Fronczek, L. P., Mende, M., Scott, M. L., Nenkov, G. Y., & Gustafsson, A. (2023). Friend or foe? Can anthropomorphizing self-tracking devices backfire on marketers and consumers?. Journal of the Academy of Marketing Science, 51(5), 1075-1097. https://doi.org/10.1007/s11747-022-00915-1

**Friend or Foe? Can Anthropomorphizing Self-Tracking Devices Backfire on Marketers and Consumers?**

**Lane Peterson**
Assistant Professor of Marketing
Georgia State University
1337, 35 Broad Street, Atlanta, GA
404.413.7679, lpeterson18@gsu.edu

**Martin Mende**
Professor of Marketing
Jim Moran Professor of Business Administration
Florida State University
College of Business, Department of Marketing
821 Academic Way, Tallahassee, FL 32306
850.644.7897, mmende@fsu.edu

**Maura L. Scott**
Persis E. Rockwood Professor of Marketing
Florida State University
College of Business, Department of Marketing
821 Academic Way, Tallahassee, FL 32306
850.644.6554, mlscott@fsu.edu

**Gergana Nenkov**
Associate Professor of Marketing
Boston College
Carroll School of Management, Department of Marketing
140 Commonwealth Avenue, Chestnut Hill, MA 02467
617.552.1018, gergana.nenkov@bc.edu

**Anders Gustafsson**
Research Professor Department of Marketing
BI Norwegian Business School
Department of Marketing
Nydalsveien 37, 0484 Oslo, Norway
+4746410191, anders.gustafsson@bi.no

Authors' note: The authors gratefully acknowledge a Transformative Consumer Research grant from the Association for Consumer Research to support this research.

**Conflict of Interest**: The authors declare that they have no conflicts of interest.**Friend or Foe? Can Anthropomorphizing Self-Tracking Devices Backfire on Marketers and Consumers?**

## Abstract

Self-quantification, with the promise of motivating consumers to engage in health behaviors through measuring their performance, is a popular trend amongst consumers. Despite the economic impact of self-tracking technologies, consumers' experiences with self-tracking devices and corresponding consequences for firms remain understudied. Six studies examine how the popular marketing tactic of anthropomorphization influences (a) consumers' favorability towards wearable tracking devices, (b) their health motivation, and (c) their health behavior (number of steps taken) over time. The authors uncover a novel dynamic effect of anthropomorphism, such that *with use*, positive evaluations of anthropomorphized (vs. non-anthropomorphized) devices decrease, and (contrary to prior literature), anthropomorphized devices are not favored. Importantly, health motivation and health behaviors are also reduced over time with the use of an anthropomorphized (vs. non-anthropomorphized) wearable device. This decrease occurs because anthropomorphized devices reduce the wearers' perceived autonomy, which in turn, reduces their health motivation and health behavior. However, customizing the anthropomorphized device (by setting a customized goal or by monitoring a greater number of health-related indicators) can mitigate its negative effect. These findings provide novel insights to marketing scholars and managers, by suggesting that anthropomorphism can be a successful short-term selling strategy, but over time, it can have unintended consequences for both firms and consumers.



**Keywords**

Self-quantification, self-tracking technologies, anthropomorphism, health motivation, product customization

Enabled by the rapid evolution of technologies, millions of consumers engage in self-tracking; that is, they use quantitative and qualitative indicators to monitor the intricacies of their lives as never before (Lee and Drake 2013; Lupton 2016b; Wolf 2009). A major illustration of this trend is the "quantified self" movement (quantifiedself.com), which refers to consumers using various technologies including smartphone apps, sensors embedded in clothing, adhesive patches, and wearable devices to track themselves, often to assess their performance toward their goals (Lupton 2016a). The corresponding growth in the prevalence of monitoring devices is illustrated by a 28.4% growth in shipments of wearable devices in 2020 (IDC.com 2021). Corporate investments in the area of wearable devices also continue to increase considerably, consistent with forecasts that predict wearable technology market size to reach more than $265.4 billion by 2026 (Markets and Markets 2021). Against this background, it is surprising how little scholarly research has examined the consumer experience of self-tracking and its psychological facets, as Table 1 illustrates.

--- Insert Table 1 here ---

In a pioneering study, Etkin (2016) showed that when consumers are engaged in self-tracking on a goal-oriented task, the task feels more like work than pleasure. However, with regard to the health benefits of self-tracking, findings in the literature are ambivalent: some research suggests *improved* anticipated health motivation (Pettinico and Milne 2017) and behavior (Harris et al. 2015), but other work suggests *reduced* health benefits, such as lower weight loss (Jakicic et al. 2016) and unhealthy relationships with technology (Van den Bulck 2015). Finally, some research has investigated self-tracking devices from a technical perspective (e.g., assessing the reliability of step-trackers; Dontje et al. 2015), but the psychological influence of self-tracking technologies remains largely understudied.

Self-tracking technologies promise consumers better health and increased motivation; thus, consumers adopt the technologies in hopes of accomplishing these goals (Gimpel et al. 2013). However, despite the proposed benefits of wearables, many consumers abandon these devices after initial use (Ledger and McCaffrey 2014). While a handful of studies have explored the adoption of these technologies (Fritz et al. 2014; Shin et al. 2019), few have investigated the consumer experience in relation to wearables and possible reasons for the dismissal of these devices over time. Some authors suggest a decrease in health motivation (i.e., consumers' willingness or interest in performing health behaviors; Moorman and Matulich 1993) might be a key reason (Clawson et al. 2015). However, we are not aware of any studies that empirically explore the *reason for such a potential decrease in health motivation*. To address this gap in the literature and to better understand consumers' underlying psychological response to wearables, we examine a closely related and substantial technological trend, namely: anthropomorphization (i.e., attributing human characteristics to the device; Epley and Waytz 2007). Drawing on recent perspectives on consumer-technology-relationships (Hoffman and Novak 2018) and answering a call for more research investigating how humanized entities affect consumers in well-being contexts (Epley 2018), we examine how *anthropomorphizing* self-tracking devices might affect consumers over time.

Anthropomorphism is a popular marketing tactic in the context of self-tracking technologies (see Table 2 for examples). Prior research suggests that consumers tend to perceive anthropomorphized products as social others, which can influence their behavioral responses to such anthropomorphized products (Chartrand et al. 2008; Hur et al. 2015), mostly in positive ways (Aggarwal and McGill 2007; Delbaere et al. 2011; Rauschnabel and Ahuvia 2014). We explore whether anthropomorphism indeed results in the consistently positive

outcomes for firms and consumers that prior research and managerial practice suggest (e.g., "… anthropomorphizing not only fosters liking but also pays off in monetary terms" [Landwehr et al. 2011 p. 142]). Our research explores three main questions: (1) How are anthropomorphized self-tracking devices evaluated by consumers over time (i.e., before and after use)? (2) How do these anthropomorphized devices affect consumer health motivation and health behavior before and after use? (3) What strategies help managers reap the benefits of anthropomorphized self-tracking devices while avoiding their unintended negative effects?

In exploring these questions, we examine effects over time and find that, consistent with prior research (Aggarwal and McGill 2007; Delbaere et al. 2011), before use consumers are *initially* more interested in and evaluate anthropomorphized self-trackers more favorably than non-anthropomorphized ones. However, with use of the tracking device, the positive effects of anthropomorphism wear off. Our research thereby makes several contributions to the marketing literature and the emerging domain of consumer self-tracking.

First, answering calls for more longitudinal consumer behavior insights (e.g., Chintagunta and Labroo 2020), we examine our predictions in a series of *longitudinal field and laboratory studies*. In observing changes over time, our longitudinal studies provide causal insights into the evolving engagement of consumers with their self-tracking devices (Costa Figueiredo et al. 2018; Maltseva and Lutz 2018). We *discover a novel dynamic effect* of anthropomorphized self-tracking devices on consumer evaluations, health motivation, and health behavior: our results show that the positive pre-usage evaluations of anthropomorphized devices decrease with use, suggesting that favorability towards anthropomorphized devices is (merely) a temporary effect.

Second, adding to the literature on how marketing relates to consumer well-being (Chandy et al. 2021), we find that the marketing tactic of anthropomorphization can have

unintended consequences for consumers' health motivation over time. That is, consumers are less likely to engage in physical activity and other health behaviors when using an anthropomorphized tracker. Increases in physical activity, exercise, and healthy eating can help bolster consumer well-being (e.g., prevent and reduce obesity; Kiwanuka 2020; Nestle and Jacobson 2000; Wiklund 2016). Thus, we discover a novel negative effect of anthropomorphism related to well-being, which can only be observed over time. In doing so we add to research on the antecedents of health motivation and health behavior, important drivers of numerous health-/well-being practices (Andrews et al. 2009; Moorman and Matulich 1993).

Third, we explore the process driving the decrease in health motivation: we find that anthropomorphism reduces consumer-perceived autonomy (e.g., Kim et al. 2016), which then undermines health motivation and health behavior. By shedding light on why anthropomorphized tracking devices influence consumer evaluations, motivations, and behavior, we expand marketing knowledge about a major facet of the rapidly-evolving digitized consumer culture.

Our findings provide important insights for managers by revealing how anthropomorphization, a common marketing tool that firms use to promote their self-tracking devices, can sabotage the effectiveness of using these devices. For companies, anthropomorphization can be an effective tactic for driving (short-term) sales, as before use, consumers are more favorable toward anthropomorphized (vs. non-anthropomorphized) trackers. However, managers should note that actually wearing and using anthropomorphized devices may have detrimental effects on both product evaluation and effectiveness, which can undermine customer relationship building and loyalty over time. These results provide new guidance to firms that promote self-tracking technology by emphasizing that it is more (less) beneficial to use anthropomorphization as a marketing tool during the pre- (vs. post-) purchase stage of the

consumer journey (Hamilton and Price 2019).

Importantly, we demonstrate that firms and consumers can *mitigate the negative effects* of anthropomorphism by customizing the tracking device, since customization can reaffirm consumer-perceived autonomy (Kim and Lee 2020; Kim et al. 2016). Our results show that consumers who customize their anthropomorphized device can mitigate the unintended effects of anthropomorphism on health motivation. We provide two strategies that marketers can employ to encourage consumers to customize their tracker: (a) fitness goal customization and (b) increased number of monitored indicators. We find that by customizing (vs. not) a daily fitness goal, and by tracking more (vs. fewer) health indicators (e.g., steps taken, heart rate, minutes exercised), the negative effect of anthropomorphism on health motivation is mitigated. Therefore, firms are advised to incorporate features into the device that allow tracker users to customize their goals and to encourage consumers using anthropomorphized activity trackers to monitor a higher number of health-related indicators (e.g., by using push strategies or app-based notifications).

**Anthropomorphism and Consumer Evaluation of Self-Tracking Technologies**

Anthropomorphism, defined as attributing human characteristics, motivations, intentions, or emotions to nonhuman agents (Epley and Waytz 2007), has various benefits when applied to consumer products. For instance, anthropomorphism enhances consumer favorability toward products (Aggarwal and McGill 2007; Wen Wan et al. 2017). Thus, marketers who promote anthropomorphized self-tracking devices have reason to expect positive outcomes for firms (e.g., sales) and consumers (e.g., product evaluation). Accordingly, anthropomorphism is a common tactic that marketers use to promote self-tracking technologies (see Table 2). For instance, the smartphone app ‘MyFitnessPal’ creates a friendly “pal” to aid consumers in their weight loss

journey. Another common anthropomorphic characteristic of self-tracking devices is incorporating a "personal coach," or "trainer" into the marketing of the technology. For example, Apple promotes its "Apple Watch" with the promise that this wearable device "…feels like having a personal trainer on your wrist" (Apple 2022).

---Insert Table 2 here---

Consistent with prior research that has shown how incorporating human-like product characteristics often results in positive outcomes (e.g., likeability, favorability, trust, positive affect; Aggarwal and McGill 2007; Delbaere et al. 2011; Hildebrand and Bergner 2021), we expect that before use consumers will evaluate anthropomorphized (vs. non-anthropomorphized) self-tracking devices more favorably. However, one limitation of extant research is that most studies focus on pre-usage effects and there is a dearth of longitudinal studies examining perceptions of anthropomorphized products after use. This void in the literature is critical because research in other fields of technology (e.g., human-robot-interactions) suggests that people's relationships with anthropomorphic technologies change over time. Specifically, Lemaignan, Fink, and Dillenbourg (2014) theorize that anthropomorphic effects evolve over time as users interact with a technology. Accordingly, these authors distinguish three phases of anthropomorphic effects: the *initialization, familiarization, and stabilization phase*.

The *initialization* phase occurs within the first few seconds to hours of an interaction with technology, before the consumer has a chance to actually experience and make use of the technology. In this phase anthropomorphic effects are maximized due to a novelty effect. This insight suggests that effects of anthropomorphized products in the marketing literature (e.g., enhanced favorability; Aggarwal and McGill 2007; Chandler and Schwarz 2010) often represent consumer experiences in this phase. However, with use of the self-tracker over time, consumers

should transition from the initialization phase to the *familiarization phase* (Lemaignan et al. 2014). In this phase, through observing and interacting with the technology, consumers can predict the technologies' behavior such that its novel social and interactive aspects wear off. As a result, consumers begin to view the technology more as a tool (Joosse et al. 2013). Finally, in the *stabilization phase,* the anthropomorphic effects become steady, and represent the long-term anthropomorphism effects. We expect initial increased favorability of evaluations of anthropomorphized self-tracking devices (that are observed before use in the initiation phase) to wear off with use of the device. We hypothesize:

H1: With use, consumers favorable pre-usage evaluations of an anthropomorphized activity tracker decrease (H1a), and consumers no longer favor anthropomorphized (vs. non-anthropomorphized) devices (H1b).

**Anthropomorphized Self-Tracking, Consumer Autonomy, and Health Motivation**

Consumer health motivation and health behavior are crucial outcome variables as self-trackers often promise enhanced motivation and engagement in health behaviors (e.g., increased walking and more frequent exercise); thus, it is imperative to test whether beyond its negative effects on product evaluation, anthropomorphism might also lead to a decline in consumer health motivation and health behavior after use. We propose that anthropomorphism undermines consumers' health motivation by lowering consumer-perceived autonomy. Autonomy – the extent to which people feel they regulate themselves, initiate their own actions, and make their own choices (Deci and Ryan 1985; Ryan and Deci 2006) – is important in various contexts of motivation including learning and education (Dickinson 1995), sports (Gagne 2003), and work performance (Dysvik and Kuvaas 2011). Autonomy also plays a critical role in consumers' mental and physical health (Deci and Ryan 2012; Ng et al. 2012). We expect that an

anthropomorphized (vs. not) tracker will negatively affect consumer health motivation and aspects of their corresponding health behavior by undermining consumer autonomy. In the context of other technologies like computer gaming, anthropomorphized digital helpers have been found to reduce perceived autonomy among players, which in turn led to reduced players' game enjoyment and play persistence, as players felt as though the outcome of the game was determined more by the anthropomorphized digital helper rather than their own actions (Kim et al. 2016).

The notion that anthropomorphism undermines consumers' health motivation and behavior by lowering consumer-perceived autonomy is also consistent with related research suggesting that consumers perceive an anthropomorphized product as a distinct external social agent to which they attribute cause of and responsibility for their actions (i.e., external attribution; Hur et al. 2015). The motivational impact of social others has received much attention in the context of goal pursuit in general (for a recent review see Hamilton et al. 2021) and in the domain of self-quantification in particular (Hamari et al. 2018; Hassan et al. 2019; Swan 2009). Even though some research suggests including another individual in goal pursuit is advantageous as it increases accountability (Abrahamse et al. 2005; Hollenbeck et al. 1989; Staats et al., 2004), other work has pointed to the negative effects that social others can have on goal pursuit. Specifically, studies suggest that incorporating a social other into goal pursuit may reduce a consumer's motivation, because people tend to engage in self-regulatory outsourcing, where they rely on the social other to make progress (e.g., thinking "they will do the work, so I don't have to"), which undermines their motivation to make effortful progress towards that goal (Fitzsimons and Finkel 2011). Prior research also shows that when a person perceives goal progress (e.g., consumers perceive other's help as progress), they can disengage

from that goal and pursue other goals instead (Fishbach and Dhar 2005). Similarly, when working with others towards the same goal, consumers tend to be demotivated to exert effort towards that goal (i.e., *social loafing*; Harkins et al. 1980).

Drawing on the above insights, we expect using an anthropomorphized (vs. non-anthropomorphized) tracker to decrease consumer-perceived autonomy, with undesirable downstream effects on consumer health motivation and related behavior. More specifically, consistent with their favorable pre-usage evaluations towards anthropomorphized (vs. non-anthropomorphized) trackers, we expect that consumers who have not used their anthropomorphized tracker yet will indicate greater health motivation. However, we hypothesize that after usage, an anthropomorphized (vs. a non-anthropomorphized) device will *reduce* consumer autonomy, which ultimately will *undermine* health motivation and behavior. Formally:

H2: Using an anthropomorphized (vs. non-anthropomorphized) activity tracker will decrease consumer health motivation and health-related behavior.

H3: The negative effect of using an anthropomorphized (vs. non-anthropomorphized) activity tracker on health motivation and health-related behavior will be driven by a decrease in consumer perceived autonomy.

## Empirical Overview

We test our predictions in six studies (see Table 3 for an overview of all studies). In a real-world setting, the Pilot Study confirms that anthropomorphizing self-tracking devices can be an effective short-term sales strategy, as consumers are more interested in these devices than non-anthropomorphized devices. Next, in two field studies using an adult (non-student) sample in Europe (Study 1) and a student sample in the U.S. (Study 2), we give participants activity trackers (anthropomorphized vs. not) to use in their everyday lives. Results from these studies show that prior to using the tracker, product evaluations are more favorable toward an anthropomorphized (vs. not) tracker, but with use over time, evaluations of anthropomorphized

trackers decrease, thereby eliminating the advantage of anthropomorphized devices over non-anthropomorphized ones. Moreover, results show that anthropomorphizing the tracker reduces participants' health motivation and behavior (measured health motivation in Study 1 and actual number of steps taken in Study 2). Studies 3 and 4 again demonstrate the negative effect of anthropomorphizing the tracker on product evaluation and health motivation/behavior over time (among consumers who were given a fitness tracker to wear in Study 3, and among existing customers who already own a fitness tracker in Study 4) and shed light on the underlying process by exploring the mediating role of autonomy. Study 5 and a follow-up study (Study 5B, Web Appendix C) examine managerially actionable strategies to reduce the negative effects of anthropomorphism by reaffirming consumer autonomy via two different customization approaches.

We find robust evidence for our predictions that with use, evaluations of anthropomorphized trackers lead to reduced product evaluation (Studies 1, 2, and 3) and reduced health motivation/behavior (Studies 1-5) across both adult and student participants, with new tracker users and consumers who already own a tracker, and by both manipulating anthropomorphism and measuring consumers' tendency to anthropomorphize the activity tracker. We also demonstrate the effects across multiple operationalizations of health motivation and its behavioral manifestations (steps taken, measured motivation, and exercise frequency). Finally, we provide process evidence via both mediation (by demonstrating the mediating role of consumer-perceived autonomy; Studies 3 and 4) and moderation (by demonstrating that the effects of anthropomorphism are attenuated when consumer autonomy is reaffirmed; Study 5 and WA Study 5B). Together, the studies reveal a robust dynamic effect of anthropomorphism on health motivation through the lens of the quantified self.

--- Insert Table 3 about here ---

## Pilot Study: Field Experiment

This Pilot Study tests how consumers initially respond to anthropomorphized trackers in a real-world setting. We use advertisements for a tracker that is either anthropomorphized or not and measure consumers' click-through rates. Consistent with prior literature, we anticipate that consumers respond more favorably toward the anthropomorphized product (e.g., Chandler and Schwarz 2010), increasing their likelihood to click on the ad for the anthropomorphized tracker.

### *Participants, Design, and Procedure*

This study employed a 2(anthropomorphized, not) between-subjects design. We published sponsored search ads using Google Ads, which appeared in Google when a consumer typed a pre-specified search keyword. For example, when a consumer types the keyword "fitness tracker," s/he might see (near or above the search results) a sponsored ad by a firm promoting fitness trackers that specified this keyword (Kronrod et al. 2012; Winterich et al. 2019).

Our ad campaign ran for four days, and the same fixed budget was specified for each day, such that on a specified day the ads would stop appearing to consumers searching the pre-specified keywords after the daily budget had been reached. The keywords selected, based on Google's suggestions, were: *fitness tracker, step tracker, step counter, pedometer, pedometer for walking, [fitness tracker], [step tracker], [tracking steps]*[1]. A "maximizing clicks" bid strategy was chosen for the campaign, in which Google Ads drives the most clicks possible with the daily budget. Therefore, Google's algorithm determined the specifics of the campaign automatically. We constructed two search ads: a control ad, with the headline "Fitness Tracker XT1000 | Device which helps you get fit," which stated that XT1000 is programmed to help you reach

[1] Parentheses denote that an exact match is required (e.g., [fitness tracker] means the ad will appear if and only if the two words entered are fitness tracker). Fitness tracker was the most clicked on keyword.

your fitness goals; and an anthropomorphized ad, with the headline: "Fitness Tracker named "Alex" | Friend who helps you get fit," which stated that Alex exists to help you reach your fitness goals (Web Appendix A for stimuli used). When consumers clicked on the ads, it took them to the same landing page – a blog that helps consumers choose the best pedometer. (A pretest confirmed that the device in the anthropomorphized (vs. not) advertisement was perceived as having more human-like qualities, and that both ads were perceived to be about devices; see Table 4 for full pretest details).

--- Insert Table 4 here ---

***Results***

*Click-through rates.* During the four days that the campaign ran, it generated 98,918 impressions and 275 clicks[2]. The frequency of appearance of the different messages was not random because the Google Ads algorithm determines which ad to show depending on the bidding strategy of the campaign (maximizing clicks in this case). Therefore, the actual number of clicks per ad could not be used. Instead, following prior research (Kronrod et al. 2012; Winterich et al. 2019), we used the average percentage of clicks per appearance as the dependent variable. A chi-square analysis revealed that, consistent with our theorizing, the click-through rate was significantly higher for the anthropomorphized ad (1.35%), as compared to the control ad (.23%; $\chi^2 = 200.12$, $p < .001$).

***Discussion***

This study shows that, consistent with prior literature, consumers searching for a fitness tracker were more interested in ads for an anthropomorphized (vs. not) device. With this baseline understanding that the favorability effect of anthropomorphism extends to activity trackers, we

[2] This study had an overall click through rate of .28%, which is consistent with other studies (e.g., .20% click-through rate; Winterich et al. 2019).

examine if this effect is sustained over time. Study 1 also explores whether anthropomorphized trackers motivate consumers with the use of actual activity trackers over time.

## Study 1

This field study has two objectives. First, it builds on the Pilot Study, by exploring how consumers evaluate anthropomorphized (vs. non-anthropomorphized) trackers before and after usage, *over time*. Second, it examines health motivation intentions after wearing anthropomorphized (vs. non-anthropomorphized) trackers.

### *Participants, Design, and Procedure*

Participants were 43 adult members[3] of an executive networking organization who regularly attend a health club ($M_{Age}$ = 49.51, 18 females). Participants were informed that they would be trying a new activity tracker as part of a study. In exchange for their participation, they could keep the activity tracker. Using a multi-stage procedure, this study employed a 2(anthropomorphized, control) between-subjects design, and we measured consumers' tendency to anthropomorphize.

*Pre-Usage Procedure.* First, participants provided demographic information and indicated their tendency to anthropomorphize via a three-item index ("to what extent do/does … "technological devices have consciousness," "an average computer has a mind of its own," "technological devices experience emotion," Waytz et al. 2010, Cronbach's $\alpha$ = .73).

One week later, all participants were given the activity tracker, which was designed to be worn on the wrist and could sync with a participant's computer or mobile device. We

[3] Fifty-nine participants began the study, but only 43 participants participated in wearing the activity tracker for the duration of the study. In the final sample, there were 21 participants in the control condition and 22 participants in the anthropomorphism condition.

manipulated anthropomorphism at this time. Participants in the anthropomorphism condition were asked to give their tracker a name and describe its personality (Chandler and Schwarz 2010; Epley et al. 2007; Yam et al. 2020; Zhou et al. 2019); this step was omitted in the control condition. Next, prior to wearing the tracker, participants reported their baseline pre-usage evaluation of the tracker (e.g., "I am satisfied with the tracker…"; r = .53, $p < .001$; see Table 5 for measurement items).

*During Usage Procedure.* Participants were encouraged to wear their activity tracker every day during normal activities and while exercising. In addition, we asked them to record their daily steps over the course of the week (i.e., until they return one week later).

*Post-Usage Procedure.* Participants returned one week later and were asked to complete a questionnaire containing a health motivation index (e.g., over the past week, to what extent were you focused on "setting health goals," and "being physically active," Cronbach's $\alpha = .91$; see Table 5). Then, participants indicated their post-usage evaluation of the tracker (e.g., actual satisfaction; r = .54, $p < .001$) and reported their steps taken over the past six days.

***Results***

*Pre-usage and Post-usage Evaluations.* Analyses of pre- and post-usage evaluations are conducted as a function of tracker type, controlling for age and gender.[4] Prior to using the tracker, participants evaluated the anthropomorphized (vs. not) tracker more favorably ($M_{Anthro}$ = 4.85, $M_{Control}$ = 4.06; F(1,39) = 4.20, $p = .05$, $\eta^2 = .10$). However, after seven days of use, participants wearing an anthropomorphized tracker reported a significant decrease in evaluations

[4] All studies control for age and gender based on their influence on health behaviors (Bender and Derby 1992; Cole and Gaeth 1990; Mathios 1996; Nayga 1997). Adjusted means are reported in the body text; Web Appendix B provides adjusted means (SEs) and raw means (SDs). Patterns hold with and without control variables. We discuss control variables in the body text when they are significant. Furthermore, at the end of the methods section, we report a single paper meta-analysis without any control variables.

($M_{Pre}$ = 4.85, $M_{Post}$ = 4.27; F(1, 39) = 7.76, $p$ = .004, $\eta^2$ = .19), supporting H1a. Participants in the control condition showed no difference in evaluations over time ($M_{Pre}$ = 4.06, $M_{Post}$ = 4.36; F(1, 39) = .71, $p$ = .40). Additionally, after using the tracker, evaluations of the anthropomorphized tracker were not significantly different from the non-anthropomorphized tracker ($M_{Anthro}$ = 4.27, $M_{Control}$ = 4.36; F < 1, $p$ = .83), supporting H1b (see Figure 1).

-----Insert Figure 1 about here-----

*Post-usage Health Motivation.* After a week of using their tracker, participants indicated their health motivation. Analyses showed the predicted significant main effect of tracker type: health motivation was significantly lower for the anthropomorphized activity tracker versus the control ($M_{Anthro}$ = 4.56, $M_{Control}$ = 4.80; F(1, 37) = 4.63, $p$ = .04, $\eta^2$ = .11), in support of H2.[5]

***Discussion***

This study uncovers several important insights. Consistent with the Pilot Study and prior literature, before using the activity tracker, consumers with an anthropomorphized (vs. control) tracker report significantly more favorable evaluations toward the product. However, over time, evaluations decrease among consumers with anthropomorphized trackers, and they do not favor anthropomorphized devices over non-anthropomorphized devices. This suggests the pre-usage favorability effect found in this study and the Pilot Study is not sustained over-time. Moreover, when actual users anthropomorphize (vs. not) their tracker, they report lower levels of health motivation after using the product. Although we were unable to obtain steps taken from all

[5] Because research suggests that consumers may differ in their tendency to anthropomorphize (e.g., Cullen et al. 2014), we include a corresponding measure in this study (Waytz et al. 2010). In this model, for exploratory purposes, we examined the effects of activity tracker type and tendency to anthropomorphize on health motivation, and we found a significant interaction (F(1, 37) = 8.05, $p$ = .007). (There was no tendency to anthropomorphize main effect; F < 1, $p$ = .50). The significant interaction showed that consumers with a higher tendency to anthropomorphize (+1SD) had significantly lower health motivation with an anthropomorphized tracker (M = 4.81; $p$ = .02), whereas those with lower tendency to anthropomorphize (-1SD) were relatively unaffected. This insight provides additional support for our theorizing that anthropomorphizing activity trackers reduces health motivation, because the effects are stronger for people with greater tendency to anthropomorphize products.

participants, number of steps were directionally consistent with our theorizing[6]. Taken together, the findings suggest that consumers indicate more favorable evaluations toward anthropomorphized fitness trackers *prior* to using it; however, *with* using an anthropomorphized tracker, the favorable product evaluations dissipate, and health motivation levels are lower as compared to the non-anthropomorphized tracker.

## Study 2

In this study, participants are given real activity trackers to evaluate as they would in a retail setting (i.e., prior to actual use), and were asked to wear them over the course of multiple days. This study seeks to demonstrate results from Study 1 with a different anthropomorphism manipulation and by measuring a health behavior, namely, number of steps taken.

### *Participants, Design, and Procedure*

Participants were 60 students enrolled in two sections of a business course ($M_{age}$ = 21.21, 37 females)[7] who participated for class credit and a chance to win a gift card. Study 2 employed a 2(anthropomorphized, control) between-subjects design and a multi-stage procedure.

*Pre-Usage Procedure.* First, on a Monday, participants were given an anthropomorphized (vs. not) activity tracker. To manipulate anthropomorphism, the product packaging had a label which read either, "Chris: Your Personal Trainer" in the anthropomorphized condition, or "XT1000: Your Personal Training Device" in the control

[6] The majority of participants did not report their steps taken. The number of participants consistently reporting their steps was not different by condition (12 in the anthropomorphism condition, 13 in the control condition). Based on the responses we did receive, we calculated the average daily steps taken; the steps taken are directionally consistent with our hypothesis ($M_{anthro}$ = 11,626.36, $M_{control}$ = 12,673.11). That is, participants in the anthropomorphism condition took 1,046 fewer steps on average than those in the control condition, consistent with the health motivation variable results.

[7] Across two back-to-back class periods, we randomized conditions by seating row within each session (i.e., in each session, participants were randomly assigned to either of the two experimental conditions). We controlled for class period in all analyses. Four students reported taking 0 steps during the experiment and were excluded from analyses.

condition (Yam et al. 2020). The tracker itself had a sticker on its band, which read either "Chris" or "XT1000," (Web Appendix A). Participants read an ad about the tracker, as follows:

> Anthropomorphism condition: "Activity Tracker Named Chris. Your personal trainer Chris is here to help you with your health and fitness goals. Chris is your personal trainer who is constantly thinking of ways to enhance your overall health and fitness level using the app and reports to keep you engaged."
>
> Control condition: "Activity Tracker XT1000. Your personal training device XT1000 is here to help you with your health and fitness goals. XT1000 is your personal training device which is designed to enhance your overall health and fitness level using the app and reports to keep you engaged."

Before putting the device on their wrist, participants evaluated the tracker ("I am satisfied with [Chris] XT1000", "I think [Chris] XT1000 will help me reach my health and fitness goals", "I will enjoy tracking my activity with [Chris] XT1000," $\alpha = .77$; see Table 5 for measures). After completing the questionnaire, participants put the band on their wrist and were given instructions to download the tracker's phone app, which recorded their steps taken over time.

*During Usage Procedure.* Participants tracked their steps using the smartphone app over three days. That includes, Monday (the remainder of the day they received the activity tracker), Tuesday (the full second day of using the activity tracker), and Wednesday (the third day, until it was time to return the tracker).

*Post-Usage Procedure.* On Wednesday, participants returned to complete the second part of the questionnaire. While still wearing the tracker, they answered the same evaluation measures as in the pre-usage questionnaire, and reported their steps taken according to the tracker and smartphone app. They also indicated how memorable the tracker's name was (Chris or XT1000), and whether they wore an additional activity tracker during the study. (A pretest confirmed that the anthropomorphized tracker (Chris) was perceived to have more human-like qualities than the non-anthropomorphized tracker (XT1000); see Table 4).

***Results***

*Pre-usage and Post-usage Evaluation.* Prior to using the tracker, participants' pre-usage evaluation of the anthropomorphized (vs. control) activity tracker was significantly more favorable ($M_{Anthro} = 5.48$, $M_{Control} = 4.82$; $F(1, 53) = 4.14$, $p = .04$, $\eta^2 = .07$). However, after wearing the tracker and monitoring their steps, there was a significant decrease in evaluations over time for participants in the anthropomorphism condition ($M_{Pre} = 5.48$, $M_{Post} = 4.43$, $F(1, 53) = 13.23$, $p = .001$, $\eta^2 = .20$), supporting H1a. In the control condition, the magnitude of the decrease in evaluations was relatively smaller ($M_{Pre} = 4.82$, $M_{Post} = 4.13$, $F(1, 53) = 5.55$, $p = .02$, $\eta^2 = .10$). In post-usage, participants showed no significant difference in their evaluation of the activity tracker ($M_{Anthro} = 4.43$, $M_{Control} = 4.13$; $F < 1$, $p = .52$), supporting H1b (see Figure 2A).[8]

*Health Motivation Behavior (Number of Steps Taken).* On the first two days of the study, although directionally consistent with our theorizing, there was no significant difference in the number of steps taken across anthropomorphized and control trackers (Monday: $M_{Anthro} = 4{,}568.23$, $M_{Control} = 4{,}959.53$; $F < 1$, $p = .72$; Tuesday: $M_{Anthro} = 6{,}967.19$, $M_{Control} = 8{,}595.77$; $F < 1$, $p = .35$). Notably, by the third day, the number of steps taken was marginally lower for those participants wearing the anthropomorphized activity tracker (Wednesday: $M_{Anthro} = 2{,}901.13$, $M_{Control} = 4{,}419.39$; $F(1, 53) = 3.53$, $p = .07$, $\eta^2 = .06$). That is, by the third day of use, participants wearing an anthropomorphized tracker took *52.33% fewer* steps than those wearing a non-anthropomorphized tracker. Over time, the negative effects on health-related behavior based on anthropomorphizing the tracker increased in magnitude: on the first day, the reduction in steps taken was 8.56%, by the second day, the reduction in steps taken was 23.38%, and by

[8] Product evaluation and health motivation analyses controlled for age, gender, class period, name recall, and whether another activity tracker was also used during the study period. For post-usage evaluations, wearing another tracker was significant $F(1, 53) = 6.16$, $p = .02$). For actual health motivation, tracker name recall was significant $F(1, 53) = 7.38$, $p < .01$).

the third day, anthropomorphizing the tracker resulted in 52.33% fewer steps taken (see Figure 2B).

--- Insert Figure 2 about here ---

***Discussion***

Consistent with our prior studies, Study 2 reveals that consumers' pre-usage evaluations are significantly more positive toward anthropomorphized (vs. not) devices. However, these positive evaluations do not endure when using the tracker over time. After wearing and using the tracker for two days, evaluations of the anthropomorphized tracker declined and there was no difference in tracker evaluation across conditions. Importantly, with use over time, participants wearing an anthropomorphized tracker took *fewer* steps than those in the control condition. Although consumers are initially more favorable toward anthropomorphized trackers, this does not translate into improvements in health-related behaviors over time. These findings suggest that, although anthropomorphism can be an effective short-term sales tactic, it may have negative consequences over the longer term. Next, we examine the process underlying this effect.

## Studies 3 and 4: Examining the Process by Mediation

Studies 3 and 4 aim to shed light on the process underlying the negative effect of anthropomorphized trackers on health motivation and related behaviors. As discussed earlier, expanding prior work (Kim et al. 2016), we expect consumers' feelings of autonomy to mediate the relationship between the use of anthropomorphized trackers and health motivation/behavior. Studies 3 and 4 provide process-by-mediation evidence using similar experimental procedures and the same measures of the autonomy mediator: in Study 3 student participants are given real activity trackers to wear for multiple days that are either anthropomorphized or not and record

the number of steps taken, and in Study 4 a Mechanical Turk panel of consumers who currently use an activity tracker report their health motivation after anthropomorphizing (vs. not) their own personal activity tracker. In Study 4, we also test several alternative mechanisms that may mediate the relationship between anthropomorphism and consumers' health motivation: activity tracker effectiveness (Hart and Royne 2017; Schneider 2018), connectedness (Tam et al. 2013), skepticism (Araujo 2018; Nowak and Rauh 2005), resistance (Yang et al. 2020), empowerment (Khenfer et al. 2020; Pettinico and Milne 2017), and product comprehension (Choi 2019; Esfahani et al. 2020; Yang et al. 2020).

## Study 3

### *Participants, Design, and Procedure*

Study 3 employed a 2(anthropomorphized, control) between-subjects design and a multi-stage procedure. Participants were 107 students enrolled in three sections of a business course ($M_{age}$ = 21.93, 60 females)[9] who participated for class credit.

*Pre-Usage Procedure.* First, on Day 1 of the study, participants were given an anthropomorphized (vs. not) activity tracker. To manipulate anthropomorphism, the product packaging had a label which read either, "Hi I'm Chris, your personal fitness coach" in the anthropomorphized condition, or "XT1000 is your personal fitness device" in the control condition (Yam et al. 2020). Participants read the same advertisement for an anthropomorphized (vs. control) tracker as in Study 2.

[9] Across two back-to-back class periods in the fall, and one class period in the spring, we randomized conditions by seating row within each session (i.e., in each session, participants were randomly assigned to the experimental conditions). We controlled for class period in all analyses. One hundred and twenty-three participants participated in Day 1, but only 110 participants completed the study. Three participants indicated they had a disability or medical issue that prevented them from walking long distances or exercising and were excluded from analyses.

Participants evaluated the tracker using the same measures as in Study 2 and indicated their feelings of autonomy (i.e., "It will be my own effort that determines my performance," and "I think I should take all the credit for performing the exercise" (Kim et al. 2016; $\alpha = .61$). They also indicated the number of classes they attend during the week, how much they enjoy walking, and their age and gender (see Table 5 for measures). After completing the questionnaire, participants were given instructions on how to download the corresponding smartphone app, which recorded their steps taken over time.

*During Usage Procedure.* Participants tracked their steps using the smartphone app over two days which included the remainder of the day they received the activity tracker (Day 1) and the full second day of using the activity tracker (Day 2). On the morning of the third day students returned their tracker.

*Post-Usage Procedure.* Participants reported their steps for Day 1 and Day 2 according to their tracker and smartphone app. When returning the trackers on Day 3, participants reported their post-usage evaluations with the same measures as in Day 1 and indicated how memorable the tracker name was.

***Results***

*Pre-usage and Post-usage Evaluation.* To examine the effect of anthropomorphism on evaluations and health motivation, we conducted ANCOVAs controlling for age, gender, class period, general walking enjoyment, name recall, and the number of classes the participant attended over the course of the study. Unexpectedly, there were no significant differences in pre-usage evaluations of the two trackers ($M_{Anthro} = 4.80$, $M_{Control} = 5.10$, $F(1, 99) = 2.58$, $p = .11$, $\eta^2 = .03$); however, after wearing the tracker and monitoring their steps, participants' evaluations of the anthropomorphized tracker significantly decreased with use ($M_{Pre} = 4.80$, $M_{Post} = 4.45$; $F(1,$

99) = 5.43, $p$ = .02, $\eta^2$ = .05), supporting H1a, whereas their evaluations of the control tracker marginally increased with use ($M_{Pre}$ = 5.10, $M_{Post}$ = 5.39; F(1, 99) = 2.90, $p$ = .09, $\eta^2$ = .03). In post-usage, participants' evaluations of the non-anthropomorphized tracker were significantly greater than evaluations of the anthropomorphized tracker ($M_{Anthro}$ = 4.45, $M_{Control}$ = 5.39, F(1, 99) = 12.39, $p$ < .001, $\eta^2$ = .11), consistent with H1b. While results from this study did not reveal the established anthropomorphism favorability effect in pre-usage, they support our predictions that after use, anthropomorphized devices are not favored in comparison to the control tracker. In fact, evaluations of the anthropomorphized tracker decrease with use, and evaluations of the control tracker become slightly more favorable (see Figure 3A).

--- Insert Figure 3A about here ---

*Health Motivation Behavior (Number of Steps Taken).*[10] Consistent with Study 2, on the first day of the study (Day 1), although directionally consistent with our theorizing, there was no significant difference in the number of steps taken across anthropomorphized and control trackers ($M_{Anthro}$ = 3720.66, $M_{Control}$ = 4434.35; F (1, 98) = .93, $p$ = .34). However, on the second day (Day 2), the number of steps taken was significantly lower for participants with an anthropomorphized activity tracker ($M_{Anthro}$ = 3867.77, $M_{Control}$ = 5365.81; F(1, 99) = 3.92, $p$ = .05, $\eta^2$ = .04). Over time, the negative effects of anthropomorphizing the tracker on health motivation increased in magnitude: on Day 1, the gap in steps taken was 17.5%, and by the Day 2 anthropomorphizing the tracker resulted in 32.44% fewer steps taken (see Figure 3B).

*Mediation.* To explore whether anthropomorphization reduces autonomy, leading to

[10] There was one outlier who reported taking over 70,000 steps on Day 1 (more than nine SDs from the mean) and was removed from the analysis. When this participant is included in the analysis, the difference in steps taken on Day 1 becomes marginal ($M_{Anthro}$ = 3223.20, $M_{Control}$ = 6541.82; F(1, 99) = 3.39, $p$ = .07, $\eta^2$ = .03). Twelve participants did not report their steps taken on Day 1, and six participants did not indicate how memorable the tracker was, and their values were mean substituted.

reduced health motivation (H3), we conducted a mediation analysis (Hayes 2017, Model 4, 5,000 resamples). The independent variable was tracker type (anthropomorphized = 1, control = 0), the mediator was autonomy, and the dependent variable was steps taken during Day 2. The model revealed the expected mediation path: anthropomorphized tracker → autonomy → steps taken on Day 2 ($b$ = -321.6984, SE = 219.1979, 90% CI = -703.4065, -12.2893)[11]. That is, the anthropomorphized tracker reduced feelings of autonomy, which in turn, reduced the number of steps taken.

--- Insert Figure 3B about here ---

***Discussion***

Consistent with Studies 1 and 2, Study 3 reveals that after wearing and using an anthropomorphized tracker, consumer evaluations of the tracker decrease. In fact, after wearing and using the tracker, participants favored the non-anthropomorphized (vs. anthropomorphized) device, further emphasizing the negative effects of anthropomorphism on consumer evaluations over time. We also find evidence that with use, participants wearing an anthropomorphized tracker take fewer steps because they have reduced feelings of autonomy. Next, Study 4 provides further process-by-mediation evidence and rules out several possible alternative process explanations.

## Study 4

***Participants, Design, and Procedure***

We conducted this study at two points in time (five days apart). Following the recommendations of Sharpe Wessling, Huber, and Netzer (2017) for creating a MTurk panel, we

[11] We also tested for mediation with two other DVs (Day 1 steps only and Day 1 and Day 2 combined steps). The indirect effect is not significant for the Day 1 steps DV ($b$=-134.0659, SE = 195.4170, 90% CI = -480.7976, 147.0399), or the combined steps DV ($b$=-424.5191, SE = 369.7382, 90% CI = -1106.2656, 58.1707).

first ran a prescreen survey asking participants to identify which products they own from a list of five products: laptop computer, desktop computer, Bluetooth headphones, smartphone, and wearable fitness tracker. The 181 participants who indicated owning a fitness tracker in the prescreen were invited to participate in the main study. From this group, 142 completed the study five days later. Eleven participants failed the attention check ("Please choose option one, strongly disagree") for a final sample of N = 131 fitness tracker owners ($M_{Age}$ = 41.19, 86 females). Participants in the prescreen who did not own a fitness tracker completed a different study.

*Study Procedure Part 1.* This study employed a 2(anthropomorphized, control) between-subjects design. During the first day of the study, we manipulated anthropomorphism by asking participants in the anthropomorphism condition to give the activity tracker they own a name and gender, and to write a few sentences about its personality (Chandler and Schwarz 2010; Epley et al. 2007; Nass et al. 2000; Yam et al. 2020; Zhou et al. 2019). Before leaving the study, we instructed participants to refer to their fitness tracker with the name they specified, and reminded them about the gender and personality of their tracker; this was omitted in the control condition. Participants in both conditions were informed that they will be contacted to participate in a future study.

*Study Procedure Part 2.* Five days later, we sent participants a follow-up invitation to complete the second phase of the study. Participants indicated their health motivation (e.g., I am very motivated to: "take more steps each day," "track my activity," "exercise regularly" ($\alpha$ = .94, see Table 5). They then indicated their feelings of autonomy using the same measure in Study 3 ($\alpha$ = .72). For exploratory purposes, we also examined potential alternative process variables, including perceived product effectiveness, connectedness, skepticism, resistance, empowerment, and product comprehension. Finally, participants provided demographics.

***Results***

*Health Motivation.* In line with prior studies and in support of H2, after anthropomorphizing their tracker for five days, participants with an anthropomorphized activity tracker had significantly lower levels of health motivation, as compared to those in the control condition ($M_{Anthro}$ = 5.67, $M_{Control}$ = 6.14; F(1, 127) = 8.58, $p$ = .004, $\eta^2$ = .06).

*Mediation*. To explore whether anthropomorphization undermines health motivation via reduced autonomy (H3), we conducted a mediation analysis (Hayes 2017, Model 4, 5,000 resamples). The independent variable was tracker type (anthropomorphized = 1, control = 0), the mediator was autonomy, and the dependent variable was health motivation, controlling for age and gender. The model revealed the predicted mediation path: anthropomorphized tracker → autonomy → health motivation ($b$ = -.0698, SE = .0471, 90% CI = -.1557, -.0042).

*Alternative Explanations.* Using Process Model 4, for exploratory purposes, we tested all alternative process measures in separate mediation models (for a more conservative test); however, none of the alternative measures mediated the relationship between anthropomorphism and health motivation. Please see Web Appendix C for detailed analyses.

***Discussion***

Consistent with prior studies, Study 4 again shows that anthropomorphized activity trackers reduce health motivation over time. Moreover, consistent with Study 3, this study shows that anthropomorphized trackers reduce the users' feeling of autonomy, which in turn, reduces health motivation. Study 4 also rules out alternative explanations regarding the underlying process. Next, we provide process-by-moderation evidence by exploring strategies that reaffirm consumers' feelings of autonomy to mitigate the negative effect of anthropomorphism on health motivation/behavior.

## Study 5: Examining the Process by Moderation

We now provide process-by-moderation evidence by demonstrating that the negative effects of anthropomorphism on health motivation and health behavior are attenuated when consumer autonomy is reaffirmed through customization. Customization refers to users' ability to modify aspects of a product/object or technology to enhance personal relevance and increase feelings of taking control (Bol et al. 2019; Sundar 2008). Therefore, scholars have proposed customization as an approach to reaffirm personal autonomy (Kim and Lee 2020). Specifically, feelings of autonomy involve "a sense of willingness or volition" when engaging in a focal task (Ryan et al., 2006, p. 349), and providing consumers with choices rests at the very heart of the idea of customization. Accordingly, research on computer games drew on self-determination theory (SDT) to suggest that being able to customize features of the game increases the gamer's perceived autonomy, because it is directly linked to the freedom to make choices (Kim et al. 2016; Ryan et al. 2006). By actively customizing the game and its features, users become aware that they are able to tailor the technology in light of their unique needs, preferences, and requirements; that is, they have the ability to modify the system to have it meet their preferred settings and choices (Kim et al. 2016; Przybylski et al. 2010). As a consequence, customizing a technology can enhance the user's sense of autonomy and agency (Sundar 2008), which can then bolster outcomes such as motivation, enjoyment, and continued use of the technology (Kim and Lee 2020; Przybylski et al. 2010). Beyond the video game context, similar effects have been illustrated for mobile health apps, in which customization enhanced physical activity for consumers with a high need for autonomy (Bol et al. 2019).

Customization is a particularly appropriate approach to reaffirming autonomy in our

context, because as technology evolves, self-tracking devices in the marketplace are more customizable and allow users to tailor their self-tracking experience in a variety of ways (Kang et al. 2017; Vnoutchkov 2021). As such, in Studies 5 and WA Study 5B (presented in Web Appendix C), we reaffirm autonomy via two different approaches to tracker customization. First, inspired by current wearable trackers, we enable participants in Study 5 to customize their tracker by allowing them to set their own personal fitness goal. Recently, wearable device manufacturers increasingly use messaging and incorporate software that encourages consumers to customize their daily fitness goals. For example, the Apple Watch encourages consumers to, "close your Move ring by reaching your personal goal of active calories burned" (Apple 2022). Similarly, the FitBit tracker encourages users to "set personal goals…" (FitBit 2022). Interestingly, some goals are pre-set for consumers by the device, like Apple's exercise goal where consumers are told: "close your Exercise ring by completing at least 30 minutes of activity..." (Apple 2022). Inspired by the range of fitness goal customization features in the marketplace, we manipulate consumers' ability to customize their tracker by setting a personalized fitness goal. We theorize that customizing a tracker via setting personalized goals gives consumers who use an anthropomorphized tracker an opportunity to reaffirm their feelings of autonomy, which should mitigate negative effects on health motivation.

In addition to testing a customized fitness goal feature, we include an additional condition in this study to also test another common tracker feature that might mitigate the negative effects of anthropomorphism: enhancing the salience of the tracker's default fitness goal. While we do not make specific predictions about this condition, we expect the increased default goal salience will nudge consumers in both the anthropomorphized and non-anthropomorphized tracker conditions towards the default goal, since more salient goals result in greater overall motivation

than inaccessible goals (Austin and Vancouver 1996; Bagozzi and Dholakia 1999). However, we expect that reaffirming anthropomorphized activity tracker users' autonomy via a salient *customized* goal will be more effective in mitigating the negative effect of anthropomorphism and increasing health motivation.

***Participants, Design, and Procedure***

As in Study 4, we created an online panel of participants who own an activity tracker. We first ran a prescreen survey (N = 2,479) asking participants to indicate their ownership of four different products: laptop, smartphone, Bluetooth headphones, and wearable fitness tracker (order randomized). The 500 participants who indicated owning a fitness tracker in the prescreen were invited to participate in the main study and 261 of them completed the study. Three participants indicated they did not wear their tracker for the duration of the study, and five participants missed an attention check and were excluded from the analysis, for a final sample of 253 participants (Mage = 41.39; 167 females). We conducted the main study at two points in time.

*Study Procedure Part 1.* This study employed a 2(anthropomorphism: yes, no) × 3(fitness goal salience: no/control, default, customized) between subjects design. Anthropomorphism and fitness goal salience were manipulated in the morning on the first day of the study. We manipulated *anthropomorphism* by asking participants to give the activity tracker they own a name and gender, and to write a few sentences about its personality, as in Studies 1 and 4 (Chandler and Schwarz 2010; Epley et al. 2007; Nass et al. 2000; Yam et al. 2020; Zhou et al. 2019). In the non-anthropomorphized condition, participants were asked to provide the tracker's brand name and version number, and to describe the shape, color, and appearance of the tracker.[12]

To manipulate *goal salience*, participants in the default goal condition read, "Reach your

[12] We thank one of the anonymous reviewers for this recommendation for the non-anthropomorphized condition.

daily goal by completing your tracker's default goal of 10,000 steps taken." Next, participants were informed that "[Brand Name /Anthropomorphized Name] set a daily step goal of 10,000 steps." Then participants read, "Your daily goal is set by [Brand Name /Anthropomorphized Name]! Reach your daily goal by taking 10,000 steps!"

In the *customized goal* condition, participants read, "Reach your daily goal by completing your personal goal of steps taken." Next, participants were informed that, "[Brand Name / Anthropomorphized Name] would like YOU to set a daily steps goal for yourself," and entered their personal steps goal. Then, participants read, "Your daily goal is set by you! Reach your daily goal by taking [personal step goal inserted] steps!"

In the *control condition*, these procedural steps were omitted to avoid any discussion of fitness goals and to encourage typical use of their tracker. Before leaving the study, we reminded participants in all conditions of their tracker's [brand / anthropomorphized] name. In the default goal salience and customized goal salience conditions participants were reminded of the corresponding step goal. Participants in all conditions were informed that they will be contacted to participate in a future study.

*Study Procedure Part 2.* One day later, we sent participants a follow-up invitation to complete the second phase of the study. Participants indicated the number of steps they took the previous day (after the intervention), according to their tracker. Finally, participants provided demographics and indicated their general walking enjoyment.

***Results***

*Health Motivation Behavior (Steps Taken)*. We examined the effects of anthropomorphism, fitness goal type, and their interaction, on steps taken (PROCESS Model 1; Hayes 2017). In our model, tracker anthropomorphism (no = 0, yes = 1) was the independent

variable, fitness goal salience (no/control, default, customized) was the dummy coded moderator, and steps taken was the dependent variable. We controlled for age, gender, and general walking enjoyment. Results indicated a fitness goal salience (control vs. customized) × anthropomorphism (no, yes) interaction ($b$ = 4473.29, $t$ = 1.8432, $p$ = .067). The fitness goal salience (control vs. default) × anthropomorphism (no, yes) interaction was non-significant ($b$ = 3188.85, $t$ = 1.3218, $p$ = .19). Results also indicated a main effect of anthropomorphism ($b$ = -3500.64, $t$ = -1.9239, $p$ = .056). The other effects in the model were non-significant.

Next, we further explored the two-way interaction. Within the control condition, consistent with prior studies, there was a negative effect of anthropomorphism ($b$ = -3500.64, $t$ = -1.9239, $p$ = .056). That is, when consumers were using their tracker as they usually do, anthropomorphism had a negative effect on the number of steps taken, supporting H2. However, as expected, results showed no significant effect of anthropomorphism in the customized goal salience condition ($b$ = 972.65, $t$ = .5997, $p$ = .55), and importantly, when wearing an anthropomorphized tracker, participants took significantly more steps with a customized fitness goal (vs. control), ($b$ = 3472.84, $t$ = 2.0429, $p$ = .04); that is, the negative effect of anthropomorphism was mitigated when participants' tracker experience is customized.

There was no significant effect of anthropomorphism in the default goal salience condition ($b$ = -311.79, $t$ = -.1961, $p$ = .84), suggesting that default goal salience can also prevent an anthropomorphism-driven decline in motivation. However, while providing a salient default goal to consumers helped close the gap in health motivation between the anthropomorphized and non- anthropomorphized tracker, it did *not* lead to a significant increase in steps taken with an anthropomorphized tracker as compared to the control condition when no goal was made salient ($b$ = 2414.88, t = 1.4527, $p$ = .15). That is, goal salience alone does not increase the number of

steps taken (vs. control); however, reaffirming autonomy via customization does provide the increase in steps taken for those participants wearing an anthropomorphized tracker. Steps were also similar for anthropomorphized tracker users in the default goal condition as compared to the customized goal condition ($b$ = 1057.96, t = .6774, $p$ = .50).

Finally, when wearing a *non-anthropomorphized tracker*, there was no difference between goal conditions (F(2, 244) = .1740, $p$ = .84); that is, the type of fitness goal did not affect the number of steps taken (see Figure 4).

--- Insert Figure 4 about here ---

***Discussion***

In line with our theorizing, Study 5 shows that when consumers' autonomy is reaffirmed (via setting a customized goal), the negative effect of anthropomorphism on health motivation is mitigated, providing further evidence of autonomy as the process driving our effects.

In addition, we conducted a follow-up study (WA Study 5B presented in Web Appendix C) that builds on Study 5 in two ways. First, it explores another customization strategy – the number of health indicators monitored via the tracker. Second, it examines the effect of anthropomorphism on health motivation by measuring (rather than manipulating) consumers' tendency to anthropomorphize their activity tracker. Consistent with previous studies, we find that when the activity tracker is less customized (e.g., tracking only one health indicator, such as steps), consumers who tend to anthropomorphize their activity tracker exhibit relatively lower levels of health motivation. However, when the activity tracker is more customized (e.g., tracking multiple indicators, such as steps, heart rate, sleep patterns), this effect was attenuated, based on customization reaffirming a sense of autonomy. For the full details of the follow-up

study please see Study 5B in Web Appendix C.

Findings from Study 5 and WA Study 5B suggest that firms benefit from strategies that nudge consumers to customize their anthropomorphized trackers by personalizing their fitness goals or monitoring multiple health indicators. Customization is a tool that marketers can leverage in their products through both the product design and promotion activities. For example, if an anthropomorphized activity tracker proactively encouraged consumers to tailor the device to their specific needs and preferences by customizing their goals or tracking a greater number of health indicators, then this may overcome the negative effects of anthropomorphizing on health motivation. Leveraging technology (e.g., app-, mobile-, and internet-based nudges) is one platform to encourage consumers to increase the number of health indicators they monitor with their tracker (Bidargaddi et al. 2018; Valle et al. 2020). In doing so, consumers will benefit from enhanced perceived customization and autonomy, ultimately increasing their health motivation and health-related behaviors.

Given the nature of Studies 1, 2, and 3 (i.e., field studies examining real behavior over time), the number of participants available in each study was limited. We recognize the relatively small sample sizes as a limitation to this research. However, we find robust effects across all studies (regardless of cell sizes), when measuring real behavior, when examining new and current self-tracking consumers, and for consumers in different countries (the U.S. and Sweden). Moreover, we conducted a single paper meta-analysis to further test the robustness of our results.

## Within Paper Meta-Analysis

To test the overall validity of H1, we performed a single paper meta-analysis (SPM; McShane and Böckenholt 2017) on the three studies that included continuous measures of

evaluations (Studies 1-3) and manipulated anthropomorphism conditions. The SPM revealed that over three studies, evaluations of anthropomorphized trackers decreased significantly with use of the device (Estimate = -.5492, SE = .2464, z = 2.228, $p$ = .01), supporting H1a. As predicted, this difference was mitigated after using the trackers, and there was no difference in evaluations between the anthropomorphized and non-anthropomorphized trackers (Estimate = .0863, SE = .0760, Z = 1.135, $p$ = .13), supporting H1b.

We also tested H2 (over time, using an anthropomorphized (vs. non-anthropomorphized) tracker will lead to reduced health motivation), by performing a single paper meta-analysis on the five studies that included continuous measures of health motivation (Studies 1 – 5) and manipulated anthropomorphism conditions.[13] We standardized the dependent variables: measured health motivation in Studies 1 and 4, and steps taken in Studies 2, 3, and 5. The SPM showed that across the five studies, consumers had reduced health motivation when using an anthropomorphized tracker (vs. non-anthropomorphized) (Estimate = -.3005, SE = .0978, z =-3.0725, $p$ = .001), in support of our theorizing.[14] This is a conservative test, as it does not include any of the (theory-based) control variables in the SPM (see also Web Appendix B).

## General Discussion

Using longitudinal analyses (see Table 3 and Web Appendix B for a summary), we uncover a novel dynamic effect of anthropomorphism: with use over time, evaluations of anthropomorphized trackers decrease, and consumers do not favor anthropomorphized (vs. non-anthropomorphized) devices after using them. Importantly, health motivation also decreases with

[13] We did not include WA Study 5B in the meta-analysis because the independent variable, tendency to anthropomorphize, was measured, not manipulated, as in the other five studies.
[14] For completeness, we note that results were consistent when analyzed in a SPM with standardized steps from Studies 1, 2, 3, and 5 and health motivation from Study 4 (estimate = -.3346, SE = .0998, z = -3.35, $p$ = .0004).

use because anthropomorphized devices reduce the users' perceived autonomy, which in turn, reduces their health motivation. These findings provide insights into the psychological effects of self-tracking technologies, which has received little scholarly attention in marketing. This is surprising given that self-tracking technologies are increasingly capable. For example, self-tracking technologies not only allow consumers to monitor health behaviors such as physical activity (e.g., steps), but also caloric intake, heart rate, sleep patterns, ovulation, and other facets of life. Technology firms are developing devices that can collect even more sophisticated data. For instance, Google is developing smart contact lenses that continuously measure glucose levels in tears, and the Amazon Halo tracks body composition, activity, sleep, and tone of voice (Farr 2020). Other wearables transmit information regarding blood volume pulse, skin temperature, and electrodermal activity to the user (Baker 2020). Given the increasing integration of self-tracking technologies into consumers' lives, self-tracking deserves greater attention by marketing researchers. The present research addresses this gap by exploring how the marketing and design of these devices can influence their effectiveness, for both marketers and consumers.

**Theoretical Contributions**

Our studies shed light on how anthropomorphized tracking devices influence consumer evaluations and motivations *over time*. Examining self-tracking devices over time offers critical causal insights into consumers' evolving intentions towards and evaluations of self-tracking (Attig and Franke 2020; Costa Figueiredo et al. 2018; Maltseva and Lutz 2018). In doing so, we contribute to the nascent marketing literature on self-quantification (e.g., Charitsis et al. 2019; Etkin 2016; Paluch and Tuzovic 2019; Pettinico and Milne 2017). Our longitudinal examination uncovers a dynamic effect of anthropomorphism: while before use, and consistent with prior

research (Aggarwal and McGill 2007; Delbaere et al. 2011), consumers are initially attracted by anthropomorphized trackers and evaluate them more favorably, their evaluations decline with use of the device. These novel findings may help explain why many consumers abandon self-tracking devices shortly after initial use (Ledger and McCaffrey 2014).

Prior research has reported mixed findings about the effects of self-tracking on health motivation (e.g., Harris et al. 2015; Jakicic et al. 2016). We shed light on this issue and identify anthropomorphism as an important determinant of the effects of self-tracking on health motivation. We discover that anthropomorphizing a self-tracking device can undermine health motivation and health behaviors (e.g., steps taken and exercise frequency) after use. Given the importance of these behaviors for obesity prevention (e.g., Nestle and Jacobson 2000), we demonstrate how anthropomorphized devices can undermine the potential for consumers to enhance their well-being. This negative effect of anthropomorphism adds to research on the antecedents of health motivation, an important driver of various (preventative) health behaviors (Jayanti and Burns 1998), health maintenance behaviors (Fletcher et al. 1989), and diet restrictions / additions (Moorman and Matulich 1993).

Investigating the mechanism underlying the negative effects of anthropomorphizing self-tracking devices on health motivation, we find that anthropomorphism reduces consumers' perceived autonomy (Studies 3 and 4), and we rule out several alternative mechanisms (tracker effectiveness, connectedness, skepticism, resistance, empowerment, and product comprehension; Study 4). These findings are consistent with prior work, which shows anthropomorphizing can reduce feelings of autonomy (Kim et al. 2016) and increase external attribution of responsibility to an anthropomorphized device (Hur et al. 2015).

Considering the negative effects of anthropomorphism for consumers and managers,

particularly for companies selling self-tracking devices or fitness products/services via subscription-based models (e.g., self-trackers used with a Peloton subscription), we examine an actionable and conceptually meaningful moderator that mitigates the negative effects of anthropomorphism on health motivation: *tracker customization*. We provide two strategies that allow consumers to customize their tracker. In Study 5, we show that when consumers wearing an anthropomorphized device are given the option to customize their daily goal, they take more steps, and the negative effect of anthropomorphism is mitigated. Then, WA Study 5B provides another avenue for tracker customization and shows that monitoring more (vs. fewer) health indicators with an anthropomorphized tracker increases health motivation, combating the negative effects of anthropomorphism. This is consistent with self-determination theory (Deci and Ryan 1985; Ryan and Deci 2000; Ryan and Deci 2006), which posits that customization can help maintain consumers' feelings of autonomy. As such, our studies provide further evidence of process via moderation, such that consumers with more personalized self-tracking devices are not negatively affected by the anthropomorphism of their device, because their feelings of autonomy are reaffirmed by the customization of their tracker.

**Managerial Implications**

Our research helps managers better understand the experience of their self-tracking customers. Companies frequently market self-tracking devices with promises of improved health outcomes (Patel et al. 2015). Our results, however, suggest that self-tracking devices do not always help consumers achieve these promised outcomes, as anthropomorphized (vs. non-anthropomorphized) self-tracking devices can *lower* consumer motivation to engage in health-promoting behaviors. These insights contrast marketing efforts that encourage consumers to

imbue human-like characteristics onto a device by branding it “My Coach” (Adidas), “Smart Coach” (Jawbone), or “Digital Coach” (Fitbug). Our research helps alert managers about detrimental effects of this marketing tactic for self-tracking devices.

Our finding that anthropomorphism may be beneficial before use, but its positive effects seem to wear off with use of the device has implications for marketing strategies. Our results suggest that in consumers’ initial interaction with a self-tracker (i.e., the initialization phase of anthropomorphic effects; Lemaignan, Fink, and Dillenbourg 2014), marketers would do well to anthropomorphize their products and services in marketing communications and point-of-purchase displays. However, with use of the self-tracker over time (in the familiarization and the stabilization phases of anthropomorphism), downplaying the anthropomorphized aspects of the product in interface design and customer service might result in better long-term customer engagement.

Important for managers, we also identify an actionable approach, tracker customization, to overcome the detrimental effects of anthropomorphism. We show that setting customized goals and increasing the number of health indicators a consumer tracks with an anthropomorphized tracker ‘protects’ consumer health motivation. Thus, companies can integrate features that allow consumers to customize their daily goals, or nudge consumers to monitor a greater number of indicators (e.g., through push notifications on the device, e-mail/internet messaging, smartphone apps), to improve consumers’ health motivation, thereby creating a win-win situation: managers can enhance short-term sales (via anthropomorphism) and help ensure long-term well-being (by encouraging tracker customization).

Taken together, our findings are of managerial importance as self-tracking devices and apps increasingly rely on artificial intelligence (AI) (e.g., Carrot Fit App, Rocket Body Personal

Trainer, Amazon Halo) (Hoffman and Novak 2019). AI is often anthropomorphized (e.g., voice, visual appearance) and self-trackers that rely on these technologies would be subject to the potentially detrimental effects of anthropomorphism discovered in the current research.

**Limitations and Avenues for Further Research**

Our research provides important insights into consumers' self-tracking, but it has limitations that identify avenues for further research. One key question is how managers can avoid the detrimental long-term effects of anthropomorphism related to self-tracking devices. Study 5 and WA Study 5B showed that customization can help; might marketing campaigns also help counter the negative effects of anthropomorphism on health motivation by boosting consumers' autonomy (e.g., Under Armour's "Rule Yourself" campaign)? Future research could also examine the reasons for the loss of autonomy, such as external attributions of responsibility for goal pursuit to the anthropomorphized tracker, or external attributions of blame toward the activity tracker in the contexts of goal failure. This is particularly relevant given the recent interest in consumers' relationships with smart objects (i.e., technology-based products with highly autonomous features), and consumers' perceived autonomy and agency (Novak and Hoffman 2019). Exploring additional moderators related to consumer autonomy, like an individual's need for control is another interesting topic for future research. Lastly, which consumer base should be targeted for anthropomorphized devices based on culture and other traits, which can influence tendency to anthropomorphize (Epley et al. 2007), are also avenues for research.

Our theorizing informs the idea that a decrease in consumers' health motivation can lead them to dismiss their devices, but there is also an opportunity to explore this empirically.

Additionally, our research reveals for the first time the negative effects of anthropomorphism that emerge in the post-usage stage; future research can extend our work by exploring the precise time at which this effect occurs (i.e., in terms of hours/days until anthropomorphism transforms from a beneficial strategy for short-term sales into a detriment on evaluations and health motivation). A related avenue for follow-up research is to dig deeper into the reasons for the decline in evaluation of anthropomorphized trackers over time. Might anthropomorphized devices create greater initial expectations that are then not met? Or do the anthropomorphic elements of the device that appeal to consumers initially lose their appeal over time (i.e., disillusionment)? Examining the human-like role that is assigned to the device (e.g., a friendly cheerleader versus a critical drill sergeant) offers another interesting avenue for future research. Lastly, future research could explore how anthropomorphism influences evaluations of *other products* over time. Perhaps the benefits of anthropomorphism wear off only for products which are utilitarian in nature. Exploring the dynamic effect of anthropomorphism in other (e.g., hedonic) contexts would be insightful.

**Authors Have No Conflict of Interest:**

The authors declare that they have no conflict of interest.

## References


Abrahamse, W., Steg, L., Vlek, C., & Rothengatter, T. (2005). A Review of Intervention Studies Aimed at Household Energy Conservation. *Journal of Environmental Psychology*, *25*(3), 273–291.

Aggarwal, P., & McGill, A. L. (2007). Is That Car Smiling at Me? Schema Congruity as a Basis for Evaluating Anthropomorphized Products. *Journal of Consumer Research*, *34*(4), 468–479.

Andrews, J. C., Netemeyer, R. G., & Burton, S. (2009). The Nutrition Elite: Do Only the Highest Levels of Caloric Knowledge, Obesity Knowledge, and Motivation Matter in Processing Nutrition Ad Claims and Disclosures? *Journal of Public Policy & Marketing*, *28*(1), 41–55.

Apple (2022). Close Your Rings. *Apple*. https://www.apple.com/watch/close-your-rings/. Accessed May 5th, 2022.

Araujo, T. (2018). Living Up to the Chatbot Hype: The Influence of Anthropomorphic Design Cues and Communicative Agency Framing on Conversational Agent and Company Perceptions. *Computers in Human Behavior*, *85*, 183–189.

Attig, C., & Franke, T. (2020). Abandonment of Personal Quantification: A Review and Empirical Study Investigating Reasons for Wearable Activity Tracking Attrition, *Computers in Human Behavior*, 102, 223–237.

Austin, J. T., & Vancouver, J. B. (1996). Goal constructs in psychology: Structure, process, and content. *Psychological bulletin*, *120*(3), 338.

Bagozzi, R. P., & Dholakia, U. (1999). Goal Setting and Goal Striving in Consumer Behavior. *Journal of Marketing*, *63*(4_suppl1), 19–32.

Baker, D. A. (2020). Four Ironies of Self-quantification: Wearable Technologies and the Quantified Self. *Science and Engineering Ethics*, *26*(3), 1477–1498.

Bender, M. M., & Derby, B. M. (1992). Prevalence of Reading Nutrition and Ingredient Information on Food Labels Among Adult Americans: 1982–1988. *Journal of Nutrition Education*, *24*(6), 292–297.

Bidargaddi, N., Almirall, D., Murphy, S., Nahum-Shani, I., Kovalcik, M., Pituch, T., et al. (2018). To Prompt or Not to Prompt? A Microrandomized Trial of Time-Varying Push Notifications to Increase Proximal Engagement with a Mobile Health App. *JMIR mHealth and uHealth*, *6*(11), e10123.

Bol, N., Høie, N. M., Nguyen, M. H., & Smit, E. S. (2019). Customization in Mobile Health Apps: Explaining Effects on Physical Activity Intentions by the Need for Autonomy. *Digital Health*, *5*, 2055207619888074.

Canhoto, A. I., & Arp, S. (2017). Exploring the Factors that Support Adoption and Sustained Use of Health and Fitness Wearables. *Journal of Marketing Management*, *33*(1–2), 32–60.c

Chandler, J., & Schwarz, N. (2010). Use Does Not Wear Ragged the Fabric Of Friendship: Thinking Of Objects as Alive Makes People Less Willing to Replace Them. *Journal of Consumer Psychology*, *20*(2), 138–145.

Chandy, R. K., Venkataramani Johar, G., Moorman, C., & Roberts, J. H. (2021). Call for Papers: Journal of Marketing Special Issue: Better Marketing for a Better World, *85*(3), 1–9.

Charitsis, V., Yngfalk, A. F., & Skålén, P. (2019). 'Made to Run': Biopolitical Marketing and the Making of the Self-Quantified Runner. *Marketing Theory*, *19*(3), 347–366.

Chartrand, T. L., Fitzsimons, G. M., & Fitzsimons, G. J. (2008). Automatic Effects of Anthropomorphized Objects on Behavior. *Social Cognition*, *26*(2), 198–209.

Chintagunta, P., & Labroo, A. A. (2020). It's About Time: A Call for More Longitudinal Consumer Research Insights. *Journal of the Association for Consumer Research*, *5*(3), 240–247.

Choi, Y. K. (2019). Characters' persuasion effects in advergaming: Role of brand trust, product involvement, and trust propensity. *Internet Research*, *29*(2), 367–380. https://doi.org/10.1108/IntR-01-2018-0021

Clawson, J., Pater, J. A., Miller, A. D., Mynatt, E. D., & Mamykina, L. (2015). No Longer Wearing: Investigating the Abandonment of Personal Health-Tracking Technologies on Craigslist. In *Proceedings of the 2015 ACM International Joint Conference on Pervasive and Ubiquitous Computing – UbiComp '15* (pp. 647–658). Presented at the 2015 ACM International Joint Conference, Osaka, Japan: ACM Press.

Cole, C. A., & Gaeth, G. J. (1990). Cognitive and Age-Related Differences in The Ability to Use Nutritional Information in a Complex Environment. *Journal of Marketing Research*, *27*(2), 175–184.

Costa Figueiredo, M., Caldeira, C., Eikey, E. V., Mazmanian, M., & Chen, Y. (2018). Engaging with Health Data: The Interplay Between Self-Tracking Activities and Emotions in Fertility Struggles. *Proceedings of the ACM on Human-Computer Interaction*, 2(CSCW), 1–20.

Cullen, H., Kanai, R., Bahrami, B., & Rees, G. (2014). Individual Differences in Anthropomorphic Attributions and Human Brain Structure. *Social Cognitive and Affective Neuroscience, 9*(9), 1276-1280.

Deci, E. L., & Ryan, R. M. (1985). The General Causality Orientations Scale: Self-Determination in Personality. *Journal of Research in Personality*, *19*(2), 109–134.

Deci, E. L., & Ryan, R. M. (2012). Self-Determination Theory. In *Handbook of Theories of Social Psychology, Vol. 1* (pp. 416–436). Thousand Oaks, CA: Sage Publications Ltd.

Delbaere, M., McQuarrie, E. F., & Phillips, B. J. (2011). Personification in Advertising. *Journal of Advertising*, *40*(1), 121–130.

Dickinson, L. (1995). Autonomy and Motivation a Literature Review. *System*, *23*(2), 165–174.

Dontje, M. L., de Groot, M., Lengton, R. R., van der Schans, C. P., & Krijnen, W. P. (2015). Measuring Steps with the Fitbit Activity Tracker: an Inter-Device Reliability Study. *Journal of Medical Engineering & Technology*, *39*(5), 286–290.

Dooley, E. E., Golaszewski, N. M., & Bartholomew, J. B. (2017). Estimating Accuracy at Exercise Intensities: A Comparative Study of Self-Monitoring Heart Rate and Physical Activity Wearable Devices. *JMIR mHealth and uHealth*, *5*(3), e7043.

Dysvik, A., & Kuvaas, B. (2011). Intrinsic Motivation as A Moderator on The Relationship Between Perceived Job Autonomy and Work Performance. *European Journal of Work and Organizational Psychology*, *20*(3), 367–387.

Epley, N., & Waytz, A. (2007). On Seeing Human: A Three Factor Theory of Anthropomorphism. *Psychological Review*, 864–886.

Epley, N. (2018). A Mind Like Mine: The Exceptionally Ordinary Underpinnings of Anthropomorphism. *Journal of the Association for Consumer Research*, *3*(4), 591–598.

Esfahani, M. S., Reynolds, N., & Ashleigh, M. (2020). Mindful and Mindless Anthropomorphism: How to Facilitate Consumer Comprehension Towards New Products. *International Journal of Innovation and Technology Management*, *17*(03), 2050016.

Etkin, J. (2016). The Hidden Cost of Personal Quantification. *Journal of Consumer Research*, *42*(6), 967–984.

Evenson, K. R., Goto, M. M., & Furberg, R. D. (2015). Systematic Review of the Validity and Reliability of Consumer-Wearable Activity Trackers. *International Journal of Behavioral Nutrition and Physical Activity*, *12*(1), 1–22.

Farr, C. (2020). Amazon unveils Halo to battle Apple Watch and Fitbit — tracks activity, body fat, emotions. CNBC. https://www.cnbc.com/2020/08/27/amazon-hal-wearable-tracks-activity-body-fat-emotions.html. Accessed 19 November 2020

Fishbach, A., & Dhar, R. (2005). Goals as Excuses or Guides: The Liberating Effect of Perceived Goal Progress on Choice. *Journal of Consumer Research*, *32*(3), 370–377.

FitBit (2022). www.Fitbit.com. Accessed May 6, 2022.

Fitzsimons, G. M., & Finkel, E. J. (2011). Outsourcing Self-Regulation. *Psychological Science*, *22*(3), 369–375.

Fletcher, S. W., Morgan, T. M., O'Malley, M. S., Earp, J. A. L., & Degnan, D. (1989). Is Breast Self-Examination Predicted by Knowledge, Attitudes, Beliefs, or Sociodemographic Characteristics? *American Journal of Preventive Medicine*, *5*(4), 207–215.

Fotopoulou, A., & O'Riordan, K. (2017). Training to self-care: Fitness Tracking, Biopedagogy and the Healthy Consumer. *Health Sociology Review*, *26*(1), 54–68.

Fritz, T., Huang, E. M., Murphy, G. C., & Zimmermann, T. (2014). Persuasive Technology in the Real World: A Study of Long-Term Use of Activity Sensing Devices for Fitness (pp. 487–496). ACM Press.

Gagne, M. (2003). Autonomy Support and Need Satisfaction in The Motivation and Well-Being of Gymnasts. *Journal of Applied Sport Psychology*, *15*(4), 372–390.

Gimpel, H., Nißen, M., & Görlitz, R. A. (2013). Quantifying the Quantified Self: A Study on the Motivation of Patients to Track Their Own Health. *Healthcare Information Systems*, 1–16.

Hamari, J., Hassan, L., & Dias, A. (2018). Gamification, Quantified-Self or Social Networking? Matching Users' Goals with Motivational Technology. *User Modeling and User-Adapted Interaction*, *28*(1), 35–74.

Hamilton, R., & Price, L. L. (2019). Consumer Journeys: Developing Consumer-Based Strategy. *Journal of the Academy of Marketing Science*, 47, 187–191.

Hamilton, R., Ferraro, R. Haws, K. L., & Mukhopadhyay, A. (2021). Traveling with Companions: The Social Customer Journey. *Journal of Marketing, 85*(1), 68-92.

Harkins, S. G., Latane, B., & Williams, K. (1980). Social Loafing: Allocating Effort or Taking it Easy? *Journal of Experimental Social Psychology*, *16*(5), 457–465.

Harris, T., Kerry, S. M., Victor, C. R., Ekelund, U., Woodcock, A., Iliffe, S., et al. (2015). A Primary Care Nurse-Delivered Walking Intervention in Older Adults: PACE (Pedometer Accelerometer Consultation Evaluation)-Lift Cluster Randomised Controlled Trial. *PLOS Medicine*, *12*(2), e1001783.

Hart, P., & Royne, M. B. (2017). Being Human: How Anthropomorphic Presentations Can Enhance Advertising Effectiveness. *Journal of Current Issues & Research in Advertising*, *38*(2), 129–145.

Hassan, L., Dias, A., & Hamari, J. (2019). How Motivational Feedback Increases User's Benefits and Continued Use: A Study on Gamification, Quantified-Self and Social Networking. *International Journal of Information Management*, *46*, 151–162.

Hayes, A. F. (2017). *Introduction to Mediation, Moderation, and Conditional Process Analysis: A Regression-Based Approach*. Guilford Publications.

Hildebrand, C., & Bergner, A. (2021). Conversational Robo Advisors as Surrogates of Trust: Onboarding Experience, Firm Perception, and Consumer Financial Decision Making. *Journal of the Academy of Marketing Science*, *49*(4), 659–676.

Hoffman, D. L., & Novak, T. P. (2018). Consumer and Object Experience in The Internet of Things: An Assemblage Theory Approach. *Journal of Consumer Research*, *44*(6), 1178–1204.

Hoffman, D. L., & Novak, T. P. (2019). Object-Oriented Anthropomorphism as a Mechanism for Understanding AI. *Advances in Consumer Research,* 47, eds. Rajesh Bagchi, Lauren Block, and Leonard Lee, Duluth, MN: Association for Consumer Research, 352-358.

Hollenbeck, J. R., Williams, C. R., & Klein, H. J. (1989). An Empirical Examination of the Antecedents of Commitment to Difficult Goals. *Journal of Applied Psychology*, *74*(1), 18.

Hur, J. D., Koo, M., & Hofmann, W. (2015). When Temptations Come Alive: How Anthropomorphism Undermines Self-Control. *Journal of Consumer Research*, *42*(2), 340 – 358.

IDC.com (2021) Consumer Enthusiasm for Wearable Devices Drives the Market to 28.4% Growth in 2020, According to IDC. *IDC: The Premier Global Market Intelligence Company*. https://www.idc.com/getdoc.jsp?containerId=prUS47534521. Accessed August 16th, 2021.

Jakicic, J. M., Davis, K. K., Rogers, R. J., King, W. C., Marcus, M. D., Helsel, D., et al. (2016). Effect of Wearable Technology Combined with a Lifestyle Intervention on Long-term Weight Loss: The IDEA Randomized Clinical Trial. *JAMA*, *316*(11), 1161–1171.

Jayanti, R. K., & Burns, A. C. (1998). The Antecedents of Preventive Health Care Behavior: An Empirical Study. *Journal of the Academy of Marketing Science*, *26*(1), 6–15.

Joosse, M., Lohse, M., Perez, J. G., & Evers, V. (2013). What You Do Is Who You Are: The Role of Task Context In Perceived Social Robot Personality. In *2013 IEEE International Conference on Robotics and Automation* (pp. 2134–2139). IEEE.

Kang, J., Binda, J., Agarwal, P., Saconi, B., & Choe, E. K. (2017). Fostering User Engagement: Improving Sense of Identity Through Cosmetic Customization in Wearable Trackers. In *Proceedings of the 11th EAI International Conference on Pervasive Computing Technologies for Healthcare* (pp. 11–20). Presented at the PervasiveHealth '17: 11th EAI International Conference on Pervasive Computing Technologies for Healthcare, Barcelona Spain: ACM.

Khenfer, J., Shepherd, S., & Trendel, O. (2020). Customer Empowerment in the Face of Perceived Incompetence: Effect on Preference for Anthropomorphized Brands. *Journal of Business Research*, *118*, 1–11.

Kim, H. Y., & Lee, Y. (2020). The effect of online customization on consumers' happiness and purchase intention and the mediating roles of autonomy, competence, and pride of authorship. *International Journal of Human–Computer Interaction*, *36*(5), 403-413.

Kim, S., Chen, R. P., & Zhang, K. (2016). Anthropomorphized Helpers Undermine Autonomy and Enjoyment in Computer Games. *Journal of Consumer Research*, *43*(2), 282–302.

Kiwanuka, E. (2020). The Health Impact of Obesity. In *Obesity* (pp. 73–83). Elsevier.

Kronrod, A., Grinstein, A., & Wathieu, L. (2012). Go Green! Should Environmental Messages Be So Assertive? *Journal of Marketing*, *76*(1), 95–102.

Landwehr, J. R., McGill, A. L., & Herrmann, A. (2011). It's Got the Look: The Effect of Friendly and Aggressive "Facial" Expressions on Product Liking and Sales. *Journal of Marketing*, *75*(3), 132–146.

Ledger, D., & McCaffrey, D. (2014). Inside Wearables: How the Science of Human Behavior Change Offers the Secret to Long-Term Engagement. *Endeavour Partners*, *200*(93), 1.

Lee, V. R., & Drake, J. (2013). Digital Physical Activity Data Collection and Use by Endurance Runners and Distance Cyclists. *Technology, Knowledge and Learning*, *18*(1–2), 39–63.

Lemaignan, S., Fink, J., & Dillenbourg, P. (2014). The Dynamics of Anthropomorphism in Robotics. In *2014 9th ACM/IEEE International Conference on Human-Robot Interaction (HRI)* (pp. 226–227). Presented at the 2014 9th ACM/IEEE International Conference on Human-Robot Interaction (HRI).

Lupton, D. (2016a). The Diverse Domains of Quantified Selves: Self-Tracking Modes and Dataveillance. *Economy and Society*, *45*(1), 101–122.

Lupton, D. (2016b). *The Quantified Self*. John Wiley & Sons.

Maltseva, K., & Lutz, C. (2018). A Quantum of Self: A Study of Self-Quantification and Self-Disclosure. *Computers in Human Behavior*, 81, 102–114.

Markets and Markets (2021). Wearable Technology Report (SE 2763). Markets and Markets Research Private Ltd. https://www.marketsandmarkets.com/Market-Reports/wearable-electronics-market-983.html

Mathios, A. D. (1996). Socioeconomic Factors, Nutrition, and Food Choices: An Analysis of the Salad Dressing Market. *Journal of Public Policy & Marketing*, *15*(1), 45–54.

McShane, B. B., & Böckenholt, U. (2017). Single-Paper Meta-Analysis: Benefits for Study Summary, Theory Testing, and Replicability. *Journal of Consumer Research*, *43*(6), 1048–1063.

Moorman, C., & Matulich, E. (1993). A Model of Consumers' Preventive Health Behaviors: The Role of Health Motivation and Health Ability. *Journal of Consumer Research*, *20*(2), 208–228.

Nass, C., Isbister, K., & Lee, E.-J. (2000). Truth is Beauty: Researching Embodied Conversational Agents. *Embodied Conversational Agents*, 374–402.

Nayga Jr, R. M. (1997). Impact of Sociodemographic Factors on Perceived Importance of Nutrition in Food Shopping. *Journal of Consumer Affairs*, *31*(1), 1–9.

Nestle, M., & Jacobson, M. F. (2000). Halting the Obesity Epidemic: A Public Health Policy Approach. *Public Health Reports*, *115*(1), 12–24.

Ng, J. Y. Y., Ntoumanis, N., Thøgersen-Ntoumani, C., Deci, E. L., Ryan, R. M., Duda, J. L., & Williams, G. C. (2012). Self-Determination Theory Applied to Health Contexts: A Meta-Analysis. *Perspectives on Psychological Science*, *7*(4), 325–340.

Novak, T. P., & Hoffman, D. L. (2019). Relationship Journeys In The Internet Of Things: A New Framework For Understanding Interactions Between Consumers and Smart Objects. *Journal of the Academy of Marketing Science*, *47*(2), 216–237.

Nowak, K. L., & Rauh, C. (2005). The Influence of the Avatar on Online Perceptions of Anthropomorphism, Androgyny, Credibility, Homophily, and Attraction. *Journal of Computer-Mediated Communication*, *11*(1), 153–178.

Paluch, S., & Tuzovic, S. (2019). Persuaded Self-Tracking with Wearable Technology: Carrot or Stick? *Journal of Services Marketing, 33*(4), 436–448.

Pantzar, M., & Ruckenstein, M. (2015). The Heart of Everyday Analytics: Emotional, Material and Practical Extensions in Self-Tracking Market. *Consumption Markets & Culture*, *18*(1), 92–109.

Patel, M. S., Asch, D. A., & Volpp, K. G. (2015). Wearable Devices as Facilitators, Not Drivers, of Health Behavior Change. *JAMA*, *313*(5), 459–460.

Pettinico, G., & Milne, G. R. (2017). Living by the Numbers: Understanding the "Quantification Effect." *Journal of Consumer Marketing*, *34*(4), 281–291.

Przybylski, A. K., Rigby, C. S., & Ryan, R. M. (2010). A Motivational Model of Video Game Engagement. *Review of General Psychology, 14*, 154–166.

Rauschnabel, P. A., & Ahuvia, A. C. (2014). You're so Lovable: Anthropomorphism and Brand Love. *Journal of Brand Management*, *21*(5), 372–395.

Ryan, R. M., & Deci, E. L. (2000). Intrinsic and Extrinsic Motivations: Classic Definitions and New Directions. *Contemporary Educational Psychology*, *25*(1), 54–67.

Ryan, R. M., & Deci, E. L. (2006). Self-Regulation and the Problem of Human Autonomy: Does Psychology Need Choice, Self-Determination, and Will? *Journal of Personality*, *74*(6), 1557–1586.

Ryan, R. M., Rigby, C. S., & Przybylski, A. (2006). The Motivational Pull of Video Games: A Self-Determination Theory Approach. *Motivation and Emotion*, *30*(4), 344–360.

Sanders, J., Loveday, A., Pearson, N., Edwardson, C., Yates, T., Biddle, S., & Esliger, D. (2016). Devices for Self-Monitoring Sedentary Time or Physical Activity: A Scoping Review. *Journal of Medical Internet Research*, *18*, e90.

Schneider, S. (2018). The More Human, the Higher the Performance? Examining the Effects of Anthropomorphism on Learning with Media. *Journal of Educational Psychology*, *111*(1), 57.

Sharpe Wessling, K., Huber, J., & Netzer, O. (2017). Mturk Character Misrepresentation: Assessment and Solutions. *Journal of Consumer Research*, *44*(1), 211–230.

Shin, G., Jarrahi, M. H., Fei, Y., Karami, A., Gafinowitz, N., Byun, A., & Lu, X. (2019). Wearable Activity Trackers, Accuracy, Adoption, Acceptance and Health Impact: A Systematic Literature Review. *Journal of Biomedical Informatics*, *93*, 103153.

Staats, H., Harland, P., & Wilke, H. A. (2004). Effecting Durable Change: A Team Approach to Improve Environmental Behavior in the Household. *Environment and Behavior*, *36*(3), 341–367.

Sundar, S. S. (2008). *Self as Source: Agency and Customization in Interactive Media*. Routledge.

Swan, M. (2009). Emerging Patient-Driven Health Care Models: An Examination of Health Social Networks, Consumer Personalized Medicine and Quantified Self-Tracking. *International Journal of Environmental Research and Public Health*, *6*(2), 492–525.

Tam, K.-P., Lee, S.-L., & Chao, M. M. (2013). Saving Mr. Nature: Anthropomorphism Enhances Connectedness to and Protectiveness Toward Nature. *Journal of Experimental Social Psychology*, *49*(3), 514–521.

Valle, C. G., Nezami, B. T., & Tate, D. F. (2020). Designing In-App Messages to Nudge Behavior Change: Lessons Learned from a Weight Management App for Young Adults. *Organizational Behavior and Human Decision Processes*, *161*, 95–101.

Van den Bulck, J. (2015). Sleep Apps and the Quantified Self: Blessing or Curse? *Journal of Sleep Research*, *24*(2), 121–123.

Vnoutchkov, M. S. (2021). *Investigating the Effect of Customization on Engagement with Wearable Activity Trackers.* University of Twente Student Theses. http://essay.utwente.nl/85995/ Accessed August 20th, 2021.

Waytz, A., Cacioppo, J., & Epley, N. (2010). Who Sees Human?: The Stability and Importance of Individual Differences in Anthropomorphism. *Perspectives on Psychological Science*, *5*(3), 219–232.

Wen Wan, E., Peng Chen, R., & Jin, L. (2017). Judging a Book by Its Cover? The Effect of Anthropomorphism on Product Attribute Processing and Consumer Preference. *Journal of Consumer Research, 43*(6), 1008–1030.

Wiklund, P. (2016). The Role of Physical Activity and Exercise in Obesity and Weight Management: Time for Critical Appraisal. *Journal of Sport and Health Science*, *5*(2), 151–154.

Winterich, K. P., Nenkov, G. Y., & Gonzales, G. E. (2019). Knowing What it Makes: How Product Transformation Salience Increases Recycling. *Journal of Marketing*, *83*(4), 21–37.

Wittkowski, K., Klein, J. F., Falk, T., Schepers, J. J., Aspara, J., & Bergner, K. N. (2020). What Gets Measured Gets Done: Can Self-Tracking Technologies Enhance Advice Compliance? *Journal of Service Research*, 1094670520904424.

Wolf, G. (2009). Know Thyself: Tracking Every Facet of Life, from Sleep to Mood to Pain, 24/7/365. *WIRED*. https://www.wired.com/2009/06/lbnp-knowthyself/. Accessed 25 June 2018.

Yam, K. C., Bigman, Y. E., Tang, P. M., Ilies, R., De Cremer, D., Soh, H., & Gray, K. (2020). Robots at Work: People Prefer—and Forgive—Service Robots with Perceived Feelings. *Journal of Applied Psychology*.

Yang, L. W., Aggarwal, P., & McGill, A. L. (2020). The 3 C's of Anthropomorphism: Connection, Comprehension, And Competition. *Consumer Psychology Review*, *3*(1), 3–19.

Zhou, X., Kim, S., & Wang, L. (2019). Money Helps When Money Feels: Money Anthropomorphism Increases Charitable Giving. *Journal of Consumer Research*, *45*(5), 953–972.

**Table 1.** Research on Self-Tracking in the Literature

| *Source* | *Method and Participants* | *Technology* | *Findings* |
|---|---|---|---|
| **Quantified-Self in Marketing** | | | |
| Etkin (2016) | Lab and field experiments, students | Counting Activities/Pedometer | Measurement increases how much of an activity people do, but it reduces the enjoyment in the activity. |
| Pettinico and Milne (2017) | Experiments, online participants | Scenario-based self-tracking technologies | Self-quantification has a positive effect on anticipated motivation through perceptions of feedback meaningfulness, self-empowerment, and goal focus. |
| Charitsis et al. (2019) | Content analysis | Online community of self-trackers | Self-tracking systems are representations of biopolitical technologies which, through marketing interventions, govern consumer interactions. |
| Paluch and Tuzovic (2019) | Qualitative, self-tracking users and non-users | Wearable self-tracking devices | How consumers perceive self-tracking technologies is dependent on individual determinants and firm-related determinants. |
| Wittkowski et al. (2020) | Field and laboratory experiments | Self-tracking technologies | Self-tracking can undermine advice compliance for those with low self-efficacy. |
| **Quantified-Self in Other Disciplines** | | | |
| Fotopoulou and O'Riordan | Autoethnography and media analysis | FitBit wearable trackers | Micro-practices, which involve practices of mediation and sharing data, regulate the contemporary healthy subject |
| Evenson et al. (2015) | Meta-analysis | Activity trackers | There is high inter-device reliability for various dimensions consumers track with activity trackers. |
| Pantzar and Ruckenstein (2015) | Conceptual | Heart-rate monitoring | Everyday analytics can become embedded and normalized in daily life. To recruit and motivate consumers, devices must promote engagement with monitoring. |
| Sanders et al. (2016) | Meta-analysis | Self-monitoring devices | There are a number of devices for self-monitoring physical activity, but a greater need for devices that monitor sedentary time. |
| Dooley et al. (2017) | Experimental | Activity trackers | Most wearable devices do not provide comparable estimates of energy expenditure, as the data given differs between devices. |
| Canhoto and Arp (2017) | Exploratory, Focus Groups | Wearable devices | Factors that support adoption of devices differ from those that support sustained use. |
| ***Current Research*** | Field and lab studies, conducted over time. Participants using a tracker over time (executives, online participants, students). | Wearable self-tracking devices | Anthropomorphizing the tracking device elicits a dynamic effect: it initially enhances product evaluations, but with use, reduces product evaluations so there is no favorability (vs. non anthropomorphized)<br>Anthropomorphizing the tracking device undermines health motivation due to a reduction in consumer-perceived autonomy.<br>Customizing the anthropomorphized tracker (by customizing goals or monitoring more indicators) mitigates its negative effects on health motivation and product evaluations. |

**Table 2.** Examples of Anthropomorphized Self-Tracking Technologies in the Marketplace

| Product Name | Tracker Type | Technology | Advertisement Copy |
|---|---|---|---|
| Apple Watch | Fitness Tracker | Wearable Tracker | "Coaching: Wearing an Apple Watch feels like having a personal trainer on your wrist…Personalized coaching will tell you how much you need to move…" |
| My FitnessPal by Under Armour | Calorie and Exercise Log | Smartphone App | "Myfitnesspal.com remembers what you've eaten and done most often in the past, and makes it easy for you to add those foods again to your log."<br>"The reason our system is so easy to use is because it learns from you!" |
| Moov Now Personal Coach and Workout Tracker by Moov | Fitness Tracker | Wearable Tracker | "Moov encourages you to make it to the top."<br>"Moov teaches you new techniques to help you perform better" |
| Vi Sense by Vi Trainer | Fitness Tracker | Headphones | "VI: A trainer in your ears"<br>"Vi is your on-demand personal trainer. She coaches you in real-time based on your heart rate, making for a more dynamic workout. She creates customized exercise plans for you based on your performance" |
| RocketBody Personal Trainer by RocketBody | Fitness Tracker | Smartphone App (syncs with wrist tracker) | "Your AI-powered personal trainer will provide daily support and recommendations for your training and nutrition, all designed to be relevant to your unique goals." |
| Fitness Buddy by Azumio | Fitness Tracker | Smartphone App | "My Fitness Buddy can tell you what exercises to do, provide you healthy food choices, take data from your smart wearable technology (heart rate, weight, distance etc.) and even let you know when you should top up on water." |
| Carrot Fit App by Carrot Fit | Fitness and Weight Loss Tracker | Smartphone App | "Your judgmental fitness overlord"<br>"CARROT is a sadistic AI construct with one simple goal: to transform your flabby carcass into a Grade A specimen of the human race. She will do whatever it takes – including threatening, inspiring, ridiculing, and bribing you – to make this happen." |

Note: Anthropomorphism refers to attributing uniquely human characteristics, motivations, intentions, or emotions to nonhuman agents (Epley and Waytz 2007). In the above examples, anthropomorphism is seen when referring to devices as human-like entities such as "coach," "pal," or "buddy," and/or by using language which humanizes the device with abilities such as "learns," "remembers," "encourages," and giving the device a gender and voice.

**Table 3:** Studies Overview and Key Insights

| | Design and Context | Summary of Results |
|---|---|---|
| P | 2(anthropomorphism, control) between subjects field experiment.<br>Consumers evaluating online advertisements. | Consumers searching for information about activity trackers clicked on an advertisement for an anthropomorphized (vs. non-anthropomorphized) activity tracker significantly more times. Thus, consumers are initially more interested in anthropomorphized self-tracking devices. |
| 1 | 2(anthropomorphism, control) × measured (tendency to anthropomorphize) between subjects experiment<br>Evaluating and wearing a real activity tracker over time. | Evaluations of anthropomorphized trackers significantly decreased with use, supporting H1a, and after use, there was no difference in evaluations between activity tracker types, supporting H1b.<br>After using the activity tracker, participants reported greater health motivation when using a non-anthropomorphized device (vs. anthropomorphized) supporting H2. |
| 2 | 2(anthropomorphism, control) between subjects experiment<br>Evaluating and wearing a real activity tracker over time. | Evaluations of anthropomorphized devices significantly decreased with use, supporting H1a, and after use, there was no difference in evaluations between tracker types, supporting H1b.<br>After wearing an activity tracker for multiple days, participants took more steps when wearing a non-anthropomorphized (vs. anthropomorphized) tracker, supporting H2. |
| 3 | 2(anthropomorphism, control) between subjects experiment<br>Evaluating and wearing a real activity tracker over time | Evaluations of anthropomorphized devices significantly decreased with use, supporting H1a, and after use, consumers favored the control device, supporting H1b.<br>Consumers reported taking significantly fewer steps with an anthropomorphized tracker (vs. non-anthropomorphized), supporting H2.<br>The negative effect of anthropomorphism on steps is mediated by a reduction in consumer-perceived autonomy, supporting H3. |
| 4 | 2(anthropomorphism, control) between subjects experiment<br>Current device owners anthropomorphizing (vs. not) their own trackers | After anthropomorphizing their own tracker (vs. not) for multiple days, participants reported weaker health motivation than those who did not anthropomorphize their activity tracker, supporting H2.<br>The negative effect of anthropomorphism on health motivation is mediated by a reduction in consumer-perceived autonomy, supporting H3. |
| 5 | 2(anthropomorphism: yes, no) × 3(goal salience: control, default, customized)<br>Current device owners anthropomorphizing (vs. not) their own trackers | Reaffirming autonomy via customization (customizing a fitness goal) of an anthropomorphized tracker mitigates the negative effects of anthropomorphism, supporting H3. |
| WA 5B | (Measured: tendency to anthropomorphize tracker) × (measured: customization as number of health indicators monitored) | Reaffirming autonomy via customization (increasing the number of health indicators monitored) of an anthropomorphized activity tracker mitigates the negative effects of anthropomorphism, supporting H3. |

**Table 4:** Pretests of Manipulations

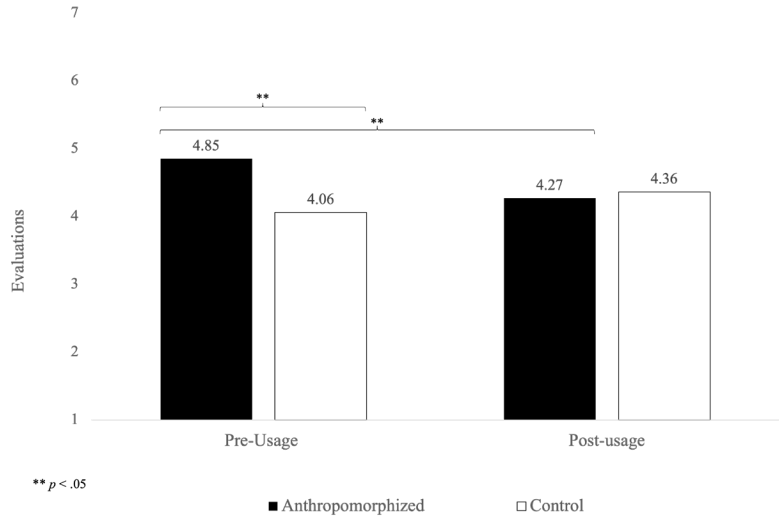
| | **Means** | **Main Effect** | **Measures** | α | **Sample** |
|---|---|---|---|---|---|
| Pilot Study: *Anthropomorphism* | $M_{Anthro}$ = 2.35, $M_{Control}$ = 1.96 | F(1, 638) = 14.29, $p$ < .001 | "The product advertised is … a technological device (reverse coded)," "a wearable device (reverse coded)," "a human being," "a person," and "an individual" (random order; 1 = "strongly disagree," 7 = "strongly agree") | .85 | N = 640<br>43% female<br>$M_{age}$ = 37.80 |
| Studies 2 and 3: *Anthropomorphism* | $M_{Anthro}$ = 4.04, $M_{Control}$ = 3.19 | F(1, 58) = 4.93, $p$ = .03 | "Rate the extent to which the activity tracker seems to have some human qualities," "lifelike," "like an observer monitoring my every move," | .82 | N = 60<br>45% female<br>$M_{age}$ = 38.80 |
| Web Appendix Study 5B: *Customization* | $M_{Fewer}$ = 4.14, $M_{More}$ = 5.14, | F(1, 59) = 5.91, $p$ = .02 | "Thinking about the aspects the consumer is able to track with their activity tracker, to what extent does the activity tracker seem: … customized, personalized, individualized" | .96 | N = 61<br>44% female<br>$M_{age}$ = 37.48 |

*Notes:* The pretests for the Pilot Study and Study 2 and 3 tested perceived anthropomorphism of an anthropomorphized (vs. control) activity tracker. The pre-test for WA Study 5B tested perceived customization of a tracker when a consumer monitors more (vs. fewer) indicators.

**Table 5:** Measurement Items by Study

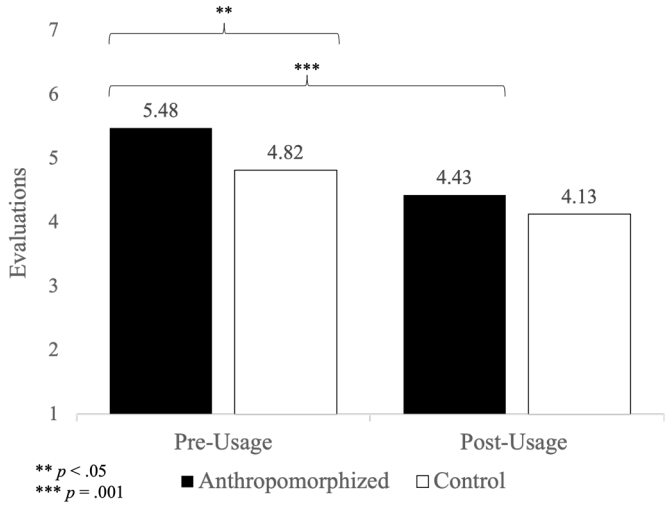
| | | S1 | S2 | S3 | S4 | S5 |
|---|---|---|---|---|---|---|
| **Pre-Usage Evaluations** (7-point bi-polar) | I think [S2: Chris/XT1000] will help me reach my health and fitness goals. | | X | X | | |
| | I will enjoy tracking my activity with [S2: Chris/XT1000] | | X | X | | |
| | I am satisfied with [S1: the tracker; S2: Chris/XT1000] | X | X | X | | |
| | Hate/Love self-tracking | X | | | | |
| | Coefficient α/Correlation | .53 | .77 | .70 | | |
| **Post-Usage Evaluations** 7-point scale (strongly disagree/ strongly agree) | I think [S2: Chris/XT1000] helped me reach my health and fitness goals. | | X | X | | |
| | I enjoyed tracking my activity with [S2: Chris/XT1000] | | X | X | | |
| | I was [S4: am] satisfied with [S1: the tracker; S2: Chris/XT1000; S4: my tracker]. | X | X | X | | |
| | Hated/Loved self-tracking | X | | | | |
| | Coefficient α | .54 | .83 | .88 | | |
| **Health Motivation** 7-point scale (strongly disagree / strongly agree) unless otherwise noted. | Monitor my health | X | | | X | |
| | Track my activity (S1, Sticking to health goals) | X | | | X | |
| | Live a healthier lifestyle (S1, setting health goals) | X | | | X | |
| | Exercise regularly (S1, Getting enough exercise) | X | | | X | |
| | Be more active (S1, Being physically active) | X | | | X | |
| | Be mindful of what I eat (S1, Eating a well-balanced diet; Avoid unhealthy foods) | X | | | X | |
| | Take more steps each day | | | | X | |
| | Increase my physical activity | | | | X | |
| | Check my data and results | | | | X | |
| | Coefficient α | .91 | | | .94 | |
| **Health Behavior** | Steps taken | | X | X | | X |
| **Autonomy** | It (was/will be) my own effort that determines my performance | | | X | X | |
| | I think I should take all the credit for the performance | | | X | X | |
| | Coefficient α | | | .61 | .72 | |

**Figure 1**
**Study 1: Pre- and Post-Usage Evaluations as a Function of Activity-Tracker Type**



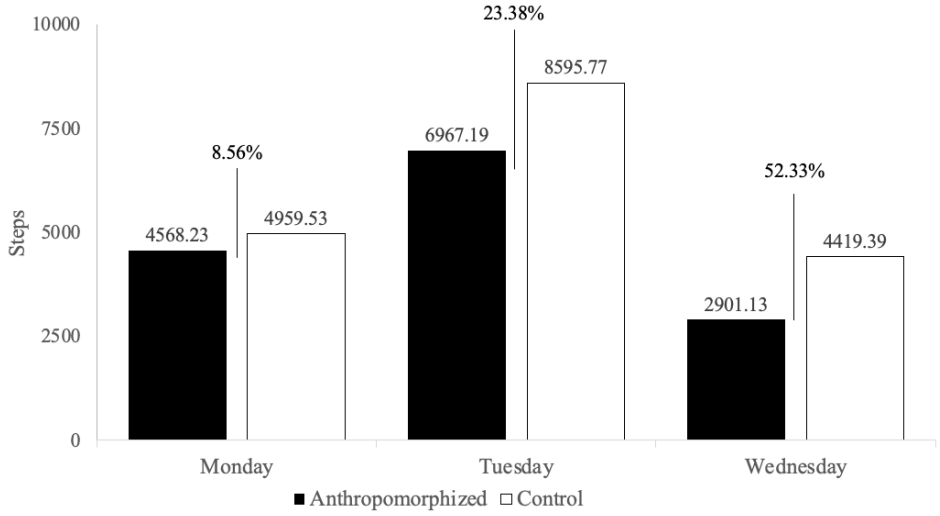

Note. Figure 1 demonstrates the pre-and post- usage evaluations of the anthropomorphized (vs. non-anthropomorphized) activity-trackers. Prior to usage, participants evaluated an anthropomorphized (vs. non-anthropomorphized) tracker more favorably ($M_{Anthro\text{-}Pre} = 4.85$, $M_{Control\text{-}Pre} = 4.06$; $F(1, 39) = 4.20$, $p = .05$). After using the tracker, the favorability toward the anthropomorphized tracker was mitigated relative to pre-usage ($M_{Anthro\text{-}Pre} = 4.85$, $M_{Anthro\text{-}Post} = 4.27$; $F(1, 39) = 7.76$, $p = .004$) and relative to the control condition ($M_{Anthro\text{-}Post} = 4.27$, $M_{Control\text{-}Post} = 4.36$; $F(1, 39) < 1$, $p = .83$).

**Figure 2A**
**Study 2: Pre- and Post- Usage Evaluations**



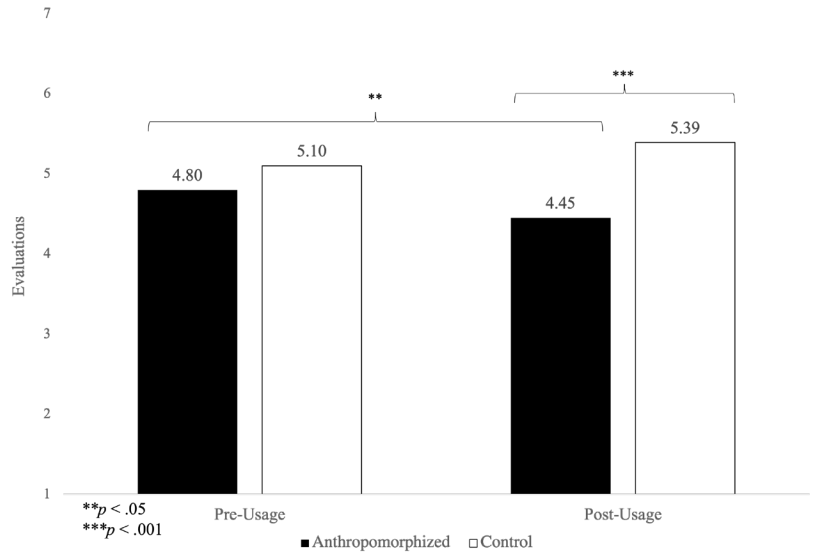

Note. Figure 2A demonstrates the pre-and post- usage evaluations of the anthropomorphized (vs. non-anthropomorphized) activity-trackers. Prior to usage, participants evaluated an anthropomorphized (vs. non-anthropomorphized) tracker significantly more favorably ($M_{Anthro\text{-}Pre} = 5.48$, $M_{Control\text{-}Pre} = 4.82$; $F(1, 53) = 4.14$, $p = .04$). After using the tracker, the favorability toward the anthropomorphized tracker was mitigated relative to pre-usage ($M_{Anthro\text{-}Pre} = 5.48$, $M_{Anthro\text{-}Post} = 4.43$; $F(1, 53) = 13.23$, $p = .001$) and relative to the control condition ($M_{Anthro\text{-}Post} = 4.43$, $M_{Control\text{-}Post} = 4.13$; $F(1, 53) = .40$, $p = .52$).

**Figure 2B**
**Study 2: Percentage Difference in Steps Between Conditions**



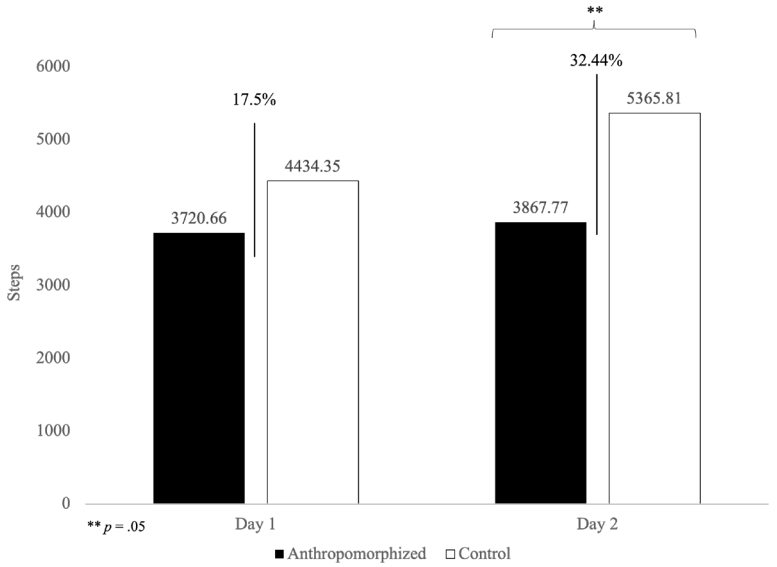

Note. Figure 2B demonstrates the steps taken by day. The magnitude of the gap between those who had an anthropomorphized (vs. non-anthropomorphized) activity tracker increased with each day. On day 1, anthropomorphizing reduced steps by 8.56%, by day two the reduction was 23.38%, and by day 3, the reduction was 52.33%. (Day 1: $M_{Anthro} = 4568.23$, $M_{Control} = 4959.53$; $F < 1$, $p = .72$; Day 2: $M_{Anthro} = 6967.19$, $M_{Control} = 8595.77$; $F < 1$, $p = .35$; Day 3: $M_{Anthro} = 2901.13$, $M_{Control} = 4419.39$; $F(1, 53) = 3.53$, $p = .07$). The aggregate daily steps for days 1 and 3 are smaller as these are partial days, and day 2 is a full day. However, all participants have the same amount of total time to complete their steps on a given day.

**Figure 3A**
**Study 3: Pre- and Post-Usage Evaluations**




Note. Figure 3A demonstrates the pre-and post- usage evaluations. Participants' evaluations of the anthropomorphized tracker significantly decreased with use ($M_{Anthro\text{-}re}$= 4.80, $M_{Anthro\text{-}Post}$= 4.45; F(1, 99) = 5.43, $p$ = .02) supporting H1a, while participants' evaluations of the control tracker marginally increased with use ($M_{Pre}$ = 5.10, $M_{Post}$ = 5.39; F(1, 99) = 2.90, $p$ = .09). Furthermore, in post-usage, the favorability toward the anthropomorphized tracker is diminished, and participants' evaluations of the non-anthropomorphized tracker were greater than evaluations of the anthropomorphized tracker ($M_{Anthro}$ = 4.45, $M_{Control}$ = 5.39, F(1, 99) = 12.39, $p$ < .001), supporting H1b.

**Figure 3B**
**Study 3: Steps Taken as a Function of Anthropomorphized vs. Control Tracker**




Note. Figure 3B demonstrates the steps taken by day. The magnitude of the gap between those who had an anthropomorphized (vs. non-anthropomorphized) activity tracker increased from Day 1 to Day 2. That is, on Day 1, anthropomorphizing reduced steps by 17.5%, and by Day 2 the reduction was 32.44%. (Day 1: $M_{Anthro}$ = 3720.66, $M_{Control}$ = 4434.35; F < 1, $p$ = .34; Day 2: $M_{Anthro}$ = 3867.77, $M_{Control}$ = 5365.81; F(1, 99) = 3.92, $p$ = .05).

**Figure 4**
**Study 5: Steps as a Function of Customization and Tracker Type**

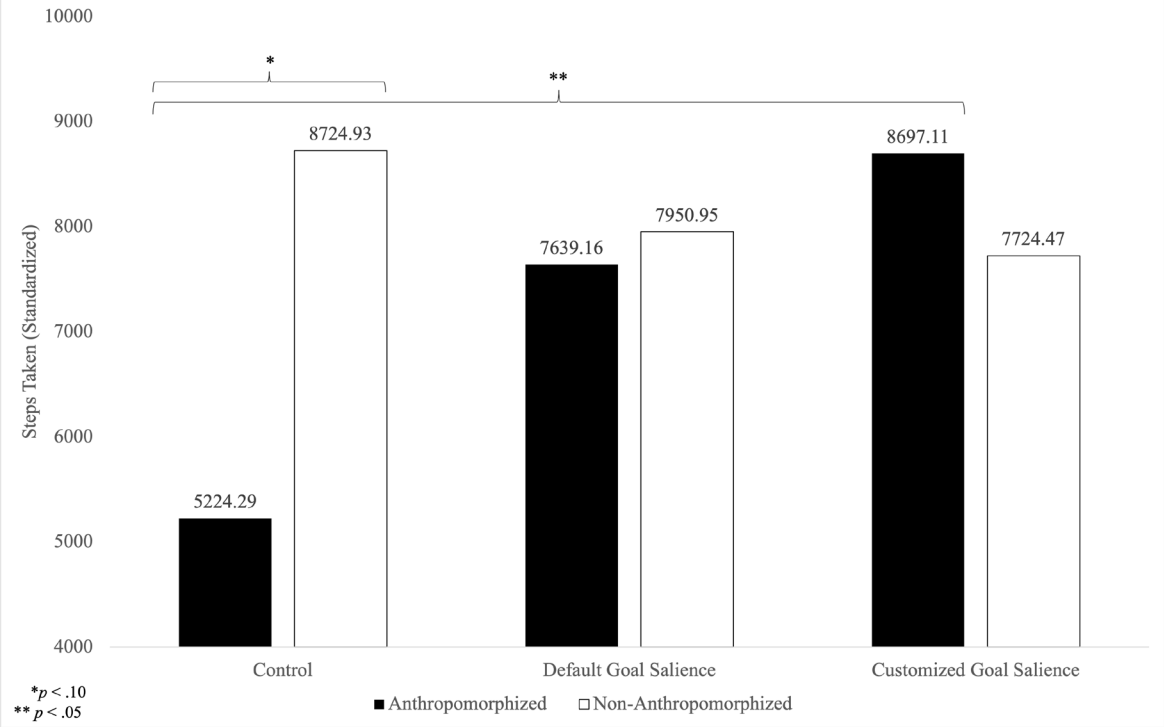



Figure 4 demonstrates steps taken as a function of tracker type and goal type.

- **Control Condition:** Consistent with previous studies and H2, in the control/no goal salient condition, anthropomorphism has a negative effect on the number of steps taken ($M_{Anthro}$ = 5224.29 vs. $M_{Non\text{-}Anthro}$ = 8724.93; $p$ = .056).
- **Default Goal Salience:** A salient default goal closes the gap in health motivation between anthropomorphized and non- anthropomorphized tracker ($M_{Anthro}$ = 7639.16 vs. $M_{Non\text{-}Anthro}$ = 7950.95; $p$ = .84), but it does not lead to a significant increase in steps taken with an anthropomorphized tracker as compared to the no goal salience/control condition ($M_{Control}$ = 5224.29 vs. $M_{Default}$ = 7639.16, $p$ = .15).
- **Customized Goal Salience:** A salient *customized* goal not only closes the gap in health motivation between anthropomorphized and non- anthropomorphized tracker ($M_{Anthro}$ = 8697.11 vs. $M_{Non\text{-}Anthro}$ = 7724.47; $p$ = .55), but also leads consumers with an anthropomorphized activity tracker to take significantly more steps as compared to the no goal salience/control condition ($M_{Control}$ = 5224.29 vs. $M_{Customized}$ = 8697.11; $p$ = .04).
- **<u>In summary:</u>** For consumers with an anthropomorphized activity tracker, it is only when customers have the autonomy to create a customized goal that the negative effect of an anthropomorphized tracker on health motivation is overcome. (And this effect is above and beyond the effects of a salient default goal.)

# Web Appendix A: Study Stimuli

***Panel A: Pilot Study Google AdWords Stimuli***

Anthropomorphized Advertisement

Fitness Tracker named "Alex" | Friend who helps you get fit
Ad www.verywellfit.com
Alex exists to help you reach your fitness goals

Control Advertisement

Fitness Tracker XT1000 | Device which helps you get fit
Ad www.verywellfit.com
XT1000 is programmed to help you reach your fitness goals

***Panel B: Study 2: Activity Tracker and Description Given to Classroom Field Study Participants***

Anthropomorphized



Control


***Panel C: Study 3: Activity Tracker and Description Given to Classroom Field Study Participants***



Hi, my name is **Chris.** I am your personal trainer. I am here to help you with your health and fitness goals

I am constantly thinking of ways to enhance your overall health and fitness level using the app and reports to keep you engaged



**XT1000** is your personal training device. It is here to help you with your health and fitness goals

It is programed to enhance your overall health and fitness level using the app and reports to keep you engaged

## Web Appendix B: Adjusted Means and Raw Means by Condition

| | | | Model Including Control Variables | | Model Excluding Control Variables | |
|---|---|---|---|---|---|---|
| Study | Dependent Variable | | Adjusted Mean | SE | Raw Mean | SD |
| 1 | Pre-Usage Evaluations | Anthropomorphized | 4.85 | .26 | 4.84 | .24 |
| | | Control | 4.06 | .27 | 4.07 | .25 |
| | Post-Usage Evaluations | Anthropomorphized | 4.27 | .28 | 4.27 | .27 |
| | | Control | 4.36 | .28 | 4.36 | .27 |
| | | Test of H1a | $F(1, 39) = 7.76$, $p = .004$ | | $F(1, 41) = 9.27$, $p = .004$ | |
| | | Test of H1b | $F(1, 39) = .05$, $p = .83$ | | $F(1, 41) = .05$, $p = .83$ | |
| | Post-Usage Health Motivation | Anthropomorphized | 4.56 | .26 | 4.62 | 1.42 |
| | | Control | 4.80 | .26 | 4.71 | 1.08 |
| | | Main Effect | $F(1, 37) = 4.63$, $p = .04$ | | $F(1, 39) = 4.54$, $p = .04$ | |
| 2 | Pre-Usage Evaluations | Anthropomorphized | 5.48 | .20 | 5.44 | .83 |
| | | Control | 4.82 | .20 | 4.86 | .87 |
| | Post-Usage Evaluations | Anthropomorphized | 4.43 | .28 | 4.40 | 1.14 |
| | | Control | 4.13 | .28 | 4.16 | 1.38 |
| | | Test of H1a | $F(1, 53) = 13.23$, $p = .001$ | | $F(1, 58) = 18.89$, $p < .001$ | |
| | | Test of H1b | $F(1, 53) = .40$, $p = .52$ | | $F(1, 58) = .50$, $p = .48$ | |
| | Number of Steps | Anthropomorphized | 2901.13 | 492.69 | 3695.76 | 2082.94 |
| | | Control | 4419.39 | 492.69 | 3624.76 | 2405.10 |
| | | Main Effect | $F(1, 53) = 3.53$, $p = .07$ | | $F(1, 58) = .01$, $p = .90$ | |
| 3 | Pre-Usage Evaluations | Anthropomorphized | 4.80 | .11 | 4.82 | .78 |
| | | Control | 5.10 | .13 | 5.02 | .98 |
| | Post-Usage Evaluations | Anthropomorphized | 4.45 | .16 | 4.75 | 1.20 |
| | | Control | 5.39 | .19 | 5.00 | 1.31 |
| | | Test of H1a | $F(1, 99) = 5.43$, $p = .02$ | | $F(1, 105) = 3.89$, $p = .05$ | |
| | | Test of H1b | $F(1, 99) = 12.39$, $p < .001$ | | $F(1, 105) = 1.09$, $p = .29$ | |
| | Number of Steps | Anthropomorphized | 3867.77 | 522.25 | 4155.05 | 2958.32 |
| | | Control | 5365.81 | 450.74 | 4999.06 | 3749.60 |
| | | Main Effect | $F(1, 99) = 3.92$, $p = .05$ | | $F(1, 105) = 1.70$, $p = .20$ | |
| 4 | Health Motivation | Anthropomorphized | 5.67 | .12 | 5.67 | .90 |
| | | Control | 6.14 | .11 | 6.14 | .96 |
| | | Main Effect | $F(1, 127) = 8.58$, $p = .004$ | | $F(1, 129) = 8.46$, $p = .004$ | |

| | | | | | | |
|---|---|---|---|---|---|---|
| 5 | DV: Number of Steps | | | | | |
| | Control (No Goal Stated) | Anthropomorphized | 5224.29 | 1265.99 | 5724.78 | 4938.60 |
| | | Non-Anthropomorphized | 8724.93 | 1312.07 | 8713.21 | 10696.08 |
| | Default Goal Salience | Anthropomorphized | 7639.16 | 1068.37 | 7573.92 | 4214.46 |
| | | Non-Anthropomorphized | 7950.95 | 1180.32 | 7498.10 | 4317.75 |
| | | (Goal: Control, Default Goal Salience) × (Anthro: y, n) Interaction | $b$ = 3188.85, $t$ = 1.3218, $p$ = .1875 | | $b$ = 3064.25, $t$ = 1.2319, $p$ = .2192 | |
| | Customized Goal Salience | Anthropomorphized | 8697.11 | 1139.91 | 9017.33 | 13846.02 |
| | | Non-Anthropomorphized | 7724.47 | 1150.98 | 7493.05 | 3618.10 |
| | | (Goal: Control, Customized Goal Salience) × (Anthro: y, n) Interaction | $b$ = 4473.29, $t$ = 1.8432, $p$ = .0665 | | $b$ = 4512.71, $t$ = 1.8005, $p$ = .0730 | |
| | | Anthropomorphism Main Effect | $b$ = -3500.64, $t$ = -1.92, $p$ = .0555 | | $b$ = -2988.42, $t$ = -1.60, $p$ = .11 | |
| | | Two-way Interaction | F(2, 244) = 1.76, $p$ = .17 | | F(2, 247) = 1.66, $p$ = .19 | |
| WA Study 5B | Exercise Frequency | Tendency to Anthropomorphize | $b$ = -.3189, $t$ = -2.6887, $p$ = .0074 | | $b$ = -.3305, $t$ = -2.7222, $p$ = .0067 | |
| | | Customization (Indicators Monitored) | $b$ = -.0819, $t$ = -.7988, $p$ = .4248 | | $b$ = -.0856, $t$ = -.8215, $p$ = .4118 | |
| | | Two-Way Interaction | $b$ = .1088, $t$ = 3.0353, $p$ = .0025 | | $b$ = .1041, $t$ = 2.8445, $p$ = .0046 | |

## Web Appendix C: Supplementary Analyses and Follow-up Study

### Study 4 Supplementary Analyses: Alternative Mechanisms Testing

Using Process Model 4, for exploratory purposes, we tested all alternative process measures in separate mediation models (for a more conservative test); however, none of the alternative measures mediated the relationship between anthropomorphism and health motivation; the confidence interval for the indirect effect through autonomy *included zero*, both at the 95% CI and the 90% CI levels. Specifically, the results show the following mediation effects: product effectiveness ($b$ = -.0401, 95% CI: -.1851, .0976), connectedness ($b$ = .0086, 95% CI: -.1002, .1076), skepticism ($b$ = -.0066, 95% CI: -.0715, .0378), resistance ($b$ = -.4492, 95% CI: -.1217, .0208), empowerment ($b$ = -.1270, 95% CI: -.2928, .0325) and product comprehension ($b$ = -.0319, 95% CI: -.1882, .1060).

### Follow-up Study 5B

The follow-up study 5B explores another strategy for consumers to customize their tracker and reaffirm feelings of autonomy. In our focal context of activity tracking, another key customization option available across many types and brands of wearables in the marketplace is the *customization of the metrics and health indicators* the user monitors (Vnoutchkov 2021). Therefore, in this study we operationalize activity tracker customization as the number of health-related indicators (e.g., steps, heart rate, calories burned, sleep patterns) a user monitors with the device, since monitoring a greater number of indicators shows the user has customized the tracker to their personal needs. We conducted a pretest to confirm that perceived customization increases with the number of health indicators monitored on an activity tracker (see Table 4). We propose that enhancing customization by increasing the number of health indicators monitored offers an opportunity for consumers using an anthropomorphized tracker to reaffirm their feelings of autonomy, which should mitigate the negative effect of anthropomorphism on health motivation.

Moreover, in this study we examine the effect of anthropomorphism on health motivation by measuring (rather than manipulating) consumers' tendency to anthropomorphize their activity tracker. Because tendency to anthropomorphize is a stable trait (Waytz et al. 2010), we examine the effects of anthropomorphism on health motivation in a realistic setting by assessing the effects of participants' tendency to anthropomorphize in real life, rather than manipulating anthropomorphism. Consistent with previous studies, we expect that when the activity tracker is less customized (e.g., tracking only one health indicator, such as steps), consumers who tend to anthropomorphize their activity tracker exhibit relatively lower levels of health motivation. However, when the activity tracker is more customized (e.g., tracking multiple indicators, such as steps, heart rate, sleep patterns), this effect would be attenuated, based on customization reaffirming a sense of autonomy.

#### *Participants, Design, and Procedure*

As in Studies 4 and 5 we created an online panel of participants who own an activity tracker. We first ran a prescreen survey (N = 1939) where we contacted 984 MTurk participants and 955 undergraduate students asking them to indicate their ownership of four different products: laptop, smartphone, Bluetooth headphones, and wearable fitness tracker (order randomized).[15] Participants who indicated owning a wearable tracker were invited to complete

[15] We thank an anonymous reviewer for the recommendation to combine two previously separate studies with identical procedures. We included data source as a covariate in the analysis ($b$ = -.4727, t = -2.6051, $p$ = .0095).

the main study (N = 478; $M_{age}$ = 26.47; 283 females; 174 MTurk participants and 304 undergraduate students). In this group, three participants indicated they cannot exercise due to a disability and were excluded from the analyses, resulting in a final sample of N = 475 participants.

This study examines participants' exercise frequency as a function of their tendency to anthropomorphize their activity tracker and the number of indicators they monitor with their activity tracker. To capture the number of health indicators monitored, we asked participants which indicators they monitor (steps taken, calories burned, minutes exercised, heart rate). We measured the tendency to anthropomorphize *their personal fitness tracker* with four items: "Thinking specifically about your wearable fitness tracker, to what extent does it seem… to have human qualities…human-like…like a companion…like a friend by my side" (Waytz et al. 2010; Mende et al. 2019) (randomized; 1 = not at all, 7 = very much so, $\alpha$ = .90). Our outcome variable was health motivation, which we operationalized as exercise frequency: "How often do you exercise physically for at least 20-30 minutes to the extent that you at least slightly lose your breath or perspire?" (1 = Never, 2 = A few times a year, 3 = 2 to 3 times per month, 4 = Once a week, 5 = 2-3 times a week, 6 = Daily; Hassmen, Koivula, and Uutela 2000). Participants also indicated their age and gender.

***Results***

*Health Motivation (Exercise Frequency)*. To explore the effect of tendency to anthropomorphize the tracker, number of indicators monitored, and their interaction, on exercise frequency, we conducted a two-way moderation analysis (PROCESS Model 1; Hayes 2017). In our model, tendency to anthropomorphize the activity tracker was the independent variable, number of health indicators monitored was the moderating variable, and exercise frequency was the dependent variable. We controlled for age and gender. Results indicated a main effect of tendency to anthropomorphize ($b$ = -.3189, $t$ = -2.6887, $p$ = .007), as anthropomorphism increases, health motivation decreases, supporting H2. There was no main effect of number of indicators ($b$ = -.0819, $t$ = -.7988, $p$ = .4248). Importantly, as predicted, there is a significant two-way interaction between tendency to anthropomorphize the tracker and number of indicators monitored ($b$ = .1088, $t$ = 3.0353, $p$ = .003).

We explored the significant two-way interaction using the J-N technique (Spiller et al. 2013). When *fewer health indicators are tracked* ($\leq$ 1.8212, $p$ = .05), consumers with greater (vs. lower) tendency to anthropomorphize their activity tracker exercise less frequently, which is consistent with our previous studies. However, when *more health indicators are tracked*, this effect reverses ($\geq$ .3.7824, $p$ = .05), and consumers with a greater (vs. lower) tendency to anthropomorphize exercise more frequently (see Figure WA 1 below).

**Figure WA 1: The Moderating Role of Indicators Monitored (Web Appendix Study 5B)**

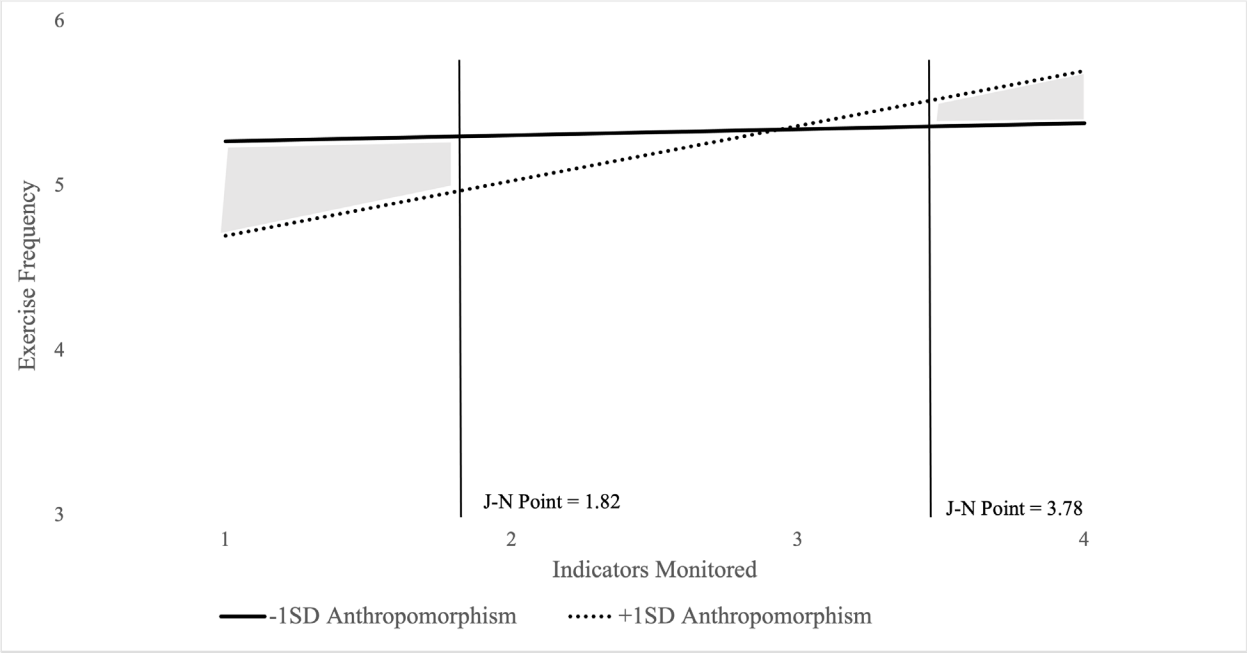



Figure WA 1 demonstrates steps taken as a function of tendency to anthropomorphize and number of indicators monitored (resulting in a significant two-way interaction ($b$ = .1088, $t$ = 3.0353, $p$ = .003).

- There is a main effect of tendency to anthropomorphize ($b$ = -.3189, $t$ = -2.6887, $p$ = .007), consistent with previous studies and in support of H2.
- With less customization (i.e., *fewer health indicators are tracked* ($\leq$ 1.8212, $p$ = .05)), consumers with greater (vs. lower) tendency to anthropomorphize their activity tracker have lower health motivation (i.e., they exercise less frequently). This replicates our findings that participants with an anthropomorphized activity tracker have lower health motivation.
- With more customization (i.e., *more health indicators are tracked* ($\geq$ .3.7824, $p$ = .05)), this effect is attenuated and reverses, such that consumers with a greater (vs. lower) tendency to anthropomorphize exercise more frequently.
- In summary, the negative effect of anthropomorphism on health motivation is mitigated when consumers customize their tracker via tracking more indicators. For people with a higher tendency to anthropomorphize their activity tracker, their health motivation increases with customization (dotted line); for people with lower tendency to anthropomorphize their activity tracker, their health motivation is relatively unaffected by customization (solid line).

**Follow-Up Study 5B References**

Hassmen, P., Koivula, N., & Uutela, A. (2000). Physical Exercise and Psychological Well-Being: A Population Study in Finland. *Preventive Medicine, 30*, 17-25.

Hayes, A. F. (2017). *Introduction to Mediation, Moderation, and Conditional Process Analysis: A Regression-Based Approach*. Guilford Publications.

Mende, M., Scott, M. L., van Doorn, J., Grewal, D., & Shanks, I. (2019). Service Robots Rising: How Humanoid Robots Influence Service Experiences and Elicit Compensatory Consumer Responses. *Journal of Marketing Research*, *56*(4), 535–556.

Spiller, S. A., Fitzsimons, G. J., Lynch, J. G., & McClelland, G. H. (2013). Spotlights, Floodlights, and the Magic Number Zero: Simple Effects Tests in Moderated Regression. *Journal of Marketing Research*, *50*(2), 277–288.

Vnoutchkov, M. S. (2021). *Investigating the Effect of Customization on Engagement with Wearable Activity Trackers.* University of Twente Student Theses. http://essay.utwente.nl/85995/ Accessed August 20th, 2021.

Waytz, A., Cacioppo, J., & Epley, N. (2010). Who Sees Human?: The Stability and Importance of Individual Differences in Anthropomorphism. *Perspectives on Psychological Science*, *5*(3), 219–232.