Emotional Support from a Digital Assistant in Technology-Mediated Services: Effects on Customer Satisfaction and Behavioral Persistence

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ABSTRACT

In their traditional role, digital assistants in technology-mediated services provide customers with information, guidance, and suggestions. However, as the opportunities offered by technology and artificial intelligence increase, digital assistants can also provide emotional support, which refers to empathetic, reassuring expressions for customers who have failed or succeeded in fulfilling a task. We show across four experiments that emotional support offered by a digital assistant increases customer satisfaction (Study 1 and 2) and persistence (Study 3 and 4) in using technology-mediated services. The increase in satisfaction occurs via the perceived warmth of the digital assistant, and the increase in persistence via the serial mediation of perceived warmth and satisfaction. Further, the results of a moderated serial mediation show that the effect on persistence only occurs when a digital (but not when a human) assistant provides emotional support in technology-mediated services. Finally, the effect of emotional support on persistence occurs independently of the digital assistant's embodiment. Practitioners learn how to imbue technology-mediated services with a human touch, inducing favorable customer outcomes.

Keywords: Emotional support, digital assistants, perceived warmth, customer satisfaction, persistence

1. Introduction

Technology-mediated services offer multiple benefits such as immediate exchange, convenience, easy access, or 24/7 availability. Given the lack of interpersonal interactions, providers of these services face the problem of offering appropriate support and assistance to their customers (van Birgelen, de Ruyter, de Jong, & Wetzels, 2002). Support and assistance are particularly important when technology-mediated services entail customers undertaking challenging tasks such as losing weight with a diet app, learning a language with an online tool, or playing an online brain-training game.

Recent service literature raises the question of how to offset a lack of human support in technology-mediated services (Larivière et al., 2017; Rafaeli et al., 2017). One solution is to imbue e-services with an automated social presence (ASP) that makes users feel another social entity is present, for example, by embedding a digital agent into the service (van Doorn et al., 2017). This agent helps users by providing advice and information either while on the task (Kim, Chen, & Zhang, 2016) or in the form of feedback on task fulfillment (Fox et al., 2015).

The social support literature defines this help as instrumental support, which helps individuals to cope with stressful situations (Lazarus & Folkman, 1984). However, a second form of social support—emotional support—may also play a salient role in serving this purpose. Emotional support is defined as the empathy and reassurance provided by others (Dunkel-Schetter, Folkman, & Lazarus, 1987; Menon & Dubé, 2007), and comprises feelings of pity and of feeling sorry for people in aversive situations, as well as feelings of happiness and pride for those in favorable situations (Ortony, Clore, & Collins, 1988). Prior research has shown that emotional support from other humans reduces stress (Duhachek, 2005) and enhances well-being (Hill, 1991), service evaluations (Menon & Dubé, 2007), as well as persistence in problem-solving (Turner et al., 2013).

While instrumental support from digital assistants is well-known (Holzwarth, Janiszewski, & Neumann, 2006; Ng & Wakenshaw, 2017), little is known about what happens when digital assistants provide emotional support. As companies move from digital agents that only provide information to those that are emotionally intelligent (Huang & Rust, 2018), the following research question becomes crucial: Does the emotional support from a digital assistant in a technology-mediated service improve customer satisfaction and persistence in the task?

We contribute to the marketing literature as follows. First, we may be the first to show that emotional support, coming as empathetic and reassuring feedback from a digital assistant, improves customer outcomes. As an attitudinal outcome, we consider customer satisfaction as a success criterion for technology-infused (van Birgelen et al., 2002) and digital service encounters (Kannan & Li, 2017). As a behavioral outcome, we use persistence in using the technology-mediated service because it predicts the purchase of future releases (e.g., of online games) (Reichheld & Schefter, 2000) and it is a success criterion of customer profitability (Kannan & Li, 2017).

Second, we extend the established findings on the merits of emotional support in negative offline service experiences (Menon & Dubé, 2007) to success situations, thus accounting for the realities in technology-mediated service usage. This usage often involves challenging tasks where users both fail and succeed (e.g., taking 10,000 steps to be tracked with a fitness app) and multiple tasks where feedback is repeatedly given (e.g., in a language-learning app).

Third, we explore the mechanisms responsible for the effects of emotional support on the two customer outcomes. Our core argument evolves from the warmth–competence model of social perception (Fiske, Cuddy, Glick, & Xu, 2002) that proposes that emotional support increases satisfaction through perceptions of warmth, and that satisfaction, in turn, fosters persistence (emotional support → warmth → satisfaction → persistence). In showing these mechanisms, we extend the sources of perceived warmth: Empathetic, reassuring expressions from non-human

agents, not only from real people, can also be perceived as warm. Thus, warmth can be detached from the presence of human employees and can be created even in e-services.

Fourth, we compare the effect of empathetic, reassuring feedback coming from a digital assistant to that of a human assistant. We show that, in a digital service, emotionally supportive feedback from a digital agent is more effective to induce perceptions of warmth than the same words coming from a human agent. To the best of our knowledge, we are the first to make such a comparison, and we show that imbuing a digital agent with an empathetic demeanor can compensate for a lack of human employees in technology-mediated services.

Fifth, we consider a potential contingency, that is the embodiment of the digital agent, with prior research showing both positive (Qiu & Benbasat, 2009) and negative effects on customers (Kim et al., 2016). We show that depicting the digital agent is not necessary for the positive effects of emotional support to occur, thus providing practical guidance to service firms.

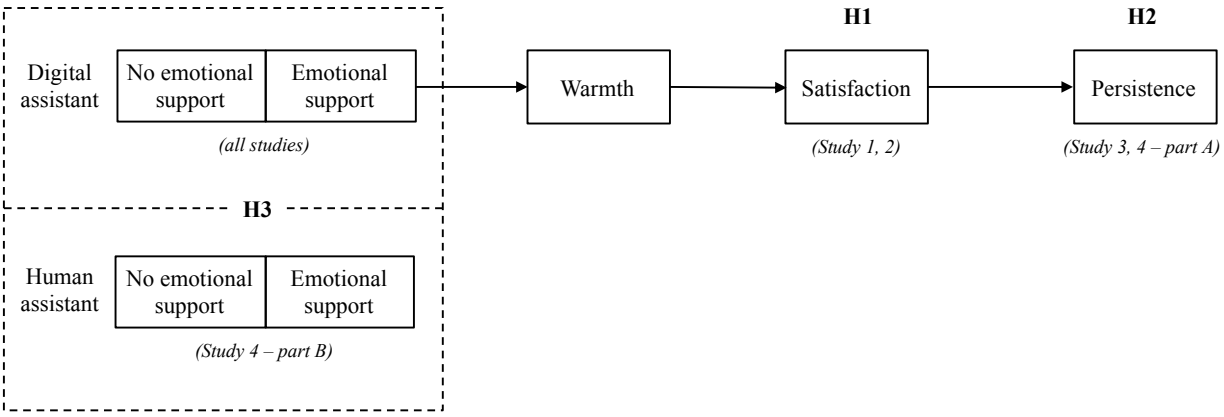
Finally, we provide service managers with an easy-to-implement feature that adds a social touch to human–machine interactions and makes customers satisfied with and attached to the technology-mediated service.

2. Conceptual background and hypotheses

2.1. Conceptual model

Fig. 1 shows our conceptual model. At the core of this model are the effects of emotional support from a digital assistant on customer satisfaction and persistence. Further, we propose that the effect on satisfaction is mediated by warmth (H1) and the effect on persistence is serially mediated by warmth and satisfaction (H2). Finally, we hypothesize that assistant type (human vs. digital) moderates the effect of emotional support on persistence through the serial mediation of perceived warmth and satisfaction (H3).

Figure 1. Conceptual framework.



2.2. The concept of emotional support

The coping literature investigates how people in stressful situations seek support from others (Lazarus & Folkman, 1984), distinguishing between instrumental and emotional support seeking (Carver, Scheier, & Weintraub, 1989). Although both coping strategies aim to reduce stress and negative emotions (Duhachek, 2005), the mechanism is different. Instrumental support seeking spurs on an objective change through receiving information and advice about what to do; emotional support seeking is about improving one's mental state (Carver et al., 1989) through receiving expressions of empathy and concern from others (Dunkel-Schetter et al., 1987; Hill, 1991). Yet, Menon and Dubé (2007) point out that emotional support goes beyond mere empathy and understanding: It shows affiliation and reassurance and, as such, comprises a motivating component that helps receivers to manage their emotions. Based on these notions, we define emotional support as providing empathetic and reassuring expressions deemed to help people in managing their emotions.

There is ample empirical evidence that both seeking and receiving emotional support reduces stress (Dunkel-Schetter et al., 1987) and increases mental well-being (Hill, 1991), life quality (Yao, Zheng, & Fan, 2015), and satisfaction (Pohl & Galletta, 2017). Prior marketing research has also

documented the positive effects of emotional support from human beings, be they frontline employees or co-consumers, on voluntary customer behavior (Rosenbaum & Massiah, 2007) and co-production activity (Temerak, Winklhofer, & Hibbert, 2018). Emotional support can also increase customer satisfaction with a firm (Zhu, Sun, & Chang, 2016), or with a service that enables emotional support (Rosenbaum, 2006).

Yet, receiving empathy is not limited to problems and failure situations; it generally refers to understanding another person's situation (Carr, Iacobini, Dubeau, Mazziotta, & Lenzi, 2003), whether negative or positive (Krebs, 1975). Accordingly, empathetic emotions entail "sorry-for" (e.g., sad-for, pity) utterances, expressed in undesirable situations, and "happiness-for" (e.g., happy-for, pride-for) utterances, expressed in desirable situations (Ortony et al., 1988). Receiving empathetic, reassuring expressions in these situations can evoke positive emotions such as pleasure or happiness (Delin & Baumeister, 1994) and increase life satisfaction (Stevic & Ward, 2008).

2.3. The positive effect of emotional support on satisfaction, mediated by warmth

We reason that the emotional support from digital agents can also exert positive effects on customer satisfaction. Conceptual (van Doorn et al., 2017) and empirical work (Fang, 2017) shows that customers are able to perceive a social presence in digital systems when the technology is imbued with a human touch. Accordingly, customers may also accept—and lean on—empathetic expressions within a digital system, even though they come from digital agents, which may increase their satisfaction with the service. This effect may occur through perceived warmth, a dimension of social perception. When a digital assistant is present in a human–technology interaction, customers may relate to this non-human object in a similar way in which they relate to people. Reeves and Nass (1996) show that people answer socially to technology that "interacts" with them; that is, they tend to act with computers and technology almost like they do with human beings, and

they hold expectations of them that resemble those they hold regarding human beings. For example, the overt actions of a computer system (e.g., giving feedback on task fulfillment) stimulate inferences about the motivations and the feelings of the object (Fournier & Alvarez, 2012) (e.g., "the computer helps me to improve my skills"), leading people to engage in social behaviors such as politeness and reciprocity toward computers (Nass & Moon, 2000). In other words, people tend to apply interpersonal models of social perception and behavior in human–technology interactions (van Doorn et al., 2017), a phenomenon that has also been shown for other non-human objects such as brands (Aaker, Garbinsky, & Vohs, 2012) and firms (Bolton & Mattila, 2015).

Accordingly, we refer to theories of social perception that claim that individuals assess other people on two fundamental dimensions: warmth and competence (Fiske et al., 2002). Warmth captures traits related to the social object's perceived intentions, including, for example, trustworthiness, sincerity, and friendliness. Competence relates to the social object's perceived ability, including intelligence, skills, and efficacy. Although the two dimensions coexist, prior research shows that warmth is judged before competence, and that it has a stronger influence on affective and behavioral reactions (Fiske, Cuddy, & Glick, 2007).

We propose that emotional support from a digital assistant increases perceptions of warmth. This is because emotional expressions communicate a social and relational orientation as the sender provides information about his or her intentions (Sevillano & Fiske, 2016). Given that the warmth dimension of social perception relies on the evaluation of good intentions (Sevillano & Fiske, 2016), emotional support, provided through expressing concern for the receiver, may foster perceived warmth.

Although related, warmth is conceptually different from emotional support (Hill, 1991). Emotional support reassures people in an affect-laden situation, helping receivers to manage their emotional state; perceived warmth indicates that someone is perceived as having positive intentions

toward receivers. In our context, customers may interpret the digital agent's empathetic, reassuring words as positive intentions and thus perceive the agent as warm. Yet, there may be other, though costlier, ways to induce warmth in e-services, for example, by connecting users to an employee via a video call or live chat. Users may take the mere presence of a human agent as a sign of good intentions and thus perceive warmth. In sum, emotional support may be an antecedent to warmth, but not a necessary condition for warmth.

Perceived warmth, in turn, may foster customer satisfaction. There is evidence in the service literature that warmth judgments are strongly linked to consumers' perceptions of satisfaction (Gao & Mattila, 2014; Stauss, 2002). This is because perceived warmth captures the positive intentions of frontline employees toward the customer. In the online realm, research shows that perceived warmth affects customer outcomes on an attitudinal level, including perceived service quality (Lemmink & Mattsson, 1998), brand attitude (Lepthien, Papies, Clement, & Melnyk, 2017), loyalty intentions (Habel, Alavi, & Pick, 2017), and willingness to interact with the provider again (Li, Chan, & Kim, 2018).

In sum, we reason that users receiving emotional support from a digital agent will likely associate it with a warm feature indicating positive intentions. As it is a feature of the service that induces feelings of warmth, users may attribute their positive perception to this service and may therefore be more satisfied with it. Formally:

H1. Emotional support from a digital assistant has a positive effect on customer satisfaction, mediated by perceived warmth.

2.4. The positive effect of emotional support on persistence, mediated by warmth and satisfaction

We propose that emotional support from a digital assistant not only increases satisfaction with a service, but ultimately fosters persistence in using that service, that is an observable action

comprising an effort to stay on a task. The rationale for this notion lies in the motivational nature of emotional support. It comprises affiliation and reassurance (Menon & Dubé, 2007), and thus may encourage individuals to deal with the source of a problem (Hill, 1991), which increases the effort spent on the corresponding task (Atkinson, 1964).

Research from social psychology supports this notion by highlighting how positive verbal feedback encourages people to spend more time on challenging activities such as solving a puzzle (Deci, 1971). In healthcare research, a meta-analysis by DiMatteo (2004) shows a significant increase in patients' medical treatment persistence when receiving emotional support. In a similar vein, educational research shows that receiving emotional support from parents makes students more persistent when solving problems (Stright, Neitzel, Sears, & Hoke-Sinex, 2001).

The theoretical mechanism explaining the effect of emotional support on persistence is based on the previously hypothesized relationship; namely, warmth and satisfaction. We propose that the perceived warmth of the digital assistant (that had been induced by providing emotional support) fosters persistence through increasing customer satisfaction. Healthcare and education research provide evidence of the relationship between the constructs involved in the mediating model. Specifically, the link between patient satisfaction and persistence with medical treatment is well established across different diseases and settings (Barbosa, Balp, Kulich, Germain, & Rofail, 2012), as is the link between student satisfaction and persistence (Berger, 2001; Joo, Lim, & Kim, 2011). Evidence also exists regarding the serial causal chain linking emotional support to persistence in healthcare settings. Several studies support how physicians' empathy and warmth foster patients' satisfaction with the visit, which fosters medication persistence (e.g., Bartlett et al., 1984; Howe, Leibowitz, & Crum, 2019).

Transferred to our context, we propose that customers' increased feelings of warmth induced by the supportive words of the digital assistant will increase customer satisfaction, and, in turn,

their persistence in the task. In other words, customers perceiving the digital assistant as empathic and warm will be more satisfied with the technology-mediated service and therefore more inclined to persist in its usage. In sum, we hypothesize the following:

H2. Emotional support from a digital assistant has a positive effect on persistence, serially mediated by perceived warmth and customer satisfaction.

2.5. The moderating effect of assistant type

In the following, we propose that the assistant type (human vs. digital) moderates the indirect effect of emotional support on persistence via warmth and satisfaction. Specifically, we argue that this moderation effect occurs because the emotional support coming from a human assistant increases warmth to a lesser extent than the emotional support coming from a digital assistant does.

The bottom line for this assumption is the idea that the benefits of digital services (e.g., 24/7 availability and easy access) go hand in hand with a "loss of human contact and personal interaction" (Bitner, 2001, p. 375). As a result, the absence of human contact in digital service experiences can make customers perceive the environment as impersonal and even as cold (Holzwarth et al., 2006). In this cold environment, the warmth-inducing effect of emotional support from a digital assistant may compensate for the lack of humanness, thereby increasing warmth perceptions.

In contrast, the effect of emotional support on warmth is likely to be attenuated when that support is provided by a human assistant. This is because warmth is one of the essential characteristics of a human being (Haslam, Bain, Douge, Lee, & Bastian, 2005) but not of a technological agent (Haslam, 2006). In support, robotics research shows that human service employees are generally perceived as significantly warmer than their technological counterparts performing the same service (Čaić, Mahr, & Oderkerken-Schröder, 2019). Hence, the mere

presence of a human agent in a digital service environment may be sufficient to induce warmth perceptions. Given that the warmth level will already be high through the mere presence of the human agent, additional human behaviors—such as providing emotional support—may only provide small incremental benefits, and thus may only slightly further increase warmth perceptions. Consequently, we expect that the effect of emotional support coming from a human assistant compared to a digital assistant will be attenuated. Formally, we state:

H3. Assistant type (human vs. digital) moderates the effect of emotional support on persistence through the serial mediation of perceived warmth and customer satisfaction. Specifically, the effect of emotional support on warmth is weaker for the human (vs. the digital) assistant.

2.6. Overview of studies

Two-stage approach. The empirical part comprises two stages (see Fig. 1 for each study's purpose and see the correlation matrices for all the studies in Web Appendix A1). *Stage I* comprises three studies that provide an initial test of our core hypotheses: the positive effect of a digital assistant's emotional support on satisfaction, mediated by warmth (H1), and on persistence, serially mediated by warmth and satisfaction (H2). In line with the preliminary nature of this stage, the first two studies are scenario-based experiments with a fictitious (fitness) app using customer satisfaction as an attitudinal outcome to test H1. Hereby, Study 1 refers to a failure context (someone failed to fulfill a task) and Study 2 to a success context (someone succeeded in fulfilling a task). Study 3 relates to the more realistic setting of mixed performance (combined failure and success) in an online game and adds persistence as a behavioral outcome to test H2. Further, it rules out the embodiment of the digital assistant as a contingency variable.

Stage II draws on a real service usage of an online language-learning app and comprises Study 4. Part A validates the findings of Study 3 by clarifying that emotional support is distinct from perceived warmth, replicating the serial mediation comprised in H2, and ruling out competence as

an alternative mediator for warmth. Part B tests the moderating effect of assistant type (human vs. digital) on the effect of emotional support (H3). All experiments are conducted online, and the experimental manipulations are checked in pretests to reduce demand characteristics (Menon & Dubé, 2007). The participants recruited via the crowdsource panels Clickworker and Prolific, receiving remuneration of 50¢ for the pretests, 80¢ for Studies 1 and 2, and 100¢ for Studies 3 and 4. They are only allowed to participate in one of the studies.

Power analysis. For all studies, a power analysis with the program G*Power 3.1 is conducted to determine the required *a priori* sample size (see Fig. 2). All pretests draw on an expected effect size of $f = .40$. This value represents the threshold for a large effect according to Cohen (1988), which is considered appropriate for checking an intended manipulation.

For the scenario-based Studies 1 and 2, we use the common minimum power level of .8 (Cohen, 1988) both for the pretests and the main studies. For the effect size in the main Studies 1 and 2, we use $f = .33$ as the mean value between a medium and large effect (Cohen, 1988). We decided on this value because on the one hand, research on emotional support from humans in offline environments shows large effect sizes on customer outcomes (Menon & Dubé, 2007), and on the other hand, as research on emotional support from non-human agents in digital environments is lacking, we cautiously expect a slightly smaller effect size here.

For the *realistic, mixed performance Studies 3 and 4*, we increase the power to .9 (both for the pretests and main studies) and decrease the expected effect size for the main studies to $f = .25$, which is a medium value (Cohen, 1988). This is because these studies imply an actual service usage and thus, they are subject to uncontrollable factors that can attenuate the effects.

Figure 2. Power analysis results.

			Required sample size ($p < .05$)	
Study	Experimental factors	Power [1]	Pretest for manipulation checks [2]	Main study [3]
#1	• Emotional support (no, yes)	.8	52	75
#2	• Emotional support (no, yes)	.8	52	75
#3	• Emotional support (no, yes) • Embodiment (no, yes)	.9	68	206
#4	• Type of assistant (digital, human) • Emotional support (no, yes) • Performance estimation (continuous)	.9	68	291 Study 4a (digital): 206 Study 4b (human): 85

[1] The power is .8 for scenario-based experiments (Studies 1 and 2) and .9 for real service usage (Studies 3 and 4). All power analyses are based on ANCOVAS with the manipulated independent variables. One exception is Study 4 (main study), which draws on an ANCOVA and a regression analysis. As a starting point, we calculated the required overall sample size based on an ANCOVA with assistant type and emotional support as the independent variables, yielding a sample size of 171 (i.e., about 85 both for the digital and the human group). Yet, ruling out performance estimation as a potential bias (i.e., a moderation) required a regression analysis that included performance estimation as a continuous moderator. The corresponding power analysis yielded a sample size of 206 in this subgroup. Hence, we used 206 (digital) and 85 (human), yielding an overall sample size of 291.

[2] f = .4 (large) for all pretests; pretests conducted for digital assistant groups only.

[3] f = .33 (medium to large) for scenario-based experiments (Studies 1 and 2); f = .25 (medium) for real service usage (Studies 3 and 4).

3. Study 1

3.1. Purpose

Study 1 tests—in a failure situation—if a digital assistant's emotional support increases customer satisfaction, mediated by perceived warmth (H1). We conduct a scenario-based online experiment with a fictitious type of service usage. The subjects are asked to imagine themselves using a fitness app to track if they have taken a certain number of steps per day. Then, the subjects learn that they have failed to fulfill this task.

3.2. Scenario and manipulations

We used a single factor between-subjects design manipulating emotional support (yes vs. no) (see Web Appendix B1.1. for the design). Participants read an introduction saying that it is recommended to take 10,000 steps per day and that fitness apps help to track one's daily steps.

Then, a smartphone display with the fitness app was presented on their computer screen, depicting the following text: "Hello. This is a step count app. The app will support you in taking 10,000 steps a day" (initial screen). Then, participants were asked to imagine that they had used this app throughout the day and that they checked the number of steps that had been taken in the evening. For all participants, the app indicated that they had taken 6,171 steps, along with the feedback "You have not achieved your goal for today" (feedback screen). Emotional support was manipulated by adding vs. not adding the following words to the feedback text: "What a pity! You can be proud of yourself anyway. Maybe you will take more steps tomorrow."

3.3. Pretest

A pretest was conducted to check the manipulations with 54 respondents (female: 51.9%, mean age: 32.7 years) recruited from Clickworker. They were randomly assigned to one of the two experimental conditions (emotional support: yes vs. no). After being exposed to the scenario, respondents completed the pretest questionnaire (see Appendix A1. for all the measures used in the experiment). It contained a manipulation check of emotional support and a realism check measure. We included two control variables as they may affect realism, these being prior experience with the service and the frequency of the underlying activity.

The results of an ANOVA with the emotional support manipulation as the independent variable and the manipulation check measure as the dependent variable showed a significant difference in the group means ($M_{ES/no\text{-}ES}$ = 4.63/3.28, F[1, 52] = 11.48, p = .001, η_p^2 = .18), in the intended direction. We checked for realism by using an ANCOVA with the emotional support manipulation as the independent variable, the realism check measure as a dependent variable, and the two controls. Subjects perceived the scenario as highly realistic across groups ($M_{ES/no\text{-}ES}$ = 6.49/6.57, F[1, 50] = .08, p = .778, η_p^2 = .00). These results held when excluding the controls, which had no significant effects on realism (p > .05). Hence, the manipulation was successful.

3.4. Main study

3.4.1. Procedure and measures

We recruited 77 respondents (female: 41.6%, mean age: 35.4 years) from Clickworker. Respondents were randomly assigned to one condition in the one-factorial experimental design described above (emotional support: yes vs. no). Following the presentation of these stimuli, respondents filled in an online questionnaire indicating their satisfaction with the technology-mediated service and their perceptions of warmth. We included the same controls as in the pretest (prior experience, frequency of the activity) and added gender and age as sociodemographic controls (see Appendix A1. for the measures).

3.4.2. Results

Test of H1. H1 proposes that emotional support from a digital assistant increases satisfaction mediated by perceived warmth. Prior to hypothesis testing, an ANCOVA with emotional support as the independent variable and satisfaction as the dependent variable showed a significant main effect of emotional support ($M_{ES/no\text{-}ES} = 5.39/4.22$, $F[1, 71] = 15.63$, $p < .001$, $\eta_p^2 = .18$). The control variables were nonsignificant ($p > .05$). For a formal test of H1, we conducted a mediation analysis according to Hayes (2013) using model 4 of the PROCESS tool, with emotional support as the independent variable, warmth as a mediator, satisfaction as the dependent variable, and prior experience, frequency of the activity, age, and gender as covariates. The results showed a significant positive effect of emotional support on satisfaction ($b = 1.17$, $t = 3.95$, $p < .001$) and warmth ($b = 2.72$, $t = 10.38$, $p < .001$). When regressing satisfaction on emotional support and warmth simultaneously, the effect of warmth was significant ($b = .52$, $t = 4.29$, $p < .001$) and the effect of emotional support became nonsignificant ($b = -.23$, $t = -.55$, $p = .586$). A bootstrap

analysis showed that the indirect positive effect of emotional support on satisfaction was fully mediated by warmth (b = 1.40, SE = .41, 95% CI = [.64, 2.27]), supporting H1.

3.5. Discussion

Study 1 examined a fictitious situation in which the users of a technology-mediated service were informed that they have failed in fulfilling a task, that is in taking 10,000 steps per day. As proposed in H1, the results indicate that participants are more satisfied with the service when the digital agent provides emotional support, mediated by perceived warmth. Hereby, Study 1 focuses on the original purpose of emotional support: help to cope with stress and failure. Given our generic conceptualization of emotional support as empathetic, reassuring expressions, it is worthwhile testing whether the mechanism also works in success settings.

4. Study 2

4.1. Purpose

Study 2 aims to test H1 for success situations where a digital agent provides emotional support for users who have performed well. To rule out contextual confounds, we asked respondents to imagine themselves using the same fictitious fitness app as in Study 1. Yet, they were asked to imagine that they had achieved the required number of steps.

4.2. Scenario and manipulations

Study 2 was an online experiment using the same scenario as in Study 1 and again manipulating emotional support (yes vs. no). The only difference was that the respondents now learned through performance feedback that they had taken 11,171 steps, thus exceeding the required threshold of 10,000 steps. Accordingly, the additional text on the feedback screen in the emotional support conditions was: "Great! You can be proud of yourself. Maybe you will take a

similar number of steps tomorrow" (see Web Appendix B1.2. for the manipulations). The measures for the pretest and main study were the same as in Study 1 (see Appendix A1.).

4.3. Pretest

The manipulations were checked in a pretest by recruiting 51 subjects from Clickworker (female: 52.9%, mean age: 32.3 years). They were randomly assigned to one of the experimental conditions (emotional support: yes vs. no). An ANOVA with the emotional support manipulation as the independent variable and the manipulation check measure for emotional support as the dependent variable showed a significant difference in the group means in the intended direction ($M_{ES/no\text{-}ES}$ = 4.83/3.96, F[1, 49] = 4.31, p = .043, η_p^2 = .08). Subjects perceived the scenario as highly realistic across groups ($M_{ES/no\text{-}ES}$ = 6.55/6.64; F[1, 47] = .20, p = .656, η_p^2 = .00). These results held when excluding the controls, which had no significant effects on realism (p > .05), indicating a successful manipulation.

4.4. Main Study

4.4.1. Procedure and measures

Again, 72 subjects (female: 44.4%, mean age: 34.8 years) were recruited through Clickworker. They were randomly assigned to one of the two conditions using the same fitness app stimuli and a one-factorial design (emotional support: yes vs. no [adapted to a success context]) and including the same variables as in the main Study 1 (see Appendix A1 and Web Appendix B1.2.).

4.4.2. Results

Test of H1. H1 proposes that a digital assistant's emotional support fosters satisfaction with the service, mediated by perceived warmth. Prior to hypothesis testing, an ANCOVA with satisfaction as the dependent variable was run. It showed a significant main effect of emotional support ($M_{ES/no\text{-}}$

$_{ES}$ = 5.31/4.60, F[1, 66] = 5.19, p = .026, η_p^2 = .07). The controls were nonsignificant (p > .05). For a formal test of H1, we ran a mediation analysis (model 4, PROCESS tool) with warmth as a mediator and prior experience, frequency of the activity, gender, and age as covariates. The results showed a significant positive effect of emotional support on satisfaction (b = .71, t = 2.28, p = .026) and warmth (b = 1.94, t = 5.70, p < .001). When regressing satisfaction on both emotional support and warmth simultaneously, the effect of warmth was significant (b = .26, t = 2.37, p =.021); the effect of emotional support was nonsignificant (b = .21, t = .57, p = .572). The indirect effect through warmth was positive and significant (b = .50, *SE* = .26, *95% CI* = [.08, 1.11]). Hence, warmth fully mediates the effect of emotional support on satisfaction, supporting H1.

4.5. Discussion

The results of Study 2 replicate Study 1's findings in a success situation. Customers who receive empathetic, reassuring feedback perceive the communication as warmer and thus are more satisfied with the technology-mediated service than customers who do not receive this feedback. Hence, as in the failure setting, emotional support provided by a digital assistant increases satisfaction, and this effect is mediated by perceived warmth (as proposed in H1). As such, the benefits of emotional support also apply to successful task completion.

5. Study 3

5.1. Purpose

Study 3 serves two purposes. First, it tests the effect of a digital agent's emotional support on persistence, serially mediated by warmth and satisfaction, as proposed in H2. To increase ecological validity, we included a series of tasks. Consumers often use e-services to solve the same task multiple times or to perform several different tasks in which they repeatedly fail and succeed. Hence, Study 3 draws on a mixed performance setting. Second, it checks the robustness of our

findings for embodied vs. disembodied digital agents. This check evolves from prior research and from the common practice of presenting digital assistants as embodied agents such as service robots (Jörling, Böhm, & Paluch, 2019) or embodied sales assistants (Holzwarth et al., 2006) to increase their humanlike appearance. Conceptually, we contend that emotional support already entails an explicit human feature and hence; depicting the digital assistant should not fulfill an additional function.

As a context, we choose a real online game where respondents receive feedback on a series of tasks. Here, performance is not presented as part of a given scenario, but it varies depending on whether respondents actually fail or succeed in fulfilling each task. As such, the users' capability, rather than the experimental setting (as in Studies 1 and 2), determine success or failure.

5.2. Scenario and manipulations

We used a 2 (emotional support: yes vs. no) by 2 (embodiment of the digital assistant: yes vs. no) between-subjects design (see Web Appendix B1.3.). Respondents played a missing icon game (based on Kim et al., 2016), programmed as a real online game for this experiment. At the beginning, participants saw ten different icon combinations (each consisting of three different icons) for 40 seconds and were asked to memorize these combinations. Then, the ten combinations were displayed sequentially, but one icon was always missing. Respondents had to pick the proper missing icon from six different icons presented at the bottom of the screen. This procedure was repeated with all ten icon combinations. For each task, respondents received feedback on whether they were right ("This answer is correct") or not ("This answer is not correct"). The final screen depicted the user's overall performance ranging from 0 (zero correct answers) to 100 points (ten correct answers).

Emotional support was manipulated by adding or not adding words of empathy and concern to the feedback in the ten icon assignment tasks and to the final feedback in a similar vein as in

Studies 1 and 2. These words were adapted based on whether participants had or had not answered a question correctly, for example, "Go on like this!" (correct answer) and "Never mind!" (incorrect answer). To avoid boredom and increase realism, the wording for the single questions was altered, using, for example, "That's a reason to be happy!" as an alternative for a correct answer or "Don't let up!" as an alternative for an incorrect answer. On the final screen, the emotional support manipulation was "Next time, it is going to be better for sure. Don't give up." (0 to 50 points), "That was pretty good already. Possibly, it is going to be even better next time?!" (60 to 70 points), "Well done. Keep it up!" (80 to 90 points), or "Very well done. Keep it up!" (100 points).

The embodiment of the digital agent (yes vs. no) was manipulated by adding or not adding a depiction of the agent as a female humanlike face to the feedback screens (see Appendix B1.3. Panel B). Faces have often been used in prior research to create agents with a human resemblance (e.g., Kim et al., 2016). To avoid confounds, we chose a neutral rather than a smiling face and included gender as a covariate into our analyses in the main study (as in the other studies).

5.3. Pretest

The manipulations were checked in a pretest with 68 subjects (female: 50.0%, mean age: 30.9 years) recruited from the Prolific panel. Subjects were randomly assigned to one of the four conditions and they then completed the pretest questionnaire. It contained the same measures as the pretests for Studies 1 and 2, adapted to the context (manipulation check measure for emotional support, realism check measure, perceived warmth, control variables of prior experience and frequency of the activity). Two control measures were new: As the respondents were actually going to use the digital service, we asked them about their expected performance prior to playing the game and recorded their actual performance during the game. Further, we added a one-item measure to check the manipulation of embodiment (see Appendix A1. for the measures).

An ANOVA with the emotional support manipulation and the embodiment manipulation as the independent variables and the manipulation check measure for emotional support as the dependent variable showed a significant effect of the emotional support manipulation in the intended direction ($M_{ES/no\text{-}ES}$ = 5.40/3.84, F[1, 64] = 24.69, $p < .001$, $\eta_p^2 = .28$), a nonsignificant effect of the embodiment manipulation ($p = .963$), and a nonsignificant interaction effect for these two manipulations ($p > .05$). The results of an ANOVA with the two manipulations and their interaction as the independent variables and the embodiment manipulation check measure as the dependent variable showed a significant effect of the embodiment manipulation ($M_{Embodiment/no\text{-}Embodiment}$ = 5.56/3.12, F[1, 64] = 31.10, $p < .001$, $\eta_p^2 = .33$), a nonsignificant effect of the emotional support manipulation ($p = .640$), and a nonsignificant interaction effect ($p > .05$). Further, users perceived the scenario as highly realistic across the emotional support manipulations ($M_{ES/no\text{-}ES}$ = 5.70/5.42, F[1, 60] = .68, $p = .413$, $\eta_p^2 = .01$) and the embodiment manipulations ($M_{Embodiment/no\text{-}Embodiment}$ = 5.72/5.40, F[1, 60] = .87, $p = .354$, $\eta_p^2 = .01$). These results held when excluding the controls, which did not affect realism (p > .05). Hence, the manipulation was successful.

5.4. Main study

5.4.1. Procedure and measures

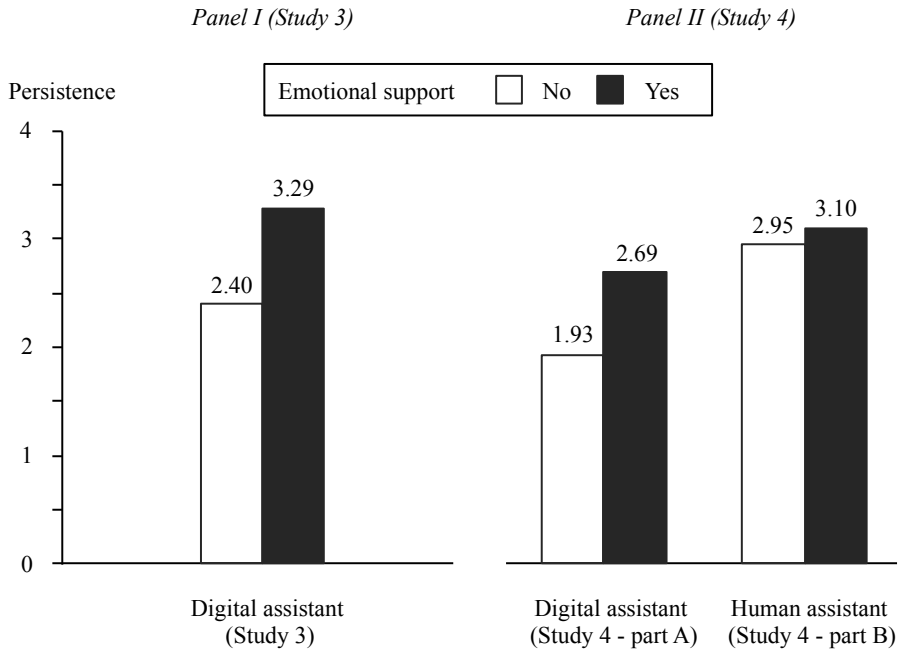
Participants were randomly assigned to one of the four conditions in the 2 (emotional support: yes vs. no) by 2 (embodiment: yes vs. no) between-subjects design using the scenario described above. Altogether, 206 respondents (female: 57.3%, mean age: 32.6 years) recruited via the Prolific panel participated in this study. Participants received the 100¢ compensation independently of their actual performance in the game and none of our instructions could have been misunderstood as promising a performance-dependent incentive.

Subjects completed an online survey including the measures for perceived warmth and satisfaction and the same four controls used in the pretest: prior experience, frequency of the activity, expected performance (captured prior to the game), actual performance (recorded during the game) plus gender, and age (measures were adapted to the context, see Appendix A1.). The dependent variable of behavioral persistence was captured as follows. At the end of the questionnaire, participants were invited to play the game (with new icon combinations) again (yes vs. no): 44.7% of the subjects refused the offer and could straightforwardly finish the survey. The 55.3% who accepted could choose how many icon combinations they wanted to guess at (between one and seven). They received the requested number of new icon combinations, and only after taking a guess at these combinations could they finish the survey (i.e., persistence was captured as an actual continued service usage on an 8-point scale ranging from 0 to 7).

5.4.2. Results

H2 proposes a positive effect of emotional support from a digital assistant on persistence, serially mediated by warmth and satisfaction. Prior to hypothesis testing, an ANCOVA with emotional support and embodiment as the independent variables, persistence as the dependent variable, and the controls prior experience, frequency of the activity, expected and actual performance, gender, and age, showed a significant effect of emotional support ($M_{ES/no\text{-}ES}$ = 3.29/2.40, $F[1, 196] = 4.68$, $p = .032$, $\eta_p^2 = .023$) (see Fig. 3, Panel I). The effects of embodiment ($p = .408$), the emotional support by embodiment interaction ($p = .863$), and the controls ($p > .05$) were nonsignificant.

Figure 3. Mean values for persistence across conditions (Studies 3 and 4).

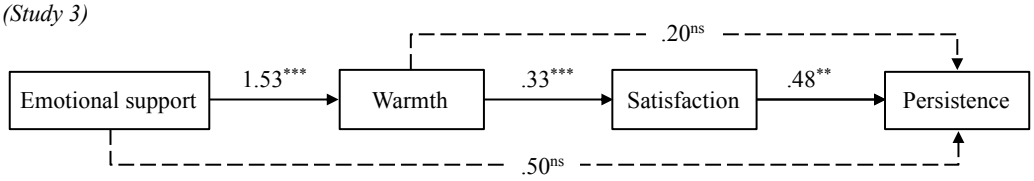


Notes: Cell means are adjusted for control variables (prior experience, frequency of the activity, expected performance, actual performance, gender, and age).

To formally test H2, we conducted a serial mediation analysis (model 6, PROCESS tool) using embodiment and the six controls as covariates. The results are depicted in Fig. 4, Panel I. We observed a significant positive effect of emotional support on persistence (b = .88, t = 2.16, p = .032) and warmth (b = 1.53, t = 10.04, p < .001), and a significant positive effect of warmth on satisfaction (b = .33, t = 4.37, p < .001). When regressing persistence on emotional support, warmth, and satisfaction simultaneously, the effect of satisfaction was significant (b = .48, t = 2.76, p = .006), while warmth (b = .20, t = 1.01, p = .312) and emotional support (b = .50, t = 1.02, p = .310) were nonsignificant. The indirect effect through warmth → satisfaction was significant (b = .25, *SE* = .11, *95% CI* = [.06, .49]), while the indirect effect through warmth alone was nonsignificant (b = .30, *SE* = .32, *95% CI* = [−.24, 1.03]). Hence, H2 is supported.

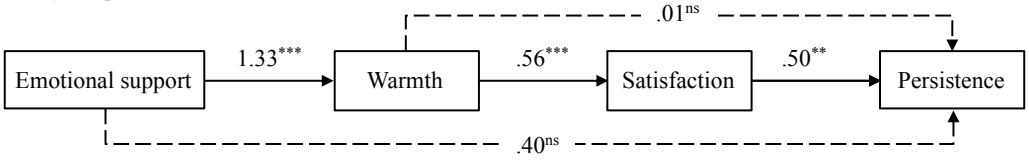
Figure 4. Mediation results (Study 3 and Study 4 – part A).

Panel I (Study 3)



Notes: * p < .05, ** p < .01, *** p < .001; non-standardized coefficients;
Control variables: embodiment, prior experience, frequency of the activity, expected performance, actual performance, gender, and age.

Panel II (Study 4 – part A)



Indirect effects:

Hypothesized model (warmth → satisfaction)	***b* = .37, *SE* = .12, *95% CI* = [.16, .65]**
Competing parallel model (warmth & competence → satisfaction)	
• Warmth → satisfaction	*b* = .13, *SE* = .08, *95% CI* = [.01, .03]
• Competence → satisfaction	b = .10, *SE* = .07, *95% CI* = [-.01, .27]

Notes: * p < .05, ** p < .01, *** p < .001; non-standardized coefficients;
Control variables: prior experience, frequency of the activity, expected performance, actual performance, gender, and age.

5.5. Discussion

Study 3 shows that users receiving (vs. not receiving) emotional support continue to play with more icon combinations. This effect is mediated by warmth and satisfaction, supporting H2. As such, Study 3 goes beyond the two previous studies in three ways. First, it shows the beneficial effects of a digital agent's emotional support on a behavioral outcome. Second, it has higher ecological validity as it relates to a series of tasks with mixed performance. Third, it provides evidence that the motivating effect of emotional support occurs independently of the embodiment of the digital assistant. Although the embodiment condition yielded slightly higher warmth perceptions than the no-embodiment condition did, these effects were very minor in scope and not sufficient enough to increase persistence. Thus, the embodiment of a digital assistant is not

necessary. A noteworthy result comes from using the estimated performance and actual performance as control variables: Many participants (89.8%) underestimated their performance, with their expected performance averaging 3.9 out of 10 icons, while their actual performance was 7.5 icons on average (see Appendix A1.). We address the potential biases resulting from this difference in the next study.

6. Study 4

6.1. Purpose

Studies 1 to 3, as the first stage of our examinations, provided an initial test of the chain of effects linking a digital assistant's emotional support to customer outcomes. While Study 2 focused on customer satisfaction (H1), Study 3 was already an important step as it focused on persistence (H2) in a mixed situation of success and failure during real service usage (an online game). Yet, Study 3 still had a stylized and playful setting, and like Studies 1 and 2, it did not include a comparison with a real human agent.

Hence, Study 4 represents the second stage of our examinations, where we seek to validate our model by addressing these shortcomings. In *part A* of Study 4, we seek to replicate H2 in a setting where consumers actually use a more realistic and non-playful digital service, and to rule out a potential bias caused by the participants' underestimation of their own skills, as observed in Study 3. We also seek to prove that emotional support is distinct from warmth, and that competence (as the second dimension of social perception) can be ruled out as a mediator. We do not expect that emotional support reinforces competence perceptions. This is because competence is linked to ability and efficacy judgments (Aaker, Vohs, & Mogilner, 2010), which do not pertain to empathetic expressions. In *part B* of Study 4, we test the potential moderating effect of the assistant type (human vs. digital), as proposed in H3.

We used an online language-learning app for this investigation. This is because such apps represent an established digital service that can include a blended learning environment as a combination of online media usage and face-to-face interaction. Hence, this type of app is suitable for integrating a human assistant (as an alternative to a digital assistant) within an online service.

6.2. Part A: Validating the model

6.2.1. Scenario and manipulations

Study 4, part A was an online experiment, manipulating emotional support from a digital assistant (yes vs. no). The subjects were invited to use an online language-learning app for Italian vocabulary. In this app, users were shown ten different Italian vocabulary words related to holidays and travel, along with corresponding pictograms (one word–pictogram combination after another, upon clicking the next button). Afterwards, users took a test to check how many of the vocabulary words they had learned. The test comprised ten multiple-choice tasks. After each response, users received audiotaped feedback (female voice) on whether their answer was correct or not. We manipulated emotional support by adding or not adding the same emotionally supportive words as in Study 3 to this feedback, all audiotaped (see Web Appendix B1.4. for the manipulations).

6.2.2. Pretest

The manipulation of emotional support was checked in a pretest with 71 subjects (female: 59.2%, mean age: 33.9 years) recruited from Clickworker. They were randomly assigned to the two conditions (emotional support: yes vs. no). After learning the vocabulary words and taking the test, users filled in a questionnaire containing the same questions as in the Study 3 pretest, adapted to the context: The emotional support manipulation check measure, the realism check measure and the four controls of prior experience, frequency of the activity, expected performance, and actual

performance. We added perceived warmth to prove that the manipulation check measure of the independent emotional support variable and the warmth mediator were conceptually different.

An ANOVA with the emotional support manipulation as the independent variable and the manipulation check measure for emotional support as the dependent variable showed a significant difference in the group means in the intended direction ($M_{ES/no\text{-}ES}$ = 4.52/3.74, F[1, 69] = 4.86, p = .031, η_p^2 = .07). An ANCOVA with the emotional support manipulation as the independent variable, the realism check measure as the dependent variable, and including the four controls showed that users perceived the scenario as highly realistic across groups ($M_{ES/no\text{-}ES}$ = 5.98/5.75, F[1, 65] = .78, p = .380, η_p^2 = .01). These results held when excluding the controls, which had no significant effects on realism (p > .05). Hence, the manipulation was successful.

To check the discriminant validity between the manipulation check measures of emotional support and perceived warmth, we examined inter-item correlations. They were above .7 within the constructs, but below .6 across the constructs. A formal examination of discriminant validity based on the Fornell–Larcker criterion (Fornell & Larcker, 1981) showed discriminant validity, as indicated by the square root of the average variance extracted (AVE) of both constructs exceeding the correlation between them.

6.2.3. Main Study

Participants (n = 206, female: 50.0%, mean age: 34.1 years) were recruited from Clickworker. They were randomly assigned to one of the two groups in the one-factor design described above (emotional support: yes vs. no). To increase realism, persistence was captured right after learning the vocabulary words and completing the test (without a questionnaire in between). Apart from this, persistence was captured in the same manner as in Study 3, adapted to the context: Users were asked whether they would like to learn more vocabulary words. If so, they chose the number of desired words (ranging from 1 to 7) and were then shown the selected number of new words. Forty-

nine percent of the subjects declined the offer to learn more and straightforwardly proceeded with the questionnaire. This procedure yielded an 8-point scale for the persistence measure ranging from 0 to 7. The questionnaire contained the measures for warmth, satisfaction, and the controls from the pretest (prior experience, frequency of the activity, expected and actual performance) plus gender, and age, measured as in the prior studies, and if necessary, adapted to the context. We added perceived competence as an alternative mediator (see Appendix A1. for the measures).

Test of H2. H2 proposes a positive effect of emotional support from a digital assistant on persistence, serially mediated by warmth and satisfaction. Prior to hypothesis testing, an ANCOVA with the six controls showed a significant main effect of emotional support on persistence ($M_{ES/no\text{-}ES}$ = 2.69/1.93, F[1, 198] = 5.17, p = .024, η_p^2 = .03) (see Fig. 3, Panel II, digital group). Expected performance (p < .001), and age (p < .001) were significant; the other controls were nonsignificant (p > .05). For a formal test of the sequence "emotional support → warmth → satisfaction → persistence," a serial mediation analysis including the six covariates (model 6 of the PROCESS tool) yielded the results depicted in Fig. 4, Panel II. There was a significant positive effect of emotional support on persistence (b = .75, t = 2.27, p = .024) and warmth (b = 1.33, t = 7.83, p < .001) and a significant positive effect of warmth on satisfaction (b = .56, t = 8.69, p < .001). When regressing persistence on emotional support, warmth, and satisfaction simultaneously, the effect of satisfaction was significant (b = .50, t = 3.35, p = .001); warmth (b = .01, t = .04, p = .968) and emotional support were nonsignificant (b = .40, t = 1.08, p = .280). The indirect effect through warmth → satisfaction was significant (b = .37, SE = .12, *95% CI* = [.16, .65]); the indirect effect through warmth alone was nonsignificant (b = .01, SE = .19, *95% CI* = [−.39, .39]), supporting H2.

Underestimation of performance. As in Study 3, many participants (84.0%) underestimated their performance, with an average expected performance of 4.9 and an average actual performance of 7.6 (out of 10 words). To ensure that our results were not biased by the performance estimation, we conducted two analyses. First, we used performance estimation (i.e., expected minus actual

performance) as a covariate in our serial mediation model instead of the components of this difference score. The results of the serial mediation analysis remained stable, with a positive, significant indirect effect through warmth and satisfaction (b = .48, SE = .14, *95% CI* = [.23, .79]). Second, we integrated the performance estimation as a moderator in our serial mediation model (model 85, PROCESS tool). There was no significant interaction between the performance estimation and any of our independent or mediating variables ($p > .05$). Most importantly, the index of the moderated mediation was nonsignificant (b = .01, SE = .03, *95% CI* = [−.05, .07]).

Ruling out competence. A competing model was employed to rule out competence as a mediator (see Fig. 4, Panel II). The competing model used warmth and competence as parallel mediators, followed by the sequence satisfaction → persistence (model 80, PROCESS tool) and it included the six initial covariates. The indirect effect via warmth → satisfaction was significant (b = .13, SE = .08, *95% CI* = [.01, .30]) and the indirect effect via competence → satisfaction (b = .10, SE = .07, *95% CI* = [−.01, .27]) was nonsignificant. Specifically, the effect of emotional support on competence was not significant ($p > .05$), whereas the effect of emotional support on warmth was significant ($p < .001$).

6.2.4. Discussion

Part A of Study 4 validates our core findings for a natural, non-playful service, specifically the positive effect of a digital agent's emotional support on persistence, serially mediated by warmth and satisfaction (H2). To further validate our findings, we provide evidence that emotional support and perceived warmth are related but distinct constructs, that participants' performance estimations do not bias the results, and that the participants' competence perceptions can be ruled out as a concurrent theoretical mediator.

6.3. Part B: Comparing the results to a human assistant

6.3.1. Scenario and manipulations

In part B of Study 4, we added a human assistant condition to the digital assistant condition. We manipulated emotional support (yes vs. no) in the same way as in part A and used the same stimuli for our online experiment. The only difference in this human condition was that respondents were connected with a human agent (again a female voice to be consistent with the digital condition in part A) when doing the vocabulary test (via Skype, audio connection only). This agent provided feedback personally to the users, either with or without emotional support. In sum, 85 new respondents (female: 37.6%, mean age: 32.7 years) recruited from the same platform (Clickworker) participated in part B. As in the digital group, persistence was captured as a real behavior on an 8-point scale ranging from 0 to 7 (here, 38.8% of subjects declined the offer to learn more vocabulary words) and they answered the same questions.

6.3.2. Results

Human assistant only. We first tested the effects of emotional support in the human assistant condition alone. An ANCOVA with the six controls showed no significant main effect of emotional support on persistence ($M_{ES/no\text{-}ES}$ = 3.10/2.95, $F[1, 77] = .06$, $p = .803$, $\eta_p^2 = .00$) (see Fig. 3, Panel II, human group). Actual performance ($p = .015$) was significant; the other controls were nonsignificant ($p > .05$).

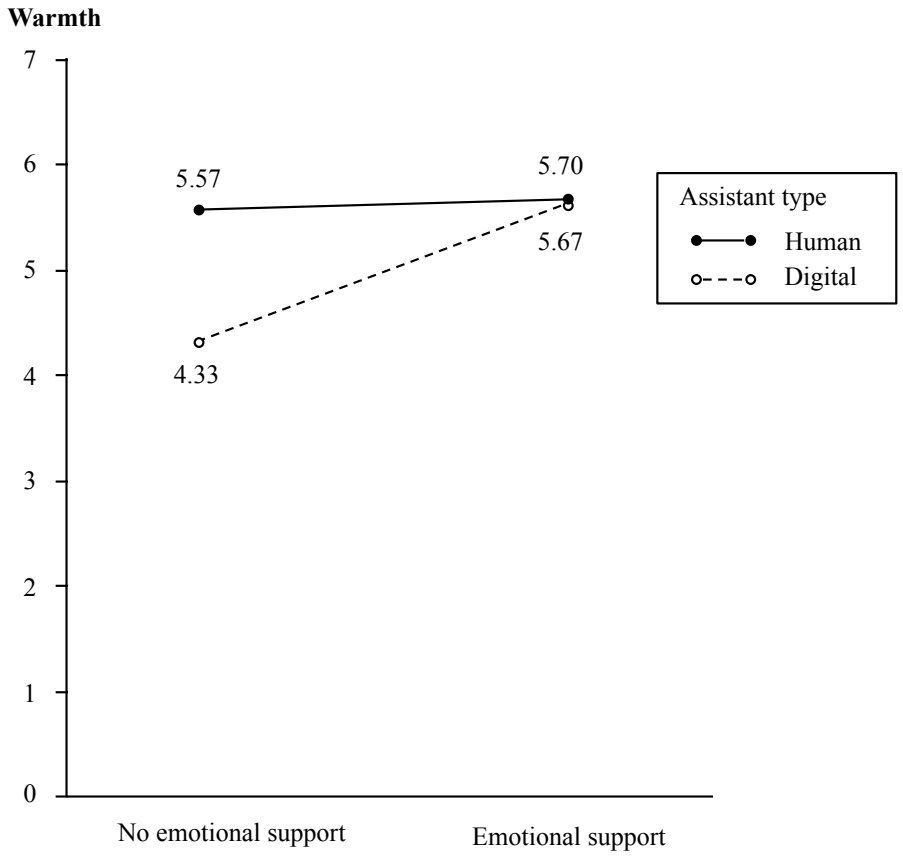
Human vs. digital assistant. In order to compare the effects of the human and the digital assistant, we pooled both subsamples and conducted an ANCOVA with assistant type (human vs. digital) and emotional support (yes vs. no) as the independent variables, persistence as the dependent variable, and the six controls. To rule out biases resulting from imbalanced sample sizes ($n_{Human} = 85$, $n_{Digital} = 206$), we checked the equality of variances across groups via a Levene test, which was nonsignificant ($p > .05$). Hence, an ANCOVA could be conducted, showing a significant

effect of assistant type ($M_{\text{Human/Digital}}$ = 3.24/2.22, F[1, 281] = 10.08, p = .002, η_p^2 = .04), while emotional support ($M_{\text{ES/no-ES}}$ = 2.92/2.54, F[1, 281] = 1.35, p = .246), and the assistant type by emotional support interaction were nonsignificant (p = .272). Expected performance (p < .001) and age (p = .003) were significant; the other controls were nonsignificant (p > .05).

Test of H3. H3 proposes that assistant type (human vs. digital) moderates the indirect effect of emotional support on persistence through the serial mediation via warmth and satisfaction. For a formal test of H3, we conducted a serial moderated mediation analysis with the pooled sample, using emotional support as the independent variable, warmth and satisfaction as serial mediators, persistence as the dependent variable, and assistant type (coded as 1 = human vs. 0 = digital) as a moderator (model 85, PROCESS tool). We added the six controls as covariates. The index of moderated mediation was significant and negative (b = −.15, *SE* = .07, *95% CI* = [−.32, −.04]), with the indirect serial effect being significant for the digital condition (b = .17, *SE* = .07, *95% CI* = [.05, .33]) and nonsignificant for the human condition (b = .02, *SE* = .04, *95% CI* = [−.05, .11]). These results support H3.

To examine why emotional support was ineffective for the human condition, we conducted a follow-up ANCOVA with the two manipulations on warmth (including the six controls). The results reveal a significant main effect of emotional support ($M_{\text{ES/no-ES}}$ = 5.69/4.95, F[1, 281] = 21.78, p < .001, η_p^2 = .07), assistant type ($M_{\text{Human/Digital}}$ = 5.60/5.00, F[1, 281] = 15.87, p < .001, η_p^2 = .05), and their interaction (F[1, 281] = 14.15, p < .001, η_p^2 = .05). Simple main effects analyses showed that the effect of emotional support on warmth was significant for the digital ($M_{\text{ES/no-ES}}$ = 5.67/4.33, p < .001), but not for the human condition ($M_{\text{ES/no-ES}}$ = 5.70/5.57, p = .878) (see Fig. 5).

Figure 5. Simple main effects analysis for Study 4 – part B.



6.3.3. Discussion

Part B of Study 4 examined the consequences of embedding a human assistant in an e-service. The results support our hypothesis that the indirect effect of emotional support on persistence via warmth and satisfaction is moderated by assistant type. In fact, this effect only occurs with a digital assistant, while it actually disappears with a human assistant. The follow-up ANCOVA supports our reasoning that the mere presence of a human agent in a digital environment already increases warmth, rendering emotional support from this agent inefficient in further increasing warmth.

7. General discussion

Technology-mediated services are becoming increasingly popular among customers in a variety of contexts and situations. Increasing numbers of consumers now interact with apps, with AI- powered conversational services, or with firms' digital assistants to perform tasks or to obtain a service. While it is undeniable that these services provide customers with convenient and accessible interactions, some business writers have noted that with technology-mediated services, "what we gain in convenience, we lose in emotion, especially in a time where expressive communication is more important than ever" (Akkawi, 2017). In this paper, we have addressed this issue, showing how empathetic and reassuring expressions from a digital assistant can compensate for the lack of human-to-human interaction in such services. We discuss the theoretical and managerial implications of our findings next.

7.1. Theoretical implications

Across four studies and three different e-services, this research has investigated how users react when a digital assistant provides emotional support when they fail or succeed in accomplishing a task with an e-service. Hereby, we make five contributions to the literature.

First, we show that emotional support from a non-human agent affects customer outcomes. In the offline world, it is established that seeking and receiving emotional support from others in stressful situations has beneficial effects on receivers (Hill, 1991; Carver et al., 1989). We show that a similar effect occurs when the provider of emotional support is not a human being in the offline world, but a digital agent embedded in an e-service. This finding is important as it expands the sources of emotional support to disembodied agents. It also enriches the concept of ASP in specifying these agents' concrete demeanor—namely, expressions of empathy and reassurance—that induces favorable customer attitudes and behaviors.

As such, we contribute to the discussion of the opportunities embraced in artificial intelligence (AI). This discussion centers around the question as to whether AI should go beyond mechanical (e.g., low-skill manufacturing), analytical (e.g., navigation), and intuitive (e.g., data interpretation) intelligences toward empathetic intelligence (e.g., providing emotional support) (Huang & Rust, 2018). Although our research has examined the provision of emotional support and not a conversation with an emotionally intelligent AI-powered assistant, it shows that even a simple form of verbal expression is beneficial. This finding can be used as a starting point for AI research seeking to make this type of support even more realistic and effective, for example, by personalizing the digital agent's empathetic, reassuring expressions.

As a second contribution, we show that a digital assistant's emotional feedback has positive effects in success conditions. This finding broadens the scope of emotional support from failed to successful task accomplishment. Further, the effect not only occurs in a single, exclusive experimental situation (i.e., either only success or only failure), but it holds in situations that are common in real activities such as succeeding one day in accomplishing a task, and another day not.

Third, we explain the effects of emotional support on customer outcomes and highlight the mechanism that drives customer satisfaction and persistence in e-service usage. At the core of this mechanism is perceived warmth, as derived from the warmth–competence model of social perception (Fiske et al., 2002), and in line with the conceptualization of how ASP affects customers (van Doorn et al., 2017). Warmth perceptions directly increase satisfaction because they indicate good intentions from the system that signals these intentions. In turn, satisfaction reinforces the use of the service, leading to greater persistence. Thus, we highlight that the perceptions of warmth that stem from the emotional support provided by a digital assistant serve a double purpose: They directly trigger a personal judgment of the service and, indirectly, repeat behavior. It is noteworthy that these effects occur irrespective of the users' expected and actual performance. Hence, users can be motivated to stay with a service even though they are performing poorly.

A fourth contribution evolves from the comparison between a digital and human assistant. At first glance, it seems surprising that emotional support from a human assistant does not increase persistence, given that there is ample empirical evidence of these effects both from the offline world (e.g., Menon & Dubé, 2007) and social networks (e.g., Yao et al., 2015). However, this counter-intuitive result may be explained in conjunction with another finding of our research: The mere presence of a human assistant in a digital environment already generates warmth perceptions, rendering emotional support from this human agent unnecessary. In contrast, a digital assistant is perceived as colder, and thus emotional support from this digital agent significantly increases warmth perceptions. These results suggest that emotional support from a digital agent can compensate for the lack of warmth in digital systems, which are often perceived as cold and impersonal (Longoni, Bonezzi, & Morewedge, 2019).

All in all, our findings further strengthen the central role of warmth: If warmth is induced in a digital service through the empathetic, reassuring words from a virtual agent, then a motivating mechanism through increased satisfaction on persistence is triggered. Related to the central role of warmth is our finding that the other dimension of social perception, perceived competence, does not explain the positive effect of emotional support. As such, users are able to perceive digital agents as social actors, but when these actors provide empathy and reassurance, they discern, and exclusively value, the warm (but not the competent) feature of the digital assistant.

As a fifth contribution, we examined the role of the digital assistant's embodiment. We show that the digital assistant providing support does not need to be depicted as an embodied agent. The words of empathy (e.g., "Never mind!") and reassurance (e.g., "You can be proud of yourself!") spoken by the digital assistant are enough to trigger perceptions of warmth and satisfaction, and thus foster persistence. This finding holds theoretical relevance for the vast research field on consumers' visual and verbal processing strategies, showing that these strategies may be influenced by the characteristics of the information itself (Wyer, Hung, & Jiang, 2008). The verbal processing

of the words of emotional support allows for a symbolic representation of the digital agent that is relatively detached from its sensory and perceptual aspects (Yan, Sengupta, & Hong, 2016). In consumers, this might leave room for triggering the signs of intentionality from the digital assistant, which have the potential to activate feelings of social connection and empathy, and fostering performance during joint tasks (Wiese, Metta, & Wykowska, 2017).

7.2. Managerial implications

As a core takeaway for firms, our research strongly suggests that there is value in imbuing e-services with a digital assistant that provides empathetic, reassuring feedback to users who execute tasks with these services. This feedback increases satisfaction through warmth, and also leads to persistence, which is crucial because many digital business models are based on revenues in the usage phase (Rutz, Aravindakshan, & Rubel, 2019), and thus marketers need to find ways to increase usage duration and intensity. Moreover, we recommend that emotional support from digital agents can be implemented in different service settings. In addition to the three tested services (fitness tracking, online gaming, and online language learning), many other e-services are conceivable, for example, wellness (e.g., weight loss), healthcare (e.g., blood sugar tracking), or counseling (e.g., improving psychological well-being). Finally, we recommend that emotional support from a digital assistant can be used across different customer types, regardless of whether they under- or overestimate their skills in solving a task with the respective e-service.

Further, the findings allow for specific recommendations on *how* to implement emotional support from digital agents into e-services. First, emotional support can be used in failure as well as in success conditions and just needs to be adapted linguistically to the respective circumstances. Further, emotional support can be used to support customers in single, but also in multiple tasks that they have to fulfill. Yet, it is advisable to avoid boredom through the use of stereotypical

phrases and this can be achieved by altering the wording during the feedback (e.g., "Go on like this!" following a success or "Never mind!" following a failure situation).

The second recommendation evolves from the role of warmth in driving satisfaction and subsequent persistence. This mechanism can be triggered in two ways: Either by letting a digital agent provide emotionally supportive feedback (A) or by connecting users to a human agent who provides feedback, where this feedback does not need to be emotionally supportive (B). Firms may weigh up these two alternative business models. Option (A) complies with the original idea of many e-services regarding cutting costs by replacing human employees with digital agents that take over their roles. While these cost savings come at the expense of reduced warmth perceptions, firms can make up for this disadvantage by letting the digital agent provide emotional support. Although very simple, the feedback used here (e.g., "You can be proud of yourself anyway!") was at a sufficiently high level to affect persistence and was easily added to the neutral feedback ("This is not correct."). Recent developments in AI allow us to envisage that the opportunity to present more complex and personalized feedback will generate even more intense warmth perceptions in the future. Thus, emotional support from a digital agent represents an easy-to-implement option for firms pursuing a low-cost business model. Further, as emotional support induces users to stay longer on the task, they may be more open to making in-app purchases (e.g., buying additional features or paying for an offline version of the app) in the future.

Option (B) is to involve a human (rather than a digital) assistant who provides feedback on task accomplishment. As in our example, the assistant can be connected to users through a live chat. We recommend that firms choosing this option should not specifically instruct these human agents to provide supportive, reassuring feedback. This is because the mere presence of a human already induces warmth perceptions and persistence. Hence, simple feedback on task performance is sufficient here and would not incur additional training costs. Option (B), however, thwarts the idea of a digital service being provided without human–human interactions to cut costs.

Accordingly, we recommend that human agents should be used for the premium version of a service (Li, Jain, & Kannan, 2019) where users are willing to pay to receive feedback from a human employee. This employee may also provide other benefits such as giving information and advice. This is the case, for example, with the fitness program Coaching Zone by Women's Health. Within the online service, users can order a personalized training and nutrition plan but can also contact a coach through a live chat three times in the twelve-week training period. As another example, firms could incorporate the idea of blended learning into the language vocabulary training service presented in our study. Here, users could learn a new language within the app on their own but book additional blended learning classroom sessions to increase their learning progress.

The third recommendation concerns the appearance of the digital agent. Our findings indicate that it does not need to be depicted. The emotional support from the digital agent is equally well received, regardless of whether the agent is presented as embodied or not. This finding is relevant for firms that consider designing service interfaces with embodied digital agents. This effort may be unnecessary as the embodiment does not offer additional benefits.

7.3. Limitations and avenues for future research

Some limitations of this research offer fruitful avenues for future research. First, in our research, the agent provides emotional support after a task has or has not been fulfilled. However, users may also communicate with digital agents while on the task (Kim et al., 2016). Future research could examine if emotional support provided before or while performing a challenging task also increases persistence. For example, users of a fitness app may be receptive to motivating words such as "This is a challenging task, but you can do it." Second, we did not vary the intensity of emotional support. Future research could examine whether users display different outcome levels depending on these variations. They could, for instance, perceive very intense emotional support as intrusive and show reactance. Third, showing that perceived warmth in a digital

environment is the driver of customer outcomes suggests that anything that can create a sufficient increase in warmth is beneficial here. As an initial step, prior research has shown that warmth can be increased by employees using emoticons during their interactions with customers (Li et al., 2018). Following up on this finding, future research could explore alternative drivers of warmth coming from the digital agent. These could be any demeaner that lets users infer positive intentions such as a friendly facial expression (e.g., smiling), a gesture (e.g., thumbs up), and verbal expressions (e.g., giving a compliment). Alternatively, potential drivers of warmth to be tested may come from the servicescape itself, for example, a pleasant digital environment (created through color and shapes) or relaxing background music while playing an online game.

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Appendix A1. Measures

Main constructs

Warmth (based on Aaker et al., 2010), Studies 1, 2, 3, 4
M, SD, α: *Study 1: 3.84, 1.77, .96; Study 2: 4.00, 1.70, .93; Study 3: 5.33, 1.36, .92; Study 4: 5.19, 1.38, .94*
The feedback of the app seems…
- … kind.
- … warm.
- … cordial.

Competence (based on Aaker et al., 2010), Study 4 (part A)
M, SD, α: *Study 4 A: 4.75, 1.41, .90*
The feedback of the app seems…
- … competent.
- … intelligent.
- … effective.

Satisfaction (based on Voss, Parasuraman, & Grewal, 1998), Studies 1, 2, 3, 4
M, SD, α: *Study 1: 4.80, 1.40, .96; Study 2: 4.95, 1.31, .96, Study 3: 5.31, 1.28, .87; Study 4: 4.92, 1.51, .95*
- I am satisfied with the fitness app.
- I am happy with the fitness app.
- I think the fitness app is satisfactory.

Persistence, Studies 3, 4
M, SD: *Study 3: 2.87, 2.87; Study 4: 2.52, 2.64*
How many new icon combinations do you want to play[2]/How many new vocabulary words do you want to learn[3]? (0 to 7)

Control variables

Prior experience, Studies 1, 2, 3, 4
M, SD: *Study 1: 3.01, 2.19; Study 2: 3.11, 2.16; Study 3: 5.23, 1.78; Study 4: 3.20, 2.19*
I have experience with using … step count apps[1]/computer games[2]/language-learning apps[3]

Frequency of the activity, Studies 1, 2, 3, 4
M, SD: *Study 1: 6.23, 5.21; Study 2: 8.83, 6.00; Study 3: 3.67, 13.21; Study 4: 5.00, 9.91*
How … often do you exercise[1]/many hours do you spend doing memory exercises[2]/many hours do you spend learning new languages[3] … per month?

Expected performance, Studies 3, 4
M, SD: *Study 3: 3.87, 1.71; Study 4: 4.76, 2.26*
- How many … icon combinations do you think you will complete correctly[2]/vocabulary words will you remember correctly[3]? (0 to 10)

Actual performance, Studies 3, 4
M, SD: *Study 3: 7.50, 2.10; Study 4: 7.57, 1.57*
Measured real performance (during game or vocabulary test)

Performance estimation (expected performance – actual performance), Studies 3, 4
M, SD: *Study 3: -3.63, 2.31; Study 4: -2.82, 2.21*

Manipulation check measures

Emotional support manipulation check (self-developed), Pretest of Studies 1, 2, 3, 4
M, SD, α: *Pretest Study 1: 3.95, 1.60, .98; Pretest Study 2: 4.39, 1.54, .97; Pretest Study 3: 4.62, 1.51, .96; Pretest Study 4: 4.12, 1.53, .97*
The feedback of the app gave me the feeling …
- … of being emotionally supported.
- … of being emotionally reinforced.
- … that I received emotional support.
- … that I was emotionally aided.

Embodiment manipulation check (Kim et al., 2016), Pretest of Study 3
M, SD: *Pretest Study 3: 4.34, 2.19*
- The one providing feedback during the game had a humanlike face.

Realism (based on Emrich, Paul, & Rudolph, 2015), Pretest of Studies 1, 2, 3, 4
M, SD, α*: Pretest Study 1: 6.53, .97, .95; Pretest Study 2: 6.60, .76, .95; Pretest Study 3: 5.56, 1.38, .87; Pretest Study 4: 5.86, 1.11, .92.*
- The fitness app[1]/missing icon game[2]/vocabulary learning app[3] could exist in reality.
- The fitness app[1]/missing icon game[2]/vocabulary learning app[3] is realistic.
- The fitness app[1]/missing icon game[2]/vocabulary learning app[3] is credible.

Warmth, competence, satisfaction with the technology-mediated service, prior experience, frequency of the activity, manipulation check for emotional support, and the realism check were measured on 7-point Likert-type scales anchored at 1 ("do not agree at all") and 7 ("fully agree").
[1] Wording in Studies 1 and 2
[2] Wording in Study 3
[3] Wording in Study 4

Web Appendix A1. Correlation matrix for Study 1, 2, 3, and 4.

Study 1

Construct	M	SD	Warmth	Satisfaction	Prior experience	Frequency of activity	Gender	Age
Warmth	3.84	1.77	1					
Satisfaction	4.80	1.40	.59***	1				
Prior experience	3.01	2.19	.01	.00	1			
Frequency of activity	6.23	5.21	-.13	-.08	.26*	1		
Gender	1.58	.50	.02	-.14	.09	.16	1	
Age	35.38	11.32	.09	.07	-.32**	-.18	-.13	1

Note: N = 77; all scales (except for gender, age, and frequency of the activity) range from 1 (= strongly disagree) to 7 (= strongly agree); gender: 1 = female, 2 = male; *** p < .001, ** p < .01., * p < .05.

Study 2

Construct	M	SD	Warmth	Satisfaction	Prior experience	Frequency of activity	Gender	Age
Warmth	4.00	1.70	1					
Satisfaction	4.95	1.31	.37**	1				
Prior experience	3.11	2.16	-.12	-.06	1			
Frequency of activity	8.83	6.00	-.06	.03	.08	1		
Gender	1.56	.50	-.08	.02	-.07	.26*	1	
Age	34.82	11.2	.00	.08	-.29*	-.29*	-.13	1

Note: N = 72; all scales (except for gender, age, and frequency of the activity) range from 1 (= strongly disagree) to 7 (= strongly agree); gender: 1 = female, 2 = male; *** p < .001, ** p < .01., * p < .05.

Study 3

Construct	M	SD	Warmth	Satisfaction	Persistence	Prior experience	Frequency of activity	Expected performance	Actual performance	Performance estimation	Gender	Age
Warmth	5.33	1.36	1									
Satisfaction	5.31	1.28	.32***	1								
Persistence	2.87	2.87	.19**	.25***	1							
Prior experience	5.23	1.78	-.05	-.09	-.08	1						
Frequency of activity	3.67	13.21	.02	-.02	-.09	.15*	1					
Expected performance	3.87	1.71	.05	.06	.00	.12	.05	1				
Actual performance	7.50	2.10	.12	.23**	.02	.10	.01	.30***	1			
Performance estimation	-3.63	2.31	-.08	-.17*	-.02	.00	.03	.46***	-.71***	1		
Gender	1.43	.50	-.21**	-.22**	-.02	.34***	-.03	.10	.-01	.08	1	
Age	32.56	11.82	.13	.17*	.08	-.31***	-.06	-.06	-.03	-.02	-.07	1

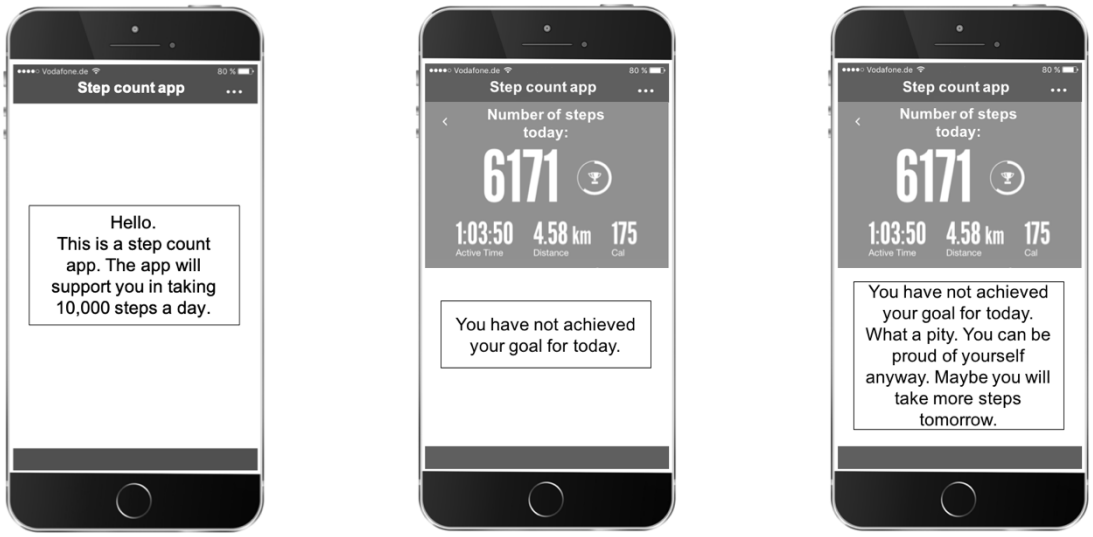
Note: N = 206; all scales (except for gender, age, and frequency of the activity) range from 1 (= strongly disagree) to 7 (= strongly agree); estimated performance ; *** p < .001, ** p < .01., * p < .05.

Study 4

Construct	M	SD	Warmth	Competence	Satisfaction	Persistence	Prior experience	Frequency of activity	Expected Performance	Actual performance	Performance estimation	Gender	Age
Warmth	5.19	1.38	1										
Competence [1]	4.75	1.41	.61***	1									
Satisfaction	4.92	1.51	.31***	.69***	1								
Persistence	2.52	2.64	.20**	.26***	.25***	1							
Prior experience	3.20	2.19	.11	.10	.01	.06	1						
Frequency of activity	5.00	9.91	.05	.05	-.06	-.03	.25***	1					
Expected performance	4.76	2.26	.15*	.14*	.23***	.26***	.03	-.05	1				
Actual performance	7.57	1.57	.22***	.21**	.15*	.24***	.00	.00	.38***	1			
Performance estimation	-2.82	2.21	-.01	-.01	.13*	.10	.04	-.05	.75***	-.32***	1		
Gender	1.54	.50	-.01	-.09	.03	-.09	-.05	-.03	-.02	-.10	.05	1	
Age	33.73	10.63	.04	.10	.06	.18**	-.06	-.07	-.03	.17*	-.15*	-.10	1

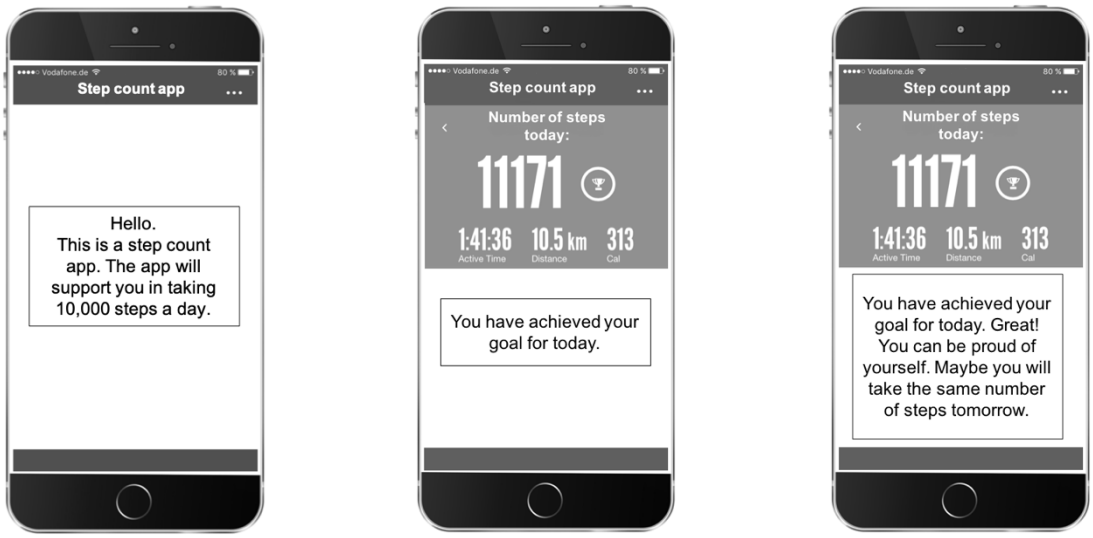
Note: N = 291; all scales (except for gender, age, and frequency of the activity) range from 1 (= strongly disagree) to 7 (= strongly agree); *** p < .001, ** p < .01., * p < .05.
[1] All correlations with competence are based on the digital assistant condition only (Study 4 – part A, n = 206) because competence was captured as a competing mediator in this subsample .

Web Appendix B1.1. Stimuli (Study 1)



(a) (b) (c)

Web Appendix B1.2. Stimuli (Study 2)



(a) (b) (c)

(a) Initial screen; (b) Feedback screen emotional support: no; (c) Feedback screen emotional support: yes

Web Appendix B1.3. Stimuli (Study 3)

Panel A. Icon combinations and sample task from missing icon game

Icon combinations:

Sample task:

Select from the 6 icons below the one that correctly completes the following combination:

1) 

2) 

3) 

4) 

5) 

6) 

Panel B. Manipulations (Study 3)

Sample feedback for correct answer and embodiment manipulation:

		Emotional support	
		no	*yes*
Embodiment of the assistant	*no*	The answer is correct.	The answer is correct. You can be proud of yourself!
	yes	The answer is correct. 	The answer is correct. You can be proud of yourself! 

Panel C. Feedback manipulation (Study 3, also used in Study 4)

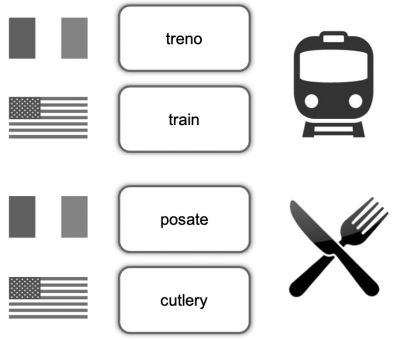
Correct answer	**Incorrect answer**
The answer is correct. *You can be proud of yourself!*	The answer is not correct. *You can be proud of yourself anyway!*
The answer is correct. *Go on like this!*	The answer is not correct. *Never mind!*
The answer is correct. *That's a reason to be happy!*	The answer is not correct. *Don't let up!*
The answer is correct. *Right-on!*	The answer is not correct. *Next time, it definitely will be better!*

Note: Italic text only added in the emotional support conditions.

Web Appendix B1.4. Stimuli (Study 4)

Panel A. Sample vocabulary words and sample task from the vocabulary test

Sample vocabulary words presented within the Italian vocabulary learning app:



Sample task from the vocabulary test:

If you notice in the restaurant that you are missing cutlery, you ask the waiter for...?

- posate
- bistecca
- scarpe
- spumante

*Panel B. Feedback manipulation (Study 4 – parts A and B)**

* The feedback used in Study 4 – part A and B was the same as in Study 3 (see Web Appendix B1.3 Panel C).