Designing a Self-Determination Theory-Based App for a Wellness Behavior Change

A thesis submitted to the faculty of the University of Minnesota by

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In Fulfillment for the Master of Arts of Graphic Design

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June 2020
Abstract

Chronic diseases and mental health conditions are a costly and rising health concern. According to the Centers for Disease Control and Prevention (CDC), chronic diseases are rapidly growing and are currently the number one cause of death in America (Chronic Diseases in America). In addition, 19.2% of Americans suffer from a mental health illness, according to the National Alliance on Mental Health (“Mental Health By the Numbers | NAMI: National Alliance on Mental Illness”). Many of these diseases are related and can be linked to unhealthy personal behaviors, such as lack of physical activity and poor nutrition (Chronic Diseases in America; “WHO | 2. Background”). Improving these health behaviors could help lower and/or improve many physical and mental conditions.

In the last decade, there has been an expansion in health and fitness apps, but that does not translate to improved health behaviors. One concern is there is a lack of regulation and theory implemented in them (Higgins; Herrmann and Kim; Ozdalga et al.). Few apps take the needed step to use behavior change strategies and building self-efficacy and instead only monitor behavior, provide information, and assist with goal setting (Direito et al.; Higgins; Herrmann and Kim; Sullivan and Lachman, Schoeppe et al.). Apps often offer incentive programs that do not show long-term results and are a source of extrinsic motivation (Herrmann and Kim). Rewards and extrinsic motivation can be helpful for starting a program or health change, but intrinsic motivation is needed for behavior maintenance (Pope and Harvey; Sardi et al.).
Self-determination theory is a human behavior meta-theory that suggests people become self-determined by three innate needs: autonomy, relatedness, and competence (Ryan and Deci). Building an app around self-determination theory will better promote long-term health changes that the user will be intrinsically motivated to maintain.

This thesis proposes a prototype app designed around self-determination theory. Both the user experience and the design of the user interface promote the theory. This is a design-based project intended to explore a way in which the app could be designed. With this approach, the app would have three levels, moving the user towards becoming intrinsically motivated. As the user advances levels, the app assists with and promotes the user’s autonomy, relatedness, and competence. The final level (and goal) of the app should have two effects on the user that work together: assist the user in developing intrinsic motivation to make healthy choices and to discourage reliance on the app to the point of potentially not needing it at all. This will create a long-term change for the user in multiple health and wellness behaviors, which will, in theory, lead to fewer health problems and chronic diseases and a longer, healthier life.
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Introduction

Health and Wellness Concerns

Chronic disease and mental health concerns are a growing concern in America. Chronic conditions, such as heart disease, stroke, diabetes, and obesity are rapidly on the rise and are the number one cause of death to Americans, according to the Centers for Disease Control and Prevention (CDC) (About Chronic Diseases). In addition, 19.2% of Americans suffer from a mental health illness, according to the National Alliance on Mental Health (“Mental Health By the Numbers | NAMI: National Alliance on Mental Illness”). These conditions are a tremendous public health burden and can lead to death.

Many of these diseases are linked to multiple poor health choices throughout a person’s life. Less than 5% of Americans are getting the recommended amount of physical activity and many are also not consuming the recommended amount of fruit, vegetables, dairy, and oils (Council). Instead, they are over sitting and consuming more calories from solid fats and added sugars, refined grains, sodium, and saturated fats (Council). Sleep health is also a problem for 25% of U.S. adults (“SleepHealth”). Health choices and behaviors are related and can have an effect on one another- it is a web of health decisions. Activity level, exercise, diet, sleep, and mental health all affect and influence one another (“Exercise and Mental Health”; Mental Health Foundation; NAMI: National Alliance on Mental Illness; National Sleep Foundation). It is important to consider all dimensions of wellness and how they are related when looking for solutions to the chronic diseases and mental health issues America is facing.
Wellness, as opposed to health, tells more about a person’s pursuit of multidimensional holistic health choices and lifestyle, rather than their current physical or mental state (“What Is Wellness? - Global Wellness Institute”). Looking at chronic physical and mental conditions from a wellness perspective, those working in a health or wellness industry can consider how someone’s wellness journey can be influenced over time, in the multiple dimensions of wellness, that lead to healthier outcomes.

Health and Fitness Apps

Applications (apps) are computer and smartphone programs designed for a specific purpose. As apps have been developed over the last decade health and fitness apps have become increasingly popular. The usage of health and fitness apps has grown 330% in three years (“Health & Fitness App, Record-High Engagement”) and the industry, amounting to 14.6 billion U.S. dollars in 2018, has more than doubled since 2015 (“U.S. Health & Fitness App MAU 2018 | Statistic”). Fitness devices, such as watches and other types of trackers, provide the user with more feedback about their day-to-day activity and can be connected to the apps. Apps also serve as a tool to help users make changes and see their progress (or regression) over time.

However, the growth in health and fitness apps does not translate to an improvement in health. Apps are still relatively new in the fitness and wellness world, with the first app store launching in 2008 (Hamburger). Due to the recent introduction of health and fitness apps, there has been little research or regulation put into place on them, resulting in a lack of theory-based and evidence-based options (Higgins; Herrmann and Kim; Ozdalga et al., Schoeppe et al.).
Current research has indicated that some apps utilize behavior change techniques, such as behavior monitoring, providing information, and goal setting (Faisal et al.; Higgins; West et al.). However, the development of theory-based apps is not well described in current literature and there appears to be an overall lack of evidence-based theory at use within the apps (Higgins; Herrmann and Kim; Rohde et al.). Instead, the apps serve as an extrinsic motivator, often providing incentives and promoting a reliance on the program (Cotton and Patel, Herrmann and Kim). Additionally, most apps provide a visual extrinsic goal that the user attempts to achieve (closing progress rings, filling a progress bar, etc.). Extrinsic rewards motivate users to start a program or make health changes, but intrinsic motivation is needed to maintain behavioral changes (Pope and Harvey; Sardi et al.). Current health and fitness apps tend to only focus on one area of wellness or one key feature; few bring a holistic, balanced, wellness change approach.

However, the utilization of apps provides several advantages: smartphone usage is increasing worldwide, they can be used almost anywhere, they are portable, and they can have a widespread effect at a low cost (Higgins; Marshall et al.; Milošević et al.). They can also be addicting; users take them with them everywhere and check them often (Casey et al.). These traits can be used to the advantage of health and fitness app developers to affect peoples’ daily wellness choices.

Intrinsic and Extrinsic Motivators

Health decisions are backed by a motive. External motivation occurs when behavior is motivated by an outside source. This could be to gain a reward (i.e. money), to gain recognition or approval, or because of a demand from another person. Behavior
that is internally motivated comes from the person; it is caused by a desire to do the behavior. External and internal motivation run a spectrum, so generally a behavior may not be entirely motivated by one or the other (Mawhinney; Ryan and Deci).

Intrinsic motivation is crucial for maintaining healthy behaviors, however many insurance companies, fitness and wellness programs, and health and wellness apps use outside sources that provide extrinsic motivation, such as health insurance rewards, social pressures, health care provider pressure, or app rewards (Crespin et al.)

Although extrinsic motivation has been shown to work well, once the reward is taken away it is likely the motivation to continue may stop, so this type of motivation is generally not helpful for long-term behavior change (Mawhinney; Pope and Harvey; Sardi et al.). Being intrinsically motivated to do a behavior more often creates a long-term behavior change that can be maintained (Mawhinney; Pope and Harvey; Sardi et al.).

Self-Determination Theory

Self-determination theory, proposed by Richard Ryan and Edward Deci (O’Hara), is a human behavior theory that suggests how humans are motivated and serves as a meta-theory for other motivational studies (O’Hara; Ryan and Deci; “The Theory”). According to the theory, humans are motivated to fulfill three innate needs: autonomy, relatedness, and competence. Autonomy explains how people need to feel they are in control of their own lives. Relatedness explains how people need to feel cared about by others and care for others. Competence explains how people need to feel they can successfully manage their environment and have success in their daily lives.
Self-determination theory has been widely studied and has proven its effectiveness in health and wellness related studies. It is already used in education and health settings. Depending on their education, training, and specific job duties, some practitioners learn the theory in detail, and some may never learn it all (“The Theory”).

Humans want to become self-determined, so they are often more intrinsically motivated to do activities that help them fulfill their autonomy, relatedness, and competence. Therefore, if they feel self-determined doing particular behavior they are more likely to have some intrinsic motivation toward it, which is needed for behavior maintenance and creating a sustained change (Pope and Harvey; Sardi et al.). Both self-determination theory and intrinsic/extrinsic motivation should be considered when trying to implement a behavior change.

With several unhealthy behaviors (inactivity, poor nutrition, poor sleep) contributing to many more severe health conditions, it is important we explore new ways to promote healthy behavior and a sustainable change to overall wellness. Apps are an external motivator, however, external motivators can be useful for getting users to start a change. Then, if the user feels more self-determined during the behavior (it is fulfilling their autonomy, relatedness, and competence needs), they may have more intrinsic motivation to continue the behavior and change their long-term health outcomes. Utilizing the advantages of apps (popularity, low cost, availability, portability) with a behavioral theory still needs to be explored as there is potential to have a widespread effect on wellness behavior change and long-term physical and mental health outcomes.
Methods

Interviews

Fourteen interviews were conducted to gather data about current health and fitness apps being used in the Field. The interviews consisted of physical therapist (6), personal trainers (8), recreation professionals (1) and health coaches (1). Some of the interviewees held more than one of these roles. Interviews consisted of questions and a continuous conversation about health and fitness apps and devices, what apps and devices they use in practice/with clients, what apps and devices they use themselves, why they do or do not like apps, features they wish apps had, and how they would describe their optimal app for health wellness practices.

The results of the interviews showed that they had concerns over patients/clients/general population focusing too much on data from outside sources (an app or watch) instead of listening to their mind/body. They also had concern that people are losing intrinsic motivation to exercise, which could be due to motivation from outside sources (an app or watch).

Here, one of the physical therapist describes his concern with users being over concerned with numbers related to health behaviors:

“If you’re too worried about a number it can be unhealthy...people worry about steps, they worry about their times on millage, they worry about they’re distance, calories...versus being more holistic and general about things.”
This same concern was repeated by another professional in the field (who was both a physical therapist and a health coach). Here, she further explains the need to make it more personal and tailored to the individual:

“I think our ability to monitor stuff gets us caught in that web of a lot of stuff, that isn’t that helpful. It can be interesting, but it can kinda suck you into a place where you think everyone of those data points is important. But how was my day? How about that data points?...and all these little goal that you set for yourself, does that line up with how you wanna feel at the end of the day?...it lets you kinda sift through it in your head without too much pressure, it really lets you really kinda figure out ‘okay, this is my core thing that I’m really struggling with’”

Multiple personal trainers echoed this need for the person to have an individualized plan and also highlighted the motivation behind client behaviors and the need for them to truly want to do the healthy behavior. One of the personal trainers described how he saw apps affecting motivation behind exercise:

“The only detriment I could see to apps at this point in time is losing the joy, or the fun, of working out, like you’re always working out with a purpose...I’ve always enjoyed having a purpose, having an outcome to reach and shoot for... maybe for some people they get so focused, like “I need to hit these
goals” it’s kinda like burn out...you get too focused on the tangible things and you miss out on what you actually enjoy about moving.”

Another personal trainer talked very passionately about his dislike for apps and devices and the need for people to focus on themselves and listen to their body during a workout:

“People slide into just chasing numbers and not really doing the workouts for the true purpose of exercising and being healthy.”

The interviews showed that professionals in the field had mixed feelings about apps, but more importantly, whether they liked them or not, they had concerns about how people were being motivated. They highlighted two major motivation concerns: they noticed people chasing numbers and being motivated by numbers instead of listening to their bodies, and they worried people were not working out for the right reasons and losing the joy they could receive from exercise and healthy behaviors.

Interviews helped make it clear that the user needed a solution that supported what they were intrinsically motivated to do and would help them become self-determined. When designing the app these things will be taken into consideration and the design and user experience will be built upon these principles. It will be explained how the branding, the visual elements, interactions, and changes among all of these help support self-determination theory and increase internal motivation.
Designing the Brand

The app will focus on five areas of wellness: movement, exercise, nutrition, sleep, and mindfulness, creating healthier behaviors in each. The app will be able to be used by anyone, at any level, and will help people achieve a higher level of wellness while building their intrinsic motivation and becoming self-determined.

In order to do this, the brand and visual design need to reflect the theory. The way the app feels and makes the user feel should further enforce the goal of the app, so a design that reflected self-determination theory was needed. After reflection on the theory and purpose of the app, three key words were used to describe the purpose of the theory-driven app: natural, foundational, and empowering.

Natural was chosen because the design needed to reflect that this was a natural change, something that happens in nature, is the right way to go about making changes, and should feel instinctive to the user. The user needs to feel connected with themselves, that it is a real event, and that they are dealing with real life elements (versus something that was a fake or synthetic process). To reflect this, the design includes rock and earth-like patterns, it has water and earth tones, it enforces a calm and steady look with lines that are predictable and not too dramatic, and it has some natural curves in the lines (like you would find in nature).

Foundational was chosen because this app was going to be laying the foundation for the user's long-term health changes. They need a strong base, something that feels rock-like, so they can stand on it without doubt. To accomplish this clean, solid lines and type are used, shapes are closed, there are solid blocks of color and rock patterns used.
The app is also straightforward with information, using very clear and numerical information with the user.

Empowering was chosen because the app should empower the user, giving them the tools to make health changes. The user should feel they are gradually rising up, feeling more accomplished, as if they are climbing a hill or pyramid; the app is helping them get to the top. To accomplish this, the color gold and lines rising up were used, pyramid shapes can be seen throughout the app, and a continuation of the rock-pattern is used. However, the rock pattern should also take on a more of a powerful, gemstone-like look, as if they are rising to a new level of power and accomplishment.

Some of the final design elements can be seen below. In Figure 1, the color palette used is shown. Some natural tones can be seen, but also some hints of gemstones-like colors. In Figure 2 the rock-like pattern is shown. It uses gold lines and pyramid shapes. It is used on the splash page (what the user will see when they open the app). In Figure 3 the icons are shown. The icons use clear steady lines, but also have some natural curves. The icons have upwards and forwards motions (enhancing the theme of progression and success), which can be seen in the stair climber and the runner icons. The icons also have up pointing shapes and achievement shapes, which can be most seen in the flag pyramid (challenges), the award badge (rewards), the radial graph (progress), and the simple pyramid (level indication).
Figure 1: Color palette

Figure 2: Rock pattern
The final design has the five areas of wellness (the progress section), profile, groups, challenges (depending on level), resources, and rewards (depending on level) in the navigation. The design included a dark blue background and uses white to highlight information. Each area of wellness is assigned a color, which is used throughout the app to tie items back to the wellness category. Opacity and size variations were used to make it clear what part of the app the user was using. Figure 4 shows the splash page where the rock pattern and gold lines are highlighted. Figure 5 shows the home screen. In the home screen you can see how the five categories are each assigned a color and how the rock shapes are continued to be used in the progress charts. Figure 6 shows what a wellness category progress page would look like (in this case the movement log). The wellness category progress page shows a progress bar that moves up and to the right to illustrate the user climbing a hill or pyramid and making progress towards their goal. The use of color to denote category is also shown here.
The tagline “The stepping stone to wellness change” was chosen to illustrate how the app acts like a strong and natural stone/rock to stand on, and how it will use small steps of change to improve the user’s wellness.

Moving from Extrinsic to Intrinsic Motivation

To create steps to change in the app (an extrinsic motivator itself) the app will have to help the user change their motivation. To do this it will slowly create a behavior change over multiple levels, moving from an extrinsic motivation to intrinsic motivation, using design and user experience to make changes in each level. The components of self-determination theory will be built in as well to assist with this change.

In level one, extrinsic motivators will be pushed onto the user. The goal of the app will be to build user engagement, get them excited about using the app, and to help
them learn wellness basics and what appropriate goals for themselves would be. In this level they will receive lots of positive feedback, earn points frequently, and be able to redeem them often for small rewards. They will be in level one for at least six month. After six month, if they are meeting at least 75% of their preset goals, they can move up to level two. If not, they will continue to stay in level one.

In level two, the user is still receiving some extrinsic motivators, but slightly less. They are also now being pushed more towards intrinsic motivators. They will become more familiar with the app and start to make their goals. The goal of the app is to push them to grow, but still give them support and guidance. They will still receive points and rewards, but the points will be less frequent, and the rewards will be bigger and more customized to their wellness goals. They will be in level two for at least one year. After one year, if they are meeting at least 75% of their preset goals, they can move up to level three. If not, they will continue to stay in level two.

In level 3, the user should be fairly intrinsically motivated, and most extrinsic motivators are taken away here. They should feel competent, make their wellness choices and goals on their own, and may be becoming independent from the app. The user should have found what activities and choices are important to them, thus will continue on their own, regardless of the app. They may still use the app for tracking or storing data, but they are not looking towards it as their source of motivation. They do not earn points, but are recognized for big achievements. These recognitions will have a prize element that will be very customized to the progress they have made and how that progress can continue. These recognitions will be infrequent and the user will not know when they are
coming. All these levels are broken down and explained in further detail in a motivation scale in Table 1.

<table>
<thead>
<tr>
<th>Intrinsic</th>
<th>level 3: until fully self-determined</th>
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<tbody>
<tr>
<td></td>
<td>• Become independent from app/grow beyond app</td>
</tr>
<tr>
<td></td>
<td>• Feel very competent (on the highest level)</td>
</tr>
<tr>
<td></td>
<td>• Find/have found activities and habits personally enjoy</td>
</tr>
<tr>
<td></td>
<td>• Use app for storing/tracking data, journaling, and as a health/wellness resource center</td>
</tr>
<tr>
<td></td>
<td>• Win very long-term grand prizes/recognition in select categories (that the user has the most interest in)</td>
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<table>
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<tr>
<th>level 2: one year to several years</th>
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<tbody>
<tr>
<td>• Become more familiar/knowledgeable with wellness practices, understand own health needs and goals</td>
</tr>
<tr>
<td>• Feel more competent (advanced a level)</td>
</tr>
<tr>
<td>• Understand own goals and progress, feel accomplished by progress</td>
</tr>
<tr>
<td>• Start to find what enjoy/care about (in respect to health and wellness)</td>
</tr>
<tr>
<td>• Start to connect and try things outside of app</td>
</tr>
<tr>
<td>• Win bigger rewards more slowly (more customized to user’s goals)</td>
</tr>
<tr>
<td>• Progress levels after meeting goals at least 75% (minimum one year months)</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>level 1: six months to a several years</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Build user engagement</td>
</tr>
<tr>
<td>• Learn health/wellness basics (what’s a healthy amount? health/wellness tips/ideas)</td>
</tr>
<tr>
<td>• Get a lot of positive feedback</td>
</tr>
<tr>
<td>• Join or make a group/connect with others inside the app</td>
</tr>
<tr>
<td>• Win small rewards quickly</td>
</tr>
<tr>
<td>• Progress levels after meeting goals at least 75% (minimum six months)</td>
</tr>
</tbody>
</table>

| Extrinsic |

Table 1: Level Motivation Scale

**Self-Determination Theory Components**

Each component of self-determination theory will affect the app and help to slowly create a shift in motivation. In level one, the app will bring the user in through external motivators, but then introduce how autonomy, relatedness, competence can be achieved with the app's assistance. The user will have limited autonomy, the app making most decisions. For instance the app will select what their goals are and what their challenges are. However, the user can adjust their profile, which affects their goals and challenges (a small amount of autonomy). The user will also have to either join or create a group in level one, adding to their opportunity to fulfill relatedness. They have the
option to add more groups, motivate group members, and leave challenges (some autonomy) And in level one the app will be trying to build the user’s competence by acknowledging achievements, letting them know when they are close to goal, reminders to stay on track with goals and challenges, and encouragement them to keep going. They will receive points frequently to help build their competence that they are doing well. And the user will have resources available if they want to learn more.

In level two, the user’s competence should have grown (moving up a level will greatly build competence), slowly pulling away from external motivators, pushing more autonomy on them. In this level, they will be able to select their own goals from a preset option of variables and they will get to select challenges, increasing their autonomy. The app will give them guidelines of goals that are too high or too low, but the app and the user both have a say in what the user’s goals are. In this level the groups have more autonomy as well, and they will continue to work with their group, building their wellness community and support. The user can now select their own challenges from several preset options. In their move from level one to level two the users competence has also grown, but they will still receive points, rewards, and encouraging feedback (but less often and with less excitement and forwardness). The user already should have a sense of whether they are doing well or not, and the app will start to pull away so the user does not rely on it as an extrinsic motivator, and instead start to see their own, and decide their own, improvement.

In the level three the user’s competence should be very high, as they are on the highest level of the app. The app will take away most external motivators, focus on
internal motives, trying to develop full autonomy in the user. The user will be writing their own goals, setting their timelines, writing their own challenges, and it will be their job to check-in with themselves and work towards their personal goals. Relatedness should continue to grow as they work with their group. The group now has full autonomy to write their own challenges, and by now the group is familiar with one another and what areas of wellness they enjoy and want to grow. The user can connect with group members and hopefully build connections and relationships with them outside of the app, potentially doing activities together and being a continuous support system for their group and/or individual goals. The users competence should be very high as they have made it to the highest level. They can still use the resources and track their data to see changes and improvements, but they shouldn’t be waiting on the app to tell them they are improving or not; they should be aware of their own improvements. The app will recognize big achievements, but the user won’t have a way to track this or see how close they are. The user should recognize their improvements on their own, as they shouldn't need the app, an extrinsic motivator, anymore. These components of self-determination theory and how they affect each level are laid out in table 2.
Table 2: Self-Determination theory throughout levels

These changes are further explained and mapped out in the following concept maps. The main structure and framework of the concept maps remains the same throughout each level, the changes are highlighted by a different color in each level (level one- red, level two- yello, level three- green). Table 3 illustrates the level one concept map and its focus on using external motivators to get the user interested and then introduce autonomy, relatedness and competence. Table 4 illustrated the level two concept map and it’s focus on pulling away from external motivators and pushing anatomy onto the user. Table 5 illustrates the level three concept map and its focus on
taking away external motivates and pushing towards internal motivators and full autonomy.

Table 3: Level one concept map
Table 4: Level two concept map
Table 5: Level three concept map

Visual Changes in Each Level

Visual changes will assist with the shift from extrinsic to intrinsic motivation and the user becoming self-determined. The changes are meant to be fairly subtle so they are not surprising or confusing for the user. The user should not need further explanation on the visual changes and may not even notice them all.

Points, progress bars, and progress graphs (extrinsic motivators) will become less visible and less attention-grabbing as the user moves up levels. They will show up less
often and be exciting in level two than level one, and will not show up at all in level three. The rewards will become less visible as the user moves up levels, being on the home screen and possessing a spot in the global navigation in level one, only being in the global navigation in level two, and not possessing a place in the global navigation at all in level three. The home screen will also change as the user moves up levels, becoming simpler and more spacious, allowing the user to customize as they move up levels and focus less on numbers. In level one, the home screen will help guide the users eye and help them decide what is important and what deserves attention. This decreases in level two, and by level three the user has full autonomy and does that themselves. The details of these changes are laid out in Table 6.
Interaction Changes in Each Level

There are several interaction changes that also assist in the shift from extrinsic to intrinsic motivation and the user becoming self-determined. The user will go through level advancements that will have interaction changes (moving up a level increases competence, the user knows they are doing well and have been successful). There will be introductory screens on each level that will explain the changes important for the user to
Goals move from little autonomy to full autonomy, being assigned to the user in level one, to the user making their own from restricted preset variables in level two, to writing them completely on their own in level three. Challenges act similar, moving to more autonomy as the user progresses. In level one challenges are assigned to groups but not available to individuals, in level two the user picks from several premade options (both individual and group), and in level three the user has the option to write their own challenges for themselves and for their groups. Rewards, an extrinsic motivation, are slowly taken away (similar to the visual points). In level one the user has several reward options, a “just earned” and “almost there” category, and the app has added navigation links on the home screen to rewards. In this level the user redeems rewards quickly (low points values), building excitement around the goals and rewards. In level two there are less reward options (but they are more customized to the user’s goals), the user redeems rewards less often (higher point values), and the excitement around redeeming rewards is lower. In level three there is no rewards section for the user to scroll through. The user cannot see reward options (only a place to see what they already earned), but they receive awards that focus on recognizing continued progress. These are infrequent and the user cannot see when or if a reward is coming. These rewards fully support personal wellness goals.

The user will also be given more journaling options as they advance. In level one the user has the option to type notes on workouts and when nutrition and can type notes
to group members to motivate them, but their freedom and autonomy to write out their own plans and thoughts is restricted. In level two they have a journaling option on homepage (as well as the previous journaling options). In level three they still have their previous options, but now can also write out their own goals and challenges. So by level three the user is basically writing the app themselves, creating the content they want to see.

Prompts and reminders will decrease as they advance levels. In level one they will automatically receive reminders to meet goals, follow-up with challenges, have better habits, and recognition for small achievements (all can switch off). They also have the option to set time and frequency reminders for group challenges and they receive motivation from their group (option to switch off). In level two prompts and reminders are set to off, but can be turned on. Group reminders and motivation options are the same. In level three everything is set to off (but can be turned on) except receiving motivation from your group. The app only follows up if the user tells it to. Table 7 further explains these interaction changes further.
<table>
<thead>
<tr>
<th></th>
<th>level 1</th>
<th>level 2</th>
<th>level 3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>goals</strong></td>
<td>- user is assigned goals</td>
<td>- user makes own goals from preset variables</td>
<td>- user writes own goals</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- warned if too high or too low</td>
<td></td>
</tr>
<tr>
<td><strong>challenges</strong></td>
<td>- individual challenges not available</td>
<td>- user can pick individual or group challenges</td>
<td>- user and groups write own challenges</td>
</tr>
<tr>
<td></td>
<td>- groups assigned challenges</td>
<td>- challenges in global navigation</td>
<td></td>
</tr>
<tr>
<td><strong>rewards</strong></td>
<td>- lots of small rewards, small point values (can redeem often)</td>
<td>- high value rewards</td>
<td>- user cannot see reward options (only a place to see what they already earned)</td>
</tr>
<tr>
<td></td>
<td>- excitement around rewards</td>
<td>- rewards personalized for user to help promote wellness habits</td>
<td>- they receive rewards as they continue to progress (they do not see when or if a reward is coming)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- max of 4 reward options at a time (rotate monthly)</td>
<td>- rewards fully support personal wellness goals</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- no extra excitement around rewards</td>
<td>- more of a recognition of success</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- infrequent</td>
</tr>
<tr>
<td><strong>levels</strong></td>
<td>- in first level, competence may be lost, need recognition of progress</td>
<td>- moved up a level, made progress, feel more competent</td>
<td>- moved to the top level, made a lot of progress, feel very competent</td>
</tr>
<tr>
<td><strong>journaling, typing</strong></td>
<td>- user has option to type notes on workloads and when nutrition</td>
<td>- journaling option on homepage</td>
<td>- user can journal on home page</td>
</tr>
<tr>
<td></td>
<td>- user can type notes to group member to motivate them</td>
<td></td>
<td>- user types own goals</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- user types own challenges</td>
</tr>
<tr>
<td><strong>prompts, reminders</strong></td>
<td>- reminders to meet goals, follow up with challenges, and have better habits automatically (can switch off)</td>
<td>- reminder to meet goals and follow up with challenges set off (can be switched on)</td>
<td>- reminder to follow up with challenges set off (can be switched on)</td>
</tr>
<tr>
<td></td>
<td>- option for set time and frequency reminders for group challenges</td>
<td>- option for set time and frequency reminders for group and individual challenges</td>
<td>- option for set time and frequency reminders for group and individual challenges</td>
</tr>
<tr>
<td></td>
<td>- group motivations (switched to on)</td>
<td>- group motivations (switched to on)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- prompts automatically on</td>
<td>- some prompts automatically off</td>
<td></td>
</tr>
</tbody>
</table>

Table 7: Interaction changes in each level

**Level Changes Specifics**

For all the visual and interaction changes to work and slowly promote a more self-determined user, we need to consider each component of the app and how it is contributing to self-determination theory and the goal of making the user more intrinsically motivated. In the following section, both the visual and interaction changes are broken down by specific areas/functions of the app and further explained how they work, what their role is, and what the user will see and experience.
Profile-Autonomy

The user's profile remains a constant source of autonomy across all levels. The user always has access and control to adjust their profile. In level one, the user goes through an initial set-up where they input information about themselves, giving a sense of autonomy (control over their profile). As they continue to use the app, the user is able to update their basic information to see weight and BMI trends (figure 7). Other data trends are in each individual wellness category. The user’s profile also has a relationship to their goals. They can always go to their profile to make adjustments to their overall wellness goals (the amount the user is able to adjust daily, weekly, monthly, and yearly goals depends on the level), but their initial set-up overall goals remain constant until the user adjusts them (figure 8). They can click on the pyramid in the profile section to view their level and get details on what each level consists of and how to progress (figure 9). And the user has control over how much they want the app to remind them about healthy behaviors and their meeting goals (figure 10). As the user progresses levels, there are less options for reminders (it is up to the use).
Figure 7: Profile screen example - constant qualitative user health data

Figure 8: Profile screen example - editing wellness goals
Figure 9: Profile screen example - level explanation

You are on level 2

- In level 2:
  - You will set your own goals
  - You can join individual or group challenges
  - Your rewards will be specially selected for you

- You will advance once significant progress on your goals have been made (at least 6 months meeting 85% of goals, goals will only count if they are challenging)

Figure 10: Profile screen example - notification adjustments
Goal Setting- Autonomy

Goal setting becomes more autonomous as the user advances. In level one, the user is assigned goals based on the initial overall wellness goals they picked during the app set-up (figure 11). The app tracks progress so it is able to create goals for the user that are challenging but not overwhelming. The app will present these updated goals to the user regularly (as frequently as the user said they wanted new goals in the initial app set-up), but the user will not have the power to change the goal (figure 12). The user has very little autonomy here.

In level two, the user makes their own goals from a set of predetermined variables. The app will let them know if their goals are too high or too low. The user decides if they want to adjust their goals (figure 13). Here, the user has some autonomy, but it is still restricted by the app.

In level three, the user writes out their own goals with no interference from the app; they have full autonomy (figure 14). As the user advances, they are given more goal setting autonomy until they are at a point where they do not need the app's assistance with setting goals.
Figure 11: Goal setting screen- initial user goals choices

Figure 12: Goal setting screen- level one, user has preset goals
Figure 13: Goal setting screen - level two, user selects from preset variables to create goal.

Figure 14: Goal setting screen - level three, user writes their own goals.
Groups- Relatedness

The groups feature allows the user to build relatedness with other users. They can work together to overcome challenges and build a community with similar goals. In all levels the user has the option to create a group (select from contacts) or join a group (be assigned based on profile and overall wellness goals). When initially creating a profile the user will have to either create a group or join a group. When creating or joining a group the user picks the type of group it will be (figure 15-16). In level one, this will help the app assign challenges to the group so the challenges are tailored to the group’s interests. Challenges are available for groups in all levels, however the group’s autonomy increases as they advance levels by letting them pick challenges and then create challenges. The group must work together to complete the challenge. Each individual member’s data for that challenge will be factored into the group total (figure 17). Group members can send motivational messages to each other (type their own or select a pre-written motivational message) to help keep all group members on track (figure 18). Group members can also help each other by helping fill in and doing extra where someone may be struggling, and then moving up the group total (ex. a group member not able to get very many steps in during a week long challenge, other group members could walk extra to bring the score up). Group members also have the option to leave the challenge (the group will go on without them), but they are welcome to rejoin at any time without penalty (figure 19). This is to help create a group culture that supports, motivates, and empathizes with one another.
Figure 15-16: Group screen- selecting a type of group

Figure 17: Group screen- group challenge progress
Figure 18: Group screen- sending motivation to a group member

Figure 19: Group screen- leaving a group
Challenges- Autonomy and Relatedness

Challenges become more autonomous as the user progresses. Some challenges are done in groups, so they also allow for continuous relatedness with groups as well. In level one, the user’s groups are assigned challenges (figure 20). The user will only be in one challenge per group. They have the option to quit the challenge at any time, that being the autonomy they have in challenges. Groups have to work together to complete the challenge; everyone’s data contributes to completing the challenge (figure 21). They can send messages and motivation to each other. This helps build relatedness for the user.

In level two, the user can select challenges (individual or group) from a variety of preset options (figure 22). They can be in as many challenges as they would like, but are restricted to the guidelines of the challenge (figure 23). Users have the option to quit the challenge at any time. Here they have more autonomy, but it is still restricted. Groups still have to work together to complete the challenge and can send messages and motivation to each other, continuing to grow relatedness within the group.

In level three, the user has the option to create challenges. They write out the full challenges and select whether it is for themselves or a group (figure 24). They determine when the challenge has been accomplished by hitting the “accomplished” button on their own (figure 25). They have the option of quitting the challenge at any time. Here, the user had full autonomy. Groups can now write challenges for each other in addition to the other aspects remaining (working together to complete the challenge and sending messages and motivation). This will further build relatedness within the group, helping bond them over the challenges they have working on and completing together.
Figure 20: Challenge screen - level one, joining a group and receiving the first challenge.

Figure 21: Challenge screen - level one, viewing all group member’s progress in the challenge.
Figure 22: Challenge screen - level two, the user picks from multiple challenge options

Figure 23: Challenge screen - level two, viewing challenge progress
**Figure 24:** Challenge screen - level three, writing a challenge

**Figure 25:** Challenge screen - level three, viewing challenge progress
Recognition - Competence

The user receives recognition of success to develop competence in their healthy choices. As the user progresses levels, accomplishes goals and challenges, completes workouts, logs healthy behavior, etc., the app will recognize that and congratulate them. This recognition of good behavior will verify for the user they are doing well and help motivate them to continue. Their competence in making healthy behavior changes will grow as they feel it is something they can do. Level one will have more of these recognition prompts and be programmed to send them more often to help ensure the user learns what healthy behaviors look like. Level two will have less. Level three will have very little, as the user should have the highest level of competence in what they are doing and be able to read their logs, understand their biofeedback, and review personal and physical feelings to confirm if they are doing well and progressing. Figures 26-29 show what some of these recognition screens look like.

Figure 26: Recognition screen - recognition of advancing a level
Figure 27: Recognition screen - recognition of completing an exercise class

Figure 28: Recognition screen - recognition of completing a breathing exercise
Wellness behavior logs will help develop competence for the user to make their own wellness decisions as they progress through the app. Each category tracks information for the user (both biofeedback the watch recognizes and inputted data from the user). The user can view their data under their logs. They have access to daily, weekly, monthly, and yearly data to see patterns, trends, connections within the data, and change over time. This is important for developing competence so the user can see their
improvements and feel connected to and understand their data. Interpreting this data is also important as the use progresses levels and has more autonomy over goal setting. Figure 30 shows an example of how the app will track and show data to the user.

Figure 30: Data tracking screen

Prompts and Reminders- Competence

The user receives motivation to keep them focused on goals and remind them how close they are to achievements. These prompts and reminders will help them to stay on track with their goals and healthy behaviors, helping them believe they can achieve them. Prompts let the user know about a behavior or how close they are to reaching their goal
(figure 31). Reminders let a user know they have not been keeping up with a behavior and this is their chance to get back on track (figure 32). These can be turned on and off at any time. These will help develop the user’s competence by reminding the user what healthy behaviors are, helping them learn what to do, and making them feel like it is attainable for them. In level one there will be more prompts and reminders; the app will be programmed to send them more often to help the user learn what healthy behaviors look like. Level two will have less, and no longer focusing on small goals and reminders. Level three will have very little, as the user should have the highest level of competence in their healthy behavior choices and be able to read their logs, understand their biofeedback, and review personal and physical feelings to confirm how they are doing.

Figure 31: Prompt screen- prompts the user to complete their daily goal
Resources and Hints- Competence

The user has easy access to learning tools in all levels. The resource section allows for the user to easily find information in an area of wellness. This makes it easy for them to further investigate an area of interest, get new ideas, and start to grow and reach beyond the app (figure 33). In addition, some of the biofeedback information may be new or confusing to users so some areas of wellness have short explanations or “hints” on what the different measurements and numbers mean (figure 34). Both of these help the user learn more about areas of wellness and what appropriate expectations are. Over time, as they learn and do not need to look at the hints and resources, their competence will grow.
Figure 33: Resources pages allows the user to further learn about each wellness area

Figure 34: Hints page explain how a category is being measured and what the numbers mean, in this, case heart rate
Points- External Motivation

Points are an extrinsic motivator. As the user progresses they will receive less extrinsic motivation, thus, the points will be minimized over time. In level one, the user receives points often and there is excitement built around the points; the user gets to see the point value of everything, points are made to be bright and noticeable, points are tied to rewards. Multiple screens (progress, groups, challenges, point logs, rewards) remind them how many points each goal and challenge is worth and how many points they have total (figure 35-36). At this level, the points are a high external motivator.

In level two, the user can still view point values and see how many points they have, however it is harder to find and less prominent. Points are now smaller and receive less attention. Points can now only be found under point log, challenges, and rewards (figure 37-38). They also accumulate points slower, as goals and challenges are more challenging, and the focus starts to shift to the goal and challenge themselves. At this level, they are starting to receive less extrinsic motivation from points.

In level three, the user no longer receives any points. Goals or challenges do not have point values. In place of a point log the user now has an archive to view past accomplishments (figure 39-40). At this level, the user should not be receiving any extrinsic motivation from points.
Figure 35: Point screen- level one, daily sleep goal page

Figure 36: Point screen- level one, sleep log/points page
Figure 37: Point screen- level two, daily sleep goal page

Figure 38: Point screen- level two, sleep log/points page
Figure 39: Point screen- level three, daily sleep goal pages

Figure 40: Point screen- level three, sleep log
Rewards- External Motivation

As the user progresses levels, rewards become more personalized, less frequent, and more helpful to the user’s wellness. In level one, the user can redeem points for rewards at any time. There are many small and simple rewards, new ones added regularly. There is also “almost there” and “just earned” categories to add extra excitement and anticipation for the user (figure 41). The user will acquire points quickly and so can redeem them often (figure 42). At this point, the rewards serve a high external motivator.

In level two, the user can still redeem their points for rewards, but the rewards take longer to attain (higher point values), are more tailored and customized to the user’s interests, there are less options, and new ones are only added monthly (figure 43). There are only rewards in the five wellness categories. At this level, the rewards should be losing some of their extrinsic motivator value.

In level three, the user no longer has a rewards section. However, as they continue to track progress the app will recognize where they are making big strides and give them rewards framed as recognition that help them continue that success (figure 44). They do not know when the reward/recognition is coming and have no clear way of specifically working towards it. The rewards are unexpected and meant to be helpful to their current wellness interest (something that goes along with and could be helpful to the user’s current goals and interests). At this level, the rewards should not be serving as an external motivator. Table 8 illustrates how the type of rewards change within each level to help promote a change from extrinsic motivation to intrinsic motivation.
Figure 41: Reward screen- level one, rewards almost attained

Figure 42: Reward screen- level one, redeeming a reward
Figure 43: Reward screen - level two, less options but larger and more personalized rewards in exercise.

Figure 44: Reward screen - level three, rewards becoming recognition.
Table 8: Rewards by level- rewards become more personalized and helpful to wellness as user advances levels to help promote the shift from extrinsic motivation to intrinsic motivation.

**Intrinsic**

- **Level 3**
  - You have run over 2,500 miles in the past year, exceeding your first year by 1,000 miles. The color run would like to offer you a comped spot at a race of your choice so you can keep running!

- **Level 2**
  - Congrats! You have met your personal goal of running 3X week for 3 months. $20 off your next shoe purchase at one of the following stores.

- **Level 1**
  - Nice job! You’ve walked at least 10,000 steps a day for a week straight! 10% off a Nike purchase.

**Extrinsic**

Progress bars, although can help motivate the user to complete their goals, are themselves extrinsic motivators; the user wants to fill the progress bar and satisfy the number. Because of this, the progress bars need to fade out; bars and graphs showing plain data (not a percentage to a goal) can stay. Level one contains several bright progress bars in easy view meant to draw the user’s attention and create high extrinsic motivation (figure 45). Level two still has progress bars but they are less obvious, appear smaller and duller, and do not provide the same details as level one (figure 46). They still provide some extrinsic motivation, but it is less than level one. Level three contains no progress bars. And since the goals are all written, the app would not have a clear and standardized
way to measure the user's percent of completed goals (figure 47). At this level, progress bars serve no extrinsic motivation.

Figure 45: Progress bars with high extrinsic motivation
Figure 46: Progress bars with lowered extrinsic motivation
Completing Level Three

The objective for the user of the app is not to attain a certain status, level, or point value on the app. As the user shifts from extrinsic to intrinsic motivation, they should depend less and less on the app (a source of extrinsic motivation), and instead shift their motivation internally to themselves and their own wellness interest and goals. Therefore,
the user “completes” the highest level when they no longer depend on the app for a source of motivation; they are independently making their wellness choices, and may even stop using the app entirely. The app is meant to help the user grow, learn, develop, and prepare to make healthy wellness decisions throughout their lifetime. The goal for the user is to become self-determined and continue their wellness journey and mindset on their own.

**Limitations**

*Limited Levels*

There are several limitations to this proposed design approach. First, wellness change is not three clear-cut steps. Each individual progresses (or regresses) at their own pace, with usually many small steps. In a perfect world, the app would slowly grow with the user, in a sense having unlimited steps/levels, tailored to each individual. A clear-cut three steps plan does not apply to everyone, and the app should be more flexible in the number of levels it contains and how different speeds of progression and regression can work within the app.

*Limited Variables*

The proposed design also has a limited number of preset variables. If the purpose is to create more intrinsic motivation and be tailored to what the user wants, then the user should be picking their wellness variables. They could then have personalized graphs with their chosen variables to see the relationships they want to see. This customization
would further support their autonomy and then would more likely create long-term change. But with this design, they are confined to what the app deems important.

**Categorization**

Similarly, the app has five distinct wellness categories, but in reality there are multiple, and not everyone divides them up the same. They are all related, can overlap, and affect each other. Different areas of wellness work and flow together, and different things are important to different people. Having them separated into five distinct categories gives the impression they are all that way in life, which is misleading.

**Interface Changes**

Some visual elements in the app change as the user progresses levels and, because of this, there are slight user interface changes. Although the overall look remains the same, it is not typical for an app to have the user interface change while they are using it. The user wants consistency and to be able to trust their same app is there, not to have to relearn a new interface and feel like they don’t understand the app anymore. They should not feel they are taking steps backwards, especially when these changes actually mean they are going forwards. Although the design changes in each level are meant to be subtle and beneficial to the theoretical framework, when the user uses and trusts in the app so much they may notice and not appreciate the changes, possibly even losing trust in the app and discontinuing use.
Theory Confinement

In addition to this, because the designer is confined to the theory, some desirable user interface and experience changes are not possible if the designer strictly follows the theory. Freedom from the rules of the theory (or at least less restriction) may allow for an improvement in the user experience.

Self-Defeating

Perhaps the biggest limiting factor is the inert self-defeating structure of the app. The goal is that users eventually stop using the app (or at least stops relying on it), therefore it would be very difficult to get a person/company to invest in developing it, knowing the goal is that their customers would eventually leave/stop using the app. Sponsors may not want to support the app for the same reason.

Future Research

Infinite Variables

There are areas for future research and exploration with the current design. First, there are infinite wellness variables one could potentially measure. What has currently been proposed has a limited number of variables the app could measure for the user, but everyone’s health and wellness status and goals are different, and the app may not be measuring what the user needs it to measure. It should be further explored what other variables a person might want to measure and how the app could include this data. It
could also be useful to allow each user to select what variables they want to measure and which they do not want included; selecting their own variables would also create more autonomy for the user. The user would then also have more control over relating data and different variables to each other. Adding more wellness variables, even though it may never cover every person’s full scope of wellness, could benefit the user.

Groups

The groups section could be expanded to make groups more specialized and better matched to make sure more variables and specifics about group members match-up. Taking into consideration current skills level, motivation, seriousness, and more specific goals could make for a better performing and/or more harmonious group, possibly even improving relatedness. Currently, there are only a few factors taken into consideration when a user joins a group. Making it more specialized and tailored to each user could help the group build more relatedness, make them feel more competent in the group, and in turn help drive their intrinsic motivation to stick with the group and make healthy choices.

Connecting Data and Graphs

And finally, the graphs could be improved to be more clear, show relationships between data sets, and allow easier user interactions. Further connecting the user’s data across multiple areas of wellness could help the user learn about patterns and trends in
their behavior and potentially build their competence, thus helping them further develop intrinsic motivation to make healthy behavior choices.

Conclusion

This thesis proposed a self-determination theory-based app. The design, the visual components, and the user interactions were all taken into account to build the app around self-determination theory and increase the user’s intrinsic motivation to make healthy choices throughout life. With the growing physical and mental health concerns alternative solutions are needed. And with the increased popularity of apps and the flexibility of using mobile devices, an app has the potential to reach a lot of people at little cost. Using the theory-based app proposed here could help people become more self-determined in their wellness choices and more intrinsically motivated to make healthier choices throughout their life. This solution could have a large, positive, cost-effective, long-term impact on overall wellness in many people’s lives because of the design choices made within the app to affect the user’s long term experience.


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