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The hard-working virtual agent in the service encounter boosts customer satisfaction

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ABSTRACT

Virtual agents (VAs) are used increasingly as representatives of the firm in retail and service settings – particularly in online environments. Existing studies indicate that the customer's experience is enhanced if VAs resemble humans, which seems to imply that what has been learned over the years in research about the influence of the human employee's behavior on customer satisfaction may be applicable also to VA behavior. This study explores one factor, effort, which has a positive impact on customer satisfaction when it characterizes the human employee in service encounters. Although a VA (i.e., a computer program) cannot experience effort, it was assumed that human sensitivity to other humans' effort, and a tendency to anthropomorphize non-human agents, would make human customers susceptible to effort-expending signals when they interact with a VA. To examine this assumption, data were collected from customers who had been interacting with existing VAs. The results indicate that three specific behaviors (engaging in personal conversation, listening, and display of warmth) boost the customer's perceptions of VA effort, and that perceived VA effort has a positive impact on customer satisfaction.

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The service encounter; customer satisfaction; employee effort; virtual agents

1. Introduction

Many retailers and service firms use various forms of virtual agents (VAs) as the firm's representative in interactions with customers (Henkel et al. 2020; Huang, Rust, and Maksimovic 2019). Such VAs are software systems, not embodied robots, which typically appear in screen-mediated forms (e.g., as chatbots on firms' webpages and as self-service kiosks in store environments), and they can offer service for customers in several ways – such as providing information before and after a purchase. Obviously, this can reduce costs and it contributes to operational efficiency (Castillo, Canhoto, and Said 2021; Henkel et al. 2020; Köhler et al. 2011).

Most firms (and designers of VAs) seem to have assumed that VAs should resemble human employees, because the typical contemporary VA has human features; it may have a name, a human-like face, and a gender. Many existing VAs resemble human employees also when it comes to how they behave in interactions with customers. A typical VA, for

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example, may greet the customer and engage in a conversation involving exchange of turns in speaking and listening. For those who want to develop VA behaviors further, to ensure that what the VA is doing will enhance customer satisfaction, research on what makes the customer satisfied in interactions with *human* employees may be useful. Indeed, such research has identified many behaviors that boost customer satisfaction (e.g., Bitner, Booms, and Tetreault 1990; Winsted 2000).

In the present study, we focus on one particular behavior that has been subject to research when the employee is human: display of effort. That is to say, existing studies show that the perceived effort of the employee in the service encounter is positively associated with customer satisfaction (e.g., Mohr and Bitner 1995; Söderlund and Sagfossen 2017; Söderlund 2018). A VA (i.e., a computer program) cannot experience effort (and cannot get tired after having expended effort), but given a strong tendency for humans to anthropomorphize non-humans (Epley, Waytz, and Cacioppo 2007; Epley 2018), particularly when they are humanlike, it is assumed in the present study that a VA can be perceived as if it is engaging in effortful behavior. The extent to which such effort perceptions would influence customer satisfaction also in a setting in which human customers interact with non-human agents has hitherto not been addressed in the existing literature, and it is this research gap that the present study addresses.

The specific purpose is to examine (1) antecedents to effort perceptions (i.e., what is characterizing the VA when it is perceived as expending effort?) and (2) if perceived VA effort is enhancing customer satisfaction. An examination of these aspects, we believe, serves to explicate the extent to which human behaviors are useful as reference points for the design and 'training' of VAs in encounters with customers. In other words, the examination addresses if characteristics of human employees should be a kind of 'gold standard' for the interactions between human customers and virtual agents that are expected to replace many human frontline employees in the near future.

2. Theoretical framework and hypotheses

2.1 The perceived effort of other humans and VAs

Effort is the amount of energy or force put into a behavior or a series of behavior, while *perceived* effort is the amount of energy an observer believes an actor has invested in a behavior (Mohr and Bitner 1995). When the observer is a customer, perceived effort has been examined in research on advertising (e.g., Modig, Dahlen, and Colliander 2014), logotypes (Baxter and Ilicic 2018), packaging (Söderlund et al. 2017), and service encounters (e.g., Mohr and Bitner 1995; Specht et al. 2007; Söderlund and Sagfossen 2017).

Typically, such studies show that perceived effort influences downstream variables in the observer's processing of information (more about this follows below), which indicates that we humans are sensitive to the effort expended by others. Indeed, we are so sensitive that merely reading about a person who is engaged in an effortful task activates the same brain regions as those involved when we actually carry out the task ourselves. And the levels of the described person's effort (e.g., 'the delivery man has forgotten the piano' vs. 'the delivery man pushes the piano') is mirrored by the levels of our own neural activity (Moody and Gennari 2010).

The sensitivity to others' effort appears to have its roots in a strong distaste to engage oneself in what is effortful. That is to say, people in general are highly effort-aversive (Söderlund and Sagfossen 2017), and given that the self is a dominant source of inferences about other persons (Epley 2018), people are likely to be attentive when others are engaging in effortful behavior. Moreover, this attentiveness is expected to be heightened in situations in which resources are exchanged, because most people want resources to be allocated in a fair way – and others' efforts in exchange situations is one major determinant of fairness (Adams 1963). In tune with this, it has been argued that the effort of others is a core dimension for evaluating the behavior of others (Rollwage et al. 2020).

To what extent, then, would sensitivity to others' effort be at hand when humans interact with non-humans? After all, most of us know that a machine, a computer program, an algorithm, and a VA would not be able to experience effort (at least not in the same way as a human). However, we humans have a strong tendency to anthropomorphize non-humans (Epley, Waytz, and Cacioppo 2007), particularly when such non-humans have features and display behavior that resemble humans (Gong 2008; Martini et al. 2016; Epley 2018). Presumably, similarity in such terms suggests the presence of a mind (Bastian et al. 2012; Urquiza-Haas and Kotrschal 2015), which in turn may imply that a non-human entity is humanlike. It has also been argued that we humans are equipped with evolution-based social responses to other humans – responses that we apply more or less automatically in interaction situations resembling the situations in which they were originally developed (Epley 2018; Westerman, 2020). In other words, an object that is somehow humanlike may automatically – without any explicit beliefs that the object is human or humanlike – be treated as a human (Reeves and Nass 1996). In any event, given a sensitivity to the effort expended by other humans, and anthropomorphization, we assume that customers who interact with a VA in a service encounter setting can ascribe effort to the VA.

2.2 Behaviors that can enhance perceived VA effort in the service encounter

Existing studies have identified several specific behaviors of a human employee in the service encounter that enhance the customer's perceptions of this employee's effort, such as actively helping the customer, spending time with the customer, displaying energy/enthusiasm (Mohr and Bitner 1995); solving problems (Sparks and Bradley 1996); being friendly, showing empathy and attentiveness (Specht et al. 2007); working hard physically and sacrificing sleep to deliver an experiential offer to the customer (Söderlund and Sagfossen 2017); initiating an interaction with customers (Söderlund 2018); and encouraging customer self-disclosure (Söderlund 2020). These behaviors indicate that perceived employee effort can stem from many other activities than those involving hard bodily work.

In the present study, we focus on three social behaviors (engaging in personal conversation, listening, and display of warmth), which have been examined for human employees in service-related studies as antecedents of outcomes such as rapport, trust, liking of a person, and customer satisfaction (e.g., Aggarwal et al. 2005; Fiske, Cuddy, and Glick 2007; Söderlund and Berg 2020). Here, in the present study, however, the main thesis is that these behaviors – when carried out by a VA – are likely to enhance perceived VA effort.

First, engaging in *personal conversation* with the customer means communication with another party in a mode that is oriented towards getting to know the other party rather than being focused on dealing with one particular task. In the marketing literature, this has been seen as a component of personalization and relationship-seeking (Winsted 2000). There is indeed an effort component in conducting a personal conversation, because there are numerous conversational norms to pay attention to. A speaker, for example, is supposed to consider what the listener already knows and to be brief (Skowronski and Walker 2004; Westerman et al. 2020). Moreover, a conversation does not normally consist of a succession of disconnected remarks; the content is a function of cooperative efforts, calling on the participants to recognize a common purpose – which may or may not exist from the start (Grice 1975). This thus adds further effort to carrying out a conversation.

Second, *listening* to the customer goes beyond merely hearing what another person is saying and is something that requires unique skills (Ramsey and Sohi 1997). It comprises the process of actively sensing, interpreting, evaluating, and responding to the customer (Castleberry and Shepherd 1993; Castleberry, Shepherd, and Ridnour 1999). Listening to customers along such lines, in effect, is about taking the marketing concept seriously (i.e., determine the needs of the customers and adapt to them) at the micro level, and it is a component of what it means to be customer-oriented (Saxe and Weittz, 1982). In any event, it can be effortful for an employee to practice effective listening in a service encounter: listening is a proactive process of seeking information (Castleberry, Shepherd, and Ridnour 1999), which demands understanding, evaluating and remembering what the customer says (Castleberry and Shepherd 1993).

Third, employee display of *warmth* in relation to the customer comprises being friendly, polite, helpful, and nice (Fiske, Cuddy, and Glick 2007). Such characteristics signal that a person can be approached (instead of being avoided), which in turn seems to have an important evolutionary function (ibid.). However, being approached or not by others can have significant consequences for an individual, which suggests that there is an effort component also in the display of warmth. For example, from the point of view of a person in a social setting, to be approached or avoided by another person can have both immediate and long term valenced consequences, meaning that one has to engage in thinking about how much warmth to display. In addition, according to politeness theory (Brown and Levinson 1987), to be polite typically comprises finding various indirect expressions that do not threaten the freedom of the other party (e.g., 'try on the shoes now' is less polite than 'it is indeed possible to try on the shoes'), which presumably requires more thoughts and thus more cognitive effort than a direct (and less polite) approach.

In more general terms, engaging in personal conversation, listening, and displaying warmth are social behaviors that demand two fundamental human capabilities, namely agency and emotionality (Haslam et al. 2008). Not much effort is needed for a human to acquire these capabilities, but it is difficult or (currently) impossible for a VA to acquire them. Yet these capabilities are not enough for successful social behavior. Personal conversation, listening and display of warmth require an understanding that also a counterpart in a social situation has agency and emotionality. This understanding is often referred to as 'mentalizing', theory of mind, and mindreading (Gallagher and Frith 2003; Heyes and Frith 2014; Martini et al. 2016). It also involves recognizing the possibility

that the content of the counterpart's mind can be different from our own (Gallagher and Frith 2003). This is what Dennett (1983) labels a second-order system. For instance, a personal conversation requires taking into account another person's agency; genuine listening to another person becomes impossible if it is not built on the premise that the other person has agency and is likely to experience emotions if goals are reached or not reached; and to display warmth without any thoughts about what this does to the other person's intentions and emotions would be odd. Although little effort is involved for humans when it comes to understanding agency and emotionality in relation to the self, more effort is needed to assess these two aspects with respect to another person. That is to say, it can be cognitively taxing to try to get inside the mind of another person (Epley and Waytz 2010; Waytz, Klein, and Epley 2013). In other words, reasoning about others' minds is not a default state; it is a tool that we humans must be motivated to use because it requires effort (Epley, Schroeder, and Waytz 2013). Or, as stated by Heyes and Frith (2014), learning to read others' minds is a long, hard, and slow process.

However, to really master personal conversation, listening, and display of warmth in a social setting, an agent would need to understand that the counterpart has theory of mind, too. In Dennett's terminology, this is a third-order system (Dennett 1983). Even higher orders are possible, and they might be needed for truly social behaviors. For each such order, however, cognitive effort increases. It even becomes effortful just to write and read sentences like this: 'I think that the VA understood that I understood that the VA was just pretending to be nice, but the VA continued to be nice anyway, because it understood that I felt that this was appropriate in an exchange in which the VA understood that I understood that the main purpose was to sell a product'.

Current VAs, however, do not have agency and emotionality, and they do not have higher order systems involving such capabilities. This can be illustrated with the problems agents powered by artificial intelligence run into when it comes to some so-called Winograd questions, which are used to assess the capabilities of non-human agents (Levesque 2014). One such question is this: 'Joan made sure to thank Susan for all the help she had given. Who had given the help – Joan or Susan?' The answer is obvious to most humans, because we understand that Joan probably is happy for the help she has received (Joan has emotionality), that Susan's help to Joan probably was based on a decision by Susan to help Joan (Susan has agency), and that Susan may have predicted that Joan would be happy (Susan has a theory about Joan's mind). In any event, without agency and emotionality, and higher order systems involving these capabilities, it becomes very difficult for a VA to engage in fully human-like personal conversations, listening activities and expressions of warmth. Therefore, it is not surprising that current VAs are underperforming as conversationalists (Gnewuch, Morana, and Maedche 2017). Small talk without any particular aim appears to be particularly difficult for VAs (Vlahos 2018). Nevertheless, a VA can be programmed to *display* behaviors so that they resemble what humans do when they are engaged in the same behaviors. When the VA does this, and given the complexity involved in mastering the behaviors – not only for a VA, but also for a human – it is assumed in the present study that a VA engaging in personal conversation, listening and expressing warmth in relation to a customer in a service encounter would enhance customers' perceptions of VA effort. The following, then, is hypothesized:

H1: VA engagement in personal conversation with the customer is positively associated with perceptions of VA effort

H2: VA engagement in listening to the customer is positively associated with perceptions of VA effort

H3: VA engagement in displaying warmth in relation to the customer is positively associated with perceptions of VA effort

2.3. Perceived VA effort and customer satisfaction

A main assumption in the present study is that perceived employee effort has a positive impact on the overall evaluations of the employee. One reason is that employee effort signals confidence, commitment (Modig, Dahlen, and Colliander 2014), motivation (Mohr and Bitner 1995) and dedication (Baxter and Ilicic 2018), and these factors typically have a positive influence on consumers' overall evaluations. Another possible mechanism is that we humans in general feel that others have a moral responsibility to work hard, and that we reward those who indeed do so with positive emotions (Morales 2005). Then, in the next step, such emotions could color overall evaluations in a valence-congruent way (Forgas, 1995).

Similarly, in a commercial setting, customers are likely to believe that it is fair when employees engage in effortful activities vis-à-vis the customer (Oliver and Swan 1989), and perceptions of another person's fairness can influence overall evaluations of the person. For example, a customer who pays for an offer to be delivered to him or her, and who finds that an employee (whose salary indirectly stems from customers' money) is expending little effort on the offer, is likely to evaluate the employee negatively because of an unfair imbalance between the inputs and outputs of the customer and the employee.

In empirical terms, several studies have identified a positive association between perceived (human) employee effort and outcome variables such as joy (Barnes et al. 2016), delight (Collier et al. 2018), satisfaction with respect to the employee (Mohr and Bitner 1995; Sparks and Bradley 1996), and satisfaction with the firm that the employee represents (Söderlund 2018). Given again the easiness with which non-human agents can be anthropomorphized, we expect that the effort–evaluation association would materialize also for a VA in a service encounter:

H4: Perceived VA effort in a service encounter is positively associated with customer satisfaction

H1-H3 combined with H4 implies that effort-enhancing VA behaviors can have an indirect influence on customer satisfaction (i.e., the influence of the behaviors is mediated by perceived VA effort). To examine this possibility explicitly, the following is hypothesized:

H5: The influence of personal conversation, listening, and display of warmth on customer satisfaction is mediated by perceived VA effort

3. Research method

3.1 Data collection approach and participants

Participants who had interacted with a VA, defined as 'a computer-generated character, sometimes powered by artificial intelligence, which provides customer service', were invited to the study. The participants were instructed to think about one specific encounter in the past when they – as consumers – had been interacting with a VA that was representing a firm. Then, the participants were asked what firm the selected VA represented, where they had interacted with the VA, and for what task the interaction took place. This was followed by questions designed to capture the variables in the hypotheses (i.e., the participants were instructed to respond to these items with respect to the selected VA). The participants (n = 110; M_{age} = 23.05, 34 percent were males) were recruited from bachelor and master courses in business administration in two Northern European countries. The data were collected in 2019. The main rationale behind using a (non-random) student sample was that the present study is an attempt to test hypotheses derived from theory and that a random sample is not necessary for testing general theoretical propositions (Calder, Phillips, and Tybout 1982, 1983). As for the selected VAs, the majority of the interactions took place on a webpage (n = 80) and the VAs represented a wide range of firms such as banks, software companies, airlines, insurance companies and online retailers.

3.2 Measures

All measures of the variables in the hypotheses comprised at least three items, 10-point scales were used for each item, and the measures were assessed in terms of Cronbach's alpha (CA), composite reliability (CR), and average variance extracted (AVE). The outcomes are reported in Table 1. Discriminant validity was assessed with the heterotrait-monotrait method (all ratios were < .60).

The behavior variables with a hypothesized potential to enhance perceived VA effort were measured with scales developed for this study (1 = do not agree at all, 10 = agree completely). *Personal conversation* was assessed with the items 'The virtual agent engaged in small talk with me', 'I had a personal conversation with the virtual agent', and 'It felt as if the virtual agent was interested in getting to know me'. For *listening*, we used the items 'The virtual agent listened to what I had to say,' 'The virtual agent was interested in what I was saying,' and 'The virtual agent really tried to understand what I said'. *Warmth* was measured with the items 'The virtual agent was friendly in the encounter', 'The virtual agent was polite', 'The virtual agent was nice in the interaction' and 'The virtual agent was behaving in a warm way'.

Table 1. Properties of the measures of the variables in the hypotheses.

Variable	Cronbach's alpha	Composite reliability	Average variance extracted
Personal conversation	.84	.91	.76
Listening	.88	.93	.81
Warmth	.90	.93	.77
Perceived VA effort	.84	.91	.76
Customer satisfaction	.89	.93	.82

The items for *perceived VA effort* (1 = do not agree at all, 10 = agree completely) were 'The virtual agent was working hard to take care of me', 'The virtual agent expended a lot of effort to help me', and 'The virtual agent really had to "walk an extra mile" in the encounter'. Similar items have been used in studies of perceived effort of human employees, for example, Barnes et al. (2016), Oliver and Swan (1989), Söderlund and Sagfossen (2017), and Söderlund (2018). In the present study, however, we used them for perceptions of non-human effort. To assess the extent to which it is reasonable to use items from the human realm for non-humans, and for a fundamentally human characteristic, we assumed that the more a non-human is anthropomorphized, the more reasonable it would be to ascribe effort to the non-human. Hence, we included a measure of perceived humanness from Söderlund and Oikarinen (2021) comprising the items 'The virtual agent behaved very much like a human', 'The virtual agent was humanlike', and 'The virtual agent acted like humans typically do' (1 = do not agree at all, 10 = agree completely; CA = .92, CR = .94, AVE = .85). The effort variable and the humanness variable were positively and significantly correlated ($r = .48$, $p < .01$), which indicates that the perceived effort measure makes sense in a non-human context.

Finally, *customer satisfaction* was measured with Fornell's (1992) three satisfaction items. Adapted to the present VA interaction context, the items were worded as follows: 'How dissatisfied or satisfied are you with the virtual agent?' (1 = very dissatisfied, 10 = very satisfied), 'To what extent did the virtual agent meet your expectations?' (1 = not at all, 10 = totally), and 'Imagine a virtual agent that is perfect in every respect. How near or far from this ideal did you find the virtual agent?' (1 = very far from, 10 = cannot get any closer). As a validity check, and given that customer satisfaction in general is positively associated with repatronize intentions and word-of-mouth intentions, the participants were asked about these two aspects ('How likely is it that you would interact with the virtual agent again?' and 'How likely is it that you would recommend this virtual agent to people you know?'; both items were scored as 1 = very unlikely and 10 = very likely). The satisfaction variable was positively and significantly associated with both the repatronizing variable ($r = .56$, $p < .01$) and the word-of-mouth variable ($r = .64$, $p < .01$), which indicates that the measure of customer satisfaction performed as intended from a predictive validity point of view.

4. Analysis and results

The hypotheses were tested with a structural equation modelling (SEM) approach (SmartPLS 3.0 was used). The main rationale behind a SEM-based approach, given the set of hypotheses in the present study, is that it allows for testing all the hypotheses simultaneously (rather than assessing individual associations in isolation) and it does so by taking measurement errors into account (Sarstedt et al. 2020). The proposed model in this assessment comprised the hypothesized H1-H4 associations. Overall, the estimated model had a good fit with the data; SRMR = 0.07 (cf. Nitzl, Roldan, and Cepeda 2016). The path coefficients are reported in Table 2.

Each hypothesized antecedent to perceived effort was significant, which provides support for H1-H3. Overall, the three behaviors explained 38 percent of the variation in perceived VA effort. Moreover, there was a significant association between perceived VA effort and customer satisfaction, thus providing support for H4 ($R^2 = .14$). In the present

Table 2. Path coefficients in the proposed model.

Path	*b*	*t*	*p*
H1: Personal conversation – Perceived VA effort	0.28	3.49	< .01
H2: Listening – Perceived VA effort	0.32	4.02	<. 01
H3: Warmth – Perceived VA effort	0.25	2.92	< .01
H4: Perceived VA effort – Satisfaction	0.37	3.88	< .01

study, this latter association was stronger than in the human-to-human encounters examined in Söderlund and Sagfossen (2017) and Söderlund (2018). At the same time, however, the relatively low level of explained satisfaction variance (i.e., 14 percent) is in tune with the literature on service encounters in which many other factors than effort have been identified as antecedents to customer satisfaction (cf. Winsted 2000).

The mediation hypothesis, H5, was assessed within the frame of the proposed model, and with SmartPLS, as recommended by Nitzl, Roldan, and Cepeda (2016) and Sarstedt et al. (2020). For each hypothesized antecedent to perceived VA effort, we added a direct link between the antecedent and customer satisfaction (to be able to control for direct effects and, if the indirect links are significant, to assess the type of mediation). With this approach, as in the perhaps more familiar Hayes (2012) PROCESS approach, mediation is at hand if there is a significant indirect effect between an independent variable and a dependent variable. This, in turn, is indicated by the confidence interval for the coefficient for the indirect effect (it should not comprise a zero). Nitzl, Roldan, and Cepeda (2016) recommends a biased-corrected confidence interval for the assessment, so this is what we used. This analysis showed that there was a significant indirect effect of engaging in personal conversation ($b = 0.09$), listening ($b = 0.10$), and display of warmth ($b = 0.08$) on customer satisfaction at the 5 percent level of significance. None of the direct effects of these behaviors on customer satisfaction was significant, so it can be contended that full mediation was at hand (Zhao, Lynch, and Chen 2010). Taken together, then, H5 was supported.

5. Discussion

5.1 Contributions

The purpose of the present study was to examine (1) antecedents to effort perceptions (i.e., what is characterizing the VA when it is perceived as expending effort?) and (2) if perceived VA effort is enhancing customer satisfaction in a setting in which human customers interact with VAs. The findings indicate that perceived VA effort is boosted when VAs engage in personal conversation, listening, and display of warmth vis-à-vis customers, and that perceived VA effort is positively associated with customer satisfaction. These findings contribute to the existing literature in several ways.

First, existing research on humans' interactions with non-human agents in commercial settings is typically based on assumptions of anthropomorphization (Epley, Waytz, and Cacioppo 2007; Epley 2018). One aspect of the anthropomorphization of a non-human agent is to ascribe mind to this agent, and it has been acknowledged that this can require effort for the sense-maker (Epley and Waytz 2010). Research on services powered by

artificial intelligence has also acknowledged that it can be effortful for the customer to use them (e.g., Ameen et al. 2021). To the best of our knowledge, however, existing research on VAs (and embodied robots) has not yet considered the possibility that such non-human agents may be perceived by the customer as effort-expending agents. We see this as a deficit in existing research, because to be able to experience effort – and to perceive that others do that, too – is a fundamental human characteristic. In relation to this, it should be observed that it is often stated that we humans have five senses (i.e., sight, hearing, taste, smell and touch). Scientific literature, however, recognizes effort as a (proprioceptive) sense, which is characterized by feelings of exertion (Sagfossen, Söderlund, and Ahlbom 2018). This is indeed a very human feeling; machines, robots, algorithms, and computer programs do not have this sense. Nevertheless, in the light of how easy we humans anthropomorphize non-humans, so that we ascribe them numerous human characteristics, it is perhaps not so surprising that we can perceive that VAs are engaging in effortful activities. In any event, the present study contributes to the literature on humanizing and anthropomorphizing non-human agents with the finding that effort can be ascribed also to non-humans. Moreover, the present study was based on existing literature comprising the effects of the human employee's effort in service encounters. The number of such studies, however, has hitherto been low (e.g., Mohr and Bitner 1995; Söderlund and Sagfossen 2017; Söderlund 2018) and a clear typology of employee behaviors that enhance the customer's effort perceptions is yet to be developed. Given the observation that studies of humans' interactions with (humanlike) non-humans may be informative for developing theory about a human-to-human setting (Broadbent 2017), the present study can also be seen as (at least indirectly) contributing to the literature on the antecedents of perceived (supplier-related) effort in service and retail settings when humans interact with humans.

Second, the main dependent variable in the present study was customer satisfaction. It has a dominant role in research on (human-to-human) service encounters and much effort has been devoted to develop theory about its antecedents and consequences. To date, however, customer satisfaction has seldom been assessed as a downstream variable in existing research on reactions to VAs and service robots (Söderlund and Oikarinen 2021). Typically, various other dependent variables (e.g., trust, attractiveness, and liking) are used – without explicit attempts to link them to a wider nomological net. The use of customer satisfaction in the present study should therefore be seen as an attempt to contribute to research on VAs in such a way that outcome variables are aligned with existing theories. In addition, those who develop and use VAs in their business are likely to be concerned with cost and revenue issues, and research on reactions to VA's may be considered more relevant by practitioners if the selected outcome variables indeed have implications for costs and revenues. In this sense, customer satisfaction may have an advantage, because the link between customer satisfaction and the firm's performance has been subject to many assessments since the beginning of the 1990s (e.g., Fornell 1992).

Third, many previous studies have utilized researcher-created VAs as representatives of fictitious companies (e.g., Araujo 2018; Go and Sundar 2019; Sheehan, Jin, and Gottlieb 2020; Verhagen et al. 2014). The present study extends such research by inviting participants who had been interacting with bona fide VAs in encounters with various firms. The empirical part of the study, then, was an attempt to capitalize on customers' personal

experience of existing VAs. Indeed, VAs are already employed by many firms, and they have been around in commercial settings for several years, so the present study contributes to the existing literature by an examination of VAs in their natural habitat.

5.2 Managerial implications

The findings in the present study imply that firms using VAs for their customer contacts would be rewarded with higher customer satisfaction if the VAs are designed so that their activities are perceived as effortful. This is consonant with a general assumption that VAs, as well as artificial intelligence in general, should be made to be humanlike to make humans more comfortable in their VA interactions (Gong 2008; Westerman et al. 2020). The present study has also identified that engaging in personal conversation, listening, and display of warmth can boost perceived VA effort, and they can be used as a point of departure by VA designers who want their VAs to be perceived as engaging in effortful behavior.

However, managers should be mindful about a potential downside of deliberately boosting perceived VA effort with such behaviors. As already indicated, these behaviors imply agency. And agency, in turn, implies responsibility (Puzakova, Kwak, and Rocereto 2013). Given that people's willingness to punish a human wrongdoer is stronger when he or she is seen as responsible for a negative outcome (ibid.), it may be expected that a VA perceived as exerting effort would evoke stronger negative reactions from customers when performance is poor. Indirect evidence pointing in this direction exists in studies of anthropomorphization of brands. For example, anthropomorphized brands evoke stronger negative reactions to price increases (i.e., a negative outcome for customers) and to product failures (Kwak, Puzakova, and Rocereto 2015; Puzakova, Kwak, and Rocereto 2013). Such brands may also reduce the customer's willingness to provide feedback to the brand when performance is low (Hydock, Chen, and Carlson 2020). This thus implies that a VA perceived as engaging in effortful activities may produce stronger negative reactions – and less feedback about them – when service failures occur.

5.3 Limitations and suggestions for further research

The present study examined perceived VA effort with a focus on the perceived effort of individual VAs, which is the same approach as in several studies of the perceived effort of human employees (e.g., Mohr and Bitner 1995; Söderlund and Sagfossen 2017). However, some studies have examined perceived effort in a more abstract sense – such as the perceived effort of the firm that is the sender of an advertising message (Modig, Dahlen, and Colliander 2014) and the effort of a brand (Baxter and Ilicic 2018). This abstract aspect of perceived effort should be examined in further studies to establish if distinctions need to be made between the effort of VAs per se and the firms that design and use them.

More research is also needed to determine the extent to which VA effort is perceived to be different or similar to the effort of humans. For example, a human who expends effort will eventually be tired. And when this human rests, he or she will hopefully regain energy. Presumably, getting tired and needing rest will add to the perceived humanness of non-human agent. Indeed, some developers of robots even design them to simulate tiredness, so that they appear less stilted and are more comfortable for people to be around (Evand 2015). Little is known, however, about perceptions of getting tired and the need for rest when it

comes to non-human agents, and such research would illuminate differences and similarities between human effort and VA effort. As an extension of this and given that VAs can be perceived as having theory of mind (i.e., they understand that their human counterpart has agency and emotionality), VAs may also be perceived as capable of understanding the effort levels of their human counterparts. This issue is explored indirectly in research on embodied robots, in the sense that it is viewed as important that robots collaborating on tasks with humans are able to sense when humans get exhausted (e.g., Peternel et al. 2018). In any event, recognizing that an agent is not only expending effort, but may also be able to understand when its counterpart is doing so, would enrich research on VA effort-related issues.

With respect to antecedents of perceived VA effort, the present study included a limited selection of VA behaviors that influenced perceived VA effort (and, in the next step, customer satisfaction). Thus, further research is needed to examine additional behaviors with the potential to boost perceived VA effort. The existing literature on what makes human employees appear as expending effort may be used as a point of departure (e.g., Mohr and Bitner 1995; Sparks and Bradley 1996; Specht et al. 2007; Söderlund and Sagfossen 2017). Research along such lines should also make attempts to address in empirical terms why this or that VA behavior is likely to boost perceived VA effort. In the present study, it was assumed that the included behaviors involve cognitive effort related to mindreading, yet this should be explicitly assessed in further studies. Existing research (on perceptions of human effort) indicates that the time spent on a task (such as helping a customer or developing a product) is likely to signal effort, so one specific aspect to explore in further studies is the relationship between time spent and mindreading as potential mediators between VA behaviors and perceived VA effort. For example, is perceived VA mindreading contributing to perceived VA effort when the time a VA spends in a conversation with a customer is controlled for?

What was just suggested above, regarding the exploration of additional VA behaviors, however, reflects a highly anthropocentric perspective. Further research on what boosts perceived VA effort in the service encounter may therefore benefit from a perspective open to factors that do not stem directly from what is humanlike, because eventually the day may come when the customer is a VA, too – as depicted in discussions of internet of things (Ritzer 2015). And this type of customer may not be susceptible to another VA's effort.

In addition, when richer theories are developed of factors that boost perceived VA effort, it may be beneficial if it is recognized that theory is not only about articulating systematic reasons for a particular occurrence; theory should also have something to say about reasons for nonoccurrence (Sutton and Staw 1995). This means that further theory-developing research is needed to identify VA behaviors that do *not* boost perceived VA effort. Such research is likely to not only increase our understanding of VA behavior in service encounters; it may also illuminate the (current) boundary between real humans and non-humans that are humanlike.

Further research is also needed on what may moderate the associations examined in the present study. For example, are there conditions in which the impact of perceived VA effort on satisfaction would be reduced or strengthened? It seems as if perceived task difficulty (for a VA) could be a moderator of this type. Presumably, the less difficult a task is, in the eyes of the customer, the more odd it would be if a VA expends substantial effort on executing it, so low task difficulty may weaken the association between perceived effort and satisfaction. Task importance (for the customer) may also be a moderator; if task

importance is high, the impact of perceived effort on satisfaction may be stronger than in situations in which task importance is low. It has also been suggested that the ambiguity of an offer, in terms of how easy or difficult it is to ascertain its quality, may moderate the impact of perceived effort on evaluations. That is to say, a high level of ambiguity is likely to increase the causal potency of perceived effort as an antecedent to quality perceptions (Kruger et al. 2004).

It should also be noted that the VA behaviors examined in the present study were focused on what the VA was (perceived as) doing in relation to the customer. Thus, the behaviors do not explicitly capture VA behaviors vis-à-vis its own organization and its (human) members. Several authors, however, have stressed that the VAs of the future may augment rather than substitute human service employees (e.g., Castillo, Canhoto, and Said 2021; Henkel et al. 2020). This means that customers are likely to become engaged in service encounters in which they interact with both VAs and human employees, which in turn may make salient VA behaviors related to cooperation with human employees. To cooperate with others can indeed demand effort, so further studies should explore the extent to which perceived VA effort in relation to its human colleagues could boost VA perceived effort (and, in the next step, customer satisfaction).

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