Tracking feels oppressive and 'punishy': Exploring the costs and benefits of self-monitoring for health and wellness

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Abstract

Self-monitoring is the cornerstone of many health and wellness persuasive interventions. However, applications designed to promote health and wellness that use this strategy have recorded varying degrees of success. In this study, we investigated why the self-monitoring strategy might work in some contexts and fail in others. We conducted a series of large-scale studies, with a total of 1768 participants, to explore the strengths and weaknesses of the self-monitoring strategy. Our results uncover important strengths and weaknesses that could facilitate or hinder the effectiveness of self-monitoring to promote the health and wellness of its users. The strengths include its tendency to *reveal problem behaviours, provide real and concrete information, foster reflection, make people accept responsibility, create awareness and raise users' consciousness* about their health and wellness. Some of the weaknesses include its tendency to *provoke health disorder, be tedious* and *boring*. We contribute to the digital health community by offering design guidelines for operationalising self-monitoring to overcome its weaknesses and amplify its strengths.

Keywords

Persuasive technology, self-monitoring, behaviour tracking, persuasive strategy, wellbeing, persuasion, health, wellness, strengths, weaknesses, captology

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Introduction

The use of persuasive technologies (PTs) aimed at bringing about desirable change by shaping and reinforcing behaviour, attitude or both, is growing in virtually all areas of health and wellness. Persuasive strategies – techniques employed in PT designs to promote desirable behaviour – are the cornerstone of PTs. Self-monitoring is the most widely employed strategy in interventions aimed at promoting health and wellness.[1] It allows people to track their own behaviour by providing information on both their past and current states.[2,3] Self-monitoring often involves self-evaluation, periodic measurement and recording of the target behaviour by the user.[4]

Self-monitoring has been used in many persuasive interventions aimed at motivating behavioural change in various domains of health and wellness. For example, it has been employed in PTs for promoting physical activity,[5] weight management,[4,6] healthy eating[7] and in the area of substance abuse prevention such as smoking cessation.[8] Despite its wide application, researchers have reported inconsistencies in its effectiveness[4]: there are varying degrees of success, mixed findings, and even failures.[4,9,10] There is no

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research that explains the reason behind the aforementioned variations in the effectiveness of self-monitoring. This is essential for effective operationalization of the self-monitoring strategy in PT intervention design and hence advancement of the field of PT.

To contribute to research in this area, we conducted two large-scale studies involving 1108 and 660 (a total of 1768) participants to explore the strengths and weaknesses of the self-monitoring strategy. We investigated the strategy in the context of PT interventions for promoting healthy eating behaviour (study one) and PTs for motivating change in risky health behaviour such as binge drinking (study two). Investigating two distinct health domains allowed us to uncover a wide range of strengths and weaknesses that could be generalised to other domains. We used the prototype persuasive implementation of the self-monitoring strategy, which has been validated in other studies.[2,11] Our results reveal important characteristics of the self-monitoring strategy that could facilitate or hinder its effectiveness in promoting health and wellness. The strengths include its tendency to: (1) *reveal problem behaviour*, (2) *provide real and concrete information*, (3) *foster reflection and make people assume responsibility for their behaviour*, (4) *create awareness and raise users' consciousness* about their health and wellness. Some of the weaknesses include its tendencies to: (1) *provoke health disorders*, (2) *become tedious* and (3) *be boring*. The manner in which the self-monitoring strategy is operationalised in a PT can amplify both its strengths and weaknesses.

We offer two main contributions that would advance the field of digital health and persuasive design. First, we reveal the strengths and weaknesses of the self-monitoring strategy – the most frequently employed strategy in the area of health and wellness – that should be taken into account by PT designers when employing the strategy. Second, based on our findings, we offer design guidelines on how to implement the self-monitoring strategy in PT design to amplify their strengths and overcome their weaknesses.

Related work

In this section, we present a brief overview of the self-monitoring persuasive strategy.

Persuasive strategies and their applications in PTs

Persuasion is often achieved in PT design using various persuasive strategies.[12] Over the years, PT researchers (such as Fogg, and Oninas-Kukkonen) have developed a number of persuasive strategies.[13,14] According to a recent meta-analysis of persuasive technologies,[1] self-monitoring is the most commonly employed strategy in PT interventions aimed at promoting health and well-being. Self-monitoring often involves self-evaluation, periodic measurement, and recording of the target behaviour by the user,[4] thereby allowing people to track their own behaviour by providing information on both their past and current states.[2]

Persuasion has been widely employed in nutrition monitoring interventions to motivate people to adhere to their dietary regime.[7] It has also been used in the area of weight management for consistent monitoring of weight to encourage weight loss.[4,6] It is the most common strategy used in interventions for promoting physical activity, for example *UbiFit*,[5] *Houston*[15] and *Fish 'n' Step*,[16] and in preventing substance abuse such as smoking cessation.[8] Self-monitoring has also found application in the interventions for managing chronic illnesses such as diabetes,[17] cancer[18] and heart disease.[19] For a detailed review of persuasive health interventions and strategies employed, see Orji and Moffatt.[20]

Although the self-monitoring strategy has been applied widely across several health and wellness domains to promote behaviour changes due to its perceived effectiveness, researchers have recorded mixing findings and even failures.[4,9] There is thus far no research into why PT interventions that employ self-monitoring to promote health and wellness, exhibit varying degrees of success and why it may work in one context and fail in another. Our study aims to fill this gap by exploring the strengths and weaknesses of the self-monitoring strategy.

Study Design and Methods

The purpose of this study was to explore the strengths and weaknesses of the self-monitoring strategy. To achieve this, we conducted two studies. The first focused on PTs for motivating healthy eating behaviour and the second focused on PTs for motivating a change of risky alcohol-consumption behaviour. To collect data for our studies, we used prototype persuasive implementation of the self-monitoring strategy that has been validated in other studies.[2,11] We specifically represented the self-monitoring strategy in a storyboard about a persuasive intervention for encouraging healthy eating (study one) and a PT for promoting change of risky alcohol behaviour (study two). The storyboard was drawn by an artist and was based on storyboard design guidelines by Truong et al.[21] Implementing the strategy in a storyboard made it easier to elicit responses from diverse populations because storyboards provide a common visual language that individuals from diverse backgrounds can read and understand.[22] The implementations closely imitated how the strategy is usually operationalised
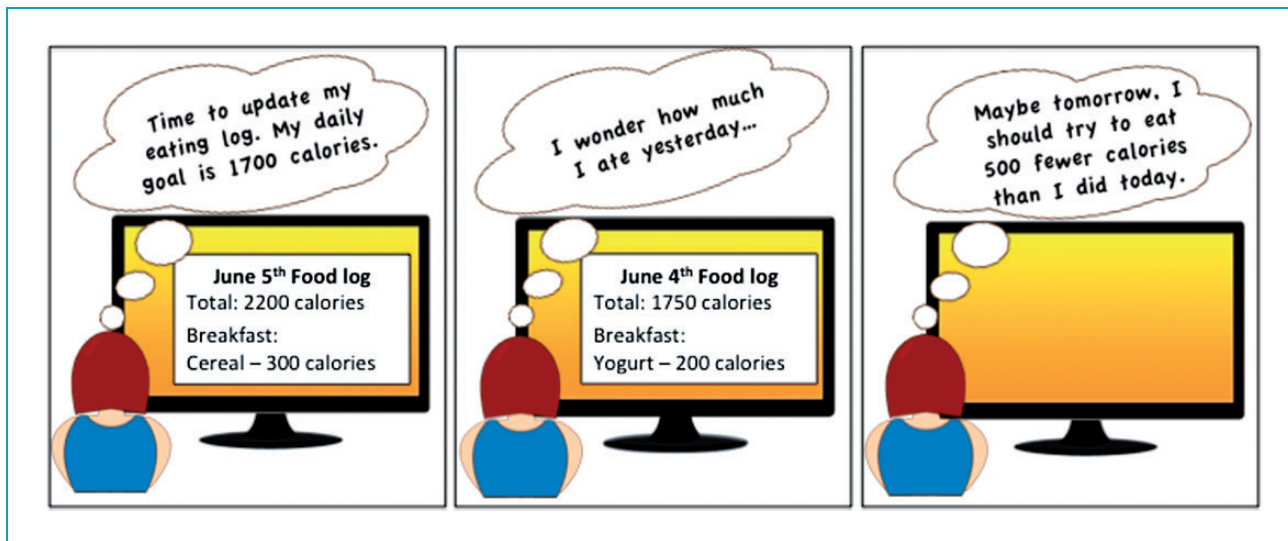
Fig. 1. Storyboard illustrating the persuasive strategies Self-monitoring – Adapted from Orij et al.[11]

in existing persuasive interventions from the literature.[7,23]

In study one, the storyboard showed a character and its interactions with a PT for motivating healthy eating behaviour and in study two, the storyboard showed a character and its interactions with a PT for promoting change of risky alcohol behaviour. We evaluated and iteratively refined the storyboards. Figure 1 shows an example of one of the storyboards illustrating the self-monitoring strategy in the healthy eating domain.

To elicit qualitative feedback about the strategy, we closely followed a well-established method that has been used in several human-computer interactions and persuasive PT papers.[2,11,24–27] Specifically, the strategy was followed with an open-ended question that required the participants to comment on the strategy represented in the system and how they would use it. Additionally, the users were required to rate and justify their rating of the strategy with respect to the effectiveness – the strengths and weaknesses. Prior to evaluating the strategy, we gave our participants the following instructions '*imagine that you are using the system presented in the storyboard above to track your daily eating (or alcohol use in study 2). . ., please, answer the following questions.*' We ensured that the participants understood the strategy depicted in the storyboard by asking them to describe what is happening in the storyboard in their own words ('*In your own words, please describe what is happening in this storyboard*'). We also included questions for assessing the participants' demographic information and eating and drinking behaviour.

We recruited participants for this study using Amazon's Mechanical Turk (AMT). After filtering out incomplete responses and incorrect responses to comprehension and attention-determining questions, a total of 1768 responses were included in our analysis (1108 responses from study one and 660 responses from study two). In the two studies, our participants were at least 18 years of age at the time of data collection and were capable of reading and understanding English well. In addition to this, for study two, participants were required to have consumed alcohol at some time. The participants received a small compensation for their time. We ended up having a relatively diverse population sample in the terms of gender, age and education level attained, as shown in Table 1.

Data Analysis and Results

To tease out the strengths and weaknesses of the self-monitoring strategy, we conducted a thematic analysis of 58 pages of qualitative comments about the self-monitoring strategy from our participants.[28] The comments were analysed in an iterative manner to identify

Table 1. Participants' demographic information.

Total number of participants = 1768	
Gender	Females (49%), Males (51%).
Age	15–25 (32%), 26–35 (38%), 36–45 (18%), Over 45 (12%).
Formal Education	Less than high school (1%), High school (31%), College diploma (13%), Bachelor's degree (37%), Master's degree (15%), Doctorate (2%), Other (1%).

the central themes within them and their relationships and classify them into strengths and weaknesses until no further ideas emerged. The following is a representation of the key themes that transpired from the analysis.

Strengths and weaknesses of the self-monitoring strategy

In this section, we present the strengths and weaknesses of the self-monitoring strategy.

Strengths of the self-monitoring and feedback strategy. There were six major strengths of the self-monitoring strategy that made it effective at promoting health and well-being, see Table 2.

Weaknesses of the self-monitoring strategy. Participants highlighted four major weaknesses of the self-monitoring strategy that could hamper its ability to promote health and wellness, see Table 3.

Discussion

Our findings uncover six main strengths and four weaknesses of self-monitoring strategy, see Tables 2 and 3. Collectively, these findings account for the varying degrees of success in the persuasive interventions that employ the self-monitoring strategy. In this section, we discuss the strengths and weaknesses and offer design recommendations for operationalising the strategy in PT interventions to minimise and overcome its weaknesses and reinforce its strengths.

Strengths

Self-monitoring raises consciousness and makes people reflect on their behaviour. Our finding shows that self-monitoring promotes health and well-being by motivating reflective thinking about an individual's behaviour. Reflective thinking about behaviour is a well-known approach for motivating and sustaining behaviour change in line with the transtheoretical model of change (TTM).[29] Research has suggested that reflective approaches to behavioural changes have the potential to intrinsically motivate users, thereby resulting in long-term behavioural change.[29,30] Self-monitoring raises users' consciousness about their health behaviour. This is in line with consciousness raising and self-evaluation process of behavioural change identified by the TTM of change, which occurs when people learn more about their behaviour.[31] Therefore, to raise users' consciousness about their behaviour and motivate long-term behaviour change via reflection, designers should employ the self-monitoring strategy.

Self-monitoring makes people assume responsibility for their behaviour by revealing problem behaviour. Attribution theory explains how people tend to assign the causes of a behaviour to some situations outside their control rather than blame it on themselves – external attribution.[32] There are many confounding factors that may contribute to ill-health and well-being (including lifestyle and genetic factors), some of which are beyond an individual's control. As a result, some people tend to attribute their state of health and wellness to factors that are outside their control, such as genotype. Hence, they are unwilling to make any changes in their lifestyle that they may perceive as good enough. Self-monitoring could reveal problematic behaviours and make people assume responsibility of their health and wellness as opposed to attributing it to other factors beyond their control. As shown by the comment *'I think it would be helpful. I always say I don't drink a lot but I never count to know. It improves self-awareness'* [P1591]. *'I like being held accountable for my actions and this system would help with that certainly'* [P1]. *'Tracking is always a great way to understand why things are not changing (such as no loss of weight)'* [P234]. Therefore, designers should operationalise self-monitoring to expose problematic behaviours to motivate those who are reluctant to change their behaviour, believing that their health and well-being are determined by factors that are not under their control.

Self-monitoring promotes intrapersonal competition. To shed light on the mechanism through which self-monitoring promotes health and wellness, many people highlighted that self-monitoring provides opportunity for them to compare their performance with their goal and their past performances. Therefore, it allows for an intrapersonal competition between their past and current behaviour as they tend to strive to break their past record. It was on that note that a participant made this comment: *'Personal competition is somewhat sufficient and better than interpersonal competition when it comes to healthy living'* [P78]. Therefore, we recommend that designers should operationalise self-monitoring to allow users to compare their current and past behaviour and hence motivate behavioural change through intrapersonal competition. Designers could also reward users for outperforming themselves, thereby consciously provoking intrapersonal competition which could replace the conventional interpersonal competition strategy, especially for people who do not respond positively to competition with others and judgement.[24]

Table 2. The strengths of the self-monitoring strategy.[a]

1. Self-monitoring provides opportunity for **self-awareness** and **raises people's consciousness** about their health and wellness:
- "*Looking back on your history might be **very revealing** and **eye opening**...*"[1][P457].
- "*I think it would be helpful. I always say I don't drink a lot but I never count to know. **It improves self-awareness***" [P1591].
- "*Knowing what you ate previously will help the user to **know the eating pattern** and also to know the line of **action to take***" [P1715].
- "*...allows a user **to compare current and previous results** to see what may be throwing his/her diet off balance and make changes accordingly*" [P933].
- "*I think it is a good idea, because **we are visual people**, and seeing what we eat in numerical and graph forms would **make me more conscious** of what I put into my body*" [P752].
- "*By comparing daily logs of calories, **changes and possible improvements could be more visible***" [P460].

2. Self-monitoring **guides** people and helps them **take control** of their health and well-being:
- "*The system would **serve as a guide** to me*" [P1023].
- "***Personal competition** is somewhat sufficient and better than **interpersonal competition** when it comes to healthy living*" [P78].
- "*Very good for staying accountable and **keeping control***" [P379].
- "*I like this one in that **you are in control and deciding what to do***" [P33].
- "*I like that you can **track your own progress** and **receive positive encouragement**...*" [P641].

3. Self-monitoring helps people **stay accountable** and exposes **hidden behavioural determinants**:
- "*Tracking is always a great way to **understand why things are not changing** (such as no loss of weight)*" [P234].
- "*Being able to log progress would help greatly with **accountability** and **self-evaluations***" [P542].
- "*Very good for staying **accountable** and keeping control*" [P379].
- "*I like being **held accountable for my actions** and this system would help with that certainly*" [P1].
- "*Like the idea of being able to monitor eating habits over a period of time so you can **keep track of whether or not it fluctuates***" [P1054].

4. Self-monitoring provides **useful information** on how to achieve **desired behavioural outcome**:

- "*This would provide me **useful information** on how to improve my caloric intake from day to day, and let me know when I slipped off the rails*" [P106].
- "*I like that I would be able to **see my past behaviour** and **get feedback** on how I can do better in the future*" [P78].
- "*Having the information right in front of you in black and white is **helpful to understand** how much you are consuming*" [P287].
- "*I think this might be relevant to me because in the past I used this method to see how much work I could get done in my job each day by **comparing** it to the **previous day**" [P1101].
- "*The system would be able to provide me **useful information** that would inform my future drinking decisions*" [P469].

5. Self-monitoring **engages** the users, encourages them to **reflect** on their behaviour and thus enables them to **make informed decisions**:
- "*Keeping track of behaviour is **engaging**. The best strategy!*" [P315].
- "*Data is **very useful to reflect** on to better **understand** one's habits*" [P1136].
- "*This system would help me be aware of my consumption and **reflect on it**...*" [P359].
- "*This would make me **stop and think about my eating habits** and may encourage me to eat healthier more often*" [P216].
- "*This system shows you how many alcohols you consume and seeing your record, you **can take best decisions** and change the alcohol drinking habits*" [P330.]
- "*I can see this working with walking ale. A device that measures the distance you walked. It would keep people honest**, make them reflect on their behaviour** and promote exercise. win win*" [P1207].
- "*I really enjoy having data, and using that as a **basis for decision making***" [P1545].
- "*Great applications, its practical and **engaging** towards achieving weight goals in today's busy life style*" [P1401].

6. It allows users to **monitor their progress** and **performance** towards their health and wellness goal
- "*I used to be an alcoholic, but I've been sober for 9 months. Something like this would have made me feel a sense of **progress** and **achievement**, rather than just a timeline (ie. "x" amount of months)*" [P294].
- "*Being able to **view** and **compare progression** from day to day is a greater motivator*" [P1034].
- "*I like that you can track your **own progress** and receive positive encouragement instead of negativity for when you don't meet your goal*" [P134].
- "*I really like the idea of being able to **compare my own performances**. It would motivate me*" [P992].
- "*Monitoring **past** and **current record** will help to achieve goal*" [P425].
- "*Being able to keep track of what you consume each day is **very helpful for making good choices***" [P372].
- "*I like having the ability to **go back and check my progress***" [P506].

Table 2. Continued

- *"I personally like being able to look back at **past performance** to see how I'm **progressing***" [P169].
- *"By monitoring **past performance,** the player will be better able to meet and measure her **performance,** so she can meet her goals"* [P1353].
- *This is really good since you can **compare what you've been doing to what you're doing***" [P1056].
- *"It is **easy to forget or confuse** what we do in the past. So being able to easily access that information would be **useful** and **help in influencing** the current day's consumption"* [P491].

Table 3. The weaknesses of the self-monitoring strategy

1. Self-monitoring could be **tedious** and hence **discourage** users from using a PT intervention:
- *User tracking would be **tedious**... Ideally I would like to see some way to easily track alcohol intake with a wearable device"* [P641].
- *"I feel like it would be **difficult** to continue to log the progress on a daily basis without some kind of motivator"* [P499].
- *"This will get really **tedious**"* [P1576].
- *"User input tracking would be **tedious without rewards**. Best to integrate with existing apps such as Untapped and remove user input from the necessary steps"* [P946].
- *"I've tried a few of these food logs, truth is I never stick to it. It's just **too much hassle** to keep up with it and update it everyday"* [P561].
- *"It would depend on how you enter your intake. It would be cool if there was a way for you to just take a picture of your food and it would automatically search for the approx. calories in that food. **The hardest part of these systems is having to figure out the calories and enter them in**"* [P118].
- *"This seems like **hard work**"* [P866].
- *"Counting calories feels **oppressive** and **punishy**. However, meeting other healthy eating goals (5 fruits and veg) feels less judgmental. Not saying there should be no calorie tracking, but if that was the only way to get info., it would be **a huge turnoff.**"* [P1441].
- *"It would be helpful, but still **a lot of trouble**"* [P811].
- *"If the game relay on the user to report honestly, **the effectiveness will be diminished**"* [P33].

2. It is not **fun**:
- *"I think it's **boring**"* [P1551].
- *"I would think this was **boring** and would not do it"* [P109].
- *"User tracking would be tedious and not **fun** without rewards"* [P315].

3. Self-monitoring could lead to **health disorders** such as eating disorder and consequently, that could lead to mental problems such as **depression**:
- *"Seems like it could **lead to eating disorders**"* [P84].
- *"When I started **my eating disorder behaviour**, it began with a simple desire to be healthier (I was overweight), and it began with calorie counting daily. Then I began deciding to lower my caloric intake each day, pushing myself to do better/eat less. **Less than a year of this behaviour landed me in the hospital with a damaged heart, damaged bones, and virtually no memory**"* [P847].
- *"Eh, this is not very motivational. It is more likely to **make you feel bad and feel you need to punish yourself** if you are not successful. That is the last thing someone trying to lose needs. **A self-esteem hit**"* [P197].
- *"This kind of system is not recommended as it could **be harmful** to many women and men too who tend **towards anorexia** as those people do already tend to restrict their dietary intake too much. This kind of program **would trigger more restriction**. There should be only the focus on now and not the thought of trying to starve oneself tomorrow"* [P1419].
- *"**Guilt can make some people eat more**. It's sort of like, "I have no control, why should I bother?" I've seen it many times, so you have to **find a way to encourage them** especially when they are doing well"* [P90].
- *"**Focusing only on numbers** sounds like an easy way to lead to an **eating disorder**"* [P376].

4. Self-monitoring may need complementary strategies to truly **motivate** users:
- *"This **combined with the reward system** would make **an effective product**"* [P479].
- *"It seems like the desire to change my behaviour in this scenario **would have to be internal** as the system only seems to monitor whether or not I achieved a goal that I set"* [P111].
- *"The system would be helpful, **but could be improved** by including some form of **positive reinforcement** and providing skills to reduce alcohol consumption"* [P150].
- *"I **need some sort of motivation; I would lose interest** in this application"* [P890].
- *"It would **not be very effective** in getting me to reconsider my eating habits, unless I was offered **a virtual reward** for my progress"* [P389].
- *"Feedback is good, but I think having **a reward system** would keep the user **more engaged**"* [P16].
- *"A **method for alerting** should be used alongside to make the person more conscious of achieving his target"* [P98].

Weaknesses

Self-monitoring may lead to health disorder and depression.
A shortcoming of self-monitoring, as pointed out by our participants, is that it may lead to health disorders. For example, an application focused on tracking calorie intake (for food apps) may provoke eating disorder in people with the tendency of being anorexic.

> 'When I started my eating disorder behaviour, it began with a simple desire to be healthier (I was overweight), and it began with calorie counting daily. Then I began deciding to lower my caloric intake each day, pushing myself to do better/eat less. Less than a year of this behaviour landed me in the hospital with a damaged heart, damaged bones, and virtually no memory' [P847].

To overcome this impediment, we suggest that designers should take a holistic approach to promoting health and wellness as opposed to tracking just one marker of health behaviour. For example, a healthy eating application that employs self-monitoring could also track how many serving of fruits and vegetable an individual consumed daily rather than focus on just the quantity of calories consumed. An application that discourages risky alcohol drinking could alongside tracking the quantity of alcohol, track the amount of water and food consumed. This is supported by the comment:

> 'Counting calories feels oppressive and punishy. However, meeting other healthy eating goals (five fruits and veg) feels less judgmental. Not saying there should be no calorie tracking, but if that was the only way to get info, it would be a huge turnoff.' [P1441].

This is also in line with other research that discovered that persuasive intervention could backfire if not strategically designed.[33]

Self-monitoring can be tedious.
Another major drawback of many applications employing the self-monitoring strategy is the labour-intensive nature of current self-monitoring tools, which makes them tedious to use. Although technological advances, such as pedometers and arm-band sensors for physical activity monitoring, have allowed for automatic monitoring of certain behaviours, there are still some limitations on the type of behaviours that can be monitored automatically. For instance, not all kinds of food and drink intake can be monitored automatically.[11] There are two main reasons why people perceive self-monitoring as tedious: the first has to do with the fact that self-tracking and recording one's own behaviour is unnatural. As highlighted by Burke et al.,[4] it is not natural for humans to track their own behaviours, thereby making it feel more like a punishment. This is also supported by a participant's comment '*Counting calories feels oppressive and punishy*'. Along with this comes the added difficulty of figuring out the actual behaviour count as highlighted by the participant's comment: '*The hardest part of these systems is having to figure out the calories and enter them in*' [P118]. To overcome this limitation, we suggest that designers who employ self-monitoring should simplify the process and reduce the amount of work involved by automating behaviour monitoring process using tools such as pedometers and armband sensors for physical activity. However, we acknowledge that there are still some limitations with respect to what behaviours can be monitored without the user's involvement. Therefore, for such behaviours that cannot be automatically monitored, such as some types of food and the amount of alcohol consumed, designers should incentivise users and reduce the perceived tediousness of the self-monitoring process using complementary persuasive strategies such as reminding users to log their behaviour, rewarding users for tracking their behaviours each day, and reducing the number of steps required to record behaviour. For example, a PT intervention that is designed to allow a user to select the alcohol level or food contents from a prerecorded list would be an easier alternative to typing the contents. This is supported by the comment '*The system for input of data should be as smooth as possible. Ideally, I would like to see some way of easily tracking alcohol intake with a wearable device. Though the technology might not be there*' [P101]. '*A method for alerting should be used alongside to make the person more conscious of achieving his target*' [P98].

Self-monitoring may not work for people in the precontemplation stage of behaviour change.
While self-monitoring is a theoretically and empirically grounded strategy, it assumes that people are motivated to change and hence ready to self-track their behaviours. However, that is rarely the case as highlighted in this comment: '*It seems like the desire to change my behaviour in this scenario would have to be internal as the system only seems to monitor whether or not I achieved a goal that I set*' [P111]. This suggests that similar to goal setting,[34] applications employing self-monitoring may work only for people who are ready to change their behaviour: those that have the motivation to change their behaviour but have not developed plans for doing so. It may work better for individuals in the contemplation, action and preparation stages of the transtheoretical model,[31] who have the intention but not yet the means to change.[34] Therefore, we suggest that self-monitoring may not be an effective strategy

for promoting behaviour change in people who lack the motivation to change.

Self-monitoring can be dull (not fun) and calls for a complementary strategy. Another reason why an application employing self-monitoring may not motivate and sustain user's motivation is that it is perceived as 'not fun'. *'User tracking would be tedious and not fun without rewards'* [P315]. *'This combined with the reward system would make an effective product'* [P479]. This comment follows closely from the previous one and suggests that self-monitoring needs a complementary strategy in order to be effective for some people. This is also in line with Burke et al. that self-monitoring was more effective when used alongside with social support.[4] It also supports Etkin, finding that, while self-monitoring may motivate desired behaviour, it can simultaneously reduce the enjoyment associated with those behaviours.[10] This is because tracking can make enjoyable activities feel more like work, hence reducing their enjoyment. 'As a result, measurement can decrease continued engagement in the activity and subjective well-being'. Therefore, we recommend that designers should employ self-monitoring alongside other supporting strategies such as reward, social comparison, cooperation and competition to engage users, provide support and motivate behaviour change. These supporting strategies have been found to be compatible in PTs in previous research.[35]

Limitations and future work

Our findings are based on our participant's opinions of persuasive intervention prototypes at one point in time and may differ from persuasive interventions used for a longer time. Therefore, as part of our future work, we plan to conduct a longitudinal study to assess our findings in actual persuasive interventions that will be used over an extended period. We will apply the guidelines we describe above when designing and evaluating the effectiveness of actual persuasive interventions; we also plan to assess our findings across other health behaviour domains (e.g. physical activity, smoking and sleep) to investigate potential variations in effectiveness.

Conclusion

This paper explores why health and wellness applications that employ the self-monitoring strategy experience varying degrees of success. By investigating the strengths and weaknesses of the self-monitoring strategy via two large-scale studies with a total of 1768 participants, we found that the self-monitoring strategy possesses six major strengths that emphasize the mechanisms through which it promotes health and wellness.

Self-monitoring is also associated with four weaknesses that explain why it may not be effective for motivating health and wellness for some people. The strengths include that self-monitoring raises people's consciousness and makes them reflect on their behaviours, reveals problematic behaviour, promote intrapersonal competition and helps people assume responsibility for their behaviours. On the other hand, relevant weaknesses include the tendency of self-monitoring to lead to health disorders, and to become tedious and boring. Based on our findings, we offer design recommendations for implementing the self-monitoring strategy on health and wellness interventions to overcome its weaknesses and amplify its strengths.

Note

a. Quotes from participants are included verbatim throughout the paper, including spelling and grammatical mistakes. Emphasis has been added by the current authors.

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