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If You Are Happy and DON'T Know IT: Continuance? Analyzing Emotion Carry-Over Effects in Activity Tracking Continuance Decisions

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If You Are Happy and DON'T Know IT: Continuance? Analyzing Emotion Carry-Over Effects in Activity Tracking Continuance Decisions

Completed Research Paper

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Abstract

Activity tracking devices and apps are positioned to enhance healthy behavior. Albeit positive outcomes are widely anticipated, many users abandon their devices and apps after short time which raises concerns about their effectiveness. Studies indicate that self-tracking can provoke –positive but particularly negative– emotions with which individuals have to cope. Though studying emotions in IS usage is gaining attention, the role of system-unrelated emotions has been largely neglected yet has been shown to play an important role in human behavior. To address this gap, this study theorizes how system-unrelated emotions 'carry-over' into activity tracking continuance decisions. Results of an experimental survey largely support the 'carry-over' effect in continuance decisions – particularly for less experienced users. Our study thereby contributes to the growing self-tracking literature but also to research on emotions in IS usage by highlighting the powerful role of system-unrelated emotions.

Keywords: Quantified self, self-tracking, IS continuance, emotions, carry-over

Introduction

Two thirds of the U.S. adults are overweight and more than one third are obese (Abril 2016; Ogden et al. 2014). Although being highly beneficial for health and well-being (Leon et al. 1987; Paffenbarger et al. 1986), the majority of people do not engage in physical activities as recommended by most public health guidelines (Sisson and Katzmarzyk 2008). A major concern of health promotion is therefore how motivation and adherence towards physical activity can be achieved (Ryan et al. 1997).

Activity trackers –in form of wearables like FitBit or mobile apps like Runtastic– are positioned to promote motivation and adherence to physical activity and healthy behavior (Hamari et al. 2014; Lupton 2017; Orji and Moffatt 2018). The expected benefits attract firms which equip employees with activity trackers as part of their health protection intervention (Giddens et al. 2017) and some health insurance companies even incentivize using activity trackers (Best 2016). However, despite the largely positive held expectations, tremendous discontinuance rates tend to prevail. Coined as the

'dirty secret of wearables', a study reported that about 50% of the people having owned an activity tracker are no longer using it – and even one-third stopped within the first six months (Ledger and McCaffrey 2014). Others even report dropout rates of up to 85% (Velayanikal 2014).

Users' reactions to self-tracking can be quite complex. Self-monitoring and goal setting –fundamental aspects of self-tracking– can provoke emotions: both the positive and the negative ones (Baumgart 2016; Prasopoulou 2017; Sjöklint et al. 2015). When personal activity targets are reached, users feel 'good', 'satisfied' or even possess feelings of 'victory', whereas negative emotions of 'disappointment' or even 'guilt' occur when falling behind one's goals (Baumgart 2016; Sjöklint et al. 2015). Especially in latter circumstances, self-tracking users have to cope with their negative emotions through various tactics, including avoidance; as one user noted: *"Guilt. That is also one of the reasons I haven't been using it lately.* (Sjöklint et al. 2015, p. 10). Albeit these emotions should be unrelated to the self-tracking system itself as these emotions are directed towards the goal attainments, these co-occurring emotions may 'carry-over' in users' continuance decisions.

Emotion psychologists tend to agree that positive and negative affective states often 'infuse' people's thoughts, attitudes, decisions or behaviors – even those that appear to be unrelated to the particular situation (Forgas 2003). Although the general role emotions play in Information Systems (IS) behavior –including IS continuance– is gaining attraction, up to now, the role of system-unrelated, 'incidental' emotions has been largely overlooked yet their existence acknowledged (Wakefield 2015; Zhang and Milic 2015). Hence, to fill this gap in our current knowledge, we ask:

RQ1: How do system-unrelated emotions affect decisions to continue using self-tracking?
RQ2: Does the effect of these emotions account stronger during earlier stages of usage?

In this paper, we make an effort to analyze system-unrelated emotion 'carry-over' effects on continuance decisions in the context of self-tracking. To this end, we draw on existing research on emotions in IS, research on the effect of 'incidental emotions' and propose a model that explicates how system-unrelated emotions –in dependence of system experience– influence beliefs and continuance decisions about the target system (i.e. activity trackers). Based on a quantitative, experimental survey with 148 actual self-tracking users, results indicate that system-unrelated emotions can indeed largely –though indirectly– affect continuance decisions particularly for low-experienced users. Our research thereby contributes to the growing field of self-tracking research as well as to research on emotions in IS usage behavior and holds important practical implications.

The rest of this paper unfolds as follows. In the next section, we introduce the 'self-tracking' phenomena and its state of research. Then, we lay out the background on emotions and their current role in IS usage and point out the role of emotion 'carry-overs'. During the model development section, we theorize how system-unrelated emotions can affect IS continuance decisions. Then, we outline our methodological approach and present the results of the empirical study. Lastly, we discuss our findings in light of the implications as well as the further research avenues our investigation holds.

Background

Self-Tracking

Measuring, recording and monitoring information of one's body and life for the purpose of self-reflection and self-improvement is the essential purpose of self-tracking (Lupton 2016). Advancements in personal and ubiquitous information technologies (IT) enable new forms of data, knowledge and insights about our bodies and ourselves (Lupton 2016). Particularly in the health domain, self-tracking devices and applications (henceforth 'activity trackers') are gaining attraction for their potentials to increase health awareness and to promote healthy behavior (Lupton 2017). Activity trackers, either wearables such as Fitbit or apps like Nike+ Running, usually allow to record and monitor bodily functions and physical performance such as movements, pulse, or calories burned.

Research on self-tracking is small yet growing and considers diverse relevant topics (for review see e.g., De Moya and Pallud 2017). So far, existing research analyzed motivations underlying self-tracking (Baumgart and Wiewiorra 2016; Gimpel et al. 2013) or the adoption of self-tracking (e.g., Pfeiffer et al. 2016). Studies also revealed positive outcomes of self-tracking, such as increased

physical activity (e.g., Giddens et al. 2017). Others investigated privacy-related issues of self-tracking (e.g., Becker et al. 2017b; Brakemeier et al. 2016). Concerning continuance decisions, Becker et al. (2017a) provided a qualitative thematic analysis proposing benefits, privacy and deficiency as main determinants for self-tracking continuance.

Only few, however, looked at the 'experiential' facets of self-tracking yet highlighting the complexities of self-tracking and goal attainment (Baumgart 2016; Prasopoulou 2017; Sjöklint et al. 2015). In her personal memoirs, Prasopoulou (2017) reflects upon her self-tracking experiences and reports emotional experiences of 'excitements' when reaching her goals. The study of Sjöklint et al. (2015) assesses how users react to their goal attainments and reveals the "tensions between rational and emotional behaviours when reflecting on personal data" (Sjöklint et al. 2015, p. 1). This study recognized that the information about reaching and not reaching goals causes emotional reactions: when goals are reached, users felt 'good and satisfied', found it 'fun' or felt a sense of 'victory', whereas not reaching goals was considered by users as 'disappointing'. Especially when goals remain unmet, self-tracking users engaged in various coping tactics to handle the situation including disregard, procrastination, selective attention, or even neglect. Especially in the latter form, the study reports that due to negative feelings, people avoid self-tracking interactions. As one respondent noted: *"Guilt. That is also one of the reasons I haven't been using it lately. I sometimes got upset about the fact that I couldn't always achieve my goal"* (Sjöklint et al. 2015, p. 10). Similar contentions about reactions to reaching and not reaching goals have been reported by Baumgart (2016).

Taken together, these latter studies indicate that co-occurring emotions can lead to conflicts when self-tracking one's behavior and highlight how users have to cope with especially negative emotions. Up to now, however, little is known whether these emotions influence users continuance decisions. Therefore, we turn to current research on the role of emotion ins IS behavior in the following section.

Emotions and IS Usage Behavior

Emotions are integral part of human behavior affecting a considerable proportion of human thinking and action (Vornewald et al. 2015). Emotions are an affective state that arise as reactions to events or objects in one's environment that appear to be relevant for an individual's needs, goals or concerns (Zhang 2013). Emotions generate subjective feelings (e.g., anger or happiness), induce 'motivational states with action tendencies' and prepare the body to adapt to the situation one faces (Zhang 2013).

Given its integral role in human behavior, emotions attracted IS scholars studying various forms of IS-related behaviors (for reviews see e.g., Beaudry and Pinsonneault 2010; Vornewald et al. 2015; Zhang 2013). Particularly of interest for this study is the role of emotions in IT usage behavior.

Much of the existing research investigated system-usage related emotions, such as enjoyment of using the system (e.g., Davis et al. 1992; Van der Heijden 2004) or anxiety associated with actual or anticipated use of the IT (e.g., Compeau et al. 1999; Venkatesh et al. 2003). Others looked at more general feelings that are associated with using a system, such as pleasure and arousal (Kim et al. 2007), general positive and negative affect (Wakefield 2015) or satisfaction and attitude (Bhattacherjee and Premkumar 2004). The general observation made from these studies is that these system usage-related emotions affect actual usage and usage intentions.

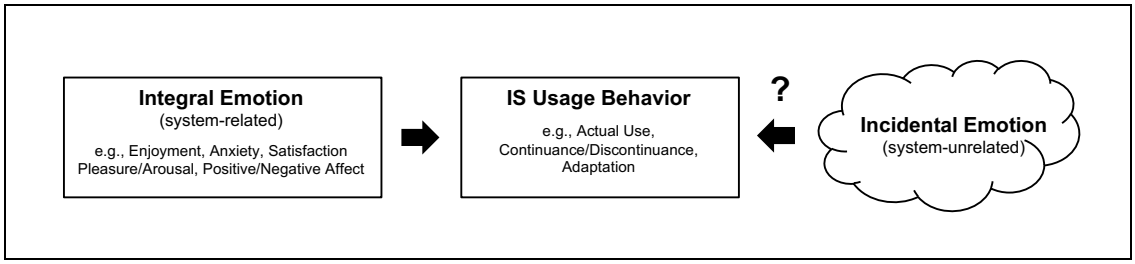

Figure 1. Emotions in Information Systems Usage

Emotion literature indicates that positive and negative affective states often 'infuse' people's thoughts, attitudes, decisions or behaviors – even those that appear to be unrelated to the particular

situation (Forgas 2003; Schwarz 1990). Emotion psychologists draw a particular line between 'integral' and 'incidental' emotions. *Integral emotions* are those that are normatively relevant to the present situation and targeted at the object of judgment or decision (Forgas 1995; Han et al. 2007; Pham 2007). Precisely, integral emotional responses are caused by features or parameters of the target object (Cohen et al. 2007). Hence, the emotions studied so far in existing IS research can be considered as integral emotions as they are targeted at the system under consideration, such as perceived enjoyment or satisfaction derived from using the system.

Incidental emotions, on the contrary, are those whose source is normatively unrelated to the object of judgment or decisions (Forgas 1995; Pham 2007). Although those emotions should be logically irrelevant, people tend to (mis-)attribute these emotions to unrelated objects that are in the focus of their current attention (Schwarz 1990; Schwarz and Clore 1988). Incidental emotions can have a variety of, both rational and irrational, influences; they 'carry-over' to unrelated domains and affect judgments and decision-making in often unappreciated ways thereby influencing reasoning processes or the accuracy of beliefs formed (Pham 2007; Renshon et al. 2015). For instance, weather-caused affective states influence how people feel about their personal lives (Pham 2007). A huge notion of research demonstrated the influential power that incidental –unrelated– emotions can have on judgements and behavioral decisions (see e.g., Forgas 1995).

However, as also observed by Zhang and Milic (2015), the role of incidental (i.e. system-unrelated) emotions has been largely overlooked albeit awareness amongst IS scholars exists (e.g., Loiacono and Djamasbi 2010; Wakefield 2015). Hence, there is a surprising gap in our current knowledge about the –potentially powerful– role incidental emotions play in IS usage behavior. Therefore, this papers makes an effort to fill this important gap in IS research.

Conceptual Model

The aim of our research is to analyze the system-unrelated emotion 'carry-over' effect on self-tracking continuance. Here, we elaborate on the central continuance factors as well as which system-unrelated emotions may arise and how they subsequently 'carry-over' into continuance decisions.

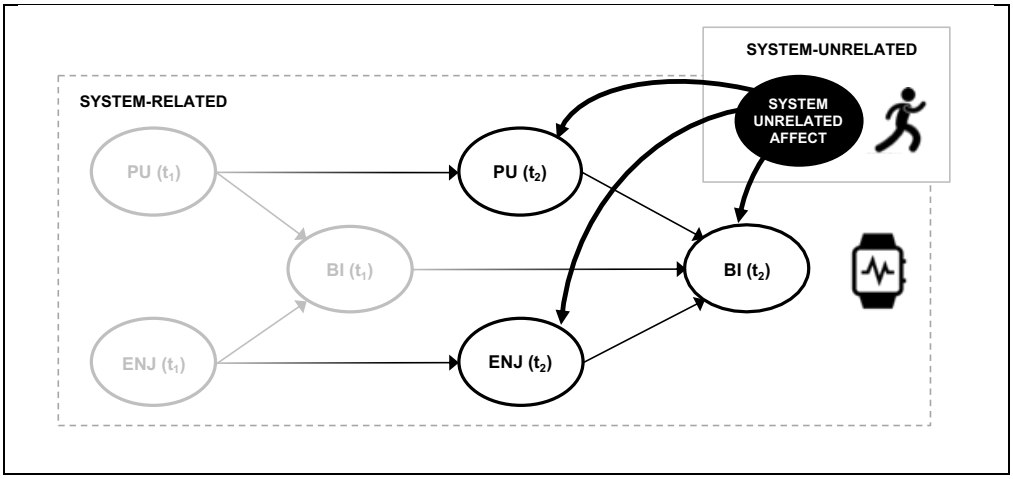

Figure 2. Conceptual Model

Baseline Continuance Model

Activity trackers aim to motivate people towards physical activity, such as running or walking. Central to activity tracking systems are goal setting and self-monitoring by setting up physical activity targets and monitoring one's performances by metrics, such as miles, time or pace. We position activity trackers as 'multi-motive information system' as using it involves both extrinsic and hedonic motives; addressing both motives is considered as relevant to encourage positive user interactions (Lowry et al. 2015). Self-tracking is generally motivated by 'self-design' –the possibilities for self-optimization and self-control (Gimpel et al. 2013)– which serves as extrinsic motivation focusing on

the outcome of using the IS. This is usually reflected by 'Perceived Usefulness' (PU; Davis 1989), a central belief that is hereto defined as the extent to which the user believes that using the self-tracking system is helpful for motivating and performing physical activity.

Equally, self-tracking has been found to be motivated by 'self-entertainment' (Gimpel et al. 2013) reflecting the hedonic motivations of using an IS (Lowry et al. 2015). This aspect is encapsulated in 'Perceived Enjoyment' (ENJ), defined as the extent to which using the self-tracking system is "perceived to be enjoyable in its own rights, apart from any performance consequences that may be anticipated" (Davis et al. 1992, p. 1113). Following plenty of research about their important role in continuance decisions (e.g., Kim et al. 2007), we put forth:

> ***P1:*** *Intentions to continue using a self-tracking system are predicted by Perceived Usefulness and Perceived Enjoyment.*

As both definitions imply, it is important to highlight that these two perceptions as well as the decision held are 'system-related' – targeted at the outcome and the process of using the activity tracking system. Next, we elaborate on 'system-unrelated' emotions and their 'carry-over' effect.

System-unrelated Emotional Reactions and Carry-Over Effects

When self-tracking users perform their physical activity, the self-tracking systems provides the corresponding performance feedback. A user evaluates this feedback by interpreting to which extent the goal has been achieved. Basically, a person may find that she/he has met the goal, has surpassed the goal, or may have fallen behind the goal set. As outlined earlier, these three basic scenarios can provoke positive and negative emotional reactions (Baumgart 2016; Sjöklint et al. 2015).

Appraisal theories of emotion explain how certain emotions arise out of specific events. Following the 'appraisal patterns' of Lazarus (1991), these three scenarios should provoke 'happy', 'pride' or 'sad' respectively. The basic premise for each of the three emotions to occur is that the event must have goal-relevance (i.e. a person aims to achieve a certain physical activity performance). For happy and pride to arise, the event must be congruent to the goal a person has (i.e. goal met), while sadness arises out of goal-incongruence (i.e. goal unmet). It is important to consider at this stage that these emotions are the result of the evaluation of goal achievement: it is the result of achieving a goal that makes one happy and not the activity tracker. Hence, these emotion are co-occurring while using a activity tracker, are system-unrelated and, thus, are classified as incidental emotions.

As outlined earlier, emotional states are incidental if their source is unrelated to the object of judgment or decision. Yet these incidental emotional states become often misattributed as integral affective response to unrelated objects (Pham 2007; Schwarz 1990). The potential of this misattribution (i.e. 'carry-over') increases when the actual source of the affective state and the objectively unrelated object share domain similarities (Cohen et al. 2007; Pham 2007). Here, emotions caused from goal achievements and the activity tracker share 'sport' domain similarities.

Incidental affective states generally tend to influence perceptions and beliefs about objects in an affect-congruent fashion: objects are evaluated more favorably when one is in a positive affective state whilst negative attributions and judgments are made in negative states (Cohen et al. 2007; Pham 2007). One explanation made for this effect builds on the idea that affective states serve as sources of information during object evaluation where individuals adopt an 'how-do-I-feel-about-it?' heuristic – known as the 'affect-as-information' mechanism (Schwarz 1990; Schwarz and Clore 1988). This mechanism is largely build on an 'inferential error' where individuals misinterpret their affective state as caused by an object they are trying to react to (Forgas 2003).

IS research has shown that people expecting to gain personal benefits from using a system (i.e. 'perceived usefulness') develop a positive affect whereas negative affect emerges when the system is perceived as not useful (Compeau et al. 1999; Wakefield 2015). Building on the 'affect-as-information' mechanism and the 'how-do-I-feel-about-it?' heuristic, users in a positive affective state may project their positive feelings to the system making favorable attributions its usefulness ('I feel happy and I used the activity tracker therefore it is useful for my motivation'). In contrast, in a negative affective state users may create negative attributions doubting the system's ability to increase

their sports motivation. In similar manner, one's perception of enjoyment using the system is likely to be affected by this mechanism as being in a positive affective state is associated with greater task enjoyment and intrinsic motivation – as shown by the 'carry-over' of moods on perceived enjoyment by Venkatesh and Speier (1999). In addition, emotions have been found to serve as a direct input for actual IS continuance behaviors (Beaudry and Pinsonneault 2010) and for forming continuance intentions alike (Kim et al. 2007). Emotions carry 'action tendencies' where positive emotions are more likely to provoke tendencies to accept and idea whereas negative emotions provoke avoidance tendencies (Lazarus 1991). Based on these arguments, we posit:

> ***P2:*** *Incidental (i.e. system-unrelated), co-occurring emotions influence evaluations of 'Usefulness' and 'Enjoyment' an continuance intentions in form of 'carry-over' effect as that positive emotions increase and negative emotions decrease these evaluations and decisions.*

However, we expect that the strength of the 'carry-over' effect is not universal. Given the practical problem of high abandonment rates in activity tracking particular in comparatively early stages (Ledger and McCaffrey 2014), we focus on the role of system experience as potential moderator.

Moderating Role of System Experience

Research has shown that incidental affective states have stronger influences when other bases of evaluation are ambiguous or domain expertise is lacking (Cohen et al. 2007; Pham 2007). In IS research, intertemporal models of post-adoption IS behavior argue and provide evidence that system-related beliefs become updated when users engage directly with a system. For instance, Bhattacherjee and Premkumar (2004) have shown that when people transition from the pre-adoption to the post-adoption (i.e. actual usage) stage, beliefs about the system become updated and revised based on the actual experiences made. Yet, users also continue updating and revising their beliefs within the post-adoption stage where beliefs become continuously updated over time (Kim 2009; Kim and Malhotra 2005). Al-Natour and Benbasat (2009) even go further arguing that every single interaction can lead to a revision of the beliefs held about the system.

A key established mechanism in post-adoption research is the 'sequential updating mechanism' that holds the premise that prior evaluations affect subsequent evaluations (Kim and Malhotra 2005). This mechanism suggests that judgments and decisions made about a system are not formed from scratch but formed in relation to earlier judgments and intentions (Kim and Malhotra 2005). During belief updates, the prior knowledge about the system serves as an anchor and new information is regarded as adjustment (Kim and Malhotra 2005). Hence, general held evaluations and decisions serve as anchors or 'baseline' for the evaluations and decisions made during a concrete interaction with the system. This 'evaluation–evaluation relationship' is depicted in the former part of our conceptual model in Figure 2 by the paths of PU_{t1}, ENJ_{t1}, BI_{t1} on PU_{t2}, ENJ_{t2}, and BI_{t2}. Given the evidence found in prior research (Kim 2009; Kim and Malhotra 2005), we posit:

> ***P3:*** *Prior evaluations concerning 'Usefulness' and 'Enjoyment' as well as continuance decisions will positively influence these evaluations and decisions during an interaction.*

Research on belief-updates in IS research also indicates, however, that the strength with which beliefs and decisions are held vary depending upon user's cumulative experience. For instance, when people transition from the pre- to the post-adoption stage, beliefs in the latter stage are held with more confidence (Bhattacherjee 2001; Bhattacherjee and Premkumar 2004). This is because as users engage more often with the system, the actual and accumulative experiences serve as the basis for more concrete perceptions and decisions. Users thereby revise their prior held beliefs in an iterative manner as they gain additional usage experiences. Yet, beliefs change more during initial phases of IT usage and tend to stabilize and become more realistic through repeated uses (Bhattacherjee and Premkumar 2004). Similar observations have been made in the marketing literature (e.g. Homburg et al. 2006) where the certainty with which beliefs are held increases as more information about the object is available. Hence, with higher experiences gained over time, users' evaluations about the self-tracking system stabilize and become more realistic (Bhattacherjee and Premkumar 2004).

In contrast, when experience is low, less information about the object is available and beliefs as well as decisions about the system are rather unstable and held with less certainty. According to Forgas

(1995), incidental affective states have greater influence on evaluations when a person engages in constructive processing – whereas on the contrary, evaluations based on nonconstructive processes, such as the retrieval of prior information and evaluations made about the target object, are less susceptible for 'carry-overs' (Cohen et al. 2007). Hence, with lower system experience, beliefs and decisions are more malleable and make room for incidental affective states and 'how-do-I-feel-about-it' heuristics (Homburg et al. 2006). We therefore put forth:

> ***P4:*** *The 'carry-over' effect of emotions is stronger for low-experienced than for high-experienced users as high-experienced users weigh stronger their prior evaluations.*

In summary, the key contention of our conceptual model is that system-unrelated, incidental affective states co-occurring in self-tracking influence continuance decisions due to 'carry-over' effects particularly for users with lower accumulative system experiences.

Research Method

Research Design

As we seek to analyze how emotions co-occurring in activity tracking could affect continuance decisions, we tested our propositions using a scenario-based factorial survey design (Rossi and Nock 1982). Our experimental survey design involved three scenarios (goal met, goal exceeded, goal unmet) and two times of measurements (before and during the scenario). Each subject first provided background and demographic information followed by an assessment of baseline PU, ENJ, and BI. Then, each subject was randomly assigned to one of the three scenarios. Respondents were instructed to carefully read the scenario description (entailed in Table 1), to imagine themselves in the particular situation and then to answer the subsequent questions regarding their emotions and evaluations of PU, ENJ, and BI in this particular situation. Moreover, respondents were asked to indicate how realistic the scenario were to them and also to answer questions about the scenario in order to assess afterwards whether they understood the scenario as intended. Before the survey was conducted, the scenarios were evaluated by five actual activity tracker users who indicated that these scenarios felt realistic and can indeed occur during activity tracking.

Table 1. Scenario Descriptions

Scenario	Text
Imagine yourself in the following scenario: You do sports and take the activity tracker with you to record your exercise activity. Your aim is to improve your performance and, hence, you set yourself a specific goal (e.g., a certain time or pace). After your exercise session, you look at the activity tracker to see your results….	
Goal met (target: happy)	*… You see that you have reached your goal.*
Goal exceeded (target: pride)	*… You see that you have surpassed your goal.*
Goal unmet (target: sad)	*… You see that you have not reached your goal.*

The measurements for PU, ENJ, and BI were derived from established IS research, adjusted to the research context of activity self-tracking and translated to German language. These measurements were identical before and during the scenarios. Emotions were assessed using items from the 'Positive and Negative Affect Schedule' (PANAS; Watson et al. 1988) which was available in German language (Janke and Glöckner-Rist 2014). Items for PU, ENJ, and BI assessed in the scenario were preceded by the stem *'In this situation…'* and items for emotions by *'How do you feel in this situation?'*. All items have been assessed using 7-point Likert scales. Table 2 entails the instrument.

Table 2. Measurement Instrument

Construct	Items	Reference
PU (t_1) PU (t_2) [a]	I find the activity tracker useful. I find the activity tracker useful for sports. I find activity tracker useful for my sports motivation.	Adapted from Van der Heijden (2004)

ENJ (t_1) ENJ (t_2) [a]	I find using the activity tracker to be enjoyable. Using the activity tracker is pleasant. I have fun using the activity tracker.	(Van der Heijden 2004; Venkatesh 2000)
BI (t_1) BI (t_2) [a]	I intend to continue using the activity tracker in the future. I plan to continue using the activity tracker when doing sports. I intent to continue using the activity tracker as I have previously used it.	Adapted from Venkatesh and Davis (2000)
Happy [b]	I feel happy. I feel delighted.	(Janke and Glöckner-Rist 2014; Watson et al. 1988)
Sad [b]	I feel sad. I feel downhearted.	
Pride [b]	I feel proud. I am proud of my performance.	
[a] Items during the scenario were preceded by '*In this situation…*' [b] Items during the scenario were preceded by '*How do you feel in this situation?*'		

Data Collection and Participants

Our research was targeted at actual users of activity trackers (apps and/or wearables) in Germany. We employed an online survey and recruited respondents by posting invitations in diverse social media channels and by inviting friends, relatives and colleagues. Data collection took place between 12/2017 and 01/2018. Participants were incentivized with the chance to win a gift card for Amazon. The entire survey was pre-tested for clarity with five colleagues. During data collection, non-users were terminated directly after initial screening questions. To ensure response quality, attention checks as well as manipulation and realism checks were incorporated (Johnston et al. 2016).

In total, 345 subjects completed the survey out of which 267 passed the attention and manipulation checks and 221 the realism checks. We then removed responses with missing data and screened for suspicious responses. This procedure resulted in a final data set of 148 completed responses.

The demographics of the final data are as follows: 65% of the respondents were female and the average age was 28.74 years (min: 18, max: 63 years). The average self-tracking experience was 17.21 months (min: 1, max: 60 months; st.dev. 15.33). 23% are using only a wearable device, 36% only a self-tracking app, and 41% are using both. 68% of the respondents are doing sports regularly, and 25% only sometimes. We tested whether these demographics differed between the three treatment groups. Results of the Kruskal-Wallis-H Test indicated non-significant differences for age (p=0.814), gender (p=0.928), experience (p=0.738) as well as for PU_{t1} (p=0.256), ENJ_{t1} (p=0.321), and BI_{t1} (p=0.423). Hence, the random scenario assignments worked out well.

Manipulation Tests

Before testing our assumptions, we verified the experimental manipulations by comparing mean scores between the three groups. Results of Kruskal-Wallis-H Test indicate that mean values for the emotions significantly differed between the two positive (goal met and goal exceeded) and the one negative group (goal unmet). However, no significant differences occurred between the two positive groups. This circumstance can be explained as people experiencing positive emotions perform relatively less differentiation between positive emotions than for negative emotions (Cavanaugh et al. 2007). Therefore, we combined these two groups into one overall 'positive' group and retained only the emotions 'happy' and 'sad'. Re-test on these two groups indicated significant mean differences for both emotions (p=0.000) as well as significant differences for PU_{t2} (p=0.009), ENJ_{t2} (p=0.000), and BI_{t2} (p=0.009) between these two groups. Demographics and baseline factors of PU_{t1}, ENJ_{t1}, and BI_{t1} did not significantly differ between the groups. Thus, the manipulation was successful.

The data was transformed in a structural equation model and analyzed with partial least squares (PLS-SEM; Chin 1998) using the software SmartPLS 3.2.7 (Ringle et al. 2015). The following section describes the data analysis and results starting with an analysis of the measurement model quality including common method bias tests followed by an assessment of the structural model.

Measurement Model and Common Method Bias Analysis

All latent constructs in the structural model were modelled using reflective measurements. Therefore, the analysis of the measurement model involves assessing indicator and construct reliability as well as discriminant validity (Chin 1998). Table 3 depicts the results of the evaluation.

Indicator reliability was achieved given that all item loadings are greater than 0.707 (ranging between 0.708 and 0.991) and are significant ($p<0.001$) as per bootstrapping with 5,000 samples. *Construct reliability* is evaluated by analyzing Cronbach's Alpha (CA), Composite Reliability (CR) and Average Variance Extracted (AVE). Estimated values are above the thresholds of 0.7 for CR and CA and above 0.5 for AVE respectively. Lastly, *discriminant validity* is evaluated by observing the cross-loadings of the indicators and our results indicate that each indicator loads highest on its designated construct. Moreover, the Fornell-Larcker criterion is fulfilled as the inter-variable correlations are smaller than the root of the corresponding AVE as demonstrated in the diagonal lines (Chin 1998).

Table 3. Evaluation of the Measurement Model

				Discriminant Validity							
Construct	**CA**	**CR**	**AVE**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
1. BI (t_1)	0.861	0.915	0.783	**0.885**							
2. PU (t_1)	0.707	0.838	0.634	0.631	**0.796**						
3. ENJ (t_1)	0.812	0.889	0.727	0.642	0.655	**0.853**					
4. BI (t_2)	0.88	0.926	0.808	0.697	0.638	0.615	**0.899**				
5. PU (t_2)	0.749	0.858	0.669	0.520	0.634	0.553	0.760	**0.818**			
6. ENJ (t_2)	0.885	0.929	0.813	0.382	0.441	0.556	0.609	0.717	**0.901**		
7. Happy	0.980	0.990	0.981	0.098	0.043	0.110	0.198	0.162	0.426	**0.990**	
8. Sad	0.955	0.978	0.957	0.007	0.086	0.073	-0.069	-0.055	-0.286	-0.834	**0.978**

Common method bias (CMB) can be of concern when using self-reported data and when data is collected using a single method (Podsakoff et al. 2003). To evaluate the extent of CMB in our data, two tests were conducted. First, results of Harman's single factor test indicate a non-single factor structure whereby 45.1% of the variance is attributed to one single factor which is not the majority (Podsakoff et al. 2003). Second, we performed the test of Liang et al. (2007) where an additional CMB factor is entered in the structural model and its influence on the respective single-item indicator factors is compared with the influence with the indicator's theoretical construct. Our ratio of 1:436 is smaller compared to 1:42 in Liang et al. (2007). Both tests indicate that CMB is not of great concern.

Structural Model Results

As our research targets the moderating role of system experience, we sought to find a balanced proportion of low- and high-experienced users. We set the threshold at 12 months so that the low-experienced group consists of 67 subjects and the high-experienced group of 81 respondents. We then assessed two structural models (happy and sad) for both groups (high vs. low experience). Evaluation of the structural model involves assessing the coefficients of determination (R^2) and the significance level of each path coefficient (Chin 1998). A bootstrapping procedure with 5,000 samples was conducted to obtain significance levels. The results are depicted in Figure 3.

The results largely support our key propositions. Our first proposition argued that self-tracking continuance decisions are based on Perceived Usefulness and Perceived Enjoyment. Results at t_1 support this proposition as indicated by the strong and significant paths as well as small- to medium-sized effects of PU_{t1} and ENJ_{t1} on BI_{t1} for both low- and high-experienced groups with R^2 values of 43% and 54%. Results of the manipulation scenarios at t_2 produced a somewhat mixed picture as PU_{t2} and ENJ_{t2} jointly influence BI_{t2} only for the high-experienced group whereas low-experienced users continuance intention solely relies on usefulness perceptions – an issue we will elaborate later on.

Our second proposition argued that system-unrelated, incidental affective states (i.e. happy and sad) influence PU_{t2}, ENJ_{t2} and BI_{t2} and the fourth proposition argued that these effects will be stronger for low-experienced than for high-experienced users. Results support both propositions for both affective states on PU_{t2} and ENJ_{t2}. The relationships between Happiness/Sadness and PU_{t2} exert only significant, strong relations yet medium-sized effects for the low-experienced group while the relationships are insignificant for the high-experienced group. In the case of Perceived Enjoyment, the affective states both significantly influence ENJ_{t2} and the relationships are stronger and effect-sizes are higher for the low-experienced group compared to the high-experienced group. Though we assumed a direct influence of affective states on continuance intentions, results indicate absence of direct effects and, hence, affective states pose indirect effects via PU_{t2} and ENJ_{t2}. On the other hand, these findings suggest that the effects of are not produced due to 'halo' effects (Sinclair 1988).

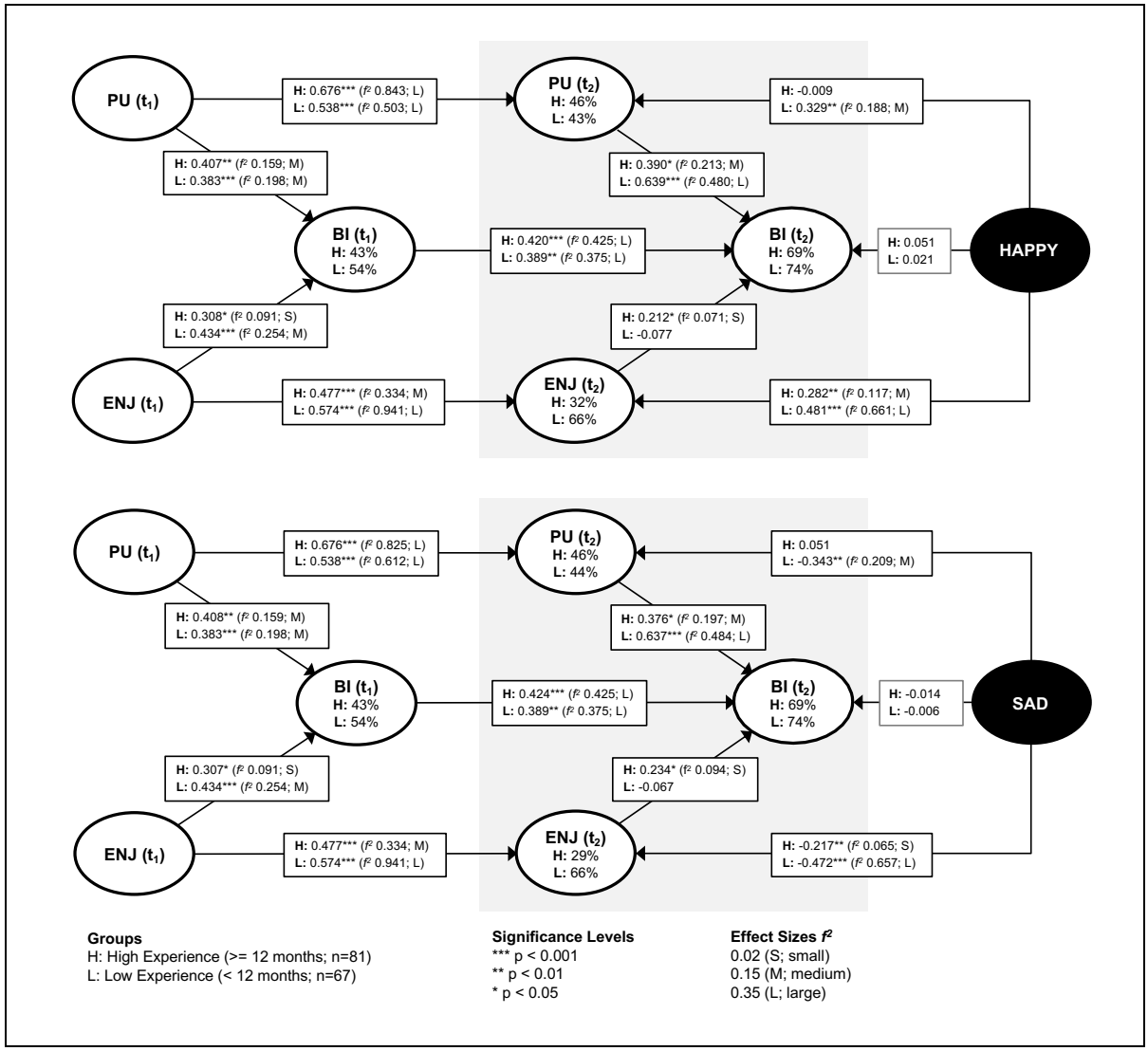

Figure 3. Structural Model Results for 'Happy' and 'Sad'

Lastly, and in contrast to the second proposition, our third and fourth propositions together argued that prior made evaluations of usefulness, enjoyment and continuance decisions will positively influence these evaluations and decisions during an interaction (P3) and that the effects will be stronger for high-experienced than for low-experienced users (P4). The strong paths and high effect-sizes of PU_{t1}, ENJ_{t1}, and BI_{t1} on their respective counterparts PU_{t2}, ENJ_{t2}, and BI_{t2} largely support P3. By comparing both groups, the paths are stronger and pose higher effect-sizes for 'Perceived Usefulness' and 'Continuance Intention' for the high-experienced group albeit the contrary is the case for 'Perceived Enjoyment' where paths and effect-sizes are stronger for the low-experienced group.

Given the insignificant effect of enjoyment on continuance decisions (indicated by ENJ_{t2} on BI_{t2}) as proposed by P1 for the low-experienced group, a post-hoc analysis was conducted. Here, we analyzed the singular relationship of ENJ_{t2} on BI_{t2} between low- and high-experienced users without the presence of the other rival factors (PU_{t2} and BI_{t1}). In this single assessment, results indicate a different picture. For high-experienced users, the effect of ENJ_{t2} on BI_{t2} (β 0.583; $p<0.001$; f^2 0.515) is lower than for the non-experienced group (β 0.667; $p<0.001$; f^2 0.800). Hence, without the presence of rival factors (PU_{t2} and BI_{t1}), low experienced users weigh more strongly ENJ than high experienced users.

Taken the results together, we find our key contention that system-unrelated, incidental affective states co-occurring in self-tracking influence continuance decisions due to 'carry-over' effects particularly for users with lower accumulative system experiences largely supported. We discuss the key findings in light of the contributions to research and their implications for practice next.

Discussion

Anchored in the larger phenomena of the 'quantified-self' (Choe et al. 2014; Lupton 2017), physical activity tracking devices and applications –such as Fitbit and Nike+ Running– are gaining attraction for their potentials to increase health awareness and to promote healthy behavior (Lupton 2017). Although positive outcomes of activity tracking are widely anticipated, a tremendous amount of people are no longer using it (Ledger and McCaffrey 2014; Velayanikal 2014). Studies indicate that self-monitoring and goal setting –integral parts of self-tracking– provokes both, positive and negative, emotions with which users have to cope (Baumgart 2016; Sjöklint et al. 2015). Although these emotions appear to be targeted rather at achieving or falling behind one's physical activity goals, they may affect the activity tracking continuance decisions.

Motivated by this, this study made an effort to analyze whether and why system-unrelated ('incidental') emotions may 'carry-over' to continuance decisions – an aspect that received little attention from IS scholars. Based on an experimental survey with 148 actual users, our paper provides empirical evidence for our theoretical arguments about the influential role of incidental emotions in IS continuance decisions. Results demonstrate that the self-tracking continuance decisions are strongly influenced by the affective states the users are experiencing from self-tracking especially for low-experienced users (those who are within the first 12 months of actual usage). These findings hold important implications for research and practice.

First and foremost, our study contributes to the small but growing and diverse IS literature about the quantified-self phenomena (e.g., De Moya and Pallud 2017; Gimpel et al. 2013; Pfeiffer et al. 2016). Our study quantitatively complements the qualitative insights that activity tracking can provoke emotions and hence supports the 'experiential' facet of self-tracking (Baumgart 2016; Prasopoulou 2017; Sjöklint et al. 2015). Whilst these inquiries have revealed various coping tactics, such as disregard or selective attention, our study has shown that these emotions alter the enjoyment and usefulness associated with using activity trackers and thereby influence their continuance decisions. Moreover, our study has shown that the determinants of general continuance decisions –perceived usefulness and enjoyment– are weighed differently by low- and high-experienced users. Low-experienced users generally assign more importance to the hedonic aspect whilst high-experienced users place more emphasis on the utilitarian facet of self-tracking. Yet these pose also differing effects when evaluated in light of their affective states produced by self-tracking. In emotion-laden circumstances, low-experienced users project their affective state on the system's usefulness which becomes then a 'biased' source for their continuance decisions. Hence, an important avenue for further research is to investigate how negative affective 'carry-overs' can be mitigated, for instance through different feedback formats.

Second, our research contributes to the growing body of knowledge about the role of emotions in IS usage behaviors (Beaudry and Pinsonneault 2010; Zhang 2013). As pointed out earlier, much of the existing emotions investigated by IS scholars can be considered as 'integral', normatively IT-relevant emotions. Emotion psychologists, however, raise awareness about 'incidental' emotions and their powerful influence on human behavior (Forgas 1995; Pham 2007; Schwarz 1990). Our study confirms this influential role infusing rational thinking and decisions. Although our paper provides initial theorizing about incidental emotions in IS continuance decisions, we acknowledge that our efforts

have limitations. We studied happiness and sadness as two positive and negative affective states and our argumentations are pre-dominantly based on 'affect-congruency' and 'affect-as-information' mechanisms. The influencing role of incidental emotions can be, however, by far more complex which provides avenues for further research by taking into account recent theories such as the Affect Infusion Model (Forgas 1995) or the Appraisal-Tendency Framework (Han et al. 2007; Lerner and Keltner 2000) that allow to pinpoint the role of specific incidental emotions.

For practice, our study gives important insights about users' interactions with and reactions to self-tracking. Anticipated to motivate people towards more physical activity, the goal-setting and self-monitoring functionalities usually incorporated in activity trackers can prompt positive and negative emotions when people observe their performance metrics. These co-occurring positive and negative affective states in turn affect peoples' decision to continue using the self-tracker, predominantly by 'infusing' their evaluations concerning the usefulness these trackers have for them. Hence, our study implies that designers, managers and promoters of activity trackers must be aware of such –rather irrational– misattributions. While positive emotional 'carry-overs' can be beneficial, negative emotions are clearly not. To potentially counteract these affect infusions, literature indicated that such misattributions can be mitigated when individuals are made aware about the true cause of their emotional reactions (Pham 2007). Hence, augmenting the pure performance data feedback with constructive feedback-mechanisms that inform how user's performance can be optimized into activity trackers may help to diminish carry-over effects – albeit this is up to further research.

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