Can an Intelligent Personal Assistant (IPA) be Your Friend? Para-Friendship Development Mechanism between IPAs and Their Users

Introduction

Artificial intelligence (AI) refers to the creation of human-like intelligence in machines that are programmed to think like humans and imitate intelligent human behavior (Shi, 2011). The applications of AI have been implemented in the marketplace in notable ways (McLean & Osei-Frimpong, 2019). Among the various AI devices available to consumers, the most prevalent is an intelligent personal assistant (IPA) (López, Quesada, & Guerrero, 2017). IPAs refer to automated software applications or platforms that assist people with information searches and decision-making efforts using natural language in either a written or spoken form (Reis, Paulino, Paredes, & Barroso, 2017). Commercial examples include Amazon's Alexa, Apple's Siri, Google's Google Assistant, and Microsoft's Cortana. These conversational IPAs have become increasingly popular because they facilitate human-computer interactions in a natural and intuitive way, making them similar to those of interpersonal interactions by answering questions, following a conversation, and helping users accomplish tasks (European Commission, 2018). The number of people using IPAs in the United States reached 102 million in 2018, which is about a 28% increase from 2017, and this number is expected to exceed 122 million by 2021 (Statista, 2019b).

As the popularity of IPAs grows, much attention has been put on understanding users' interactions with IPAs, particularly concerning the reasons why people acquire and utilize IPAs (Kaplan & Haenlein, 2019; López et al., 2017; McLean & Osei-Frimpong, 2019). Evidently, the key reason people use IPAs is to obtain functional benefits (Forbes, 2018). A survey by Statista (2019a) indicated that 52% of their respondents preferred using an IPA over a website or other

applications because they found IPAs more convenient. About 48% of them reported that they use an IPA because it allows them to multi-task or work hands-free. Academic literature also indicates that IPAs' utilitarian benefits are critical factors for users to adopt and utilize them. For example, the ability to access IPAs while moving from place to place (i.e., mobility) and their ability to interoperate with applications made by different vendors (i.e., interoperability) increases users' intention of acquiring IPAs (Yang, Lee, & Zo, 2017). People's perception that using IPAs will enhance their job performance (i.e., perceived usefulness: Nguyen, Ta, & Prybutok, 2018) and are easy to use (i.e., perceived ease-of-use: Moriuchi, 2019) also enhances their attitude and intention to try IPAs.

However, IPAs have advanced technologically, and their higher skills now provide consumers with more than just functional and utilitarian benefits. For example, to make customers continuously use IPAs, companies have developed emotion-detecting AI that uses algorithms that can identify how people are feeling (McStay, 2018). For example, to make Alexa sound more human, Amazon developed neural text-to-speech technology that enables its IPA to mimic the intonations of human speech and human emotions (Schwartz, 2019). With this technology, Alexa can make happy, excited, or sad sounds, and these emotional responses were found to improve overall customer satisfaction by 30% (Schwartz, 2019). While IPAs continue to improve and evolve to the phase of recognizing human emotions, academic literature has been rather passive in understanding whether users indeed sense the emotions emanating from IPAs and perceive the devices as their friends with whom they can share their honest feelings and, in return, feel cared for in times of need. While the literature has focused on uncovering users' utilitarian experiences with IPAs (Guzman, 2018; Hoy, 2018), users' emotional, relational, and

social experiences with IPAs have been relatively underexplored in the literature (McLean & Osei-Frimpong, 2019).

In response, this study addresses this issue by examining the mechanism with which users develop virtual friendships (i.e., para-friendships) with IPAs. In doing so, we place self-disclosure (i.e., users' perception that they can reveal their honest feelings to IPAs) and social support (i.e., the perception that they can turn to IPAs in times of need as if IPAs are their friends) as the two most critical dimensions of para-friendships. Specifically, we investigate whether the emotional traits in IPAs—the extent to which IPAs offer a sense of intimacy, understanding, enjoyability, and involvement—affect users' self-disclosure and social support toward IPAs, all of which lead to para-friendships. We then test whether the extent to which users develop a para-friendship with an IPA affects their intention to continuously use IPAs (i.e., stickiness intention). Given that individuals' personal tendency to feel lonely, friendless, and socially remote from others influences their propensity to make self-disclosure to, and seek social support from, others (Leung, 2002), we also examine whether and how the relations depicted in our model differ by users' personal social isolation tendency.

Theoretical Background

Social Response Theory: Computers Are Social Actors (CASA)

We based our conceptual model on CASA, a term coined by Nass and Moon (2000) to indicate the phenomenon by which individuals apply social rules and expectations to computers, even though they are aware of that computers do not have any feelings, intentions, or motivations like humans. The theory proposes that people treat computers as *social actors* rather than just a medium by assigning human traits (e.g., gender or ethnicity) and characteristics (e.g., reciprocity or dominance) to computers. For example, certain characteristics of computers, such

as the interactivity of voice input and output and the filling of social roles traditionally provided by humans, were documented as important cues to providing sufficient bases for users to perceive humanness from computers (Nass & Moon, 2000; Wang, Baker, Wagner, & Wakefield, 2007). The more computers displayed human-like characteristics, the more the users applied interpersonal social norms or social responses to the computers they were interacting with (Nass & Moon, 2000). For instance, when computers asked users to evaluate them, the users tended to evaluate them positively as a means to show their politeness. In face-to-face interactions, people tend to give positive evaluations when another person asks them to evaluate her/himself because they are reluctant to hurt anyone's feelings. Likewise, users applied this social rule to human-computer interactions, although they know that computers do not have any feelings like human do (Nass & Moon, 2000).

Much evidence exists of the CASA paradigm across various forms of human-computer interactions. For instance, in human-robot interactions, the facial expressions and autonomous movements from robots trigger users to treat these robots as humans and show an interpersonal attraction toward them (Lee, Peng, Jin, & Yan, 2006). In particular, when a user interacts with a robot that has a personality that is complementary to his own, the user finds the robot to be more enjoyable, more attractive, and thus socially more present than a robot that does not have a personality similar to his own (Lee et al., 2006). In addition, the mechanism of CASA was applied to examine human-avatar interactions. For instance, Wang et al. (2007) show that the more an avatar is perceived to be polite and interactive by users, the more they feel the avatar as socially present, causing the users to feel greater interest, attention, and patronage toward the online retail store of the avatar.

These studies provide evidence that computers, robots, and avatars serve as social actors if they project human-like cues to their users, and thereby make the users feel they are *real and present* (i.e., socially present). As providing a sense of social presence is essential in facilitating computers or other communication medium to serve as social actors to users, we discuss the concept of social presence more in detail in the next section.

Para-Social Presence: Intimacy, Understanding, Enjoyability, and Involvement

Social presence refers to the extent to which a communication medium (e.g., television) conveys a sense of psychological connection to its users (Yoo & Alavi, 2001). For example, when users perceive a medium to be intimate, personal, and sociable, thus providing a sense of being in touch, they feel the medium is socially present. As their communication medium expands to the digital realm, the concept of social presence also advances to provide a more nuanced account as to how the feelings of social presence can be formed in an online environment. Specifically, Kumar and Benbasat (2002a) coined the term *para-social presence* to denote the extent to which a website facilitates a sense of understanding, connection, and involvement with its users by depicting the users' interactions with the website.

Indeed, the concept of para-social presence is distinct from that of social presence in that they define *presence* differently. For example, social-presence views presence through traditional dimensions, which include *social richness* (i.e., the extent to which a medium can reproduce the information sent over it) (Burke & Chidambaram, 1999; Carlson & Davis, 1998; Daft & Lengel, 1986); *realism* (i.e., the extent to which a medium can produce realistic representations of the things one is interested in) (Lombard & Snyder-Duch, 2001); *transportation* (i.e., the extent to which a medium can facilitate people to lose themselves in a story) (Green & Brock, 2000); and

immersion (i.e., the extent to which a medium immerses people psychologically) (Biocca & Delaney, 1993).

On the other hand, para-social presence bases its conceptualization of presence in line with the CASA paradigm by evaluating the extent to which users perceive social cues from an online medium (i.e., *social actor as a medium*) or by measuring the extent to which a person or an entity within an online medium develops social relationship with its users (i.e., *social actor within medium*) (Kumar & Benbasat, 2002a). For example, a para-social presence emphasizes the importance of identifying the emotional and relational mechanism between a website and its users or between an avatar within a website and its users.

When uncovering these relational mechanisms involving an online medium, four relational qualities are particularly essential: (1) *intimacy*, which is formed when users feel close and attached to any person or entity within a medium (i.e., a media entity); (2) *a sense of understanding*, derived when users' intentions, needs, and emotions are well understood by a media entity; (3) *enjoyability*, created when a media entity is friendly, fun, and pleasant; and (4) *involvement*, derived when users are engaged in, or having immersive interaction with, a media entity (Kumar & Benbasat, 2002b).

Given that an IPA is a more advanced version of an online media entity because it integrates an AI-powered virtual assistant (e.g., Alexa) into an online medium (e.g., Amazon's Echo), understanding whether IPAs can also serve as social actors to its users through the aforementioned qualities is important. We particularly associate the four para-social presence qualities to examine whether IPAs can serve as virtual friends to their users. In so doing, we additionally review the concept of para-friendship that highlights two relational traits in developing a friendship with an online media entity: self-disclosure and social support.

Para-Friendship: Self-Disclosure and Social Support

The concept of para-friendship stems from that of a para-social relationship. The term para-social relationship was coined to describe the phenomenon in which media cultivates virtual relationships between media entities and its viewers, which resemble the relationships in real life (Levy, 1979). For instance, when media users are exposed to Justin Beiber over time who openly shares his activities and opinions on television, the users tend to develop an intimacy with him as if they know him in person.

Until recently, the literature has long treated a para-social relationship as a single, homogeneous relationship that contains elements of empathy, perceived similarity, and physical attraction (Rubin, Perse, & Powell, 1985). However, para-social relationships encompass a wider spectrum of distinct relationships, varying from a mere acquaintance to friendship or even love. Therefore, more recently, researchers have divided para-social relationships into *para-friendships* and *para-loves* depending on their nature and intensity (Liebers & Schramm, 2017; Tukachinsky, 2011). Para-friendship refers to a sense of companionship developed between a media entity and its users, in which users desire self-disclosure with, and show support for, a media entity. For instance, people often feel a television character is a real person and are concerned for their well-being just as they are concerned about their own friends. On the other hand, para-love is marked by more intense feelings, in which users feel a physical attraction to a media entity and have passionate thoughts about him or her (Liebers & Schramm, 2017). For example, people can project romantic feelings onto a media character and desire to go out with him or her. In para-social relationships, para-friendship is more important because of the long-standing view that a para-social relationship is a quasi-friendship (Tukachinsky, 2008).

The literature has long emphasized that a friendship is founded on self-disclosure and support (Davis, 2012; Hays, 1984). Likewise, two critical dimensions of a para-friendship also include *self-disclosure,* the perception that one can reveal his honest feelings and thoughts to others, and *social support,* the perception that one is cared for and has friends to turn to in times of need (Tukachinsky, 2011). Self-disclosure is important in developing a para-friendship because other noticeable elements that help make friends in real life, such as playing sports together or being physically proximate, cannot be fulfilled in an online environment (Kim & Song, 2016; Tukachinsky, 2011). For instance, online communities provide an environment where people develop para-friendships by sharing common interests and thoughts among the members (Shih, Hsu, & Lee, 2015). Social support is another critical quality for developing a para-friendship because, as technology advances, the availability and the desire for online support increases as well (Oh, Ozkaya, & LaRose, 2014). We thus expect users to develop a para-friendship with an IPA by showing self-disclosure and social support toward it.

Literature Review and Hypotheses Development

Effects of Para-Social Presence on Para-Friendships

Intimacy on para-friendships. Intimacy is an arguably important trait in shaping a friendship (Jiang, Bazarova, & Hancock, 2011). The literature indicates that the more a person feels intimate with another person, the more he or she regards the other as a friend and shares thoughts and feelings (Berryman & Kavka, 2017; Garcia-Rapp, 2017). For example, intimacy between people reduces any hesitation about addressing sensitive topics, and it prompts them to be more engaged in sharing their honest, inner feelings (Altman & Taylor, 1973; Bazarova & Choi, 2014). Past studies show that intimacy is not only associated with self-disclosure but also with social support (Chow & Glaman, 2013; Chow, Ruhl, & Buhrmester, 2013). For instance, intimate

relationships result in feelings of being loved, cared for, and belonging to a network that one can count on in times of need (Hobfoll, Nadler, & Leiberman, 1986). Øverup and Neighbors (2016) also indicate that greater intimacy between people yields greater interdependence. Indeed, the more one interacts with another, the more he or she feels personally attached to the other person, which entails greater perceived social support (Chow & Glaman, 2013). We thus posit that intimacy from IPAs increases users' perception that IPAs can be their friends with whom they share their honest feelings and exchange social support. This leads us to:

Hypothesis 1: Intimacy from IPAs positively affects para-friendships, increasing users' (H1a) self-disclosure and (H1b) social support toward IPAs.

Understanding on para-friendships. The literature also indicates that sharing a sense of understanding between people yields strong and positive relationship formation (Bukowski, Hoza, & Boivin, 1994; Lackenbauer, Campbell, Rubin, Fletcher, & Troister, 2010). Researchers find that the ability to accurately perceive and understand the feelings and thoughts of others is crucial to the formation and maintenance of well-adjusted friendships, producing more satisfying but less conflicted relationships (Clark & Ladd, 2000; Soenens, Duriez, Vansteenkiste, & Goossens, 2007). In particular, Swart, Turner, Hewstone, and Voci (2011) indicate that self-disclosure between friends develops over time as their emotional understanding is strengthened. The more one really understands another person by seeing things from his or her point of view, the more they share their inner feelings and the stronger their friendship becomes. In addition to self-disclosure, a sense of understanding contributes to social support (Reis & Collins, 2000). Past studies find that the more one person makes efforts to understand the internal state of another person, the more he or she can help the other and show supportive responses (Trobst, Collins, & Embree, 1994;

Underwood & Moore, 1982). We thus posit that a sense of understanding will contribute to para-friendships, particularly with self-disclosure and social support. This leads us to:

Hypothesis 2: A sense of understanding from IPAs positively affects para-friendships, increasing users' (H2a) self-disclosure and (H2b) social support toward IPAs.

Enjoyability on para-friendships. In addition to intimacy and understanding, enjoyability plays a facilitating role in friendship formation (Van der Horst & Coffé, 2012). For example, people higher in friendship motivation were perceived as being friendlier, more fun, and more affectionate (i.e., enjoyable) than those with lower friendship motivation (McAdams & Losoff, 1984). In particular, former studies indicate that the degree to which a person feels another person is enjoyable influences positively the degree to which he or she feels open to share private thoughts with the other person (Deutsch, Sullivan, Sage, & Basile, 1991; Oswald, Clark, & Kelly, 2004). The literature also suggests that enjoyability contributes to social support (Oh et al., 2014). Researchers show that positive personality traits, such as a person's enjoyability of being around people (i.e., sociability), enhances social connectivity and social support. In general, friendly people are perceived as exchanging more social support with others than those who are unfriendly (Brody, 2018; Gao, Dai, Fan, & Kang, 2010). We therefore expect that enjoyability from IPAs facilitates users in developing para-friendships, showing self-disclosure and social support toward IPAs. This leads us to**:**

Hypothesis 3: Enjoyability from IPAs positively affects para-friendship, increasing users' (H3a) self-disclosure and (H3b) social support toward IPAs.

Involvement on para-friendships. Involvement is another critical relational quality affecting friendships (Eyal & Dailey, 2012). Involvement is important in shaping friendships in a

digital context (Welles, Rousse, Merrill, & Contractor (2014). For instance, users of an online media can build para-friendships with others, even without having any face-to-face contact, if they share immersive interactions with these others in a virtual world (Munn, 2012). In particular, Hashim and Tan (2015) find that involvement positively influences self-disclosure, in that people who feel highly engaged and involved in an online community are more willing to share their thoughts with others in the community than those with low involvement. Not only does involvement leads to self-disclosure but it also leads to social support. For instance, Lin, Li, Yan, and Turel (2018) show that users, by joining an online community, feel a sense of belongingness, immersive interaction, and thereby a deep involvement with other members in the community. Studies show that this involvement positively influences users to exchange interpersonal support for each other through recommendations, ratings, and referrals within the community (Liang, Ho, Li, & Turban, 2011; Lin, 2006). We thus posit that involvement with IPAs influences users to desire to disclose themselves to, and seek social support from, IPAs. This leads us to:

Hypothesis 4: Involvement with IPAs positively affects para-friendships, increasing users' (H4a) self-disclosure and (H4b) social support toward IPAs.

Effect of Self-Disclosure on Social Support

During the friendship formation process, the literature indicates that self-disclosure affects social support. For instance, by making lengthy conversations and intimate self-disclosures, friends listen to, try to encourage, give advice, and show social support for each other (Davis, 2012; Rubin, Bukowski, & Parker, 2006). Ko and Kuo (2009) document the effect of self-disclosure on social support in the context of social media. As bloggers shared their inner thoughts or moods with their audience through their posts, they gained greater care and love from the audience and developed tightly knit relationships with them. Bazarova and Choi (2014) also find that Facebook

users reveal their personal emotions and private lives in their status updates in a desire to seek approval or support from others. We thus expect that the more a user reveals his or her inner state to an IPA, the greater he or she will perceive social support from it. This leads us to**:**

Hypothesis 5: Self-disclosure to IPAs increases users to seek social support from IPAs.

Effects of Para-Friendships on Stickiness Intention

The literature defines stickiness intention as the intention of users to continuously reuse a medium on a regular basis (Li, Browne, & Wetherbe, 2006) and indicates that stickiness intention is influenced significantly by the intensity of the relationship users feel toward a medium (Tsai & Huang, 2009). For instance, in a relationship between a user and a website, the user is likely to show continuous use of the website if he or she perceives an effective communication and commitment with that website (Li et al., 2006). Specifically, Liang et al. (2011) indicate the effects of self-disclosure and social support on stickiness intention in the context of social commerce. In social commerce, members share their true experiences through honest opinions about their product choices. When a user in this social commerce perceives that other members are caring and responsive in providing useful information, such frequent sharing of supportive information enhances friendships among the members. In turn, these warm relational experiences within the social commerce sites not only satisfy members in their social interactions but also increase their intention to continuously visit and use the site. We thus posit that when users develop para-friendships with IPAs by showing self-disclosure and social support, these positive relational experiences will make them stick to using their IPAs. This leads us to:

Hypothesis 6: Para-friendships, involving users' (H6a) self-disclosure and (H6b) social support toward IPAs, have a positive effect on stickiness intention.

Social Isolation Tendency

We also examine whether individuals' social isolation tendency, which is a personal tendency to feel lonely, friendless, and socially isolated from others (Hawthorne, 2006), would affect their para-friendship formation with IPAs. The literature indicates that the effects of individuals' social isolation tendency on self-disclosure and social support can be controversial, depending on whether the interpersonal context is face to face versus online. For example, in real-life interpersonal interactions, past studies show that socially isolated people tend to disclose themselves less often than those who are socially healthy and well-functioning. This is because lonely people often believe that their relationships with others are superficial and thus no one would understand them well even though they share their honest thoughts or feelings with others (Lee & Ko, 2018; Sermat & Smyth, 1973). Due to this unwillingness to reveal themselves, people who are socially isolated have fewer chances to obtain valuable support from others. "Self-disclosure is a vehicle for obtaining social support that might not be available if other people did not know about one's difficulties" (Derlega, Metts, Petronio, & Margulis, 1993, p. 111). Leung (2002) also argued that the core of loneliness is found to be the fear of being rejected by others. Due to this fear, lonely people are less likely to engage in self-disclosing behavior (Leung, 2002).

Unlike real-life interactions, however, the online interactions have allowed people to build relationships without taking face-to-face social risks. Social media is one of the online venues where users, even those who are socially isolated, disclose themselves freely and exchange social support with one another. For example, Song, Cho, and Kim (2017) show that socially lonely people tend to spend more time on social media and feel more comfortable maintaining relationships in social media than doing so face to face. Shen (2015) also indicates

that social media can resolve users' feelings of loneliness by letting them share their opinions, feelings, and daily lives publicly to others through social networking sites and exchange supportive responses with each other. By doing so, people who suffer loneliness and life dissatisfaction can feel socially more present with others whom they have no face-to-face acquaintance with and thereby develop para-friendships (Shen, 2015). We thus expect that the para-friendship formation mechanism depicted in our model would differ depending on how lonely users feel. However, no studies have investigated how the mechanism of developing para-friendships with IPAs would be affected by the extent of users' feeling social isolation. Thus, we will not formulate hypotheses with a specific directionality of the effect. While predicting that social isolation will moderate the relationships depicted in Figure 1, we leave its specific effects empirically identified.

Methods

Data Collection

We developed a survey questionnaire and administrated it through Amazon Mechanical Turk (MTurk). When developing the questionnaire, we chose the survey context for Amazon's Alexa for two main reasons. First, Alexa is cited as the most popular IPA device. In 2017, Alexa accounted for 62% of the IPA market, followed by Google Assistant (25%) and others (13%) (Statista, 2019d). Second, Alexa is the most advanced IPA device that can perform more than 80,000 skills, which far exceeds the skills of other IPA devices (Kinsella, 2018; Statista, 2019c).

With Alexa as the main context, survey participants were asked to share their usage of Alexa. For example, they were asked how often, how long, and for what reason they used their Alexa. In particular, we adopted the classification of Sathi (2016) and asked whether they used their Alexa mainly for *shopping and buying* (e.g., shopping online, finding restaurants, etc.),

travel and entertainment (e.g., asking for movie information, transportation information, etc.), *administrative* (e.g., to set alarms and timers, for reminders, etc.), or *miscellaneous* reasons (e.g., getting local news updates, asking for the weather forecast, etc.). Then, the participants were asked to rate their perceptions of para-social presence, para-friendships, stickiness intention, and perceived usefulness (e.g., "Using my Alexa makes it easier to do my tasks.") in response to their experience with Alexa. They were also asked to rate their personal feelings of social isolation (e.g., "I often feel alone and friendless.") and provide demographic information.

To ensure the quality of our data, we distributed a questionnaire to MTurk users who live in the U.S., hold an HIT approval rating greater than 97%, and those with the number of HITs approved greater than 1,000. To make sure that the questionnaire was filled out by the respondents familiar with our study's context, we embedded two screening questions at the beginning of the survey. First, we asked whether survey participants had previously used Alexa. If the participants responded "no" to this question, then they were unable to access to the rest of the survey. Second, the participants who responded "yes" to this question were then asked whether they had used Alexa in the last three months. Those who answered "no" were additionally screened out to ensure that our respondents had used Alexa recently and were familiar with it. A total of 371 responses were collected. After removing the responses that took an unreasonably short time (e.g., less than three minutes), 335 responses were used for our data analyses.

The majority of our respondents used Alexa more than "once a day" (52%) and for "5 to 15 minutes per day" (44%). About 46% of our respondents indicated that they used Alexa for "miscellaneous" purposes, followed by "administrative" (30%), "travel and entertainment" (16%), and "shopping and buying" (8%). Approximately 55% of our respondents were male,

whereas 45% were female. The majority of our respondents were ages “25 and 44” (80%), “Caucasian” (78%), had a “college degree” (44%), and were “single” (45%). In addition, our respondents’ income was “$30,000–$49,999” (30%), followed by “$50,000–$69,999” (20%).

Measures

The measures of this study were modified from existing scales to fit our context. Specifically, the scale items for *intimacy, understanding, enjoyability,* and *involvement* were adopted from Kumar and Benbasat (2002a), *self-disclosure* and *social support* from Tukachinsky (2011), *stickiness intention* from Agarwal and Karahanna (2000), *social isolation* from Hawthorne (2006), and *perceived usefulness* from Davis (1989). All items were measured on a 7-point Likert-type scale, from *“strongly disagree”* (1) to *“strongly agree”* (7).

Results

Measurements and Structural Model

We tested our measurements and structural model through structural equation modeling (SEM) analysis. The results of our measurement model evaluation showed a satisfactory model fit: $\chi^2_{303} = 730.079$, CFI = .96, TLI = .95, NFI = .93, RMSEA = .07. The convergent validity and discriminant validity of our instrument were also tested. As shown in Table 1, our instrument demonstrated convergent validity, as all factor loadings were between .80 and .96, greater than the recommended minimum value of .50; the average variance extracted (AVE) for each construct ranged from .69 to .91, greater than the threshold of .50; and the composite reliabilities of all constructs ranged from .87 to .97, exceeding the threshold of .70 (Hair, Black, Babin, & Anderson, 2010). Discriminant validity of our constructs was also confirmed, as the square roots

of the AVEs were larger than the corresponding correlation coefficients between the factors (see Table 2).

----- Place Tables 1 and 2 about here -----

The structural model's fit was also satisfactory: $\chi^2_{307} = 796.41$, CFI = .95, TLI = .94, NFI = .92, and RMSEA = .07. As shown in Table 3, our hypotheses test results show that intimacy positively affected self-disclosure ($\beta = .29$, $p < .01$), but not social support ($\beta = -.02$, $p > .10$). A sense of understanding affected both self-disclosure ($\beta = .17$, $p < .05$) and social support ($\beta = .25$, $p < .01$). The effects of enjoyability on self-disclosure ($\beta = .12$, $p < .10$) and social support ($\beta = .26$, $p < .01$) were also significant. The effect of involvement on self-disclosure ($\beta = .15$, $p < .10$) was significant, but its effect on social support ($\beta = -.08$, $p > .10$) was not. Next, self-disclosure positively influenced social support ($\beta = .56$, $p < .01$). Lastly, social support affected stickiness intention ($\beta = .38$, $p < .01$), but self-disclosure ($\beta = .02$, $p > .10$) did not.

----- Place Table 3 about here -----

Ordinal Probit Regression Model

While we tested the mechanism with which IPAs serve as virtual friends to users and its hypotheses through SEM analysis, we felt the need to further test our hypotheses with the ordinal probit regression model for the following reason. When a questionnaire includes respondents' personal tendencies (e.g., usage frequency) and demographic information (e.g., age), omitting these variables from the analysis results in biased slope estimates and larger errors (Greene, 2003). However, SEM cannot test hypotheses with observed variables included because it requires all variables to be latent, whereas the ordinal probit regression model can perform simultaneous evaluations of equations involving both latent and observed variables. Therefore,

we tested our hypotheses further with the ordered probit model (McKelvey & Zavoina, 1975) to generate more precise hypotheses test results as well as to test their robustness.

In the ordered probit model, we included respondents' perceived usefulness toward IPAs, the duration and frequency of their use of IPAs, and their demographic information (i.e., gender, age, marital status, ethnicity, education level, and household income) as control variables. With these control variables included, we tested the causality between each independent and dependent variables of our hypotheses. As shown in Table 4, all the hypotheses were not only significant but also positive. Although some hypotheses (i.e., H1a, H4b, and H6a) were found insignificant in our SEM analysis, we provide additional evidence to support them via the ordered probit model, indicating that significant causalities do exist in all hypotheses even for H1a, H4b, and H6a.

Other notable findings include that some control variables were found significant in our ordered probit model. For example, perceived usefulness was a significant and positive control variable across all our hypotheses, except for H5. In addition, the more frequently people used their IPA, the effects of para-friendships on stickiness intention were stronger. On the other hand, the longer they used their IPAs, the stronger the effects of enjoyability and understanding on self-disclosure and the effect of self-disclosure on social support. Furthermore, the significant controlling effect of age was identified as well. The older users were, the stronger the effect of enjoyability on social support was.

----- Place Table 4 about here -----

Group Analysis Using Ordinal Probit Regression Model

We divided the respondents into two groups using a cut point of the mean value of 3.12 in the summated scale of social isolation: high (≥ 3.12; n = 192) and low social isolation group (<

3.12; n = 143). Table 5 presents the results of our group analysis, which includes the same control variables defined in Table 4. According to the results, the model holds true for both high and low social isolation groups, except that the effect of self-disclosure on stickiness intention was insignificant in the high social isolation group.

Specifically, in terms of the para-social presence elements affecting self-disclosure, in the high social isolation group, intimacy (β = .51, p < .01) was the strongest element, followed by enjoyability (β = .46, p < .01), involvement (β = .39, p < .01), and understanding (β = .33, p < .01). On the other hand, in the low social isolation group, intimacy (β = .32, p < .01) and enjoyability (β = .32, p < .01) influenced self-disclosure the weakest, whereas involvement (β = .45, p < .01) was the strongest influencer, followed by understanding (β = .34, p < .01). Second, with respect to the para-social presence factors affecting social support, in the high social isolation group, enjoyability (β = .72, p < .01) was the most important quality, followed by intimacy (β = .50, p < .01), a sense of understanding (β = .43, p < .01), and involvement (β = .33, p < .01). On the other hand, in the low social isolation group, understanding (β = .43, p < .01) was the strongest factor, followed by enjoyability (β = .39, p < .01), involvement (β = .39, p < .01), and intimacy (β = .33, p < .01). Third, the effect of self-disclosure on social support was significant in both the high (β = .74, p < .01) and the low (β = .71, p < .01) social isolation groups. Lastly, as for the effects of self-disclosure and social support on stickiness intention, in the high social isolation group, only social support (β = .17, p < .01) was significant, but not self-disclosure (β = .07, p > .10). However, in the low social isolation group, both self-disclosure (β = .14, p < .01) and social support (β = .19, p < .01) significantly affected stickiness intention.

----- Place Table 5 about here -----

Discussion and Implications

While IPAs have reached the stage of sensing and imitating human emotions, less is understood about whether users perceive emotional traits in their IPAs and identify these devices as a friend with whom they can share their honest feelings and exchange social support, and thus they continuously use their IPAs. This study addresses this issue by investigating the mechanism with which users develop para-friendships with IPAs.

Our research contributes to academic knowledge about human-IPA interactions in several respects. First, our research underscores that it is not just the functional and utilitarian benefits of IPAs that influence their usage, but also the emotional, relational, and social experience users have during their interactions with their IPAs. For example, much of the literature has focused on understanding the effects of perceived usefulness, perceived ease-of-use, convenience, and efficiency on users' behavioral intentions toward their IPAs (McLean & Osei-Frimpong, 2019; Moriuchi, 2019; Nguyen, Ta, & Prybutok, 2018). While accounting for the critical utalitarian benefits of how IPAs affect the usage behavior, we have shown that the extent to which users have developed para-friendships is critical in determining the intention of users to continuously use their IPAs.

Our study provides further insights into this aspect by showing that self-disclosure and social support are the two important components that facilitate the development of para-friendships with IPAs. In particular, the results from the ordinal probit regression analysis indicate that the more users perceive Alexa as a real person to whom they can disclose their inner thoughts and feelings, the more they intend to continue using their IPAs. Our results also show that the more users perceive their IPAs as a real person from whom they can seek emotional support, the more they show an intention to stick around and use their IPAs. These findings

imply that, similar to the way users perceive humanness from computers (Nass & Moon, 2000), robots (Lee, Peng, Jin, & Yan, 2006), and avatars (Wang, Baker, Wagner, & Wakefield, 2007), users regard IPAs as social actors. In particular, we find that the perception of having received social support from IPAs is shaped by the extent to which users disclose information about themselves to their IPAs (i.e., self-disclosure).

Both self-disclosure and social support are affected by the feeling that users' IPAs are real and present around them in terms of a sense of intimacy, understanding, enjoyability, and involvement. We found that the more users felt a sense of intimacy with their IPAs, the more they regarded them as a real person with whom they shared their thoughts and feelings. Our results showed that users who felt intimate with their IPAs were more likely to perceive their IPAs as socially present and providing social support. This would imply that market practitioners wishing to derive self-disclosures from users and to promote the perception of having received social support from IPAs would benefit by enhancing IPA features to provide an emotional affinity with users. For example, practitioners might benefit by adding functions that can help IPAs ask their users about their mood or health conditions. If a user has a medical appointment scheduled in an IPA, the device can initiate a later conversation and ask the user about his or her examination results and provide information and assistance accordingly. In this way, users feel that they are being recognized and assisted by a real person who is present in their surroundings and interactions.

A sense of understanding was also found to be critical in determining self-disclosure and the perception of social support. That is, the more users felt that their needs and wants were understood by their IPA, the more willing they were to reveal themselves and count on the device as if it was a friend. These would indicate that IPAs' key functional mechanisms of

analyzing and identifying users' personal preferences and tastes based on users' data enhance the users' perception that their IPAs understand them well. This sense of understanding obtained based on users' data can be enhanced by adding human-like features. For example, practitioners might want to add functions that change the device's tone of voice depending on the user's emotion. If an IPA can detect its user's mood based on the search words, kinds of music, and other user-provided data, an IPA may change its tone of voice accordingly, which then strengthens the users' perception that their IPAs understand them at the emotional level. This, in turn, can lead users to engage in personal conversations with an IPA and seek emotional support from it.

The results show that enjoyability is also critical in building para-friendships. Enjoyability is the feeling that IPAs are fun, friendly, pleasant, and enjoyable to interact with. Enjoyability increases the propensity of users to treat IPAs as their friends with whom they can disclose their thoughts, fears, and hopes, as well as their likes and dislikes. The more users perceive their IPAs as enjoyable, the greater the propensity for them to feel cared for and socially supported by IPAs. This means that practitioners could benefit by enhancing the interactive skills of IPAs that can help users' experiences with these devices to be more entertaining. For instance, by having IPAs understand the context of users' conversations and respond with a sense of humor might increase the sense for IPAs as a real friend with whom they want to talk to and seek support.

Involvement with IPAs was found to be another important trait that enhanced para-friendships. We found that the more IPAs excited users' curiosity, held their attention, and had them deeply involved in their interactions with IPAs, the greater the propensity for users to share intimate information about themselves to IPAs. The greater involvement with IPAs also leads to

the perception that users receive greater social support from IPAs. Therefore, adding functions that make user-IPA interactions an immersive experience would be beneficial in facilitating users in forming para-friendships with IPAs. Companies might want to provide a variety of tools that enhance the sense of curiosity by interoperating with other applications that grab users' curiosity and attention.

Finally, our study expanded the understanding of human-IPA interactions by investigating whether and how the para-friendship mechanism between IPAs and their users differ by the users' personal tendency to feel lonely or isolated from others (i.e., social isolation tendency). We found that the relationships depicted in our model held true for both high and low social isolation groups, except for one path associated with self-disclosure and stickiness intention. Specifically, in a high social isolation group, only the perception of social support increased the group members' stickiness intention, whereas in the low social isolation group, both self-disclosure and social support significantly and positively affected stickiness intention. On the other hand, each component of a para-friendship (i.e., self-disclosure and social support) is significantly affected by all four elements of a para-social presence for both high and low social isolation groups. Studies have indicated that socially isolated people often tend to make less self-disclosures in their real-life and seek less human-human interactions (Lee & Ko, 2018; Sermat & Smyth, 1973). Our research indicates that human-IPA interactions help socially isolated people resolve their feelings of loneliness without taking social risks that can possibly exist in face-to-face interactions.

Our results should be generalized with caution. First, we conducted an online survey asking about users' experiences with IPAs in the context of Amazon's Alexa. Given that the specific features of the IPAs differ slightly across brands (e.g., Apple's Siri and/or Microsoft's

Cortana) (Reis et al., 2018), the results would be different if respondents were asked to share their experiences by using a different IPA device. An interesting extension of our study is to examine whether the relationships proposed in our model would hold true across various types of IPA devices. Second, although people used IPAs for different purposes, for shopping and buying (8%), travel and entertainment (16%), administrative (30%), to miscellaneous (46%), our study could not moderate these effects because the sample size of each classification was not even for an empirical comparison. A future study may test, if the purpose of using IPAs affects the relations depicted in our model. Lastly, our data is based on respondents residing in the U.S. It will be interesting to distribute our model among users in other national and cultural contexts and see if our results hold true or differ.

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Table 1

Measured Items and Confirmatory Factor Analysis Results

Construct	Factor loading	AVE	CR
Para-social presence			
Intimacy	—	.79	.94
I find my Alexa to be very attached in its interactions with me.	.86		
I find my Alexa to be very personal in its responses to, or interactions with, me.	.87		
I feel highly attached to my Alexa.	.91		
I feel close to my Alexa.	.91		
Sense of understanding	—	.77	.94
My Alexa understands what I am trying to do.	.86		
My Alexa understands my goals.	.87		
My Alexa knows me well.	.85		
My Alexa understands what I want.	.89		
My Alexa understands my needs.	.91		
Enjoyability	—	.69	.87
My Alexa is pleasant.	.86		
My Alexa is friendly.	.82		
Using my Amazon Alexa is fun.	.82		
Involvement		.76	.94
My Alexa excites my curiosity.	.80		
My Alexa keeps me absorbed completely in my interactions with it.	.93		
My Alexa holds my attention.	.81		
When using my Alexa, I am completely absorbed in what I am doing.	.90		
When using my Alexa, I am usually deeply involved in my interactions with it.	.91		
Para-friendship			
Self-disclosure	—	.90	.96
If my Alexa was a real person, I would disclose a great many things about myself to him/her.	.95		
If my Alexa was a real person, I would reveal myself honestly and fully to him/her.	.96		
If my Alexa was a real person, I would share my thoughts, fears, and hopes.	.94		
Social support	—	.79	.94
If my Alexa was a real person, I could trust him/her completely.	.86		
If my Alexa was a real person, she or he would be able to count on me in times of need.	.89		
If my Alexa was a real person, I would give him other emotional support.	.89		
If my Alexa was a real person, I would be able to count on him or her in times of need.	.90		
Stickiness intention	—	.91	.97
I plan to keep using my Alexa in the future.	.95		
I intend to continue using my Alexa in the future.	.96		
I expect my use of Alexa will continue in the future.	.95		

Table 2

Correlation Matrix of Variables

Variable of interest	1	2	3	4	5	6	7
1. Intimacy	**.89** [a]						
2. Sense of understanding	.67	**.88** [a]					
3. Enjoyability	.59	.51	**.83** [a]				
4. Involvement	.78	.52	.67	**.87** [a]			
5. Self-disclosure	.59	.50	.48	.54	**.95** [a]		
6. Social support	.57	.61	.58	.50	.75	**.89** [a]	
7. Stickiness intention	.30	.34	.56	.39	.30	.37	**.95** [a]

[a] Square root of average variance extracted (AVE) value for each construct.

Table 3

Structural Model Evaluation and Hypotheses Test Results

Hypothesis	Structural path	β	t-value	Result
H1a	Intimacy → Self disclosure	.29***	3.15	Supported
H1b	Intimacy → Social support	-.02	-0.27	Not supported
H2a	Understanding → Self disclosure	.17***	2.63	Supported
H2b	Understanding → Social support	.25***	4.72	Supported
H3a	Enjoyability → Self disclosure	.12*	1.73	Supported
H3b	Enjoyability → Social support	.26***	4.49	Supported
H4a	Involvement → Self disclosure	.15*	1.67	Supported
H4b	Involvement → Social support	-.08	-1.09	Not supported
H5	Self-disclosure → Social support	.56***	11.31	Supported
H6a	Self-disclosure → Stickiness intention	.02	0.18	Not supported
H6b	Social support → Stickiness intention	.38***	4.32	Supported

Note. *$p < .10$ **$p < .05$ ***$p < .01$.

Table 4

Hypotheses Test Results from the Ordered Probit Model

Variables	**Step 1**									**Step 2**	**Step 3**	
	Dependent variables: Self-disclosure				Social support					Social support	Stickiness intention	
	H1a	H2a	H3a	H4a	H1b	H2b	H3b	H4b		H5	H6a	H6b
Independent variables									*Independent variables*			
Intimacy	0.38*** (0.04)				0.36*** (0.04)				Self-disclosure	0.70*** (0.05)	0.11*** (0.04)	
Understanding		0.33*** (0.05)				0.41*** (0.05)			Social support			0.17*** (0.05)
Enjoyability			0.41*** (0.08)				0.54*** (0.08)					
Involvement				0.43*** (0.05)				0.35*** (0.05)				
Control variables									*Control variables*			
Perceived usefulness	0.17*** (0.06)	0.14** (0.07)	0.18*** (0.07)	0.14** (0.06)	0.26*** (0.06)	0.20*** (0.06)	0.23*** (0.06)	0.25*** (0.06)	Perceived usefulness	0.07 (0.06)	0.61*** (0.07)	0.59*** (0.07)
Usage duration	0.04 (0.07)	0.14** (0.07)	0.15** (0.07)	0.07 (0.07)	-0.02 (0.07)	0.06 (0.07)	0.08 (0.07)	0.03 (0.07)	Usage duration	0.13* (0.07)	-0.06 (0.08)	-0.06 (0.08)
Usage frequency	-0.02 (0.05)	-0.01 (0.05)	-0.04 (0.05)	-0.02 (0.05)	-0.05 (0.05)	-0.03 (0.05)	-0.07 (0.05)	-0.05 (0.05)	Usage frequency	0.01 (0.05)	0.21*** (0.05)	0.21*** (0.05)
Gender (ref = male)	0.06 (0.13)	-0.06 (0.13)	-0.06 (0.13)	0.08 (0.13)	0.14 (0.13)	0.01 (0.13)	0.01 (0.13)	0.14 (0.13)	Gender (ref = male)	-0.06 (0.13)	0.20 (0.14)	0.18 (0.15)
Age	-0.07 (0.06)	-0.01 (0.06)	0.01 (0.06)	-0.07 (0.06)	0.03 (0.06)	0.09 (0.06)	0.11* (0.06)	0.04 (0.06)	Age	-0.07 (0.06)	0.09 (0.07)	0.08 (0.07)
Marital status (ref = single)									Marital status (ref = single)			
DIV	-0.05 (0.28)	-0.08 (0.28)	-0.11 (0.28)	-0.04 (0.28)	-0.13 (0.28)	-0.19 (0.28)	-0.22 (0.28)	-0.12 (0.28)	DIV	0.01 (0.29)	0.12 (0.32)	0.14 (0.32)
MAR	0.05 (0.16)	0.07 (0.16)	0.12 (0.16)	0.06 (0.16)	0.04 (0.16)	0.06 (0.16)	0.10 (0.16)	0.05 (0.16)	MAR	0.07 (0.16)	-0.24 (0.18)	-0.24 (0.18)
OTHER	-0.05 (0.22)	-0.10 (0.22)	-0.01 (0.22)	-0.15 (0.23)	0.32 (0.23)	0.24 (0.23)	0.34 (0.23)	0.22 (0.23)	OTHER	-0.28 (0.23)	0.33 (0.25)	0.26 (0.26)

Ethnicity (ref = others)									Ethnicity (ref = others)			
AA	-0.11 (0.77)	-0.10 (0.77)	0.16 (0.77)	-0.30 (0.77)	-0.51 (0.78)	-0.53 (0.78)	-0.20 (0.78)	-0.62 (0.78)	AA	0.42 (0.78)	0.23 (0.89)	0.32 (0.91)
CAU	-0.14 (0.75)	-0.34 (0.75)	-0.04 (0.75)	-0.41 (0.75)	-0.55 (0.76)	-0.77 (0.76)	-0.38 (0.76)	-0.75 (0.76)	CAU	0.25 (0.76)	0.38 (0.87)	0.47 (0.88)
HIS	-0.16 (0.79)	-0.54 (0.79)	0.09 (0.79)	-0.55 (0.79)	-0.68 (0.80)	-1.14 (0.80)	-0.32 (0.80)	-0.98 (0.80)	HIS	0.32 (0.80)	0.39 (0.91)	0.50 (0.92)
ASI	-0.29 (0.78)	-0.46 (0.77)	0.01 (0.77)	-0.60 (0.78)	-0.84 (0.79)	-1.08 (0.79)	-0.41 (0.78)	-1.05 (0.78)	ASI	0.46 (0.79)	0.43 (0.89)	0.57 (0.91)
HPI	-0.40 (1.00)	-0.59 (0.98)	-0.20 (0.99)	-0.54 (1.00)	-0.40 (0.97)	-0.69 (0.97)	-0.14 (0.97)	-0.48 (0.97)	HPI	-0.19 (1.02)	-0.09 (1.07)	0.00 (1.09)
Education	-0.08* (0.05)	-0.09* (0.05)	-0.07 (0.05)	-0.06 (0.05)	-0.09* (0.05)	-0.11** (0.05)	-0.09* (0.05)	-0.07 (0.05)	Education	-0.05 (0.05)	-0.05 (0.05)	-0.05 (0.05)
Income	0.00 (-0.02)	0.01 (0.02)	-0.01 (0.02)	0.00 (0.02)	0.04 (0.02)	0.05** (0.02)	0.02 (0.02)	0.04* (0.02)	Income	-0.02 (0.02)	0.02 (0.03)	0.02 (0.03)
Constant	0.28 (0.92)	0.50 (0.91)	1.86* (0.96)	0.58 (0.92)	0.33 (0.75)	0.95 (0.75)	1.97** (0.96)	0.16 (0.92)	*Constant*	1.82* (0.94)	1.78 (1.10)	2.10* (1.12)
Goodness of fit	χ^2 (16) =131.47	χ^2 (16) =144.49	χ^2 (16) =86.22	χ^2 (16) =146.35	χ^2 (16) =104.10	χ^2 (16) =127.22	χ^2 (16) =128.70	χ^2 (16) =120.92	Goodness of fit	χ^2 (16) =244.30	χ^2 (16) =156.91	χ^2 (16) =163.06
	Prob > χ^2 =.00	Prob > χ^2 =.00	Prob > χ^2 =.00	Prob > χ^2 =.00	Prob > χ^2 =.00	Prob > χ^2 =.00	Prob > χ^2 =.00	Prob > χ^2 =.00		Prob > χ^2 =.00	Prob > χ^2 =.00	Prob > χ^2 =.00
	Pseudo R^2 = .11	Pseudo R^2 = .13	Pseudo R^2 = .07	Pseudo R^2 = .13	Pseudo R^2 = .09	Pseudo R^2 = .11	Pseudo R^2 = .11	Pseudo R^2 = .10		Pseudo R^2 = .20	Pseudo R^2 = .20	Pseudo R^2 = .21

Notes:

1. Standard errors in parentheses; *$p < .10$ **$p < .05$ ***$p < .01$.
2. Log likelihood test of the hypothesis that all coefficients are jointly equal to zero are rejected at $p < .10$
3. Dependent variables: DIS (Self-disclosure) and SUP (Social support)

Table 5

Group Analysis: High Social Isolation (n = 192) vs. Low Social Isolation (n = 143) Groups

Hypothesis	Independent variable	Dependent variable	Both (n = 335)	High social isolation	Low social isolation
				β	
H1a	Intimacy	Self-disclosure	.38*** (.04)	.51*** (.08)	.32*** (.06)
H2a	Understanding		.33*** (.05)	.33*** (.08)	.34*** (.07)
H3a	Enjoyability		.41*** (.08)	.46*** (.10)	.32*** (.12)
H4a	Involvement		.43*** (.05)	.39*** (.09)	.45*** (.07)
H1b	Intimacy	Social support	.36*** (.04)	.50*** (.08)	.33*** (.08)
H2b	Understanding		.41*** (.05)	.43*** (.08)	.43*** (.07)
H3b	Enjoyability		.54*** (.08)	.72*** (.11)	.39*** (.11)
H4b	Involvement		.35*** (.05)	.33*** (.09)	.39*** (.07)
H5	Self-disclosure	Social support	.70*** (.05)	.74*** (.07)	.71*** (.09)
H6a	Self-disclosure	Stickiness intention	.11*** (.04)	.07 (.07)	.14** (.06)
H6b	Social support		.17*** (.05)	.17*** (.07)	.19*** (.07)

Notes:

1. Standard errors in parentheses; *p < .10 **p < .05 ***p < .01.
2. Log likelihood test of the hypothesis that all coefficients are jointly equal to zero are rejected at p < .10
3. Control variables are the same as defined as Table 4.

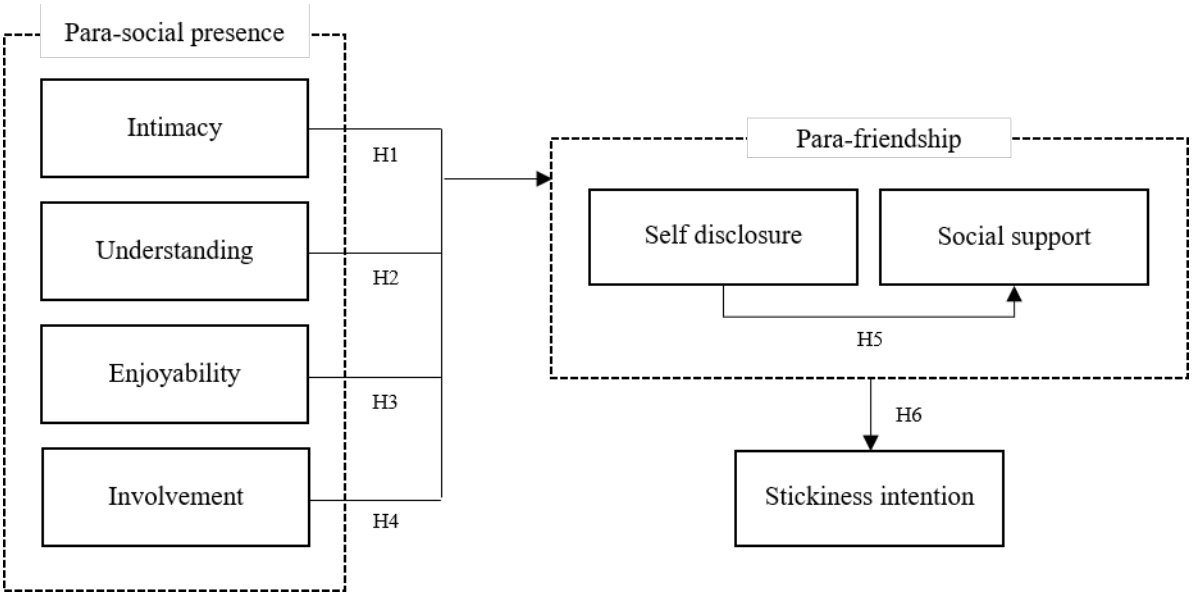

Figure 1. Conceptual Model