Design for Engagement of Online Positive Psychology Interventions

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Abstract Online Positive Psychology Interventions (oPPIs) can provide a low-cost way to improve wellbeing in the general population. However, for these interventions to be effective, participants need to use them for a longer period of time and need to practice the content in their daily lives. This means that participants need to feel engaged with the intervention in a certain way. The first part of this chapter introduces this need for engagement with online interventions and provides insight in what engagement might actually be in this context. The next part of the chapter will focus on ways technology can be designed to positively influence engagement. This will be illustrated by means of two cases of oPPIs. Next, the chapter will discuss the way engagement might be used to personalize interventions and thereby increase the individual effectiveness. The chapter concludes with a summary of the main learning points.

Keywords Online positive psychology interventions · Engagement · Intervention design · Personalization · Gamification

1 Introduction

With the increase of the popularity of positive psychology, people from various disciplines acknowledge the value of wellbeing and the potential benefits of increasing wellbeing. Within mental health care, wellbeing or positive mental health has been shown to be a protective factor against developing mental illnesses, it has been shown to positively impact physical health, and it is seen as a worthwhile goal in itself to strive for, besides combating the symptoms of mental illnesses themselves (Duckworth, Steen, & Seligman, 2005; Keyes, Dhingra, & Simoes, 2010; Lamers, Westerhof, Glas, & Bohlmeijer, 2015; Ryff, 2014). Also within e.g. education and

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organizations, focusing on wellbeing is more and more seen as a positive way forward (Seligman, Ernst, Gillham, Reivich, & Linkins, 2009; Youssef & Luthans, 2007). With this positive attitude towards wellbeing, interventions to increase wellbeing have also become more popular. Positive Psychology Interventions (PPIs) have been proven to be effective in increasing e.g. positive emotions, self-compassion and wellbeing (Bolier et al., 2013; Sin & Lyubomirsky, 2009). Furthermore, PPIs seem to be able attract and interest many people, even those without (mental) health complaints, making them widely applicable to the general public. Increasing wellbeing in the general public and being able to let more people flourish provides many opportunities to increase the overall wellbeing level of communities, countries and even the world (Bolier et al., 2013).

One way to reach all of these people, is by using technology such as smart phones and the internet. PPIs using technology to reach people, or oPPIs (online Positive Psychology Interventions) have been shown to be able to increase wellbeing in the general population (Schueller & Parks, 2012), although the effects tend to be smaller than online interventions targeting mental illnesses such as depression (Bolier & Abello, 2014). An explanation for this might be that oPPIs and PPIs in general tend to be delivered without any human care provider involvement. This does make these interventions extremely scalable with minimal costs (Bolier et al., 2013). However, oPPIs do often struggle with a lack of engagement of participants, after their first interest has waned: often participants start enthusiastically with an oPPI, but after a while usage wanes or even stops (Bolier & Abello, 2014). This issue is well-documented in the literature on eHealth interventions, and seems to be a major reason for the sometimes small or even non-existing effects of interventions (Christensen, Griffiths, & Farrer, 2009; Donkin et al., 2011; Kelders, Kok, Ossebaard, & Van Gemert-Pijnen, 2012).

Fortunately, there seem to be ways to harness the enthusiasm participants start interventions with. Studies have shown that the technology itself can influence adherence to online interventions (i.e. the degree to which participants use an interventions as was intended by the developers) (Kelders et al., 2012). A simple example is the use of reminders that can help people to keep using an intervention. Another example that has received much attention in recent years is gamification, i.e. the use of game design elements in non-game context, to increase engagement of users (Deterding, Dixon, Khaled, & Nacke, 2011; Hamari, Koivisto, & Sarsa, 2014). However, although many researchers in the field agree on the importance of engagement for the effectiveness of digital intervention, including oPPIs, there is much ambiguity about what actually entails engagement and how interventions may be designed to foster this engagement (Kelders, Sommers-Spijkerman, & Goldberg, 2018; Perski, Blandford, West, & Michie, 2016).

Therefore, this chapter will first focus on the concept of engagement in this particular field and will then discuss ways to design for engagement. Afterwards, we'll turn to the importance of personalization and the opportunities engagement offers in this respect. The chapter will conclude with a wrap up of the most important lessons of the chapter.

2 Engagement

2.1 Engagement and Adherence

In the field of eHealth interventions, the attention was drawn towards the issue of participants not using the interventions around 2005 (Eysenbach, 2005). Since then, there has been much debate on what terms to use in which cases and about whether and why the issue is really important. Relating to the concepts, Eysenbach first used the term (non-usage) attrition to refer to users stopping their use of an intervention. Later on, Christensen et al. provided more clarity to the concepts by distinguishing between drop out attrition (i.e. participants not following the research protocol, e.g. not completing the questionnaires) and non-adherence (i.e. participants not using the intervention) (Christensen et al., 2009). This is an important distinction, first because attrition is only relevant in research studies and online interventions can and are used outside the context of a research study as well. Second because although attrition and adherence are related, they are truly different: a participant can fill out all the questionnaires in a research study, but never have accessed the intervention; or a participant can use an intervention intensively, but never fill out a questionnaire. The definition of adherence of Christensen et al. was later refined by adding the concept of intended use; the way that the developers of an intervention intended the intervention to be used for the participants to gain the most effects (Kelders et al., 2012). Adherence became the concept to describe whether participants used an intervention as intended by the developers. However, this is not always the way it has been operationalized in research papers. Often, adherence is still operationalized as usage and it is assumed that more usage is 'better' and can be seen as more adherence (Sieverink, Kelders, & van Gemert-Pijnen, 2017). Although this dose—response relationship (more usage of an intervention leads to better outcomes) is sometimes observed, this relationship is by far not always present, leading to the question whether it is really worthwhile to entice participants to use interventions more (Donkin et al., 2013). It has been posited that the focus should be more on the adherence—response relationship, because that better reflects a meaningful use of interventions (Sieverink et al., 2017). However, even this last relationship is not always found.

Recently, the attention seems to have shifted more from looking at adherence, to looking at engagement, where engagement is seen as a concept that captures the reasons behind usage more than adherence, and might therefore be more related to the effect of an intervention (Kelders et al., 2018; Perski et al., 2016). Unfortunately, the concept of engagement is not devoid of ambiguity either. In the field of digital interventions, it is commonly understood as not only the extent of usage, but also as a subjective experience with this intervention. This subjective experience can be 'characterized by attention, interest and affect' (Perski et al., 2016). However, engagement is often operationalized as just the extent of usage, pointing towards the issue of how operationalize engagement according to the full understanding of the concept (Perski et al., 2016). In this respect, user engagement should also be mentioned, but because user engagement is often applied to other contexts (e.g.

online shopping, or searching information) (O'Brien & Toms, 2008), where the goals of users are different than those of health interventions, this concept seems to not fully fit with engagement in this context. Especially when taking into account that engagement with health technologies seems to be needed at two levels: engagement with the technology itself, and engagement with the behavior the technology focuses on (Yardley et al., 2016). Researchers have argued that concepts as involvement, enjoyment and flow might be related to engagement in this specific context, but a common understanding of the components of engagement is still missing (Kelders, 2015; Kelders et al., 2018).

2.2 Components of Engagement

When looking at other fields, engagement is often conceptualized as consisting of the components behavior, cognition and affect. For example, two fields where engagement is seen as an important concept are education (student engagement) (Appleton, Christenson, & Furlong, 2008) and organizations (work engagement) (Bakker, Schaufeli, Leiter, & Taris, 2008). In both cases, the most commonly described components of engagement are behavior, cognition and affect. Behavioral engagement is seen as e.g. participation in classes and positive conduct (student engagement), or vigour, i.e. working with a high level of energy (work engagement). Cognitive engagement is seen as self-regulation and seeing value in learning (student engagement), or absorption, characterized by being fully concentrated with work and time passing by quickly (work engagement). Affective engagement is seen as e.g. identification with school or a positive attitude about learning (student engagement), or dedication, i.e. being involved in your work and experiencing e.g. pride and enthusiasm (work engagement).

To investigate how the components of engagement can be seen in the specific context of eHealth technologies, a recent study interviewed engaged health app users, to find out how they view their engagement (Kelders & Kip, 2019). This study confirmed that engagement can be seen as consisting of the components behavior, cognition and affect, and gives more insight in how each component can be operationalized, which will be summarized below.

2.2.1 Behavioral Engagement

The most prominent theme within behavioral engagement was that usage of the health intervention was routine: it was embedded in the daily lives of the users and was something that became natural to them. Engaged users also felt that the using the technology had become part of the behavior that the technology targeted (e.g. running or having a meal). The distinction between the technology and the target behavior seemed to have faded. A second theme in behavioral engagement was that engaged users think of their technology as easy to use. It does not cost them much

effort to use the technology, which seems to enhance the possibility of the usage becoming routine. The last theme was that engaged users indicated that their usage of the technology matched their goals. This seems to be a personal 'intended usage' that they would like to achieve. If their goals with the technology change (e.g. from getting insight to changing behavior), the intensity of their usage will also change. Overall, behavioral engagement was not so much just the extent of usage, but more related to the quality of the usage.

2.3 Cognitive Engagement

For engaged users, cognitive engagement was closely related to the goals they wish to achieve with using the technology. The most prominent themes were ability and motivation. Ability refers to users being engaged because the technology increases their ability to achieve their goals. E.g. a step counter gives them insight in how active they are and helps them control and change their behavior to become more active. Using the technology makes this easier for them. The second prominent theme is closely related and refers to engaged users' thinking, or even knowing, that the technology motivates them. They 'just know' that the technology e.g. motivates them and is helpful, without really experiencing any emotions or expressing that the technology increases their ability. The last theme is mental effort: engaged users tend to expend mental effort in understanding the data that the technology gives them, e.g. by analyzing their runs, or they expend mental effort in using the app itself, e.g. by meticulously entering their diet information. This mental effort is not seen as a burden, but as a positive: this helps them achieve their goals and is a motivating activity in itself.

2.3.1 Affective Engagement

Positive emotions were also important for engaged users. However, these were not only positive emotions (e.g. enjoyment) regarding the use of the technology, but also positive emotions (e.g. enjoyment or pride) regarding achieving their goals such as getting to a certain number of steps. Interestingly, negative emotions also seemed to play a role as not reaching your goal can lead to e.g. a feeling of frustration. However, this is not necessarily a bad thing, as this might also increase motivation to reach the goal a next time. Within affective engagement, connection also played a role. Engaged users seem to identify themselves in some way with the technology or with the goal of the technology. They feel a connection and indicate that they would miss it when it would not be there anymore.

2.4 Measuring Engagement

Taken together, the preceding operationalization of engagement seems to be more nuanced than earlier definitions imply. For example, the extent of usage of the technology which is so prominent in earlier definitions and in measuring engagement, seemed to be less important than how this usage is established (e.g. as a routine which costs little effort) and what it is aimed at (an extent of usage which matches the goals participants wish to achieve). Also, it is clear from the description of the components of engagement that it is both about engagement with the technology and engagement with the target behavior, but these different 'forms' of engagement seem to be intertwined making the distinction somewhat fabricated.

To gain a nuanced view of the whole concept of engagement, it seems to be necessary to measure the different components and to see how these 'building blocks' are arranged to shape an individual's engagement. E.g. the total engagement score of two people might be similar, but when for one individual this is solely in the form of behavioral engagement, this individual may quickly become disengaged when something breaks the routine. Whereas a different individual with a less strong behavioral engagement might be quicker to miss a day of usage, but be inclined to stay engaged due to the larger cognitive or affective engagement which might motivate a renewed engagement.

A recent overview paper on methodologies to measure engagement identified various ways to assess (a form of) engagement, e.g. qualitative methods, self-report scales, ecological momentary assessments and system usage data (Short et al., 2018). Of these methods, most studies in this field rely on system usage data only (Perski et al., 2016). However, as system usage data mostly captures just how often a system is used, this seems to provide a very narrow image of engagement and does not take into account the complexity of the concept. Self-report scales on engagement might be the most accessible way to gain a more nuanced view of engagement. However, most of these scales are created for measuring engagement with e-commerce websites or video games (Short et al., 2018). The two scales identified in the previously mentioned overview paper specifically targeted at eHealth interventions are not explicitly focused on the three main components of engagement (i.e. behavior, cognition, affect). Moreover, only one of these scales has been the subject of a validation study. It is clear that more work needs to be done in this field and it seems valuable to create and validate a measurement scale based on the previous operationalization of the different components of engagement. However, this work is still in the preparatory stages.

3 Design

Now that we know a bit more about what engagement is, it is time to turn towards ways to foster engagement to digital interventions in general and oPPI's in specific.

One way to foster engagement is by using the design of these technologies. A common belief, which is supported by research, is that a design that matches the expectations and practice of the intended users, is more engaging than a design that does not provide this match (Abras, Maloney-Krichmar, & Preece, 2004). One way of reaching such a match between the users and the system is by using a development approach that incorporates the views and values of different stakeholders (as the target group and counselors). An example of such an approach specifically for the eHealth field is the CeHRes-roadmap (Kip & van Gemert-Pijnen, 2018; van Gemert-Pijnen, Kelders, Beerlage-de Jong, & Oinas-Kukkonen, 2018; van Gemert-Pijnen et al., 2011), see Fig. 1. This roadmap is built on theoretical approaches relating to behavior change and technology, but also business modeling to increase the chances of sustainable implementation. One of the pillars of the roadmap is participatory design: this entails incorporating the views and values of different stakeholders in all stages of the design. Another important pillar is iterative development: this means that the design process consists of multiple rounds of idea generation with stakeholders, prototyping, checking ideas and prototypes against the values of the stakeholders, and incorporating the feedback in an adapted idea or prototype. Although it is difficult to assess whether such an approach leads to a more engaging eHealth technology than when the technology would have been developed using a different approach, multiple studies suggest that this approach seems successful.

A second way to look at how design can lead to more engagement, is by looking at specific design elements or features and their influence on engagement. Much of this kind of research has been done in the field of Persuasive Technology, where it is often investigated which kind of features (e.g. reminders or suggestions) lead to more effective interventions. Providing a comprehensive overview of such studies is beyond the scope of this chapter, but can be found elsewhere (see van Gemert-Pijnen et al., 2018). However, to give an impression of this body of knowledge consider a systematic review in which 83 web-based interventions were analyzed to investigate which program and technology features of these interventions predicted adherence (Kelders et al., 2012). This study found that a RCT study as opposed to an observational study, increased interaction with a counselor, more frequent intended usage,

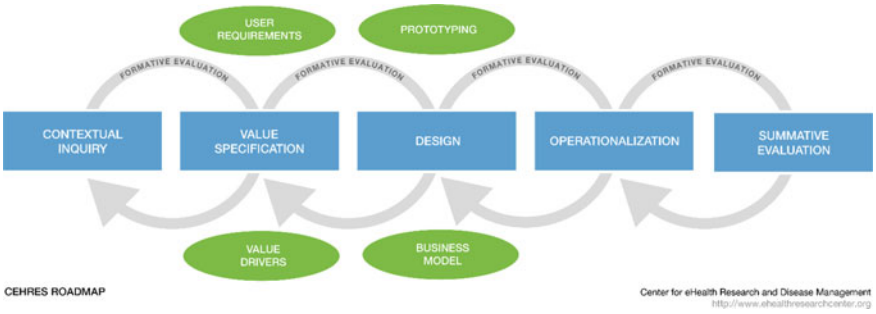

Fig. 1 CeHRes-Roadmap for the development of eHealth Technologies

more frequent updates and more extensive employment of dialogue support significantly predicted better adherence. Interestingly, the results showed that although interaction with a counselor predicted adherence, this variable contributed the least of all the significant predictors. This stresses the importance of using technology to design for adherence and engagement. According to the study, aspects from dialogue support, i.e. features that support the interaction and dialogue between the system and the user, may play an important role in this. Examples of dialogue support features are reminders, providing rewards and having the system itself adopt a social role as e.g. a coach. More recently, newer technologies and design approaches have made their way into the field of health and positive psychology interventions. In the next section, two examples will be discussed to explore in what ways these designs may be able to influence and foster engagement.

3.1 Case: This Is Your Life

The first example is a web-based positive psychology intervention targeted at the general public aimed at improving wellbeing. This intervention has been proven to be effective as a self-help book with email counseling (Schotanus-Dijkstra et al., 2017). The web-based intervention that was created, using a Human Centered Design (Ludden, Kelders, & Snippert, 2014), consisted of an introduction and eight lessons that could be completed in 12 weeks. Each lesson consisted of psychoeducation and approximately five exercises that could be completed multiple times (e.g. each day). In each lesson, there were approximately two key challenges. These were the exercises that needed to be completed to be able to continue to the next lesson. The intervention was self-guided; there was no feedback from a human counselor. However, the intervention itself did provide tailored feedback when a user finished a lesson and provided general feedback about how to best perform exercises at different points during each lesson. For the study, two versions of the intervention were created: a gamified and a standard, non-gamified, version (Kelders et al., 2018). Screenshots of the overview page and a lesson page of both versions are shown in Figs. 2 and 3.

Both versions of the intervention contained the same information and exercises. Differences were only in lay-out and in wording of feedback:

Overview: In the gamified version, the overview was visualized as a map, in which the participants travel to various destinations (the different lessons). In the non-gamified version, a list of lessons was provided.

Lessons: The basic features of the lesson screen were the same in both versions (list of exercises on the left and explanation and filling out opportunity on the right). The gamified version showed an additional progress bar, in which the activities of the lesson were visualized. After finishing all the mandatory activities, participants in the gamified condition were granted a key with which they could enter the next destination, whereas participants in the non-gamified condition were provided with a link to start the next lesson.

Fig. 2 Overview of the intervention in the gamified version (left) and non-gamified version (right)

Fig. 3 Lesson screen in the gamified version (left) and non-gamified version (right)

Professor avatar: In the gamified version of the intervention, participants were guided through the intervention by an avatar of "Professor Happiness". Instructions and feedback appeared as a pop-up coming from the avatar. In the non-gamified version, the same instructions and feedback were given through a pop-up of the info-button.

Badges: Only participants in the gamified version earned a badge after completing the introduction and each of the lessons. These badges were shown on the right side of the screen, and when "mousing over" these badges, a quote matching the badge's lesson was shown.

This intervention was used in an experiment to investigate the short term impact of a gamified design on the experiences of the users. For the study, participants were asked to use the intervention for one session of approximately 30 min. They were instructed to do the introduction and two exercises from the first lesson. 75 Participants were randomized to either the gamified version or a standard, non-gamified version of the intervention. Afterwards behavioral, cognitive, and affective engagement were measured. Behavioral engagement was assessed by means of usage mea-

sures gathered through system logs (log data). Cognitive engagement was assessed by measuring involvement. Affective engagement was assessed by measuring positive emotions and enjoyment. Lastly, flow was measured to assess both cognitive and affective engagement.

The results of the study showed that participants in the gamified intervention scored higher on cognitive engagement (i.e. involvement) and on some elements of affective engagement (i.e. flow as a combination of cognitive and affective engagement and the emotions "interest" and "inspiration"). This showed the possibility of the design of an intervention, in this case gamification, to impact the engagement that participants experience when using the intervention. This way, it provides a first step in uncovering how the design of interventions may enhance engagement with online (positive) psychological interventions and it offers a starting point for creating engaging interventions. However, it must be noted that this study does not imply that gamification is always a good strategy to increase engagement. Research indicates that gamification can also have negative effects (Hyrynsalmi, Smed, & Kimppa, 2017). The study merely shows that this specific design approach, which can be classified as a form of gamification, can have a positive effect in a specific context. However, more research is needed on what specific design elements show these effects in which contexts.

3.2 Case: Mobile PPI

The previous case is an example of a full blown web-based intervention that has taken much time, effort and money to be created. It is interesting to see how such a design can influence engagement, but developing such a technology might not be something that is always possible to do. This second example describes a mobile Positive Psychology intervention with a shorter duration, which was developed within a much shorter duration and without any technical (e.g. programming) expertise. This approach might be more feasible in a many situations. What it shows is that even in such a situation, it may be possible to leverage engaging design opportunities, but this arguably requires a bit more creative and pragmatic thinking.

First to provide some background information, the current example was developed within The Incredible Intervention Machine (TIIM), a web-based system created at the University of Twente that allows researchers to create their own mobile interventions without the need to program. The system works analogue to online survey tools as e.g. Qualtrics or Survey Monkey. In essence, the researchers create different modules that together form an intervention. These modules consist of short texts, questions and/or videos. The researcher can create modules and decide on the timing of when these will be available to the user. This can be at a specific time; related to when an earlier module has been finished; or related to a specific answer to an earlier question allowing for the creation of tailored interventions.

Figure 4 provides three screenshots of a basic interventions as displayed to a user. However, using images, it is also possible to create a more elaborate version that may

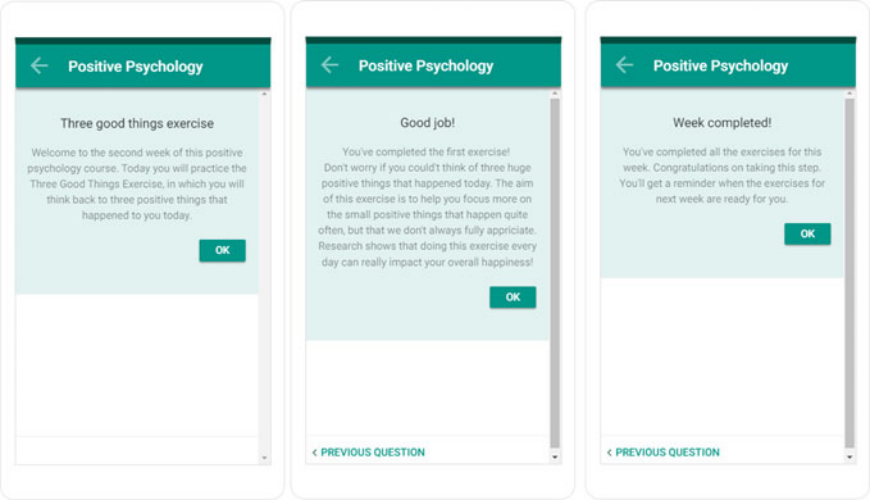

Fig. 4 Basic mobile positive psychology intervention created with TIIM

increase engagement. E.g. Fig. 5 shows the same content, but this time, gamification aspects and a virtual coach are presented as ways to increase engagement. Although in this case the gamification elements are only minimal, in essence, it provides the same experience as the more elaborate gamification aspects of the previous example, in that the progress through the intervention is visualized as a journey. It can be hypothesized that this will positively impact especially affective engagement in making progress more visible and enjoyable. Research into the impact of these less elaborate design approaches is still only emerging, so future research should investigate the value of these approaches in practice.

4 Personalization

Until now, in this chapter we have discussed ways to improve and foster engagement to an intervention in general, so on average. However, as research indicates more and more, the average does not really exist in practice. Often, when looking more in depth to the effects of an intervention, you see that there are people who show positive change, people who show no change, and people who show deterioration (Andrews & Williams, 2014). Of course, this is not what we want: we do not want anybody to be worse off when using an intervention. However, we also have several different intervention-approaches (e.g. positive psychology, Cognitive Behavioral Therapy, Acceptance and Commitment Therapy) which may work differently for different people. Hypothetically, this could mean that there is an effective intervention-approach for everybody, we just have to find the right one.

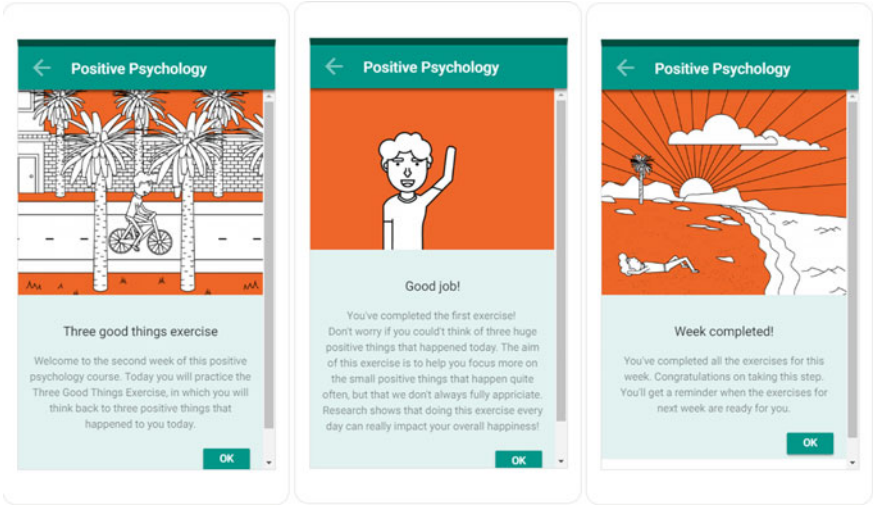

Fig. 5 More elaborately designed mobile positive psychology intervention, created with TIIM

The same goes for the design of an intervention. For example, research on the influence of persuasive technology features in general, and gamification specifically, often show small effects (Hamari et al., 2014; Kelders, Bohlmeijer, Pots, & van Gemert-Pijnen, 2015). It could very well be that this can be explained, in part, by individual differences. For some people, gamifying their health intervention might seem to diminish the value of it, seeming to no take the goals seriously anymore. However, for some, the same gamification techniques might give a welcome boost to motivation.

For both the therapeutic content of the intervention and the design of it, the one-size-fits-all approach seems to be far from ideal. However, at the moment, it has proven to be very difficult to decide in advance which content and design of an intervention is appropriate for whom. For example, studies have shown that we cannot yet identify consistent characteristics that predict for whom psychotherapy is the best option and for whom medication is appropriate (Cuijpers et al., 2012). This limits our ability to personalize interventions by a large degree. However, it may be that engagement provides a solution to this issue.

As we have seen before, engagement is consistently linked to the effectiveness of interventions, although more research needs to be done to empirically validate this assumption. Second, as we have seen, the design of interventions can influence individual engagement. Theory also suggests that the therapeutic content of interventions can influence individual engagement (Hyland & Whalley, 2008; Whalley & Hyland, 2009). In theory, this means that we can have people start using an intervention, measure their engagement, and predict whether or not this intervention will be successful. In itself, this could already increase the effectiveness of an intervention,

by only giving it to the people who score reasonably well on engagement and for whom chances are high that it will be effective.

However, technology enables us to, quite easily, create more versions of an intervention. This way, we can not only not give an intervention to someone who might not benefit, but might also be able to find the right version of an intervention to anyone. Consider for example that you would want to create personalized interventions for people with depressive or anxiety complaints. For this target group, Cognitive Behavioral Therapy, Acceptance and Commitment Therapy and Positive Psychology have been shown to be effective in decreasing complaints (Bolier et al., 2013; Jiménez, 2012), however, it could well be that different people respond better to different approaches. However, there is no knowledge on whether there are any characteristics of people that predict who will respond better to which approach (Andrews & Williams, 2014). Furthermore, within an online intervention, how feedback is given and the design-approach of the intervention are likely to influence engagement in different ways in different people. Table 1 gives an overview of these intervention and technology factors that are likely to influence individual engagement.

Based on these three factors with three levels each, 27 (i.e. $3 \times 3 \times 3$) different versions of an intervention can be created. Although this seems like a difficult thing to do, using technological tools like the earlier described TIIM, this is feasible. The next step would be to find out for each individual which of the 27 versions of the intervention is appropriate. One way to approach this, is to let participants go through a set-up phase where they try out the different versions of an aspect step-by-step. So e.g. first they are asked to read a description of the different content approaches and try out an exercise, after which their engagement will be measured. Based on these engagement scores, the most appropriate content of the intervention can be determined for this individual. Next they will receive feedback in different

Table 1 Intervention and technology factors that are likely to influence individual engagement

Aspect	What	Why
Content	*Intervention will be based on*: a. Cognitive Behavioral Therapy b. Acceptance and Commitment Therapy c. Positive psychology	Motivational concordance theory: engagement is influenced by whether the content fits personal values and beliefs (Hyland & Whalley, 2008; Whalley & Hyland, 2009)
Feedback	*Feedback on completed exercises*: a. In text b. By a counselor in a pre-recorded video c. In text given by a virtual agent	Research suggests that individuals are engaged differently when feedback is given in different ways (Kelders et al., 2015; Talbot, 2012)
Design	*Intervention will*: a. Be gamified competitively (points, levels and achievements) b. Be gamified non-competitively (story line, personal challenges and rewards) c. Not be gamified	Research has shown that gamification influences engagement and that this influence is likely different between individuals (Hamari et al., 2014)

ways and will be shown the different designs after which engagement will again be assessed. Using this approach enables us to predict which of the 27 versions of the intervention is most appropriate for whom and thus gives us the ability to personalize interventions.

However, personalizing interventions based on individual engagement is still new. Although it sounds promising, research should look into how different groups respond to these attempts to increase their engagement. It might be that some people show reactance to these attempts as they might see it as a way to manipulate them. One way of countering this might be by allowing people to choose their own version and in this way increasing their autonomy.

5 Conclusion

In this chapter we have seen that for oPPIs to reach their full potential, it is important that people are engaged with these interventions. Engagement can be seen as a concept that encompasses behavior, cognition and affect. Engaged behavior does not only refer to using an intervention as intended, as the concept of adherence does, but also suggests that is important that people create a routine in which they use the intervention and exercises. Cognitive engagement is very much related to the intervention being able to support people in reaching their goals, e.g. improving their wellbeing. Affective engagement is related to emotions that are felt when seeing progress, or even a lack thereof, and related to emotions, e.g. enjoyment, when using the intervention itself.

Furthermore, we have seen that the design of oPPIs can influence engagement. Certain aspects of technology, e.g. visualizing progress through gamification techniques, or giving the technology a social role in the form of a coaching avatar, can positively impact the engagement that participants feel and in this way help increase effectiveness. We have seen that although it can be quite difficult to implement these design techniques, newer technological tools may provide researchers and intervention builders with easier ways to implement these kind of features. However, more research is needed to assess the impact of these less elaborate forms of e.g. gamification.

Lastly, we have seen that although some design techniques may increase engagement in general, personalization may be needed to achieve the best results. Technology enables us to create many different versions of an intervention, e.g. varying on the content, the way feedback is given and on the design approach itself. However, it remains an issue how to decide which variation of an intervention is most appropriate for whom as research has yet failed to identify characteristics of people that help us in this decision. We have discussed that engagement may be used to overcome this issue and provide a way to personalize interventions. This may be done by having participants try out different versions and measure their engagement. Based on these scores, a substantiated decision can be made for the version of the intervention that has the highest chance of being successful for each individual.

For future research it seems worthwhile to place more emphasis on measuring and designing for engagement. Specifically, future research should address how to measure the complex concept of engagement. With such a measure, engagement can, and should be, assessed in any online health intervention. This will give us much more insight in how (the design of) interventions impact engagement and opens up the way to effectively use the opportunities both technology and psychology offer to create more effective interventions on a large scale.

References

Abras, C., Maloney-Krichmar, D., & Preece, J. (2004). User-centered design. In W. Bainbridge (Ed.), *Encyclopedia of Human-Computer Interaction* (Vol. 37, No. 4, pp. 445–456). Thousand Oaks: Sage.

Andrews, G., & Williams, A. D. (2014). Internet psychotherapy and the future of personalized treatment. *Depression and Anxiety, 31*(11), 912–915.

Appleton, J. J., Christenson, S. L., & Furlong, M. J. (2008). Student engagement with school: Critical conceptual and methodological issues of the construct. *Psychology in the Schools, 45*(5), 369–386.

Bakker, A. B., Schaufeli, W. B., Leiter, M. P., & Taris, T. W. (2008). Work engagement: An emerging concept in occupational health psychology. *Work & Stress, 22*(3), 187–200.

Bolier, L., & Abello, K. M. (2014). Online positive psychological interventions: State of the art and future directions. In *The Wiley Blackwell handbook of positive psychological interventions* (pp. 286–309).

Bolier, L., Haverman, M., Westerhof, G. J., Riper, H., Smit, F., & Bohlmeijer, E. (2013). Positive psychology interventions: A meta-analysis of randomized controlled studies. *BMC Public Health, 13*(1), 119.

Christensen, H., Griffiths, K. M., & Farrer, L. (2009). Adherence in internet interventions for anxiety and depression: Systematic review. *Journal of Medical Internet Research, 11*(2).

Cuijpers, P., Reynolds, C. F., III, Donker, T., Li, J., Andersson, G., & Beekman, A. (2012). Personalized treatment of adult depression: Medication, psychotherapy, or both? A systematic review. *Depression and Anxiety, 29*(10), 855–864.

Deterding, S., Dixon, D., Khaled, R., & Nacke, L. (2011). *From game design elements to gamefulness: defining gamification.* Paper presented at the Proceedings of the 15th international academic MindTrek conference: Envisioning future media environments.

Donkin, L., Christensen, H., Naismith, S. L., Neal, B., Hickie, I. B., & Glozier, N. (2011). A Systematic Review of the Impact of Adherence on the Effectiveness of e-Therapies. *Journal of Medical Internet Research, 13*(3).

Donkin, L., Hickie, I. B., Christensen, H., Naismith, S. L., Neal, B., Cockayne, N. L., & Glozier, N. (2013). Rethinking the dose-response relationship between usage and outcome in an online intervention for depression: randomized controlled trial. *Journal of Medical Internet Research, 15*(10).

Duckworth, A. L., Steen, T. A., & Seligman, M. E. (2005). Positive psychology in clinical practice. *Annual Review of Clinical Psychology, 1,* 629–651.

Eysenbach, G. (2005). The law of attrition. *Journal of Medical Internet Research, 7*(1).

Hamari, J., Koivisto, J., & Sarsa, H. (2014). *Does gamification work?—A literature review of empirical studies on gamification.* Paper presented at the 2014 47th Hawaii International Conference on System Sciences.

Hyland, M. E., & Whalley, B. (2008). Motivational concordance: An important mechanism in self-help therapeutic rituals involving inert (placebo) substances. *Journal of Psychosomatic Research, 65*(5), 405–413.

Hyrynsalmi, S., Smed, J., & Kimppa, K. K. (2017). *The dark side of gamification: How we should stop worrying and study also the negative impacts of bringing game design elements to everywhere.* Paper presented at the Proceedings of the 1st International GamiFIN Conference.

Jiménez, F. J. R. (2012). Acceptance and commitment therapy versus traditional cognitive behavioral therapy: A systematic review and meta-analysis of current empirical evidence. *International Journal of Psychology and Psychological Therapy, 12*(3), 333–358.

Kelders, S. M. (2015). Involvement as a Working Mechanism for Persuasive Technology. In *Persuasive Technology* (pp. 3–14): Springer International Publishing.

Kelders, S. M., Bohlmeijer, E. T., Pots, W. T., & van Gemert-Pijnen, J. E. (2015). Comparing human and automated support for depression: Fractional factorial randomized controlled trial. *Behaviour Research and Therapy, 72,* 72–80.

Kelders, S. M., Kok, R. N., Ossebaard, H. C., & Van Gemert-Pijnen, J. E. W. C. (2012). Persuasive system design does matter: A systematic review of Adherence to web-based interventions. *Journal of Medical Internet Research, 14*(6), 17–40.

Kelders, S. M., Sommers-Spijkerman, M., & Goldberg, J. (2018). Investigating the direct impact of a gamified versus nongamified well-being intervention: An exploratory experiment. *Journal of Medical Internet Research, 20*(7).

Kelders, S.M. & Kip, H. (2019). Development and initial validation of a scale to measure engagement with eHealth technologies. In CHI Conference on Human Factors in Computing Systems Extended Abstracts (CHI'19 Extended Abstracts), May 4–9, 2019, Glasgow, Scotland UK . ACM, New York, NY, USA, 7 pages.

Keyes, C. L., Dhingra, S. S., & Simoes, E. J. (2010). Change in level of positive mental health as a predictor of future risk of mental illness. *American Journal of Public Health, 100*(12), 2366–2371.

Kip, H., & van Gemert-Pijnen, L. J. (2018). Holistic development of eHealth technology. In *eHealth Research, Theory and Development* (pp. 151–186). Routledge.

Lamers, S. M., Westerhof, G. J., Glas, C. A., & Bohlmeijer, E. T. (2015). The bidirectional relation between positive mental health and psychopathology in a longitudinal representative panel study. *The Journal of Positive Psychology, 10*(6), 553–560.

Ludden, G. D., Kelders, S. M., & Snippert, B. H. (2014). *This is your life!* Paper presented at the International Conference on Persuasive Technology.

O'Brien, H. L., & Toms, E. G. (2008). What is user engagement? A conceptual framework for defining user engagement with technology. *Journal of the American Society for Information Science and Technology, 59*(6), 938–955.

Perski, O., Blandford, A., West, R., & Michie, S. (2016). Conceptualising engagement with digital behaviour change interventions: A systematic review using principles from critical interpretive synthesis. *Translational Behavioral Medicine*.

Ryff, C. D. (2014). Psychological well-being revisited: Advances in the science and practice of eudaimonia. *Psychotherapy and Psychosomatics, 83*(1), 10–28.

Schotanus-Dijkstra, M., Drossaert, C. H., Pieterse, M. E., Boon, B., Walburg, J. A., & Bohlmeijer, E. T. (2017). An early intervention to promote well-being and flourishing and reduce anxiety and depression: A randomized controlled trial. *Internet Interventions, 9,* 15–24.

Schueller, S. M., & Parks, A. C. (2012). Disseminating self-help: Positive psychology exercises in an online trial. *Journal of Medical Internet Research, 14*(3).

Seligman, M. E., Ernst, R. M., Gillham, J., Reivich, K., & Linkins, M. (2009). Positive education: Positive psychology and classroom interventions. *Oxford review of education, 35*(3), 293–311.

Short, C. E., DeSmet, A., Woods, C., Williams, S. L., Maher, C., Middelweerd, A., … Poppe, L. (2018). Measuring engagement in eHealth and mHealth behavior change interventions: Viewpoint of methodologies. *Journal of Medical Internet Research, 20*(11), e292.

Sieverink, F., Kelders, S. M., & van Gemert-Pijnen, J. E. (2017). Clarifying the concept of adherence to eHealth technology: Systematic review on when usage becomes adherence. *Journal of Medical Internet Research, 19*(12).

Sin, N. L., & Lyubomirsky, S. (2009). Enhancing well-being and alleviating depressive symptoms with positive psychology interventions: A practice-friendly meta-analysis. *Journal of Clinical Psychology, 65*(5), 467–487.

Talbot, F. (2012). Client contact in self-help therapy for anxiety and depression: Necessary but can take a variety of forms beside therapist contact. *Behaviour Change, 29*(02), 63–76.

van Gemert-Pijnen, J. E., Kelders, S. M., Beerlage-de Jong, N., & Oinas-Kukkonen, H. (2018). Persuasive health technology. In *eHealth research, theory and development: A multi-disciplinary approach*. Routledge.

van Gemert-Pijnen, J. E., Nijland, N., van Limburg, M., Ossebaard, H. C., Kelders, S. M., Eysenbach, G., & Seydel, E. R. (2011). A holistic framework to improve the uptake and impact of eHealth technologies. *Journal of Medical Internet Research, 13*(4).

Whalley, B., & Hyland, M. E. (2009). One size does not fit all: Motivational predictors of contextual benefits of therapy. *Psychology and Psychotherapy: Theory, Research and Practice, 82*(Pt 3), 291–303.

Yardley, L., Spring, B. J., Riper, H., Morrison, L. G., Crane, D. H., Curtis, K., … Blandford, A. (2016). Understanding and promoting effective engagement with digital behavior change interventions. *American Journal of Preventive Medicine, 51*(5), 833–842.

Youssef, C. M., & Luthans, F. (2007). Positive organizational behavior in the workplace: The impact of hope, optimism, and resilience. *Journal of Management, 33*(5), 774–800.

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