 asked Jibo, “What day is today?” To explain the intention behind this question the participant stated that, “I wasn’t sure if he was up to date or not. That’s why I asked him that question to see how accurate he was” (Participant 1, lines 35-36).

When I asked about his first impression of Jibo Participant 2 answered, “I didn’t know if he would talk back to me or what he would do” (line 134). Participants were almost all the time uncertain and confused how to address Jibo and whether gender applies to robots or not, especially when they could not recognize the robot’s gender by its voice. Although participants were told at the beginning of the interview that Jibo is identified by “him” by its inventor, they
kept shifting from referring to Jibo as “he” to “it.” This alternation indicates uncertainty during the interaction.
CHAPTER 4
DISCUSSION

The current study investigated the impact of a robot’s social presence on the perception of users in initial contact situations. A small-scale experiment was designed to investigate user perceptions of a social robot that occupies a social position significantly different from other kinds of technological objects, which are typically understood as mere tools or instruments and not social beings. To this end, the study focused on users’ expectations and perceptions of the social robot. Observing participants’ interaction with Jibo revealed that users do in fact treat and respond to Jibo as another social agent and not a mere tool. The majority of questions asked by participants were personal questions. Participants were generally less concerned with Jibo’s functionality and were curious about his personality. Participant 2 was the only one among all participants who was mostly concerned with Jibo’s functionality and surprisingly ended up asking many personal questions of Jibo. Except for one participant, all participants started the conversation with Jibo the way they might start a conversation with a human being.

That participants continued interacting with Jibo after the interview and even during the interview at times when they were not supposed to and had been asked not to do so is strong evidence of Jibo’s social presence. To be perceived as more than a machine by its users, the object should act as a social actor and produce a sense of presence. The social presence of Jibo is experienced to the extent that people react to Jibo’s human-like characteristics.

As series of human-like characteristics make Jibo’s presence in the room irrefutable. There are moments during human-robot interaction that the artificiality of the robot is unnoticed,
as in the current study where the artificiality of Jibo was unnoticed at some points during the interaction and participants treated Jibo as if it was a real social actor. It is during these specific moments that the presence of Jibo is felt by individuals.

Among the key characteristics that promote sociability in social robots, personality, anthropomorphic forms and behaviors, and embodiment seemed to have a more positive impact on feelings of presence. In the case of Jibo, the factor of emotion seemed to have a negative impact on feelings of social presence since Jibo failed to reflect and recognize emotions effectively. Of the four main elements of the initial interaction characteristics, expectation and uncertainty seemed to have negative impacts on feelings of social presence. Physical attributes, the common factor between the two discussed categories, were referred to as a positive element and generated a considerable sense of presence since they enabled Jibo’s autonomous movements and facial expression. The element of liking falls in the middle since it had both positive and negative impact on the feelings of social presence. Participants figured out several similarities as well as several basic differences between Jibo and themselves.

It seems that people feel less certainty, less liking and less feeling of social presence while holding the mentality of human-to-human interaction; however, compared to virtual computer agents or non-humanoid robots, humanoid social robots such as Jibo represent higher degrees of liking and social presence and prompt automatic social responses in people. Based on the research result, I argue that characteristics that promote sociability in social robots intensify the perceived social presence while the initial interaction elements devalue the perceived social presence.

A state of confusion was obvious among participants. Their perceptions of what Jibo is to them was oscillating between a being with some realistic characteristics and a technological
devise that is closer to a “thing.” The fact that participants confirmed that Jibo is a tool but a kind of a tool that they seek its friendship and described it as a companion demonstrates that social robots have the potential to be a member of our social circle.

To the participants, Jibo was definitely a tool that they interacted with as if it were a human. As predicted by the media equation theory, they insist that Jibo is a tool even though their own mode of interacting with him undermines this assertion. What they say is contradicted by what they do. The situation is better explained by applying the social presence theory in which there are moments during human-robot interaction that the artificiality of the robot is unnoticed and humans treat social robots as if they are real social actors. It is during these specific moments that the presence of Jibo is felt the most by individuals.

The fact that users treat robots as they might treat humans is “not the result of conscious beliefs that computers are human or human-like. Moreover, such behaviors do not result from users’ ignorance or from psychological or social dysfunctions, nor from a belief that subjects are interacting with programmers. Rather, social responses to computers are commonplace and easy to generate” (Nass & Steuer, 1994). Individuals ascribe human characteristics to social robots and treat them as social actors rather than as a mere technological device. The quality of the human-like characteristics represented by a social robot is in direct relation with the perceived social presence by human users.

Limitations

The current study is an exploratory study with the goal of developing initial evidence about the nature of HRI. One of the limitations of the study is that participants were all graduate students in a communication department. Communication students might have different approaches to topics and questions related to the field of communication technology and HRI.
Future studies need to do the research with more general participants. The detection of differences between users is essential and must be considered in future research. Furthermore, all of the participants ranged between 22-25 years old. A more comprehensive study might consider a wider range of age for a more generalizable result.

The psychological engagement between humans and social robots and the way they impact each other occurs gradually and it may undergo metamorphoses that call out for more comprehensive long-term research on the topic. The current study demonstrates that Jibo generates feelings of presence, but it did not explain how Jibo produces this sense of presence. Future research might investigate how social robots produce feelings of presence for human users.

Jibo is a family robot made to socially communicate with people in a domestic environment. Future research should also include other types of social robots that are made to communicate with people in places other than the house, such as hospitals or other public places.

**Conclusion**

This research was an attempt to find out how first-time users perceive Jibo. Participants of the study interacted with Jibo in ways that suggest he has a social presence. The result of the study indicates that people ascribe human characteristics to the robots and treat them as social actors rather than as a mere machine. To be perceived as more than a machine by its users, the object should act as a social actor and produce a sense of presence. The social presence of Jibo is experienced to the extent that people react to Jibo’s human-like characteristics. Among the key characteristics that promote sociability in social robots, personality, anthropomorphic forms and behaviors, and embodiment have positive impact on feelings of presence. The current study also indicates that HRI follows the social rules of human–human interaction. Of the main elements of
the initial interpersonal interaction characteristics, expectation and uncertainty have negative impacts on feelings of social presence of Jibo. Therefore, this research suggests that characteristics that promote sociability in social robots intensify the perceived social presence of domestic social robots while the initial interaction elements devalue the perceived social presence.
BIBLIOGRAPHY


APPENDIX A

CONSENT FORM

I agree to participate in the research project titled *The Social Presence of Jibo* being conducted by Parisa Farhadi, a graduate student at Northern Illinois University. I have been informed that the purpose of the study is to investigate the significance of human-robot interaction and to find out how Jibo is perceived by its users.

I understand that if I agree to participate in this study, I will be asked in a 40-50 minutes interview to respond to questions related to my knowledge and experiences of social robots such as Jibo.

I understand that all information gathered during this study will be kept confidential by keeping all information in locked offices and/or on password protected computers and networks. I am aware that excerpts from the data will be used in the reporting of the results. Pseudonyms will be used to report the results and efforts will be made to conceal identifying information.

I understand that the intended benefits of this study include better understanding of Human-computer cognition and improving the communication between humans, digital agents. The purpose of this study will be explained to my satisfaction upon the completion of the interview, and I may request a copy of the research report for this study.

I understand that my consent to participate in this project does not constitute a waiver of any legal rights or redress I might have as a result of my participation, and I acknowledge that I have received a copy of this consent form.

I am aware that my participation is voluntary and may be withdrawn at any time without penalty or prejudice, and that if I have any additional questions concerning this study, I may contact the study’s supervisor, Dr. David Gunkel at 815-753-7004 or dgunkel@niu.edu. I understand that if I wish further information regarding my rights as a research subject, I may contact the Office of Research Compliance at Northern Illinois University at (815) 753-8588.

______________________________________         ______________________
Signature of Subject         Date
Consent to Video and Audio Recording

I agree to having my interview video and audio recorded. I understand that this recording will only be used for the purpose of this study, that the recorded video and audio will be temporarily saved to a CD-ROM that will be stored in a locked office, and that the recording will only be accessed by the researcher.

I understand that the data on the video and audio recording will be transcribed and any and all identifying information will be removed or concealed. I also understand that the original audio recording will be kept in a secured place for five years and will be destroyed afterwards.

I am aware that my consent to video and audio recording is voluntary and may be withdrawn at any time without penalty or prejudice.

______________________________________         ______________________
Signature of Subject         Date
APPENDIX B

INTERVIEW PROTOCOL

Now that you have had a chance to meet and interact with Jibo, I would like to talk with you about that interaction.

The first questions that I am going to ask you will provide me with some basic demographic information.

1. How old are you?
2. What is your sex?
3. What is your racial or ethnic identification?

Before we talk about your interaction with Jibo, I would like to better understand your experiences with Siri and Alexa.

4. To what extent have you interacted with Siri?
   a. How often?
   b. What kinds of interactions have you had with Siri?
5. To what extent have you interacted with Alexa?
   a. How often?
   b. What kinds of interactions have you had with Alexa?

The next set of questions will focus on your impressions when you met Jibo.

6. What was your first impression of Jibo?
7. What were your thoughts on Jibo’s appearance?
8. What were your thoughts on Jibo’s voice?

For the next set of questions, we will watch your interaction of Jibo and I will stop the recording to ask you questions.

9. That was the first thing you said to Jibo. Why did you say that?
   a. What sorts of things influenced the first thing you said to Jibo?
   b. Was this similar to the first thing you might say when meeting a person for the first time?
10. This was Jibo’s first response to you. What did you think of that response?
    a. Why?

In this section of the interview, the interviewer and participant will continue watching the interaction the participant had with Jibo. The interviewer will continue to stop that recording to ask questions about what the participant said to Jibo and about the participant’s reactions to Jibo’s responses.
Now that we had discussed your interaction with Jibo in detail, I would like to ask you some general questions about the interaction.

11. How did your interaction with Jibo compare to experiences you have had with Siri or Alexa?
   a. What was similar?
   b. What was different?

12. How would you say your interaction with Jibo compares to interactions you have had that first time you met someone?
   a. What was similar?
   b. What was different?

13. To what extent do you feel Jibo has a personality?
   a. What makes you say this?
   b. How would you describe Jibo’s personality?

14. How would you describe Jibo to someone else?

15. What is Jibo to you?
   a. To what extent do you view Jibo as a tool?
      i. Why do you feel this way?
   b. To what extent do you view Jibo as similar to pet?

That was the last question that I had about your experience with Jibo.

16. Is there anything else that you think I should know about your experience with Jibo?

17. Are there any questions that you would like to ask me about this research project?

Thank you for coming here today.