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Help Me Help You: Shared Reflection for Personal Data

by

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Abstract

Although our ability to collect personal information has increased dramatically through personal informatics tools such as personal digital tracking technologies for step counts, location, and more, minimal attention has been paid to designing tools to generate actionable insight from data. Self-reflection is important to generate these insights; however, without scaffolding to support the process, it is often ineffective. In this thesis, I introduce and explore *shared reflection* – the reciprocal process of reflecting on others' data and having others reflect on one's own data – as a means to bootstrap the reflection process. I synthesize literature on personal informatics and social learning theories, design and conduct a six-week personal data collection study, and evaluate the results. Shared reflection appears to show promise; however, users value privacy and control over their personal data when sharing in a social context. Finally, the potential application of shared reflection to new personal informatics tools is explored.

Table of Contents

List of Tables

List of Figures and Illustrations

Chapter 1: **Introduction**

Historically, the patient-health care professional relationship has been a constantly evolving entity with more patients seeking medical help as the field evolved and grew [1]. Theoretically, current health care is focused on patient-centric care, which considers the biopsychosocial perspective and features mutual participation between the patient and their health care professional. In patient-centric care, health care professionals need to take into account all aspects of the patient's life from their medical data to their psychological health to their social life [2]. Patient-centric care is a lot of work and takes valuable time away from time-starved health care professionals. Thus, community health programs have been created to alleviate this pressure.

Community health looks at a particular group of people and the status of the group's health, including actions and conditions which promote, protect, and preserve health [3]. There are many community health programs available today for a range of health concerns including headaches [4], childbirth [5], mental health [6], and cancer [7]. These programs offer patients access to health care professionals who can provide specific information and guidance for a particular health concern, often successfully intervening and solving problems proactively rather than reactively [3]. The key to creating a successful community is the participation of many individuals [3]. One example of a successful community health program is breast cancer patients engaging in activity while undergoing treatment (BEAUTY).

BEAUTY is a community health program focusing on physical activity for breast cancer patients [7]. Previous work has shown that physical activity can reduce the risk of contracting some cancers, help survivors cope with the disease, and possibly reduce recurrence and extend

survival [8]. Women in BEAUTY regularly meet to partake in group exercise classes and informational sessions, and many of the participants also meet up outside of the program. Studies have shown psychological improvements in participants [9] and that the group-based structure with high group cohesion is beneficial [10]. Although the benefits of this program are substantial, a significant amount of work is required to run and maintain the program. Additionally, the scope of the program is geographically limited as it is delivered in person. In this thesis, I will explore ways in which the social aspects of a community health program such as BEAUTY can be integrated in technologies such as personal informatics tools to not only benefit people involved in community health programs, but the more general population as well.

1.1 Problem

Technology can be beneficial in tracking habits and activities through personal informatics tools. These tools can collect a large amount of diverse data, which can be used to evaluate behaviour. By integrating these tools into a location-dependent program such as BEAUTY, the existing program can be improved by providing additional tools for its participants while also expanding the reach of the program to people who are unable to attend because of the location (such as rural communities or those who have mobility limitations).

Although collection of data is important, the information is only valuable if it is reviewed. Li et al [11] have proposed a five stage model to gain maximum benefit from data collection:

- Preparation – determine what the goal of the collection is, what data to collect, and how to collect it
- Collection – collect data (personal informatics tools can be used for this)

- Integration – transform collected data into a format suitable for reflection (graphs are one example of this)
- Reflection – determine trends in data and see summaries of activities
- Action – based on the discoveries in reflection, choose a course of action

Current personal informatics tools focus on the collection of data and integration, but there is little guidance for reflection. In the case of BEAUTY, participants can track information on what exercise they are doing, how they feel, and what kind of treatment they are currently undergoing. This information on its own does not provide much insight; however, over time, the participant can collect sufficient data to see trends. By reflecting on their data, they can hypothesize how their activities are affecting them. For example, a participant may notice that during a particular phase of their treatment, on days in which their exercise level was reduced, they also did not feel as well. From this, the participant could try to increase their daily exercise level to improve how they feel. Without reflecting on their data, the participant may not realize the effects of exercise on how they are feeling.

Li et al [12] suggest that the self-reflection needs of users of personal informatics tools are not well understood. In their study, the authors identified six kinds of questions people ask about their data and two different phases of reflection. Although these questions are beneficial for personal reflection, it is still a challenge to encourage people to reflect on their data as they are not standard practice in designing existing personal informatics tools yet.

Another example of data reflection can be seen in a patient's visit to a doctor. If the patient has undergone tests of some sort, the doctor will see the raw data collected (such as medical

images, blood test results, blood pressure numbers, and more) and use their knowledge and experience to interpret the results. In the appointment, the doctor shares this information with the patient. For example, the doctor may suggest that the patient exercise more to reduce the patient's blood pressure. The patient may bring up additional information about themselves which could result in the doctor re-evaluating the situation. In this case, the doctor is reviewing the patient's data and drawing conclusions about it. When presenting these conclusions to the patient, the patient provides their insight on the situation, which gives the doctor new information to consider. Ultimately, this collaboration may result in the doctor providing a more effective way for the patient to lower their blood pressure. This is an example of how shared reflection can work in real life. This thesis explores how reflection can be better supported in personal informatics tools through shared reflection.

1.2 Objectives

To determine whether and how reflection can be better supported in personal informatics tools, I first examine the existing literature on personal informatics and learning theories. From this, I design and execute a study based on social learning theories using what I call *shared reflection*. In this approach, users review other users' data and receive reviews from other users on their own data after which they are prompted to reflect on their data. The purpose of the study is to determine whether it is viable to implement shared reflection in a digital environment. The results of the study are then analyzed and a set of design recommendations for personal informatics tools extracted. Finally, a preliminary evaluation of a set of design ideas are conducted via a small interview study followed by an evaluation of the results.

Thesis Objective 1: Synthesize literature on personal informatics and learning theories

I first examine existing literature on personal informatics tools. The first area of exploration includes how personal informatics tools are currently designed and existing suggestions for improvement. The use of social networks in personal informatics tools is also examined. The second area of exploration includes psychology theories on learning with a focus on constructivism and adult learning. These two areas are synthesized to provide the basis for a study on shared reflection conducted in Chapter 3. Crowdsourcing is briefly mentioned as an extension of leveraging social networks.

Thesis Objective 2: Design and execute a study on shared reflection

A study was designed to determine whether shared reflection is useful and could be supported in personal informatics tools. The study consisted of a questionnaire to gauge existing participant knowledge on personal informatics (including whether they have collected personal data in the past or present and how comfortable they are with it) and to set intentions for the data collection part of the study; a six-week data collection phase where participants collected data, provided feedback on other participants' data, and reflected on their own data with other participant feedback; and a questionnaire to allow participants to reflect on their experience and provide feedback on the process.

Thesis Objective 3: Extract a set of design recommendations for personal informatics tools based on shared reflection

Based on the results of the study on shared reflection, a set of four design recommendations were extracted. These recommendations were determined based on how participants responded to the activities in the study (were they engaged?), what

participants did in the study (how did they respond to reviewing other participants' data? Their own data when given feedback from another participant?), and how participants perceived their experience (was it a positive experience? Was it beneficial?). Each recommendation was illustrated within the context of the study. For example, the data log template of the study was modified to reflect a design recommendation.

Thesis Objective 4: Conduct a preliminary evaluation of design recommendations

The design recommendations were presented to six participants as low fidelity prototypes in the context of an interview. Four of the participants were participants from the main study and two were newly recruited. The interviewees were asked some specific questions as well as encouraged to provide free-form feedback on the prototypes. The results of the interviews were collected and summarized with suggestions to refine the initial design ideas and suggest future areas of exploration.

1.3 Contributions

This work provided four major contributions to the existing body of knowledge:

1. Synthesis of personal informatics and learning theories from literature (Chapters 2, 3). The existing body of literature on personal informatics and learning theories was explored and synthesized to come up with a new way for people to reflect on their data – shared reflection. Shared reflection supports adult learning theories and important features of personal informatics tools.
2. Study design based on shared reflection (Chapter 3). I introduce and define a solution to this problem called *shared reflection* which allows people to gain insight into their own

data by leveraging others' insight and by reflecting on others' data. To explore this idea, I conducted a study including two questionnaires and a six week period of data collection where participants engaged in shared reflection. The data collection activities were met with a positive response from participants both during the study and in the post-study questionnaire.

3. Design recommendations for personal informatics tools based on shared reflection (Chapter 4). Based on the responses in the six week study, a set of four design recommendations were extracted and implemented as low fidelity prototypes. These were evaluated in an interview study conducted in Chapter 5.
4. Preliminary evaluation of design recommendations (Chapter 5). To evaluate the prototypes, a short interview study was conducted with six participants, four of whom also participated in the main study. These interviews provided the first set of feedback on the design recommendations. Although some aspects of the designs were accepted by the interviewees, other aspects require further iteration.

1.4 Overview

The remainder of this work has been divided into five chapters each of which contributes to achieving the previously set goals.

Chapter 2 addresses objective 1 – synthesizing literature on personal informatics and learning theories. It explores existing literature in the personal informatics and learning theory space. An overview of how personal informatics are used is examined. A number of learning theories are presented and important points extracted for the design of the study in this work.

Synthesizing the literature on learning theories and personal informatics, shared reflection is proposed as a way to encourage users of personal informatics systems to reflect on their data.

Chapter 3 addresses objectives 1 and 2 – synthesizing literature on learning theories and personal informatics to propose shared reflection as a way for people to reflect on their data and designing, executing, and analyzing the results of a study based on shared reflection. In this chapter, the study design is presented along with results, the analytical approach, and analysis of the results. Participant response to the activities in the study were quite positive indicating shared reflection could be a useful addition to the personal informatics design repertoire.

Chapter 4 addresses objective 3– extracting design recommendations for personal informatics tools. In this chapter, the design recommendations are illustrated as low fidelity prototypes to exemplify the concepts. Furthermore, the ideas are presented in the context of existing tools to demonstrate how they could be implemented in a real-life scenario.

Chapter 5 addresses objective 4 – conducting a preliminary evaluation of design recommendations. In this chapter, a small interview study of six participants is conducted to validate the design recommendations presented in Chapter 4. The results showed that although there were some good ideas, the design recommendations could benefit from further refinement.

Chapter 6 revisits the problem presented in this chapter and summarizes the key results from this work. Suggestions for future exploration in this area are also included.

Chapter 2: **Background**

In this chapter, I explore literature on personal informatics and social learning theories. I then synthesize this literature to provide the framework of the study presented in Chapter 3 and fulfil Thesis Objective 1 (synthesize literature on personal informatics and learning theories). As mentioned in Chapter 1, community health programs exist to create a patient-centric experience while alleviating time pressures felt by some health care professionals. An important aspect of creating a patient-centric experience is the participation of the patient in their care [2]. Programs such as BEAUTY often ask patients to collect data about themselves, which is the basic premise of personal informatics tools. Yet, how does this process of collection become self-knowledge that is usable by patients? Furthermore, how can we design tools to support this process?

Section 2.1 discusses personal informatics, focusing particularly on domains of interest to human-computer interaction researchers, which include sampling tools to support data collection, and a stage-based model that describes people's adoption and use of such personal informatics tools. I briefly describe how crowdsourcing fits into this picture. Section 2.2 describes constructivist theories including social learning theories to show how some of the components can potentially be used in analysis of personal informatics. We first look at the beginnings of constructivism and move through a number of theories related to and derived from constructivism. In exploring these theories, an emphasis is placed on how they relate to learning from different age perspectives. The final part of this section looks at a set of design considerations proposed for adult online learning environments, which are derived from the previously examined theories. I then synthesize these ideas in Section 2.3 and use these as design ideas in the study described in Chapter 3.

2.1 Personal Informatics Tools, Reflection, and the Role of Social Networks

Personal informatics systems "help people collect personally relevant information for the purpose of self-reflection and gaining self-knowledge." [11] There are a plethora of consumer-based personal informatics tools from physical trackers such as FitBit (http://www.fitbit.com/), to purely software-based solutions such as Goodreads (https://www.goodreads.com/) to tools that support combinations such as RunKeeper (http://runkeeper.com/). Each of these tools provide support in collecting personal data with varying levels of input from the user. For example, FitBit is a wristband-style tracker which automatically tracks steps, calories, and sleep. As long as the user is wearing the device, it is collecting data. Goodreads is a book recommendation and review site that allows users to track books read, books to read, submit reviews, and receive personalized recommendations. Although the recommendations are automated, users are required to manually enter which books they have read, which books they are interested in reading, progress on books they are currently reading, and provide reviews. RunKeeper is a GPS tracking workout application which supports both automated capture and manual entry. Users can use RunKeeper in conjunction with FitBit to automate its usage, use GPS on their phone for a semi-automated tracker, or manually enter workouts. These commercial tools leverage commodity hardware and web-based systems; however, these tools simply provide support for people collecting this information. They provide limited means to deeply explore the data.

The Quantified Self movement (http://quantifiedself.com/) is a moniker for a community focused on going beyond simply collecting data. Their focus is on learning from personal data they have collected. Many of the people in this movement spend a lot of time tracking and analyzing their personal data. Unfortunately, for the average person, this level of commitment is

often unsustainable and/or simply infeasible. This is one area researchers have been attempting to address [13].

Two examples of existing and proposed research on the Quantified Self (QS) community include Choe et al's work on understanding QS practices [13], [14] and Swan's proposed work on realizing personalized medicine [15].

In their earlier work [13], Choe et al examined videos from the QS community to determine what tools were used, what challenges were faced and how individuals overcame them, and what the outcomes of tracking were. There were three challenges identified by the authors including tracking too many things (resulting in tracking fatigue), not considering context or triggers (affecting insights), and tracking in a non-scientifically rigorous manner (resulting in inconclusive results). Assistance in these areas can be provided by helping trackers refine their practices earlier in the data collection process, enhancing the context, and providing guidance in collecting data in a more scientifically rigorous manner.

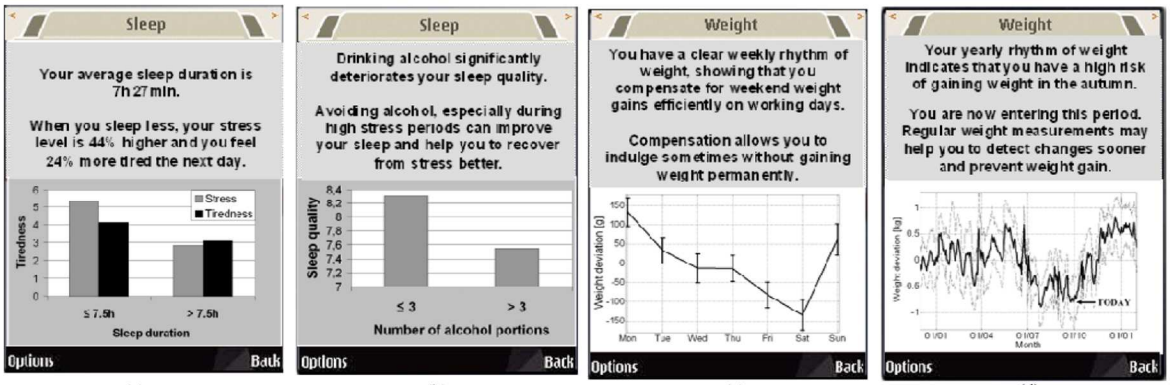
In later work [14], Choe et al used a similar method to evaluate the visualization choices of participants in the community. They noted that visualizations weren't always presented as effectively as they could have been possibly due to a lack of experience and that the results were often not viewed from a statistics perspective (specifically considering whether the results are statistically significant).

Swan's proposed work [15] suggests that citizen science could be helpful when used in conjunction with a medical system as participants engage in highly personalized self-

experiments. The projects are highly practical, which can be beneficial as patients take control over certain aspects of their health and well-being.

Researchers have been working toward developing personal informatics tools for the average person. Two example domains currently under study include chronic illness [16], [17] and sustainability [18], [19]. With the rapid rate of technology advancement, it is becoming more feasible for the average person to have access to sensors and tools for collecting data. Such data can be used for personal insight or decision making.

For example, Wellness Diary is a mobile application which facilitates behaviour change by assisting users in learning about their behaviours [16]. This application is geared toward chronic conditions brought on by lifestyle choices. Users enter a number of health and behaviour points such as weight, stress, blood pressure, and more, and the tool automatically presents their data in graphical form (Figure 1).



(a) (b) (c) (d)

Figure 2.1: Sample Graphical Analyses from Wellness Diary. Advanced feedback and analysis from a study subject. (a) Effect of small amount of sleep on stress and tiredness. (b) Effect of alcohol consumption on sleep quality. (c) Weekly weight. (d) High-risk period in yearly weight rhythm [16]

The authors of [14] identified a number of challenges in the current implementation of Wellness Diary including lack of motivation and engagement (especially long term) and lack of

dynamic goals (to change a goal, it must be done manually). One suggestion made in this work was that social support could be beneficial to improve long term engagement [13], [16].

Another example of a personal informatics tool is Power Advisor, which provides information on residential power consumption [18]. Users install a meter reader on their existing power meter, which reads information each hour and sends it to the mobile application where the information can be viewed in a number of different ways. Messages were generated based on the user's consumption and included expert advice (based on knowledge databases from the Danish Energy Savings Trust), community advice (based on other consumers' activities), and personal advice based on the user's data. An interesting point highlighted in this work was when the users reviewed their data – often, the data was reviewed in small pockets of idle time such as while waiting for public transportation, rather than in focused sessions on desktops (as would be expected with many visual analytics tools) [18].

2.1.1 Requirements for Designing Personal Informatics Tools

Li et al take a high level view of personal informatics systems [11]. In their work, they studied the problems experienced by users in using personal informatics systems for collection of and reflection on data. Based on the questionnaires and interviews conducted, they came up with a stage-based model of personal informatics [11]. They describe people's effective use of personal informatics systems as consisting of five stages:

- **Preparation** (occurs before collection; includes motivation and planning what will be collected and how it is recorded)
- **Collection** (actual connection of data)
- **Integration** (data is aggregated in preparation for reflection

- **Reflection** (look for trends/interesting points in data)
- **Action** (choose what action to take based on the new-found knowledge)

As a whole, the model may be executed sequentially; however, users often jump back and forth between stages. For example, a user may create a plan in the preparation phase but find the plan is not feasible as they start the collection phase, so they return to the preparation phase to re-evaluate their plan [11]. As shown in the two example tools, data collection can be extremely simple as in Power Advisor where the data collection is automated, or more complex and demanding of the user as in the case of Wellness Diary. Li et al show that collecting the data (preparation and collection phases) is only part of the equation – in order for data collection to be useful, it is important to review the data (integration stage) and, hopefully, learn something (reflection stage) and make changes (action stage) based on the learning. This reflection is one area in which Li et al believe there is still a gap [12].

To further articulate these ideas, Li et al suggest that current personal informatics tools do not provide sufficient support for self-reflection and set out to determine what questions users ask about their data, what tools they use to answer their questions, and how they deal with problems [12]. The authors came up with a set of six categories of questions:

- **Status** (What is my current status? Am I making progress toward my goal?)
- **History** (Am I making progress toward my goal? Long term, am I getting closer to my goal, moving away from it, or staying steady? How does my data from one period compare to another?)

- **Goals** (What goal should I set? (establishing a baseline first to determine what goal to set) How do I fix a problem? (already know the goal))
- **Discrepancies** (How does my current status compare to my goal? How can I change to reach my goal more effectively?)
- **Context** (What other factors may contribute positively or negatively toward my goal?)
- **Factors** (How do my behaviours contribute to my goal over a long period of time?)

Furthermore, the authors found these questions could be grouped into two different types of reflection phases – maintenance and discovery. In the maintenance phase, users already have a set goal and some knowledge of how their behaviour is affected by different factors. Question types addressed in the maintenance phase include status and discrepancy. In the discovery phase, users are exploring their behaviours to see how they are affected by different factors and do not have a specific goal. Question types addressed in the discovery phase include history, goals, context, and factors. Both the phases and the questions asked do not remain static, which is a challenge in designing tools to support self-reflection. One way in which researchers are addressing this is by harnessing the power of social networks.

2.1.2 Enhancing Personal Informatics Tools through Social Networks

One example of using social networks is Baumer's work on sharing health behaviours via a mobile application called VERA (virtual environments for raised awareness) [20]. In this application, users post health decisions, share whether they are positive or negative based on the context, and provide comments on the decision. Other users can view the posts and comment. The purpose of the application was to let the user determine their definition of health rather than

imposing a definition on them. The study found that although a number of instances occurred where users identified healthy behaviours that may not be deemed healthy by a medical professional, the social network provided a means of keeping the user accountable.

Bentley et al [21] have simulated natural language observations on data by creating a tool called Health Mashups. The tool aggregates manually entered (mood, pain, food, etc), sensor collected (such as data from FitBit), and environmental (calendar free/busy times, location at city level, weather) data daily and gives the user natural language observations based on trends. An example observation may be “You sleep more on cloudy days.” The goal of the tool was to provide accessible interpretations for users of varying experience and education. One problem with this, however, is that it can provide what users termed as 'obvious' feedback, which may cause users to abort their use of the tool if this happens too often. A simpler way to get natural language feedback on trends may be to leverage a social network as in Baumer's work with VERA [20] as well as Fritz et al's work with long-term users [22].

Fritz et al's study [22] focuses on the needs of long-term (3-54 month) users of wearable activity-tracking devices and found they differed from short-term users. In particular, they found that motivational features, changing activities and metrics, rewards, and *social interactions* were important to long-term users. It is important to consider support of both short and long-term users when designing a new system. Stawarz et al [23] take this further and suggest that personalization is important as well.

In Stawarz et al's study [23], the authors examine existing medication reminder applications and compare them to literature on how people integrate medication into their daily

habits without the assistance of an application. One of the design recommendations was that a more personalized approach can be beneficial in designing reminder applications to support routine creation, checking in, and support for disrupted routines. These behaviours can be supported by being accountable to another person.

Providing accountability and sharing information with others does not need to be a significant amount of work. In Truong et al's work [24], the authors focused on acquiring useful information from frequently repeating micro-tasks. This study looks at how replacing an unlock screen of a smartphone with a simple task can, over time, provide useful information in a variety of domains. In the case of personal data, reviewing a small subset of another person's data could be used as one of these tasks such that it is not a heavy burden to review the data infrequently and all at once. However, the first step is to find another person or people to review this data.

A study by Kittur et al [25] looked at how information gathering structures could be leveraged to decrease the amount of time it takes for someone new to a domain to create their own personalized structure. The authors used averages of expert knowledge maps to create basic structures from which new people can work to build their own knowledge maps. The major finding in this study was that by having access to a scaffold, new people were able to learn much more quickly than if they were forced to create their own knowledge map from scratch. Such knowledge structures could be created to help people review other people's data.

In summary, there are already a significant number of tools available which support collecting data manually or in a semi-automated or automated fashion. Some work has suggested how reflection on this data can be supported [11], [12]; however, it is not extensive. One

common suggestion for reflection is that social networks can be beneficial. However, it is important to understand how people learn to determine whether social interactions are beneficial from a learning perspective.

2.2 Learning Theories

There are a number of different ways to approach teaching and learning. The approach many people are most familiar with is called objectivism, which is based on the premise of an ultimate truth existing independent of experience [26]. This method is delivered in the classroom using instructivism where teachers use the objectivist view to teach a pre-defined curriculum which is passed on to the students, and students are expected to reproduce this view in examinations [27]. This approach, however, may conflict with what a student has experienced. An alternative approach to learning is constructivism, which allows students to interpret reality based on their experiences [26]. Constructivism acknowledges the existing knowledge base each learner has, which consists of their experiences and previous knowledge. When new knowledge is presented, it will be interpreted based on the existing knowledge base, which means the same information is learned differently by different people. Objectivism and constructivism are on two opposing ends of the learning spectrum. Objectivism is highly structured and therefore teachers are easily able to evaluate how much students have learned. Constructivism is unstructured and allows students to move at their own pace and according to their interests making it more difficult to evaluate [26]. Here, we will look at the evolution of constructivism and related theories and explore how it can be applied in personal informatics systems.

Maria Montessori created a constructivist-type curriculum in Italy for children. Her method focused on giving students the freedom to learn at their own pace according to their own

interests while the teacher acted as a guide. This method has become popular, and there are now many schools in existence worldwide which use the Montessori method [28]. However, the original curriculum was designed specifically for children, and research has shown there are differences in the learning behaviours of children and adults [27], which suggests other forms of constructivism may be better suited for adult learning.

How can social interactions be applied to adult learning given this constructivist approach? Two theories discuss this idea in detail. Piaget's social constructivist sociocognitive theory suggests that interactions between peers yields superior cognitive development to those of non-peers (for example, an exchange between two children or two adults is more effective than an exchange between a child and an adult) [29]. For this to be effective, it is important for each person involved to feel as though they are interacting with a peer rather than an authority figure. In a situation with adults only, this could manifest as a young adult feeling as though they should defer to an older adult due to age differences and cultural norms. Piaget suggests that through these peer interactions, there is the potential for upsetting a person's equilibrium causing them to re-evaluate their understanding of how things work, which is, essentially, learning [29].

Another social theory developed around the same time as Piaget's work is Vygotsky's sociocultural theory. In this theory, a zone of proximal development (ZPD) is described, which considers the difference between what a learner can accomplish on their own and what they can accomplish with assistance [29]. This is illustrated in Figure 2 where the outer circle includes all possible skills and the inner circle includes all skills in which the learner is competent. The circle between is the ZPD where the learner gets assistance from another person.

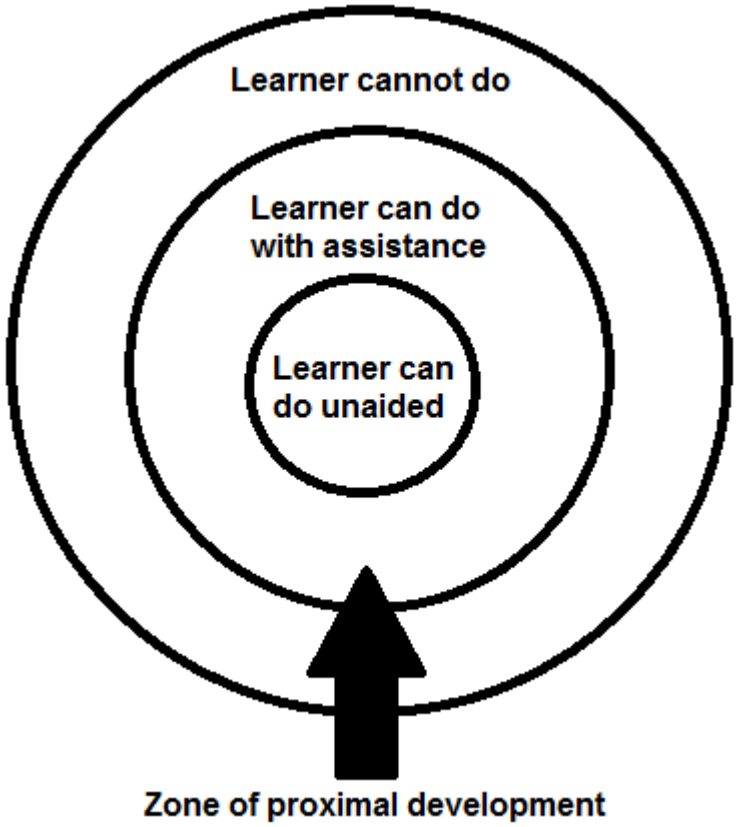


Figure 2.2: Vygotsky's Zone of Proximal Development

Similar to Piaget's suggestion that interactions between peers is important, Vygotsky suggests that it is important for learners to be matched in their level of development [29]. This creates the peer-driven environment in which socially supported learning can occur.

In *Introduction to Vygotsky*, Palinscar summarizes two studies on peer interactions and how they affect learning. In one study, peer interactions between grade 12/13 students were more successful than with grade 9 students [29, p. 359]. Here, the peer interaction appears more beneficial in older students than younger students, which is promising for an adult learning application. In a second instance, peer editing of stories without the assistance of a teacher resulted in more story elements used following collaboration [18, p.363]. For this case, peer support resulted in a higher quality product than that which was developed by only one person.

In terms of adult learning, this may indicate that by working together, learners develop a deeper understanding of and comfort with the topics presented leading them to feel more comfortable integrating them in their work.

Cercone and Cercone suggest [27] that using a hybrid of learning theories provide a better learning experience for adults. In their work, they bring together andragogy (experiential and self-directed learning) and the transformative learning theory (related to constructivism) to create a set of assumptions from which a set of design considerations for online learning systems for adult learners was developed. The considerations relevant to this thesis include [27]:

1. *Active involvement*. Adults prefer to have control of what they are learning and to use the knowledge in new ways often.
2. *Scaffolding*. Adults value having access to a support system which helps them advance their skills while still allowing them to be self-reliant.
3. *Contextualization*. Adults value connecting new knowledge to their past experiences. It is important for instructors to integrate support for applying new knowledge to past experiences.
4. *Practical value*. Adults are problem-focused in learning and value immediate practical application over background theory.
5. *Learner-centric*. Adults need to know what they will be learning, how learning will be conducted, and why the material is important to see how it applies to them.
6. *Safe environment*. It is important to provide an environment in which adult learners feel comfortable expressing their views and collaborating in a respectful and informal manner.

7. *Self-reflection*. Adults need to reflect on the learning process and should be given support to discuss how their learning is progressing.
8. *Collaboration*. Dialogue and social interactions are important for adult learners. Cooperation and collaboration with peers is encouraged.

These design considerations are highly learner-centric compared with the existing prescriptive approach used in many personal informatics applications. The focus here is to get learners to take control of their own learning process and interpret and understand their data based on their experiences to date. Based on the suggestions extracted from personal informatics literature in section 2.1 and the exploration of constructivism and related learning theories here, it is clear that collaboration and social interaction are very likely to be beneficial in the personal informatics reflection space.

2.3 Synthesis: Social Learning Theories for Personal Informatics

Recall that the context of this work is to understand how the reflection phase can be supported for personal informatics data. Based on the benefits of social constructivism and related theories, reflection activities involving collaboration and interpretation are presented here. This approach takes the design considerations from Cercone and Cercone [27] into account. Table 1 outlines high level activities in the study and the previously discussed theories which are relevant to each part of the study.

Table 1.1: Study Phases and Goals

Study Activity	Li et al's Stage-Based Model Activity [11]	Goal	Design Consideration
Pre-Study Questionnaire	Preparation	Determine knowledge of personal data collection	Active involvement, scaffolding, contextualization, practical value
Data Collection	Collection	Collect personal data of participant's choice	Active involvement, scaffolding, practical value, learner-centric, safe environment
	Integration Reflection	Review other participant data	Active involvement, contextualization, safe environment, collaboration
	Integration Reflection Action	Review own data given comments from another participant	Active involvement, contextualization, practical value, learner-centric, safe environment, self-reflection, collaboration, ZPD
Post-Study Questionnaire	Reflection Action	Evaluate what was learned in the study	Active involvement, scaffolding, contextualization, learner-centric, self-reflection

The first study activity (pre-study questionnaire) is used to determine the existing knowledge of personal data collection and also to encourage thinking about goals and what data could assist the participant in achieving these goals. The relevant stage in Li et al's model to which this is related is the *preparation stage*. The questionnaire provides an opportunity for participants to decide what their goal is and to start thinking about what data they can collect to achieve their goal. After the pre-study questionnaire has been completed, a welcome email providing further information is sent out along with a data collection template. This may provide the last piece of the preparation phase – determining how to collect the data. In terms of the design considerations, the participants are *actively involved* in the process by determining their goals

and what types of data they are interested in collecting. This freedom also supports *scaffolding* by letting the participants choose their own direction while providing a bit of guidance to get them started. Participants are also supported in getting *practical value* from the study and *contextualizing* the information by choosing their own path.

The data collection activity is comprised of three sub-activities – collecting data, reviewing another person's data, and reviewing one's own data. Each of these activities correspond to Li et al's stages and also some design considerations.

The first activity – collecting personal data – corresponds to Li et al's *collection phase* where participants are collecting the raw data for later integration, reflection, and action. Since participants are collecting data of their choosing to achieve a goal of their choice, they are *actively involved* in the process, receiving *practical value*, and are made aware of the structure and process of the study (*learner-centric*). With regular check-ins and assistance available as needed with the researchers, the participants have *scaffolding* available to help them in their data collection. Participants are provided with a *safe environment* in which to collect their data by having the freedom to collect the data as they choose with no interference.

The second activity – reviewing other participant data – corresponds to Li et al's *integration* and *reflection phases*. In order to reflect on the data, participants have to organize the data in a way that will support reflection. Again, participants are *actively involved* and can connect their reflections to previous experience (*contextualization*) while anonymously collaborating with other participants (*collaboration* in a *safe environment*).

The third activity – reviewing one's own data given another person's input – corresponds to three of Li et al's phases – *integration, reflection, and action*. At this point, participants organize both their data and the reflection from another participant in a manner which supports reflection (*integration* and *reflection*). Based on what they have learned from their own data and someone else's perspective on the data, they take *actions* on it for the next week's data collection. Since the interactions are anonymous, the participants are acting in a *safe environment* while *collaborating*. They are *actively involved* in the process by reviewing their data and eliciting trends to improve future data collection (*contextualization*, *practical value*, *learner-centric*, *self-reflection*). With the feedback provided from another participant, the participant is now acting in Vygotsky's Zone of Proximal Development, which, as mentioned earlier, is where they are learning with assistance, theoretically providing an enhanced learning experience. These latter two activities are what I call *shared reflection.*

Finally, the post-study questionnaire evaluates what was learned in the study. This is reflected in Li et al's *reflection* and *action stages*. At this point, participants review the entire period of data collection and short-term reflections and come up with an overall, long-term reflection. This is also a good point for participants to choose to continue with their data collection, stop collecting if their goals have been achieved, or modify their collection practices to work toward existing or new goals. Participants are assisted in the reflection stage by being asked a number of questions selected by the researchers (*scaffolding*). Again, participants are *actively involved* by being asked to *self-reflect* on their specific data collection experience (*learner-centric* and *contextualized*).

2.3.1 Shared Reflection

By integrating crowdsourcing in both the discovery and maintenance phases of reflection, people can receive multiple naive perspectives on a particular data set. This can be beneficial as it provides new ideas on collection practices and evaluation or resource suggestions from other people. By receiving this information, the owner of the data set may also think of additional ideas. This can be important for both the discovery and maintenance phases of data collection. Crowdsourcing is a kind of social interaction. For our purposes here, we will distinguish between the two – crowdsourcing is a one-off interaction between people and social interactions are more advanced relationships where there are multiple interactions between people. Social interactions can provide all of the benefits of crowdsourcing, but there is potential for deeper, more meaningful interactions. As people interact, they learn more about each other. This knowledge provides at least a partial context, which can change the way someone approaches analysis of another person's data. Furthermore, mentorship relationships may develop as experienced collectors step up to the plate to assist new collectors.

Through exploring different learning theories, social interactions appear to be quite important to adult learning. By combining personal tracking tools and technologies with crowdsourcing, it may be possible to achieve the social benefits of the previously discussed learning theories.

2.4 Summary

In this section, we explored the inspiration for the study, literature on learning theories, how existing work on personal tracking and crowdsourcing can be related back to these theories, and briefly some notes on the methods used. In the next chapter, we will examine the design of a

study based on the synthesis of these learning theories with existing work on personal tracking and crowdsourcing using the aforementioned methods.

Chapter 3: **Study Design, Results, and Analysis**

This chapter presents a study design that explores and illustrates how social learning theory can be applied to the design of personal informatics tools which support shared reflection. Chapter 2 demonstrated that there has been much research into supporting personal data collection using personal informatics tools. However, there is still limited work on supporting personal analysis of the collected data. Based on the theories articulated in Chapter 2, this chapter shows how I develop a basic framework for analysis of personal informatics data through the use of reciprocal feedback that I call *shared reflection*. The idea is that people engage in reflection and analysis of their personal data in two ways – by analyzing others' data and by receiving feedback from another person on their own data to consider in the analysis of their own data. As such, people develop analytic skills, as well as see how others might view their own data. The study presented here explores two questions:

1. Does analysis of another person's personal informatics data support one's own analytical process?
2. Does getting feedback from another person assist in one's personal analytical process and affect the approach to analyzing one's own data?

Although this process is more involved than strictly collecting data, participants developed a richer understanding of their own data both by exploring other participants' data and by receiving feedback on their own data.

Section 3.1 describes the particulars of the study continuing to address Thesis Objective 1 (synthesizing literature on personal informatics and learning theories) from Chapter 2 and also

addressing Thesis Objective 2 (designing a study based on learning theory synthesis). Section 3.2 presents the raw results of this study, which further addresses Thesis Objective 2 (executing the study). Sections 3.3 and 3.4 analyze the results of the study. Section 3.3 looks at the analytical process used to evaluate the raw data and section 3.4 presents the findings of the study.

3.1 Study

Recall that social cognitive theory considers how social relationships can be leveraged to provide accountability and assistance in achieving personal goals [29]. Adult learning theory based on constructivism and social constructivism focuses on encouraging learners to fit their goals into their current knowledge infrastructure and to evaluate what they have learned through self-evaluation [27]. Here, the intention is to determine whether providing feedback exchange between participants can enhance understanding of personal data.

In this study, analysis of personal informatics data was supported by three points of contact with the data:

1. *Anonymous reflection.* Participants received another person's data on which they were asked to generate feedback to the person collecting the data. The data collector was asked to provide a goal, which helps provide a lens for participants to interpret the data. By being asked to reflect on this data, the participant was required to provide another perspective on data collection and interpret the data based on what (s)he saw and his/her past experiences (constructivist approach [26]). In viewing another person's data, participants may recognize areas in which they could improve their own data collection processes (i.e. re-evaluating understanding of how things work [29]).

2. *Receipt of anonymous comments.* Participants receive anonymous feedback on their data. This alternate perspective may provide insight into how to analyze the data, validate some of their own analysis, or see an entirely new way to view their data. Participants were asked to provide a goal each week. As adults are goal-oriented [27], this was meant to keep the goal in mind for the data collector as well as anyone reviewing their data.
3. *Personal reflection.* Finally, participants are asked to reflect on their data after being given this feedback. Explicit self-reflection is an important step in the learning process for adults [27]. By receiving comments from others and then reflecting on their own progress each week, the participants can continuously evaluate their progress. In addition to continuous evaluation, anonymous comments might provide a sense of social interaction, which is also important for adult learning [27].

Each point of contact with the data was integrated into the data collection process such that participants were regularly engaged in submitting data, reviewing data from other participants, receiving feedback from other participants, and reflecting on data and received feedback.

3.1.1 Participants

The goal of this study was to determine whether shared reflection was a viable method to improve personal informatics tools. As such, I was not looking for inferential statistical power and hoped to recruit participants comparable to numbers from other studies (ranging from 30-83 participants in the main study and approximately 15 for the interview study) [11], [12], [13], [14]. Recruitment proved to be a challenge, however, and a total of 15 participants were recruited for the main study. Four additional participants were recruited for a pilot study and two of the participants in the main study began in the pilot study. Participants were recruited via public

advertising spaces, email lists, Meetup groups, presentations, and in-person. Advertisements asked for people who were 18 years of age or older, interested in data collection (whether they currently collected data or not), and interested in learning more about themselves. Potential participants were told they would complete two questionnaires (<15 minutes) and participate in six weeks of data collection. Remuneration was advertised as a draw for $100CAD. Participants were entered in the draw on completion of the study. Due to slow recruitment, this was later updated to include a maximum $20CAD incentive for completing the study according to the following schedule:

- Pre-study questionnaire: $2
- Week 1 submission: $1
- Week 2-6 submission: $3 ($1 for each of log submission, shared reflection, and personal reflection)
- Post-study questionnaire: $2

Payment was made on completion or withdrawal from the study in the form of an Amazon gift card to the regional site of the participant's choosing. Before starting the study, participants were given an online consent form to review. By clicking the button at the end of the page, participants agreed to participate and were directed to the first page of a questionnaire.

3.1.2 Procedure

This study was designed as a six-week field study consisting of three parts. The results of a pilot study indicated that it would not be useful to compare results with a control group (outlined in Section 3.1.3); consequently, all incomplete participants in the main study were placed in the experimental group. Figure 3.1 illustrates the phases and activities of this study.

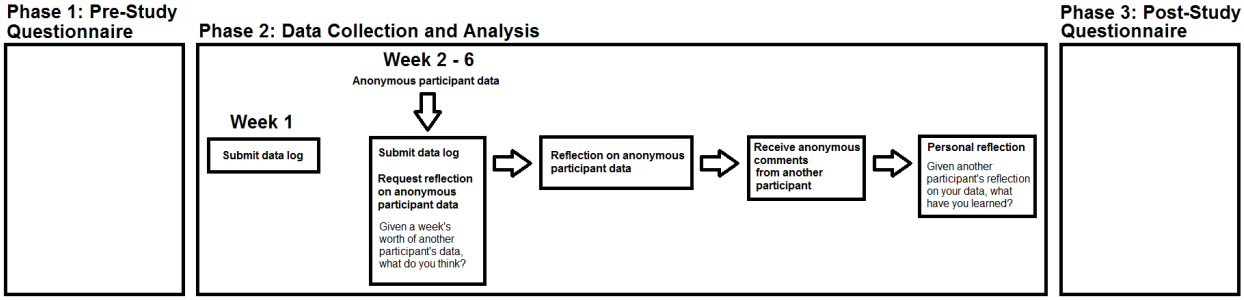


Figure 3.1: Study Phases and Activities

Phase 1: Pre-Study Questionnaire. The first part of the study consisted of an online pre-study questionnaire collecting demographic information, experience in data collection and current practices (if any), and a structure to help participants identify personal goals for the study (i.e. what data would they collect and to what end). The pre-study questionnaire can be found in Appendix A.1.

Phase 2: Data Collection and Analysis. For six weeks, all participants collected data. Data collection consisted of participants completing an activity log (using the provided template as in Appendix A.2.2 if needed). Participants were free to choose which type(s) of data they were interested in collecting to give them control over the process and allow them to collect something which was practical. Furthermore, I was interested to see whether naïve perspectives would result in useful feedback for the shared reflection part. At the end of each week, the researchers reminded the participants to submit their data collection logs.

Starting at the end of week two through to the last week, the participants were given a second activity to complete. In addition to submitting their own data logs, participants were given a week's worth of data from another participant in the study and asked to provide feedback on it (i.e. by writing a paragraph of text). Once they submitted their feedback to the researchers, it was returned to the original owner anonymously. The original owner would then be asked to

study and reflect on this. For example, Alice provides feedback on Bob's data; when she returns it, Bob sees the anonymized feedback, and submits his own reflection on what he has been given. Each week, participants are given the data of a different participant if possible. These activities were repeated each week until the end of week six. Appendix A.2 provides email templates for the welcome email and weekly data collection, shared reflection, and self-reflection emails. Phase 2 in Figure 3.1 shows the workflow of the data collection part of the study.

Phase 3: Post-Study Questionnaire. After the last week of data collection was complete, participants completed a post-study questionnaire which asked them to reflect on what they had done and learned over the last six weeks. The purpose of the questionnaire was to allow participants to self-evaluate what they had learned, which is an important part in adult learning [27]. A copy of the post-study questionnaire can be found in Appendix A.3.

3.1.3 Pilot Study

The procedure in Section 3.1.2 was informed by an earlier pilot study where my intention was to compare this condition (D) with an additional two experimental conditions (B and C) and a control condition (A). These conditions are outlined in Table 3.1. Briefly, the control condition is equivalent to what happens today—reflection occurs on an ad hoc basis when participants choose to do so. The experimental condition B primes participants to consider reflection by asking them what they have learned each week. Experimental condition C explores whether regular, targeted reflection on one's own data is sufficient to promote useful, effective learning. Experimental condition D is equivalent to the procedure I chose in the end, and it asks participants to reflect weekly on others' data as well as their own.

Table 3.1: Pilot Study Summary

Group	Tasks	Number of Participants
A	• Collect data for six weeks	1
B	• Collect data for six weeks • After week one, answer a question on what they have learned so far	1
C	• Collect data for six weeks • After week one, receive prompt to go back to a certain week and reflect on the data • After week one, answer a question on what they have learned so far	2
D	• Collect data for six weeks • After week one, receive another participant's data on which to reflect • After week one, receive feedback from another participant and answer a question on what they have learned so far	2

As detailed in Table 3.1, six participants were recruited for the pilot study. Based on the post-study questionnaire, both participants in group D expressed that they enjoyed their experience while those in the other groups provided more neutral or negative comments. For example, some of the comments from groups A to C were that participants identified data processing as a boring activity, the experience was interesting, keeping track of data is hard at the beginning but becomes easier, and submitting Word documents was unpleasant. Both participants in group D mentioned the experience was enjoyable and one participant even expressed surprise in how much they enjoyed the study. In terms of what participants learned about data collection, one of the participants from group D mentioned their knowledge grew, especially from looking at other participant's results. Participants in groups A, B, and C did not experience a change in their understanding for the most part; however, one participant did note they developed a better understanding of the importance of reviewing data. When asked if they achieved their objectives for the study, half of the participants in groups A, B, and C reported success whereas both of the

participants in group D were successful in achieving their objectives. The results from groups A, B, and C were consistent with much of the existing literature on personal informatics such as Wellness Diary [16] and the benefits to the participants minimal, so these groups were dropped for the main study. Both of the participants in group D were merged into the main study as there were no changes made in the execution of the study for that group.

3.2 Results

In this section, I report on the objective measures from my study, namely the pre-study questionnaire, the post-study questionnaire, and report on the nature of the data that was collected by participants.

3.2.1 Initial Questionnaire

A total of 19 participants completed the study, 4 of whom were in the pilot study. The results presented here represent the 15 participants from the main study.

Demographics. Of the main study participants, 60% identified as female and 40% identified as male. Ages ranged from 20 to 74 years of age with a median age of 38. Participants were located across Canada and the United States.

Data Collection Experience. In the next section of the questionnaire, participants were asked questions about their current data collection behaviours. Ten participants already collected data, four people did not collect data, and one person refrained from answering the question. Of those who collected data, they reported collecting a variety of data, including work hours, finances, diet, photos, recipes, physical activity, weight, radio listening habits, books, sleep, program data, and headaches. Participants reported they collected that data as needed, daily, occasionally, or weekly depending on the nature of the data.

Three participants reported using digital devices (e.g. worn sensors) to aid collection while 11 did not and 1 refrained from answering. Of those who did not use sensors, data was logged immediately following the activity, daily, within a day or two, or a couple times per week. This data was logged on paper such as a diary (5/11), in a spreadsheet (4/11), using an app (2/11), or via another method (1/11).

Of the participants who collected data (3 refrained from answering), most mentioned reflecting on it (9/13). Some (3/13) mentioned they were collecting data for another person, so they returned the information to the other person after collecting it. Only one person did not do anything with their data after collecting it. One participant collected multiple types of data and used different techniques for dealing with it, which accounts for the extra answers provided here (totalling 16). When asked if they reviewed their data (3 refrained from answering), most participants (7/12) affirmed they reviewed their data. A few (4/12) participants sometimes reviewed their data and one participant did not review their data. When asked how often they reviewed their data (4 refrained from answering), the results varied from as needed to occasionally. Table 3.3 shows the number of participants who reviewed their data in each frequency:

Table 3.2: Frequency of Data Reflection (14 total answers)

Frequency	Number of Responses
Daily	2
A few times per week	2
1-2 times per month	3
As needed	3
Occasionally	2
Unsure	2

Note: Some participants collected multiple types of data and reviewed the types at differing frequencies, which accounts for the difference. (18 answers instead of 15)

Goals for Participation. The third part of the questionnaire was set up to get participants thinking about what they would be doing in the data collection phase of the study. The first question asked what participants were interested in collecting data about and the responses included work, reading, exercise, diet, weather, sleep, opinions, practice, unknown, gas, communication, learning, and mood. There were various reasons for collecting this data including curiosity/self-interest, awareness of current status, long-term trends, fun, quality of life, self-improvement/to achieve goals, and to explore cause and effect relationships. When asked to evaluate their current level of knowledge (1 refrained from answering), two participants identified themselves as knowing nothing about data collection and the remainder were split evenly between knowing a lot and a little (6 in each) about data collection. The final question in the quesitonnaire asked what participants were expecting to learn from the study. Responses included results of data analysis, what data collection can yield, keep on track for meeting goals, unsure, better ways to collect/analyze data, understand their own reasons for collecting data, good collection habits, and staying motivated.

3.2.2 Data Collection

Participants were asked to identify data they were interested in collecting for the duration of the study. Although many participants chose to track one type of data, some participants experimented with multiple types either dropping some as they discovered they were not relevant after a few weeks or completely changing what they were collecting. The data collected for this study per participant is outlined in Table 3.4.

Table 3.3: Summary of Data Collected by Main Study Participants

Participant	Data Collected
P1	Physical activity (6 weeks)
P2	Food (5 weeks), time (6 weeks)
P3	Teaching effectiveness (6 weeks)
P4	Physical activity (2 weeks), mileage (4 weeks)
P5	Physical activity (6 weeks)
P6	Physical activity (6 weeks)
P7	Screen time (6 weeks)
P8	Physical activity (6 weeks)
P9	Music practice time (6 weeks)
P10	Wearing aligners (3 weeks), physical activity (3 weeks), physical ailments (6 weeks)
P11	Physical activity (2 weeks), study time (6 weeks)
P12	Weather (6 weeks)
P13	Food (6 weeks), physical activity (4 weeks)
P14	Physical activity (6 weeks)
P15	Mileage (6 weeks)

Over the course of the study, one third of participants changed the data they were collecting in some way. Some people found that the data they initially chose to collect was not getting them the information they were hoping for, so they completely changed their goals and data type. Of the participants who changed the data they were collecting, most of them (60%) made their modifications in week 3. It is interesting to note that all of these participants were also collecting multiple types of data. Other participants refined their initial goal as they learned the benefits and drawbacks of what they initially chose to collect. The remaining two thirds of the participants stayed with the same type of data throughout the study and made minor changes to their collection practices if any.

3.2.3 Final Questionnaire

The goal of the final questionnaire was to get participants to self-evaluate what they learned over the course of the study. Each participant came into the study with different background knowledge and goals in mind. Self-reflection is an important part of adult learning [27], and by

self-evaluating, participants were evaluated by the person in the best position to do so – themselves.

A total of 19 participants completed the final questionnaire, four of which were in the pilot study. The results of the 15 participants from the main study are the primary focus here.

Objective Fulfilment. Of the fifteen responses, twelve participants felt they achieved their objectives. One participant felt their data collection did not help them achieve their goal while two participants did not achieve their original goal because they changed goals during the study. Of the people who changed goals, one person mentioned they achieved their alternate goal, so this was included in the count for participants who achieved their goals. One participant did not recall their original goal and did not elaborate, so their response was categorized as undefined.

Knowledge of Data Collection. When asked if their understanding of data collection had changed over the course of the study, nine of the participants felt their knowledge had improved. Of these nine, one participant felt their knowledge changed only slightly while the remaining eight felt it had changed a fair amount. Five participants didn't feel as though their understanding had changed. In their responses, they mentioned previous experience as a contributing factor to this. One participant even highlighted that they know the same amount, but realized they know more than they thought they did. One participant did not respond to the question.

From the pilot study participants, three of the four did not feel as though their understanding had changed. One person mentioned review of data as important in data collection.

Learning Expectations. Thirteen of the fifteen participants felt as though their learning expectations were met. One participant did not feel as though they met their expectations from the beginning of the study and one person provided an undefined response. Three of the four pilot study participants also felt as though their leaning expectations were met.

Of the participants who felt their expectations were met, some (2/15) mentioned that interactions with other people was a great motivator for them to continue collecting data. Another participant received results they were not expecting, but they still managed to achieve their learning objectives.

Overall Learning. When asked what they learned in the study, participants answered the question in a variety of ways. Some focused on what they learned from their data (5/15) while others focused on what strategies and techniques they learned (10/15). A few of the participants (3/15) highlighted interactions with other participants in some way in their responses. These people found it interesting to see what other people were doing and also felt more motivated to keep up with their data collection when they knew they would be held accountable.

Three of the four pilot study participants felt as though they didn't learn much if anything during the study. One participant felt they learned something about their habits.

Overall Experience. An interesting finding in the answers to this question was how often the word 'enjoy' was used to describe the overall experience. Five of the fifteen participants explicitly used the word in their comments. Some highlights from this section included enjoyment giving and receiving comments to and from other participants and enjoyment in collecting the data.

Five of the participants expressed consternation or provided suggestions to improve their experience in the future. One participant enjoyed the anonymity of the study but expressed an interest in engaging in further conversation with their data matches. Another participant's data submissions got ahead of the reflections on the data. A third participant felt they learned everything they could in the first half of the study and did not have much to contribute for the second half. The fourth major comment was from a participant who felt they received a lot of negative feedback in their comments because the commenters did not have a good understanding of the participant's situation. Finally, one person expressed disappointment in the types of comments they received from others. They were hoping for more thorough feedback.

Other Comments. Five of fifteen participants chose to refrain from answering this question. The remaining participant comments were mostly re-iterating comments they had previously made. One participant expressed an interest in learning what other people did during the study and their responses. Another person commented on the mechanics of the study itself.

3.3 Analytic Process

Each week, participants were asked to give feedback on another participant's data and reflect on feedback they received from someone else on their own data. This data was analyzed to see what kinds of feedback participants provided to others and how participants responded to this feedback and reflected on their data.

For this study, we used the comparative analysis technique to code the data [30]. The set of codes was provisional allowing it to change as more participants completed the study and were analyzed. Two sets of codes were elicited – one for the feedback on another participant's data and one for responses to the feedback and evaluation of one's own data. Many of the codes

overlapped, but there were some differences. The process for evaluating the feedback and responses to the feedback was the same, so only the feedback evaluation will be described here.

The feedback was divided into phrases. Most phrases were complete sentences although some sentences contained multiple phrases. Each phrase was evaluated and assigned a code. This process was repeated for all phrases in all weeks for each participant adding codes to the master list as needed. Once the initial coding was done, a second researcher reviewed the codes for consistency and validation.

For example, when coding a phrase from a participant ("The amount of data collected is sustainable, but if other sorts of data could also be collected, it may help narrow down causal variables."), this phrase would be coded with two different codes. The first part of the phrase ("The amount of data collected is sustainable") would be coded as an *Observation*. The second part of the phrase ("if other sorts of data could also be collected, it may help narrow down causal variables.") would be coded as a *Suggestion*.

The purpose of the codes is to provide a shorthand for the massive amounts of textual data that needed to be analyzed. From here, the codes are grouped into conceptual themes to provide insight into the nature of the overall picture of the data.

Perspective. My orientation toward this data is from the perspective of a socio-technical designer. My interest is in understanding whether they gain insight into their own data that they would not have on their own, and, if so, the kinds of insights that they gain. I am interested specifically in whether tools can be built to support this kind of reflective process.

3.4 Findings

This section presents the major findings from the data collection part of the study. We'll first look at the codes used to interpret the comments and responses and then the results based on the coded data.

3.4.1 Final Codes

Two sets of codes were created – one for comments on another participant's data and one for personal reflections. Table 3.5 and 3.6 show each set of codes, the criteria which led to the coding of a particular phrase, and an example from the study data.

Table 3.4: Codes for Commenting on Another Participant's Data

Code	Description	Example
Observation	Re-iterating the data	I'm not sure I got everything, but what I got was related to aligners being in or out, pushups, what foods were affecting tinnitus.
Extrapolation	Interpreting the data	I assume it's a teenager or young adult.
Suggestion	Ideas to make changes to data collection or interpret data	I may suggest changing the ringing scale to 5, with 5 being worst and 0 being non-existent.
Sharing	Providing resources such as books, articles, etc or referencing personal experience	I did similar food tracking...and it helped a lot
Support	Providing words of encouragement	This is a great data sample.
Clarification	Asking questions to better understand the data or person collecting the data	How long has this person been collecting data?
Shout Out	Request for information from others	Anyone know any exercises to relieve the symptoms ... in my thumb, especially?

Table 3.5: Codes for Personal Reflection

Code	Description	Example
Response	Addressing comments provided by another participant	Thanks for the comments, which, obviously, someone put a great deal of thought into before expressed.
Observation	Re-iterating the data	The main data I'm concerned with is distance and speed
Extrapolation	Interpreting the data	While the scale doesn't show much improvement, I believe my energy level and overall health and well-being has improved
Re-evaluation	Revising data collection or evaluation methods	The first...offered some time management advice, where the second...offered a method of improving my training tracing through the addition of including comments. I am hoping to put both into practice.
Speculation	Guessing what could happen in the future	I had hoped that adding exercise, without changing my diet, would result in more weight loss
Sharing	Providing resources such as books, articles, etc or referencing personal experience	The following study, which I just completed, inspired an engrossing piano practice session afterward

3.4.2 Evaluating Coded Results

The comments from other participants mostly fell under three categories – support, suggestions, and observations. Participants seemed eager to help others out as much as possible and often tried to make sense of the data by writing out their observations. Here is an example:

> "It looks as though there are 2 weeks of data from a runner/jogger keeping track of distances run, both with a partner and alone, in order to increase endurance & cardiovascular performance, with the goal of working up to 50 km (31.0686 miles), "even ONCE A DAY!"." - from P9's analysis of P4's data (code: observation)

Based on their observations, they offered suggestions to improve data collection practices and also words of encouragement to the other participant such as:

> "... one thing I would suggest is trying to use other sensors, such as heart rate monitors etc. to find an approximate calorie deficit created by the exercise" - from P11's analysis of P14's data (code: suggestion)

There were also some instances where participants shared knowledge and resources with their data partner for the week. This included anything from sharing personal experience to suggesting books or articles that might be useful.

> "... I did some research on practicing habits and such when I was starting out and I found this helpful article on making the most of practice time, it is attached, maybe it will help this participant as well." - from from P1's analysis of P9's data (code: sharing)

Some of the participants attempted to extrapolate on the data and make sense of what was going on. In these cases, they often wished to clarify their understanding with more background information on why the data was being collected and the history of the collector:

> "Screen time, I am guessing might include watching tv/movies, computer work/email/internet, and gaming." - from P6's analysis of P7's data (code: extrapolation)

There was one instance in which a participant actually asked a question about their own data in the context of responding to another person's data (shout out):

"Anyone know any exercises to relieve the symptoms (numbness, tingling, pain) in my thumb, especially?" - from P9's analysis of P4's data (code: shout out)

Figure 3.2 shows the distribution of comments for each category.

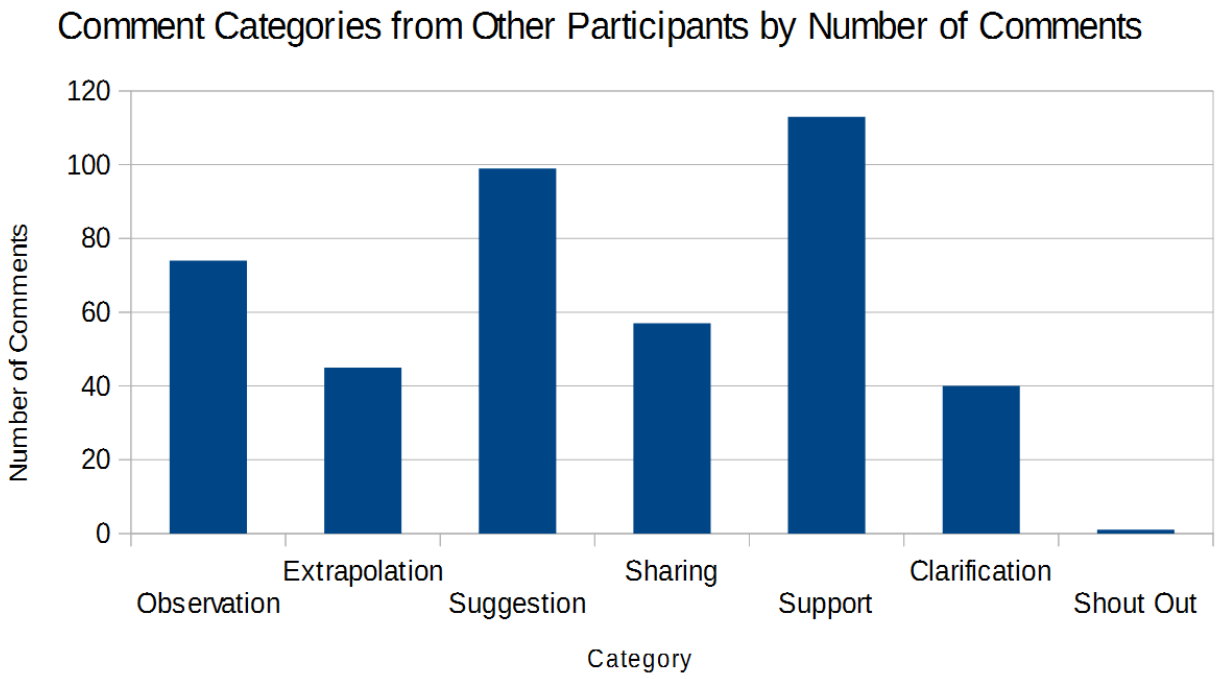


Figure 3.2: Coding Categories for Evaluating Another Person

When evaluating their own data, participants tended to spend a lot of time acknowledging and responding to the comments provided by other participants:

"Thank-you for the nice comment on my data. I just use it for year to year comparisons of the date and what the weather was like the previous year..." - from P12's reflection on P15's analysis (codes: response and response)

They also evaluated their data to determine trends in order to make changes in their daily lives:

> “Through week three, I learned I wake-up later if I spend less time with backlit screens at night: r=-0.78 (r^2=0.6).” - from P7's reflection on P9's analysis (code: extrapolation)

Interestingly, there were a number of instances of sharing comments where it seemed as though the participants wanted to carry on a dialogue with their data partner for the week:

> “I want some sort of anonymous discussion with the person.” - from P2's reflection on P8's analysis (code: response)

There were some instances of participants making observations about their data, but it was nowhere near as prevalent as when other people were trying to make sense of their data:

> “My weight fluctuates a lot” - from P5's reflection on P10's analysis (code: observation)

Other comments made by participants included re-evaluating their methods based on other participant’s comments or their own extrapolations and speculations on what may happen in the future if they were to perform certain actions:

> “This would be something I would consider making a diary of to incorporate it with my lifestyle after I am in the routine. I think if I was to make recording to much information at this point would perhaps work in reverse for me as I don’t want to make this a “make work” activity.” - from P8's reflection on P2's analysis (codes: re-evaluation and speculation)

It should be noted that although these are the general trends, there were differences[1] among participants that deviated from the norm. For example, one participant's responses contained a lot of sharing, but very little response to their data partner's comments. Figure 3.3 shows the distribution of comments for each self-reflection category.

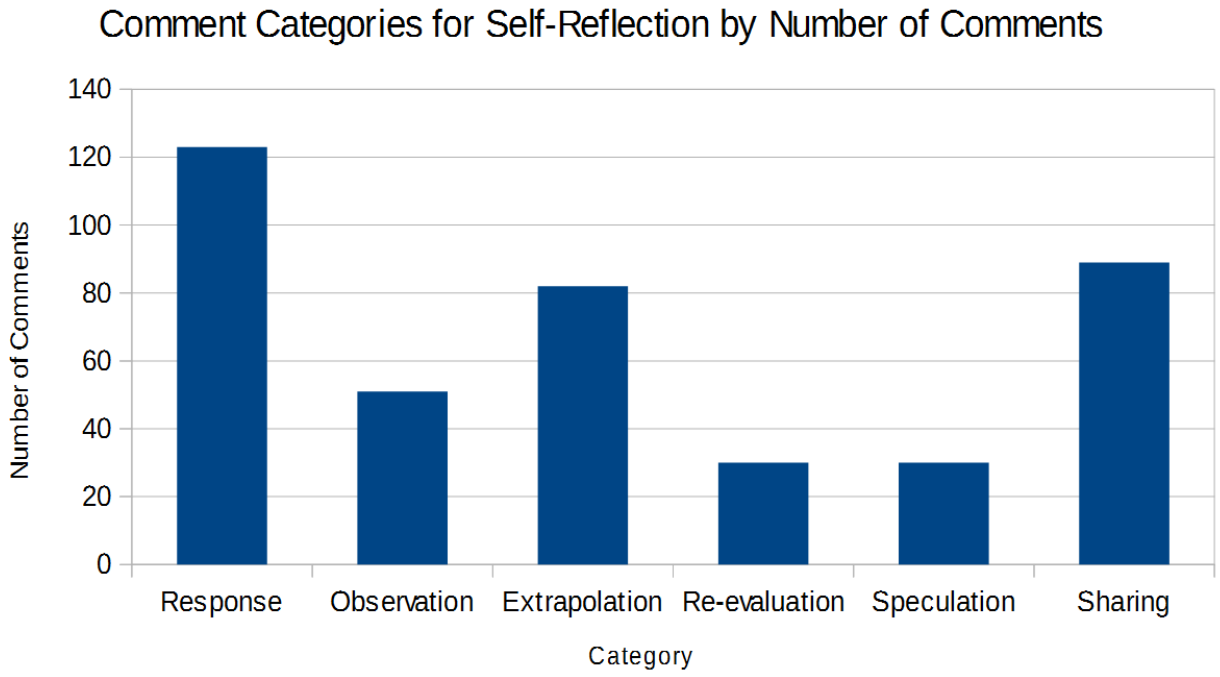


Figure 3.3: Coding Categories for Self-Reflection

Previous literature has shown that there are differences in the way male and female brains process information and solve problems [31]. By looking into gender differences, there were some interesting trends from the perspective of people reviewing others and themselves. To start, let's look at how participants responded to other people's data (Figure 3.4).

[1] Differences are descriptive rather than of statistical significance.

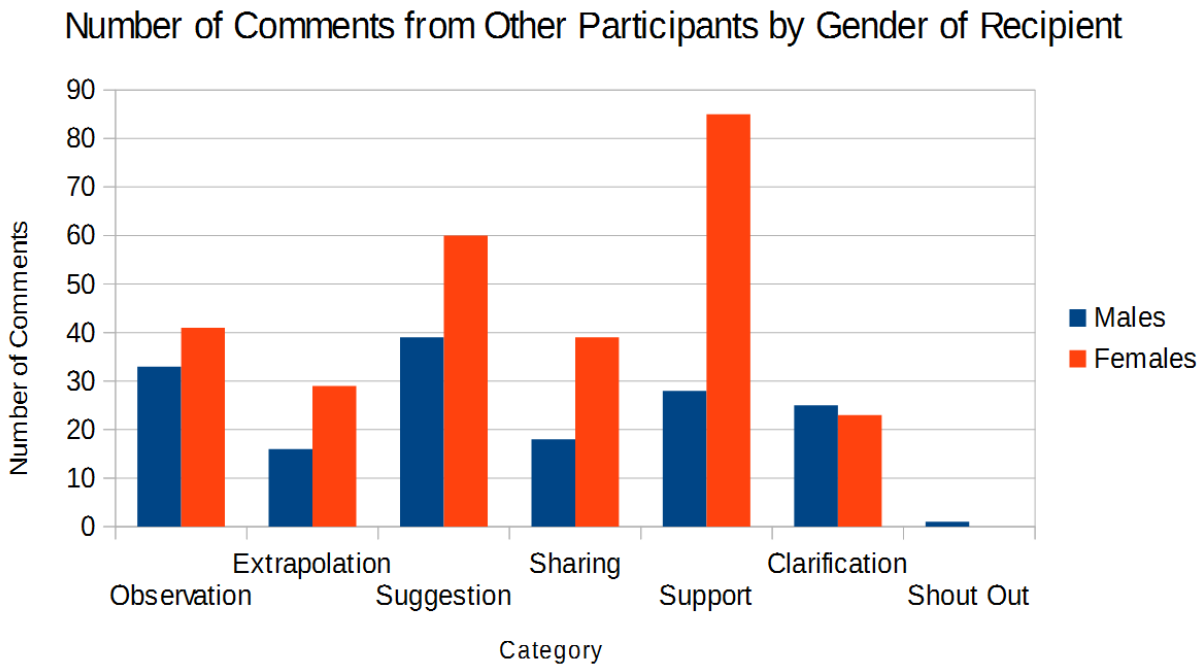


Figure 3.4: Categories by Gender of Recipient

This graph shows the types of comments given to male and female participants by mixed gender participants. It is interesting to note that significantly more supportive comments were given to females than males. Requests for clarification and making observations were similar across genders and there was not a significant difference between genders for other categories.

Self-reflection between genders also showed some interesting results (Figure 3.5). By looking at the figure, it's interesting to see that both males and females responded to comments from other participants, made observations, and re-evaluated what they were doing nearly equally. Females tended to make more sharing and extrapolation comments than males.

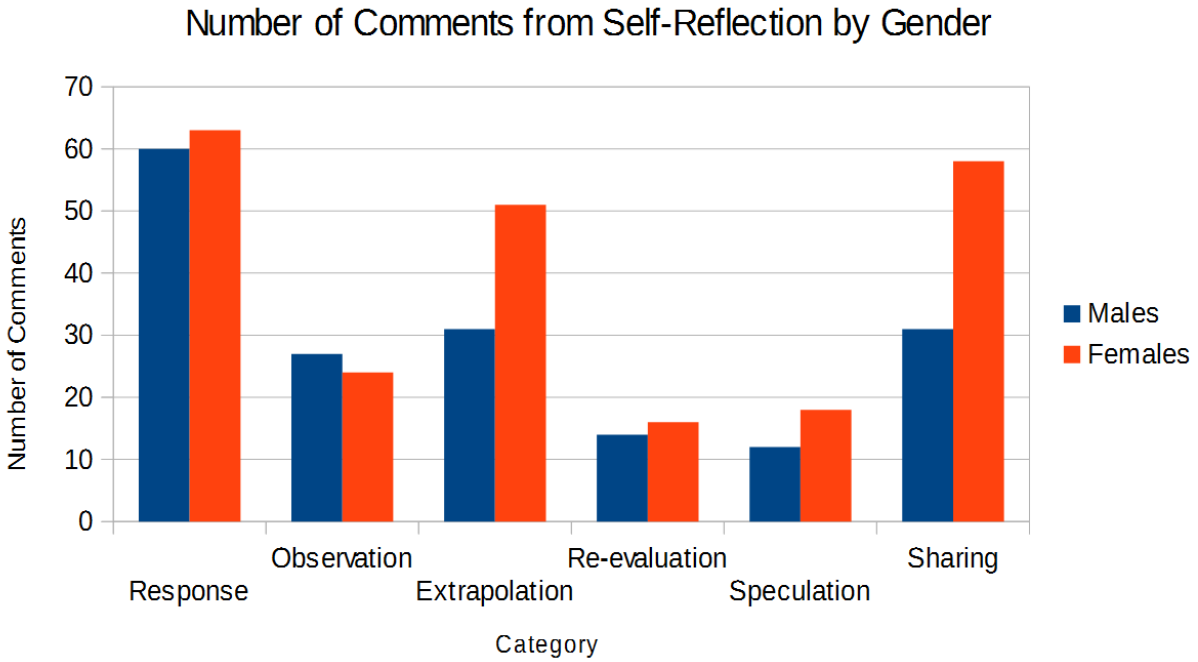


Figure 3.5: Self-Reflection Categories by Gender

In terms of age differences, the youngest participants consistently received more comments from their data partners than either of the other age groups (Figure 3.6). There were 6 participants in each of the 20-36 and 37-52 age groups and 3 participants in the 53+ group.

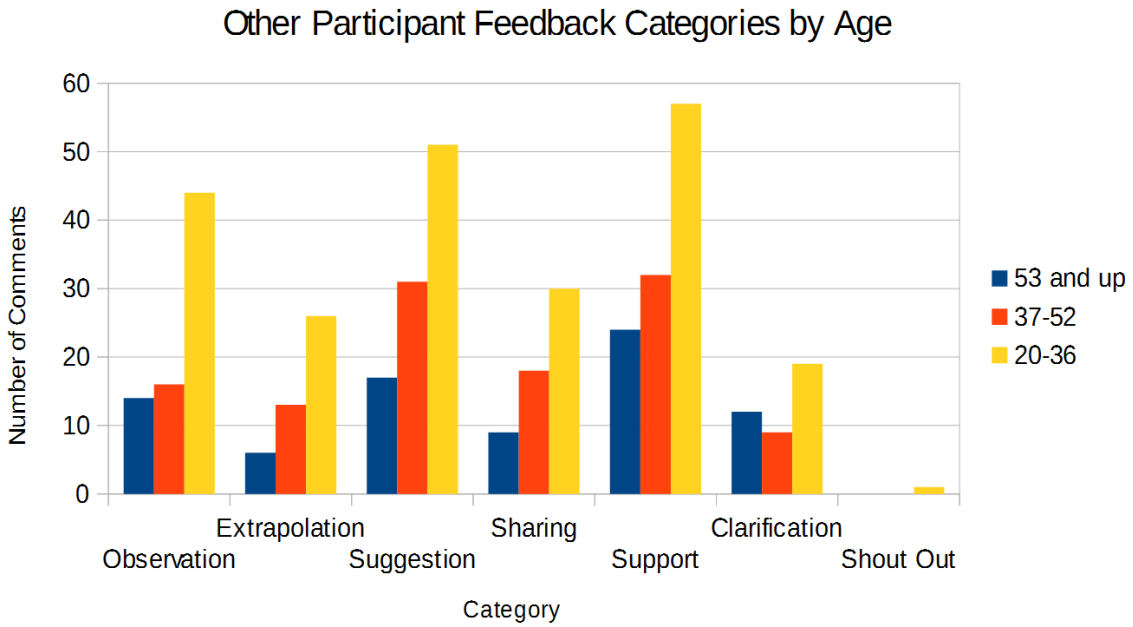


Figure 3.6: Other Participant Feedback Categories by Age

From a self-reflection perspective, the middle age group tended to share and extrapolate on their own data more than the other two age groups. Both the youngest and middle age group responded to comments more than the eldest group (Figure 3.7).

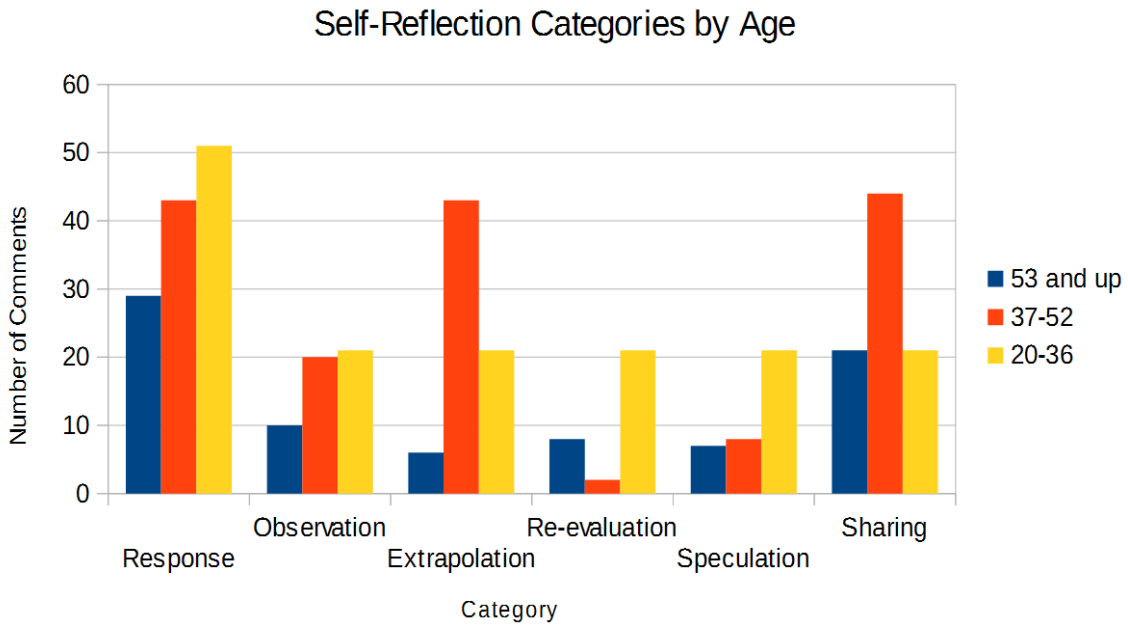


Figure 3.7: Self-Reflection Categories by Age

When participants were responding to comments, they seemed to either extrapolate or respond and share for the most part. Only two participants did not exhibit this behaviour. From this, I would expect most data collectors to be interested in either interacting with other people about their data or coming to their own conclusions about what they have collected. I suspect the minority will value both the social and solo data evaluation aspects.

3.4.3 Summary

In summary, two sets of codes were developed for comments – one for participants commenting on other participant data and one for participants commenting on their own data.

Comments received from other participants were mostly of three types – support, suggestions, and observations. When commenting on their own data, participants tended to

respond to comments from others, extrapolate interesting trends from their data, and share resources to supplement their comments.

In terms of gender differences, participants tended to provide more supportive comments to female data collectors without knowing the gender of the person to whom they were providing comments. When doing personal reflections, females tended to share and extrapolate more than males.

Participants tended to provide a lot more feedback to the youngest participants. As participant data was anonymous, this occurred without knowledge of the age of the person to whom the participant was providing feedback. Those participants falling in the 37-52 age range extrapolated and shared more in their personal reflections than other age groups.

3.5 Exemplars

This section presents commentary on some of the events that occurred during the data collection phase of a select number of participants. The participants chosen for this section include one with no experience collecting data, one with a limited amount of experience collecting, and one with significant experience collecting data, which demonstrate a number of different perspectives. The complete data sets for each participant can be found in Appendix B.

3.5.1 No Data Collection Experience: Esther

Esther identified as someone who had not previously collected data nor knew anything about collecting data. For the duration of the study, Esther collected the same type of data and maintained the same goals – to improve musical performance through practice. This type of collection represents a total of nine participants in the study. Her data set can be found in Appendix B.1.

Esther's data was intriguing to follow. She used the provided template without modification, which in itself was not overly interesting. Her responses to comments, however, were very interesting. Periodically throughout the study, Esther would provide extra information in the form of notes or resources when she submitted her data. Notably, this occurred in Week 1 with a quick note on the data, and Week 4 with a reference to another study through which she provided some context to her data. Additionally, Esther provided an article and sound clip in her response to the Week 1 commenter. In Week 4, Esther's commenter also provided an article for her to which she responded with some additional information and links. Each week, Esther's comments were thorough and often rife with little snippets of what inspired her or links to whatever she was thinking about at the time of commenting.

Esther addressed issues and questions raised by her weekly commenters and, as in Week 5, further shared her collection practices. In this case, the commenter suggested recording herself play to determine difficult sections to practice in order to optimize practice time. In her response, Esther acknowledged these comments and also explained how she integrated comments and resources from others into her regular practice space for easy reference.

In the post-study questionnaire, Esther mentioned that seeing other participants' data logs were helpful to her in terms of seeing what other people collected. She felt that she learned a lot about herself throughout the study including what factors affected her practices. Another point Esther made was that she was more motivated to continue practising regularly due to keeping regular logs. She was also interested in finding out what other people in the study had learned, which hints at an interest in some sort of interaction with others.

This exemplar illustrates how someone with no knowledge of data collection can get started. Esther was able to learn by seeing other examples of data collection as well as through comments from participants. This case is particularly interesting because of the number of resources shared by Esther on a regular basis as well as the instance of another participant sending her resources as well.

3.5.2 Limited Data Collection Experience: Sarah

Sarah identified as someone who collected and reviewed data, but did not know much about data collection. Initially, Sarah collected three types of data. She collected information about aligners (an alternative to braces) usage to ensure she was using them the recommended 20-22 hours per day, ear aches to determine what factors might instigate them, and pushups to strengthen her arms. As the study progressed, she dropped the pushups data collection because it was not working for her and the aligners because she was satisfied with her current status. She also refined her ear ache tracking to determining which foods cause the ringing to get worse, which is on what the majority of the data collection focused. Sarah's experience represents three of the participants in the study. Her data set can be found in Appendix B.2.

Sarah's journey is particularly interesting when looking at the evolution of the data collection. At the beginning of the study, she was collecting data on three different activities. As the study progressed, she figured out which types of data were most interesting to her while removing unnecessary information. She took comments from other participants under consideration and acted on some of the suggestions such as modifying the intensity scale from 1-10 to 1-5 from Week 4 to Week 5. Other suggestions, however, were not taken into account such as the suggestion to convert minutes to hours made in Week 3. In the post-study questionnaire,

Sarah expressed that she felt as though she learned a lot from the study. In particular, she identified that learning the right kind of data to collect was very important and is clearly reflected in the evolution of their data collection over the six weeks presented here. Although Sarah identified goals at the beginning of the study, these goals did not remain static. In the post-study questionnaire, she stated she did not fulfil her objectives from the pre-study questionnaire; however, she also acknowledged her goals had changed and that she did meet her goals in some other areas. Esther also acknowledged the benefits of seeing what other people were doing in their personal data collection practices.

This exemplar illustrates one way in which someone with self-identified minimal knowledge of data collection can explore personal goals and refine activities to align with personal values and objectives. In Sarah's case, there is clear evidence of exploring different types of data collection, refining goals, and reacting to other people's feedback by both accepting and rejecting suggestions.

3.5.3 Significant Data Collection Experience: Tarquin

Tarquin identified as a person who collected data without sensors. He had previous experience, but had never collected personal data in such depth. Tarquin's goal remained consistent throughout the study (tracking physical metrics, activities, and diet to lose fat and gain muscle) and he made use of graphs to analyze his data. This case represents three participants in the study. His data set can be found in Appendix B.3.

Tarquin did not make use of the provided template in his data collection. Starting in Week 1, it was apparent he was familiar with the area in which he was collecting data. His goal was fairly well defined and the justification of his methods and processes were extremely

precise. An interesting part of Tarquin's data is that he used cumulative data collection and included cumulative graphs in his weekly submissions.

In responding to comments, Tarquin mentioned that some of the comments did not provide enough constructive criticism on his methods. Many of his comments were centred on extrapolating meaningful information from his data. Starting in Week 4, Tarquin's comments become much shorter and he spent minimal time extrapolating his data. At this point, he mentioned that he believed he had extracted most of the interesting information from the data in previous weeks and didn't feel the need to re-iterate what had already been learned. That said, he continued to acknowledge the comments from other participants.

In the post-study questionnaire, Tarquin responded that he met his goals for the study and that his knowledge of data collection was expanded. He identified some specific items he had learned in the study in terms of both methods of collecting data and from the data collection itself.

This exemplar illustrates how an experienced data collector can stay motivated with their practices by interacting with others. The main points of interest for this case are the inclusion of graphs throughout the data collection, the well-defined goal and collection parameters, and how the personal reflections changed throughout the study (extensive extrapolation at the beginning with acknowledgement of other participant comments moving to acknowledging other participant comments with minimal extrapolation once the initial understanding was achieved). It also highlights that long term engagement may prove challenging.

3.6 Conclusions

At the beginning of this chapter, two questions were put forth:

1. Does analysis of another person's personal informatics data support one's own analytical process?
2. Does getting feedback from another person assist in one's personal analytical process and affect the approach to analyzing one's own data?

Based on the comments provided during the study and also the final questionnaire, many people do find that looking at another person's data is beneficial to one's own data collection practices. This was demonstrated explicitly through some of the comments provided in the final questionnaire. Question two can be answered affirmatively as well. This is illustrated particularly well by Sarah's exemplar where she changes her scale based on another participant's comments. This is also illustrated in evaluating the comments provided by participants and the reactions to the comments. The charts from section 3.2 show that people are interested in providing feedback and suggestions for others and that the comments are appreciated by the recipients (demonstrated by the number of response comments in personal reflections).

Four thesis objectives were put forth at the beginning of this chapter to be addressed. Section 3.1 addressed Thesis Objective 1 (synthesizing literature on personal informatics and learning theories) and Thesis Objective 2 (designing a study based on learning theory synthesis) by presenting the particulars of the study. Section 3.2 also addressed Thesis Objective 2 (executing the study) by presenting the raw results. Sections 3.3 and 3.4 presented the analytical process used to evaluate the data and the findings of the study. Three exemplars were presented

in section 3.4 to highlight interesting findings for participants of different backgrounds who chose to collect different types of data.

Chapter 4: **Design Recommendations for Personal Informatics Tools**

Chapter 3 showed that many people found looking at another person's data to be beneficial to personal data collection practices. It also showed that people are interested in providing feedback to others and are grateful to receive constructive comments back from others. These are both important aspects of shared reflection. From these findings, we will present a set of design recommendations for personal informatics tools to support shared reflection by sharing one's data, seeing others' data, and commenting on data.

Each section of this chapter will present a design recommendation. As a whole, these recommendations address Thesis Objective 3 (extracting a set of design recommendations for personal informatics tools based on shared reflection). Section 4.1 presents the idea of providing communication support between users. Section 4.2 illustrates support for a continuous data feed with manual control available. Section 4.3 demonstrates two concepts for providing additional context to the data. Section 4.4 shows a shout out feature allowing people to elicit feedback on specific areas of interest. Sections 4.1-4.4 also demonstrate how the design recommendations could be integrated into already existing tools by modifying screenshots of three different personal data collection tools – RunKeeper (http://www.runkeeper.com), MyFitnessPal (http://www.myfitnesspal.com), and Fleetly (http://www.fleetly.com). Section 4.5 provides a brief summary of this chapter.

4.1 Communication Support

One of the goals of this study was to facilitate short, anonymous dialogue between participants focused on a particular data set. As participants interacted during the study and from the comments made in the post-study questions, it was apparent participants were interested in

conversing more with their weekly data partners in some instances. For example, one comment was:

> “In some ways, I'd like to have an ongoing discussion with the same person, almost like a 'personal coach.'” - unsolicited comment from P2

And another:

> “I want some sort of anonymous discussion with the person.” - from P2's reflection on P8's analysis (code: response)

Figure 4.1 presents three possible design ideas to facilitate conversations between participants.

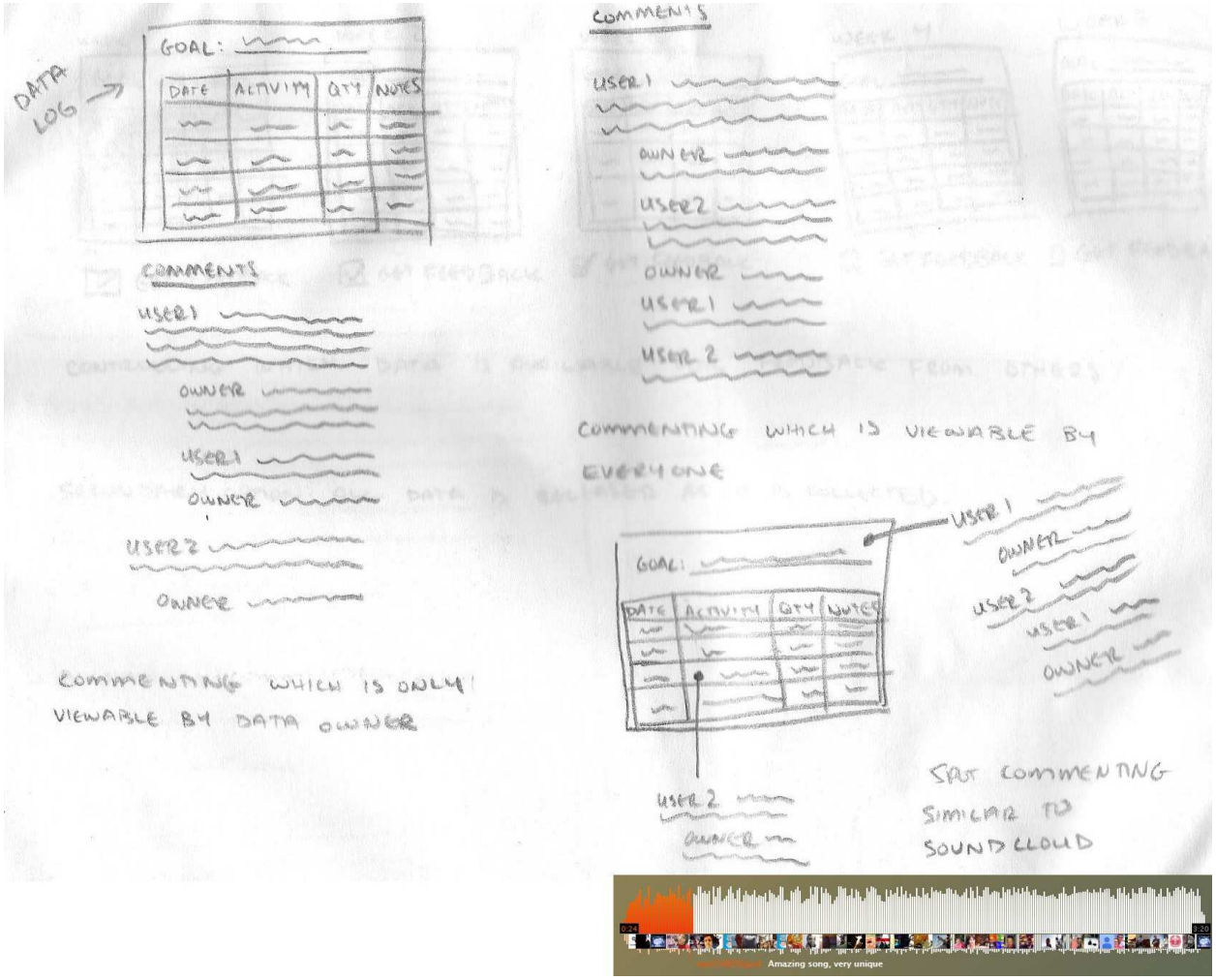


Figure 4.1: Three Design Ideas to Facilitate Communication

The left side of the figure illustrates the view from the data owner's perspective. Users provide comments on the data and the data owner can view and respond to comments. In this case, users are unable to see or comment on comments from other users. The conversations are strictly between individual users and the data owner. The top right area of the figure shows an alternative to the left side where users are able to interact with each other as well as the data owner. In this case, comments are visible to everyone, and anyone can interact on any thread. This is similar to existing comment features found on YouTube (http://www.youtube.com). The bottom right area of the figure illustrates a spot comment feature. This is somewhat similar to

how SoundCloud comments are presented (pictured the far lower right of the picture) where users comment at specific times in the music and these comments are visible as a song is played. In the case of data, users would be able to tag certain specific elements of the data and provide comments on that section. As with the previous two design suggestions, the comments could be visible to all users or only to the data owner and commenter. There is the possibility to allow users to create handles to support non-anonymous communication or to support anonymous communication depending on user preferences.

The following three figures demonstrate how these three design suggestions could be implemented in an existing tool. The screenshots have been taken from RunKeeper and modified to illustrate a possible implementation.

Figure 4.2: Suggested Implementation of Restricted Comment View in RunKeeper

Figure 4.2 illustrates the implementation of the restricted comment view. The top part of the figure shows the original graph from RunKeeper and the bottom shows the graph with the comment modification. In this instance, the view is from the data owner's perspective. Users run_master and biker_chick111 have provided comments on the data. They are unable to see each other's comments; however, the data owner is able to see and respond to both users.

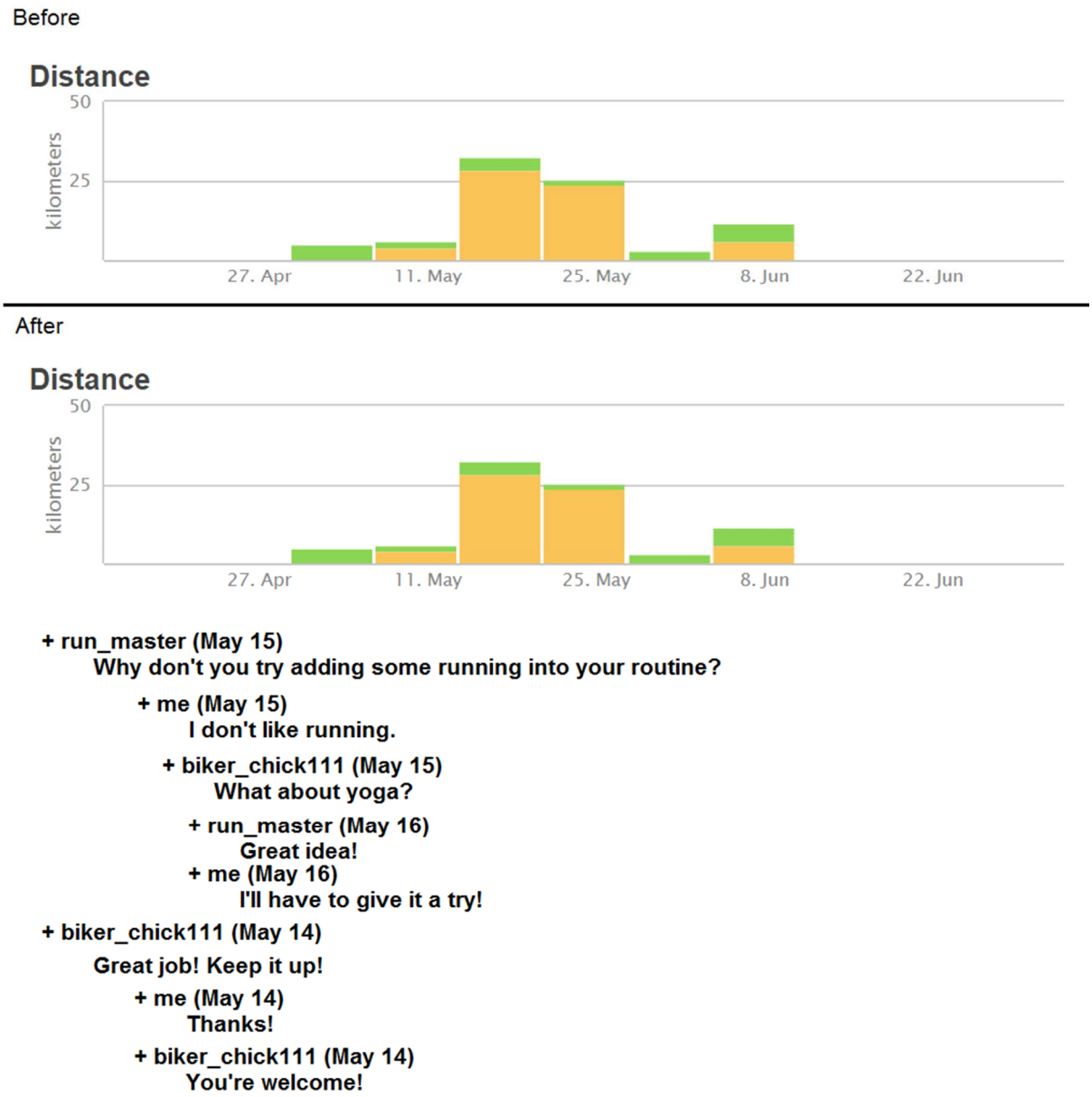


Figure 4.3: Suggested Implementation of Open Comment View in RunKeeper

Figure 4.3 takes this one step further and allows users to see each others' comments. Again, the top part of the figure shows the original graph in RunKeeper and the bottom includes the modification. Although it is not necessary for users to comment on each others' comments (as in the comment by biker_chick111), it is possible (as in the comment by run_master). The data owner is again able to view all comments.

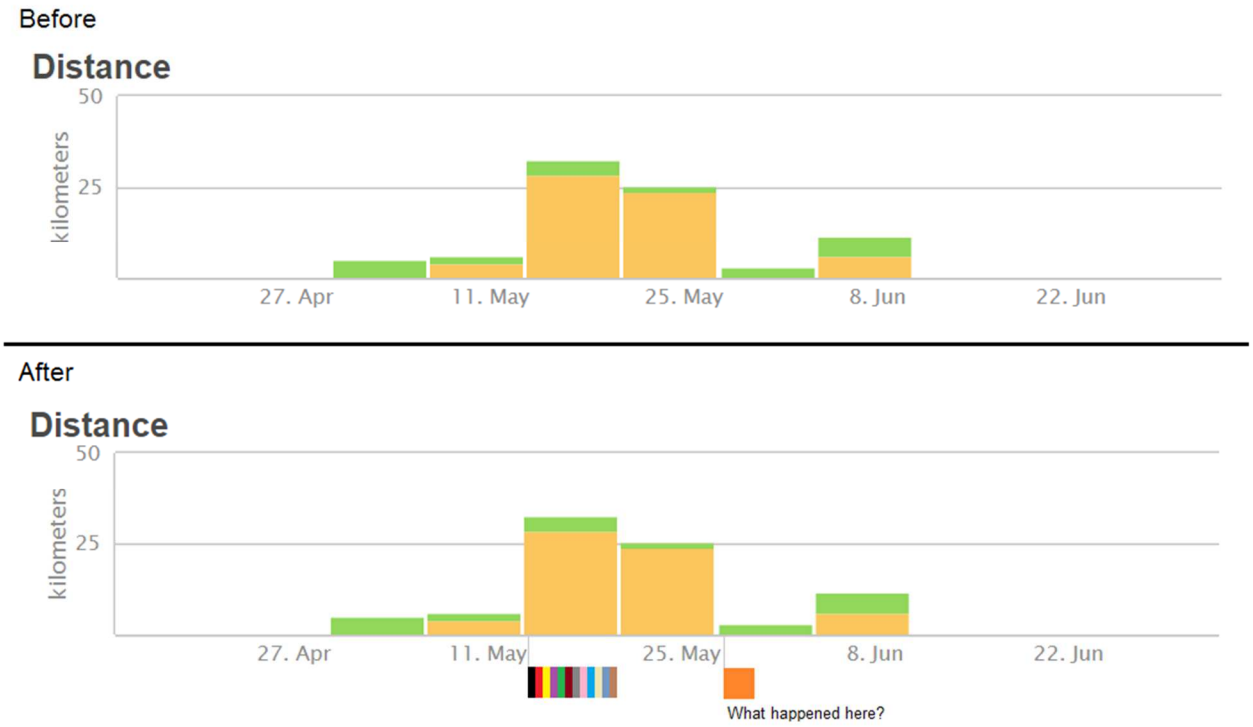


Figure 4.4: Suggested Implementation of SoundCloud-Like Comments in RunKeeper

Figure 4.4 demonstrates how SoundCloud-like comments could be implemented. The top graph is, once again, the original graph from RunKeeper. On the bottom graph, a number of users have made comments on the third bar in the graph, which is illustrated by the rainbow of colours under the graph. The fifth bar only has one comment which is represented by a coloured square. When the user hovers over the square, it shows the user's comment (in this case "What happened here?").

4.2 Continuous Data Feed

There were a few instances in which participants submitted another week of data prior to receiving a reflection from another participant. In one particular case, this lag caused some consternation:

> "The logistical problem of delayed reflection (pretending it was two weeks into the process although all six weeks of logs were complete) was challenging. It is difficult to un-see a pattern." - P7 in the post-study questionnaire

This was difficult to manage in the context of this study, but it could be easier to show commenters the most up-to-date information if the data were readily accessible via a mobile or web application. For example, when a commenter is ready to review data for another user, they will automatically be shown all of the data submitted thus far. This way, the data owner does not receive comments from past behaviours which may have changed nor do they have to think about the data from a past perspective – the comments always propel the data forward. Figure 4.5 shows a potential view from the data owner's perspective based on the available data.

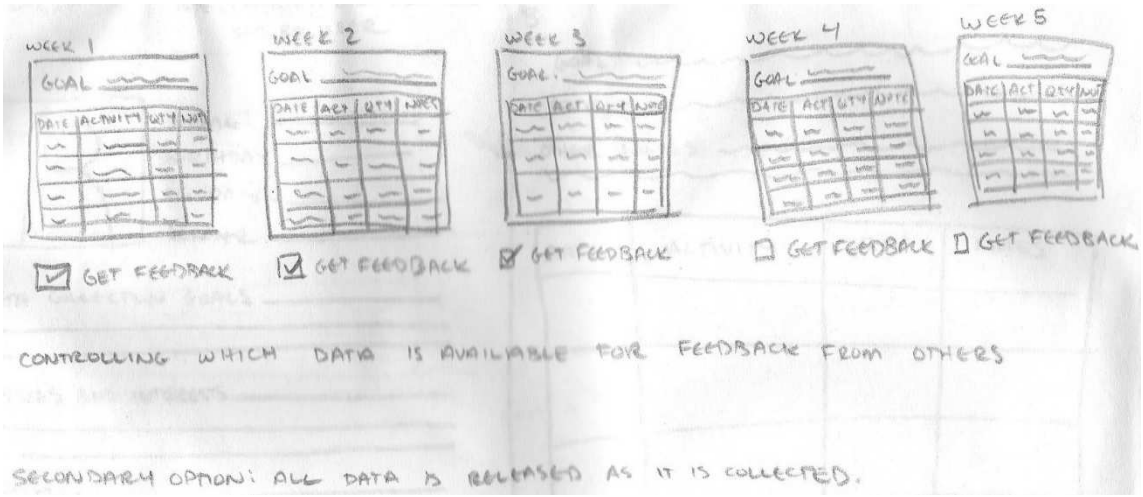


Figure 4.5: Two Ideas for Feedback Elicitation from Data Owner's Perspective

As shown in the figure, the data has been separated by week similar to how the study data was organized. This is not the only way to present the data and there is the possibility of letting the data owner customize how they would like to present their data. Below each data set, there is a checkbox the data owner can check if they are ready for feedback on the data. This allows the data owner control over what data is shown to others and how current the data available for comments is. An alternative to this is to allow all data to be available for commenting immediately on collection. This could be presented as a checkbox which overrides the individual Get Feedback boxes. The settings would be configurable by the data owner.

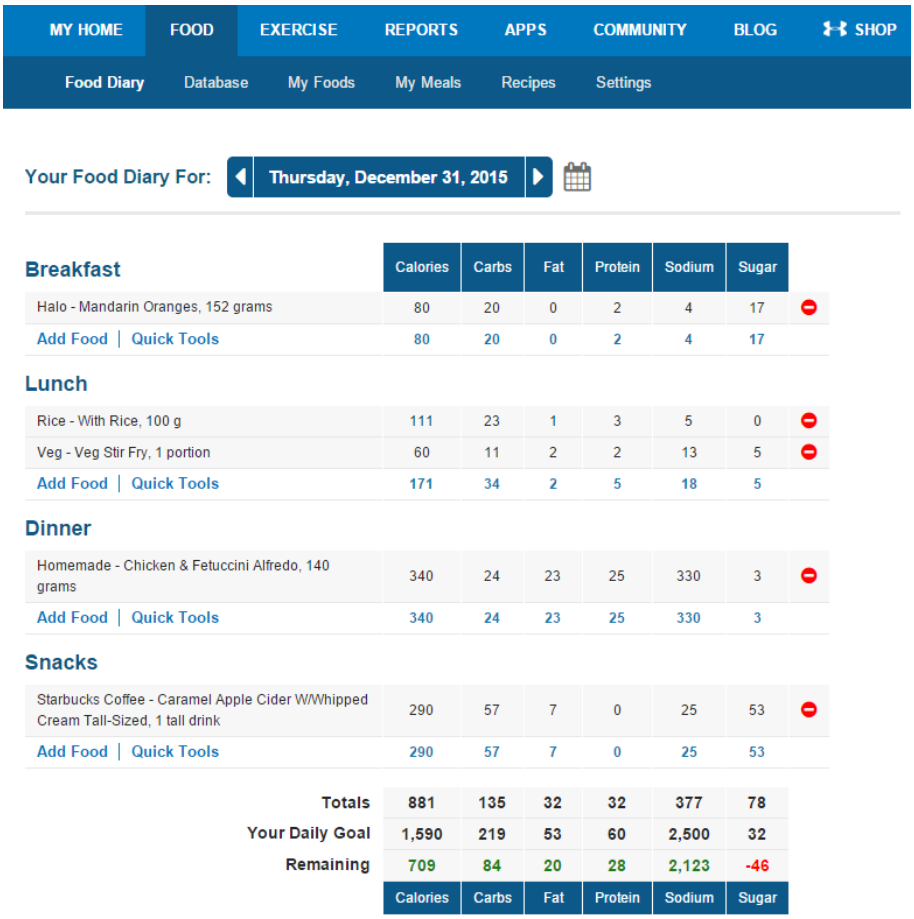


Figure 4.6: Food Tracking Feature of MyFitnessPal

Figure 4.6 is a screenshot from the personal tracking tool called MyFitnessPal. The tool is set up to track both food and exercise.

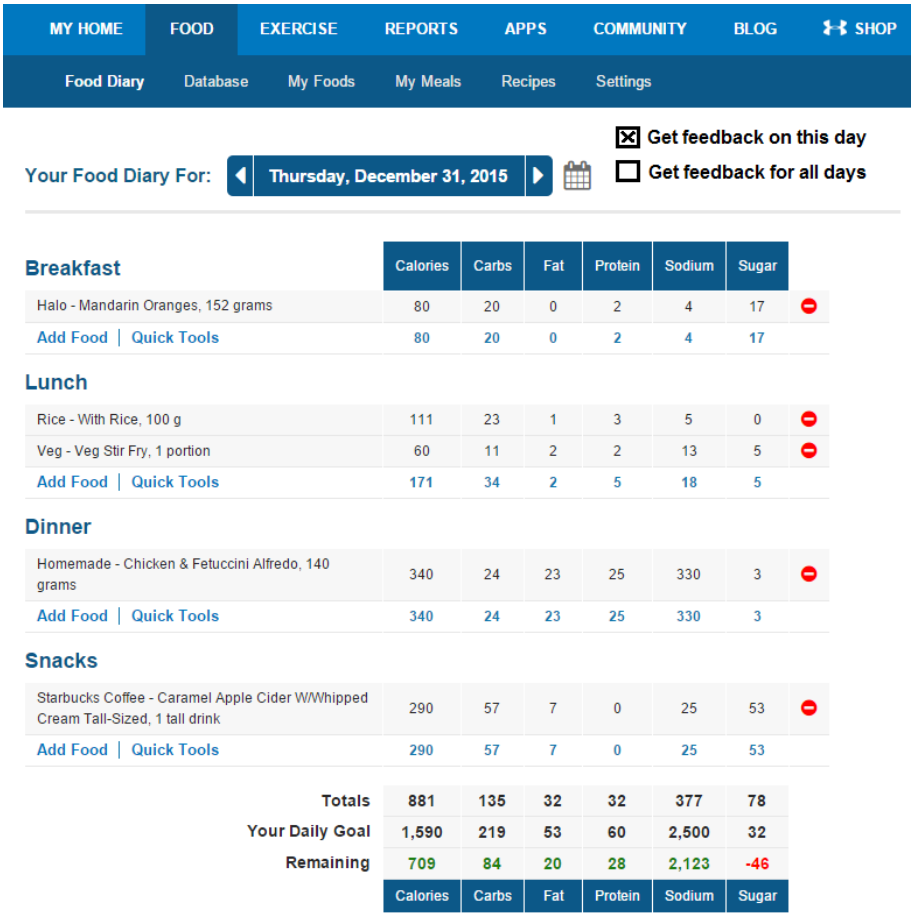


Figure 4.7: Suggested Implementation of Feedback Elicitation to Food Tracking Feature of MyFitnessPal

Figure 4.7 shows how the food tracking feature could be modified to support feedback elicitation. In the figure, the checkbox for getting feedback on a particular is selected. For this case, the data owner would be required to check this box on every day for which they would like to elicit feedback. If the unchecked box (feedback for all days) were checked, the top checkbox would be greyed out and all days would automatically be available for feedback. The data owner would only be required to check this box once to make all of their data available for feedback. Although not illustrated in either figure, the exercise tab at the top would have similar features

available. The checkboxes for food and exercise would act independently of each other. For example, the data owner could choose to get feedback for all days on their food entries, but only choose certain days for the exercise entries.

4.3 Additional Contextual Information

Based on the way in which the study was conducted, it was sometimes challenging for participants to provide useful feedback to others as there was not enough context provided by only the data:

> "I think I would have benefitted from more thourough reflections on my data. That being said however, I could have given better data for people to reflect on by adding notes and thoughts about the work out" - P1 in the post-study questionnaire

One participant felt she received a lot of negative feedback because the commenting participants did not have a good understanding of her situation:

> "I received a lot of negative feedback from other participants who didn't really understand my situation." - P13 in the post-study questionnaire

On a related note, another participant felt he had learned everything he could in the first half of the study:

> "I've already said my thoughts in previous reports." - from P5's reflection on analysis

In both situations, a profile (Figure 4.8) or a dedicated section for contextual comments on weekly data logs (Figure 4.9) could be provided.

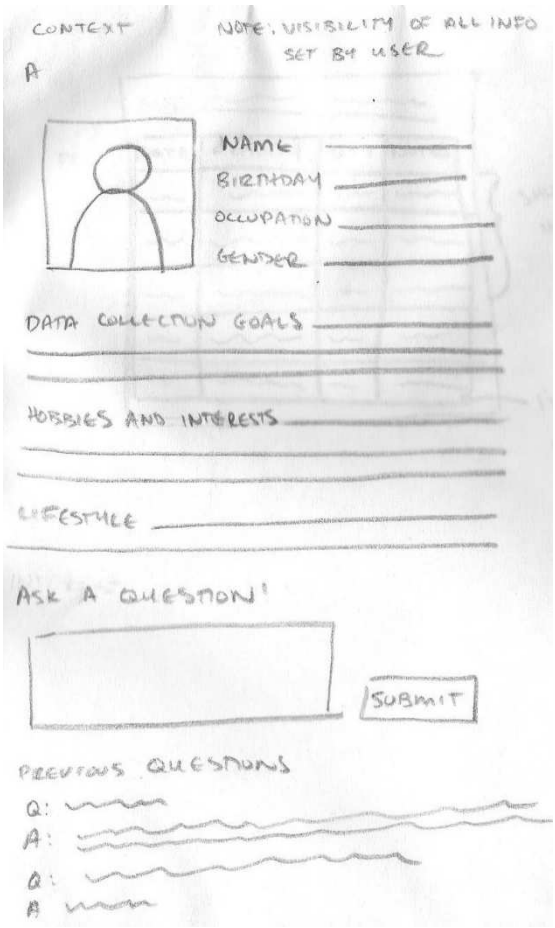


Figure 4.8: Sample Profile Page

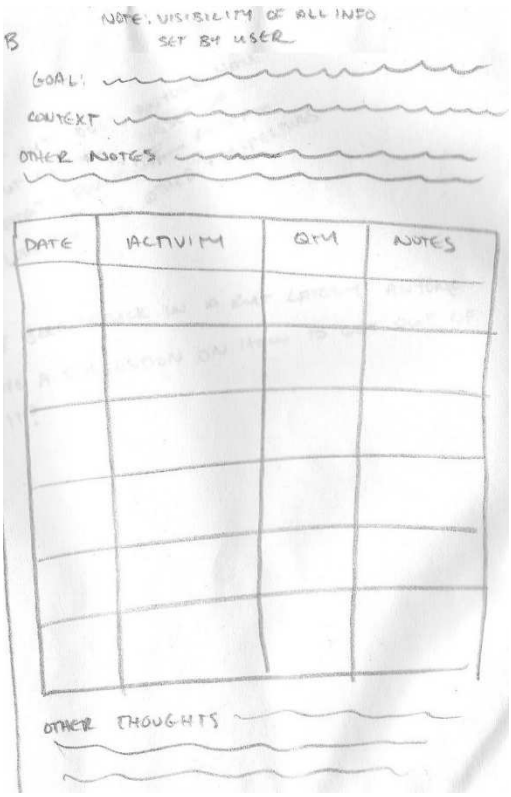


Figure 4.9: Sample Context Placement on Weekly Log

In Figure 4.8, the profile page would allow users to share information about themselves they feel comfortable with that is relevant to their data collection. The goal of this section is to explicitly provide sufficient information for the use of people providing feedback. Figure 4.9 provides a section for context, other notes, and other thoughts in addition to the information currently available on the weekly log. The context section allows users to write any information they feel would be helpful to people who give feedback free-form. The notes section allows for additional notes that don't quite fit under the context category. At the bottom of the sheet, the other thoughts section is available for users to make comments at the end of their week. A few participants included short reflections on their data when they submitted their logs, and this section was created here to provide support for those activities.

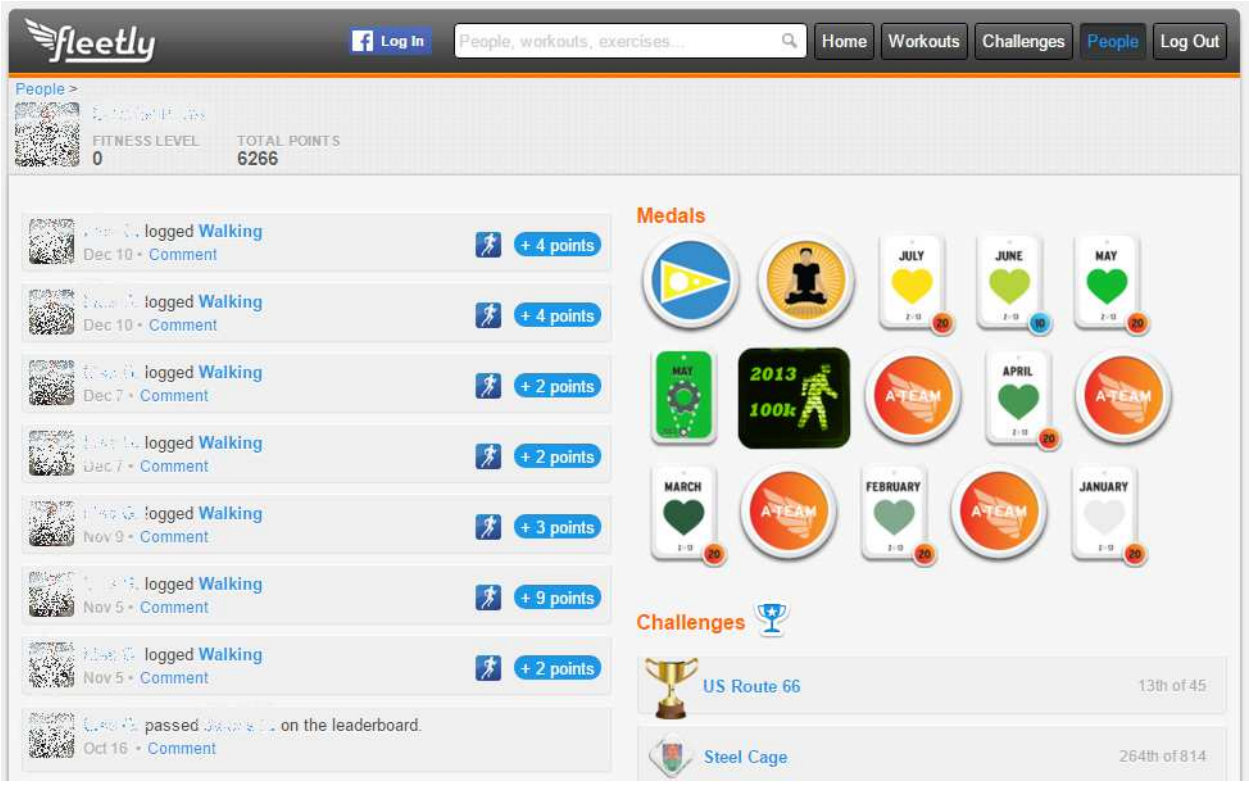


Figure 4.10: Profile Page in Fleetly

Figure 4.10 shows the profile page of an activity tracking application called Fleetly. The main features of the page include a list of recent activities, medals from completing activities, and challenges in which the user is currently enrolled.

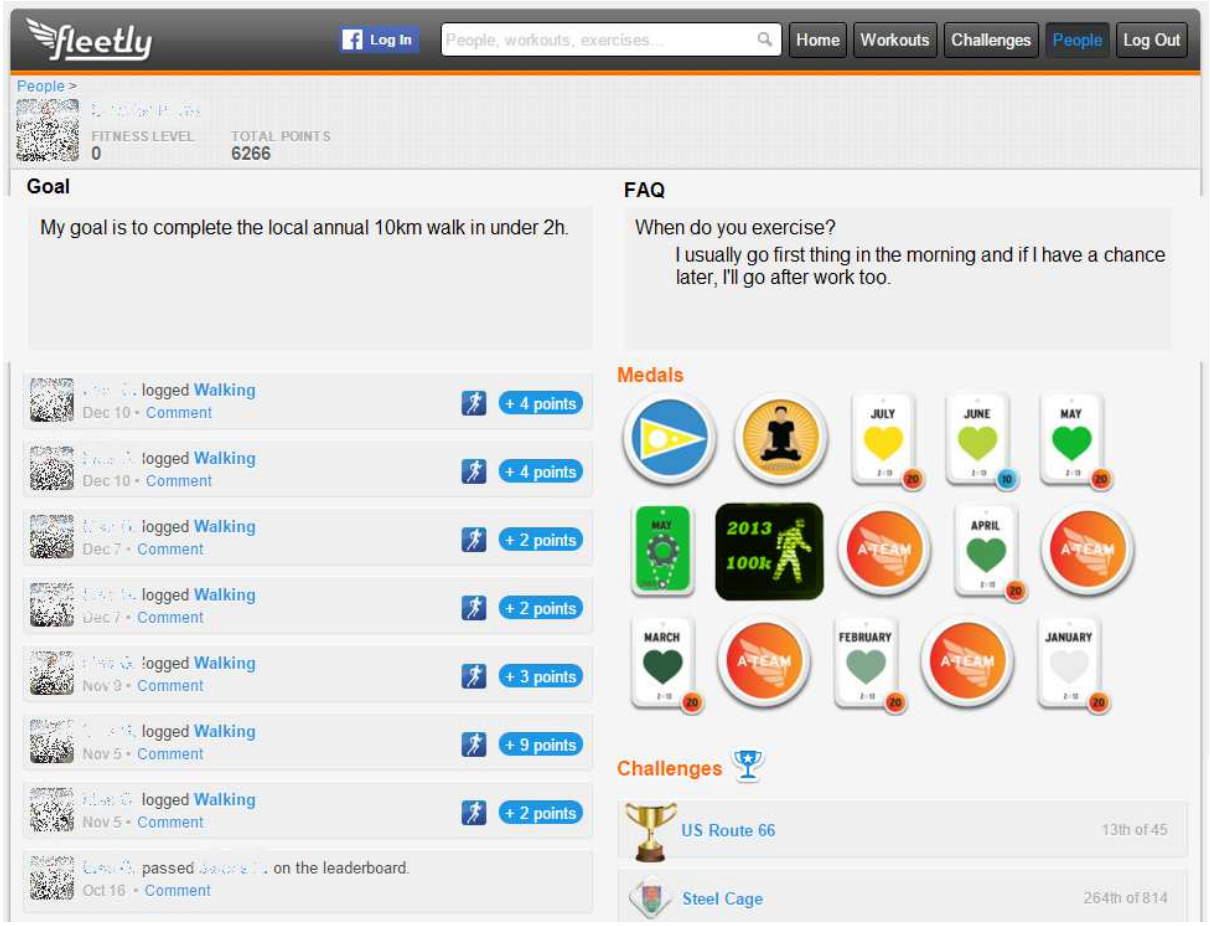


Figure 4.11: Suggested Implementation of Context to Profile Page in Fleetly

Figure 4.11 shows how goals and frequently asked questions could be introduced to the profile page of Fleetly. The goal is at the top of the page to remind the profile owner and quickly show visitors the goal the profile owner is trying to achieve. The frequently asked questions are also added at the top to make it easy to get clarification and learn a bit more about the profile owner.

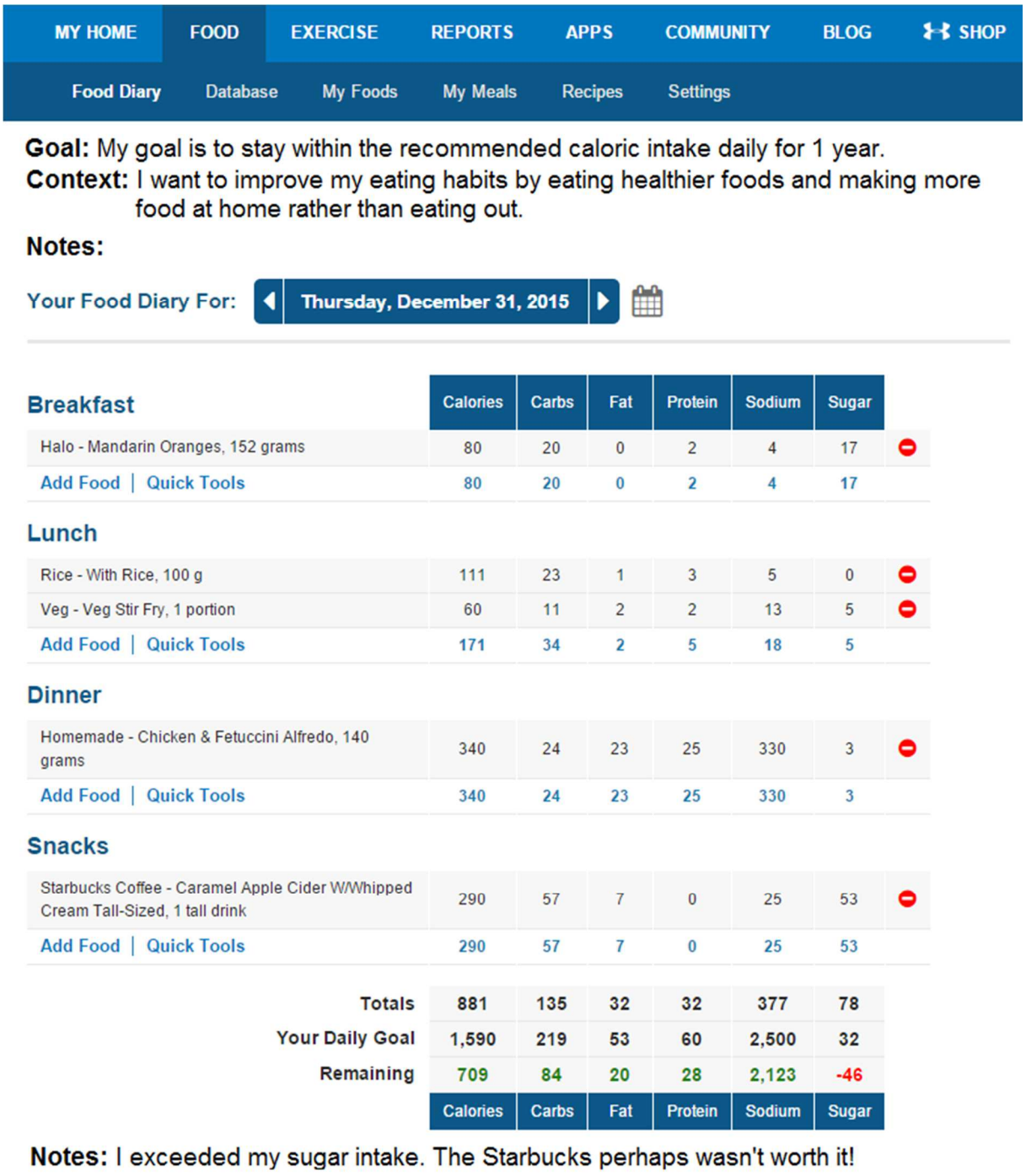


Figure 4.12: Suggested Implementation of Context to Food Tracking Feature of MyFitnessPal

Figure 4.12 shows the MyFitnessPal food tracker with modifications. Again, the goal is at the top of the page to ensure it is easily found and can be frequently referenced. The context field allows

the data owner to provide additional information about their goal to assist visitors in contextualizing their information. The notes field is for any additional notes the data owner feels are important to share with visitors. In this case, the user felt providing the goal and context was sufficient. At the bottom of the page, there is another field for notes. This field allows the data owner to reflect on their data after they have entered it. In this case, the user exceeded their recommended daily sugar intake, which they felt important to acknowledge.

4.4 Query the Network

The final design recommendation put forth here relates to the disappointment of a participant in the types of comments he received from others:

> "I think I would have benefitted from more thourough reflections on my data" - P1 in the post-study questionnaire

To ensure the data owner's expectations are met, it might be possible to allow them to pose questions to the network on some aspect of their data. This way, they can hone in on specific aspects in which they are interested and highlight areas which are important to them. By encouraging users to point out specific components of their data to others, this may also help with users who feel there is nothing more they can learn about their data. Instead of tagging specific parts of the data, suggestions could be elicited from the network on techniques to optimize data collection or suggest related goals that might be interesting. Figure 4.13 shows a potential implementation of this suggestion.

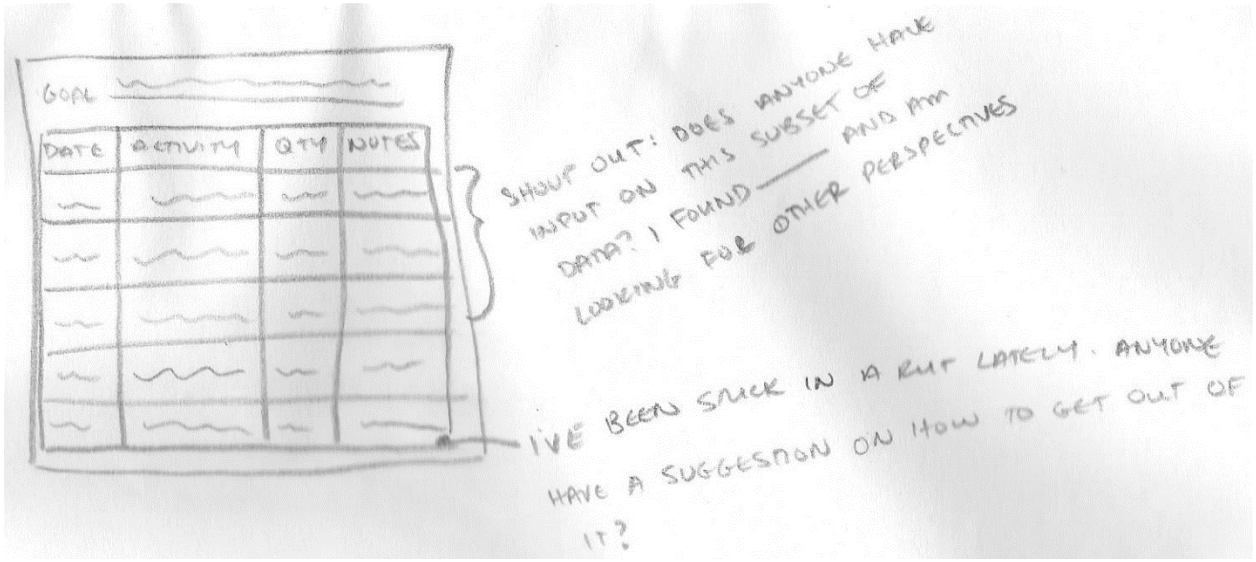


Figure 4.13: Allowing Data Owners to Send a Shout Out for Feedback

This figure illustrates two ways in which a data owner can ask for feedback on data – by highlighting a large section of the data or by identifying a very specific point in the data. The first shout out highlights a few rows of data and poses a question to the network while also illustrating what the data owner has found so far. In this case, they are sharing context and asking for a second opinion. The second comment is focused on only one point and asks the network for assistance for moving forward with their data collection. For these cases, supporting discussion (as suggested in section 4.1) may also be beneficial.

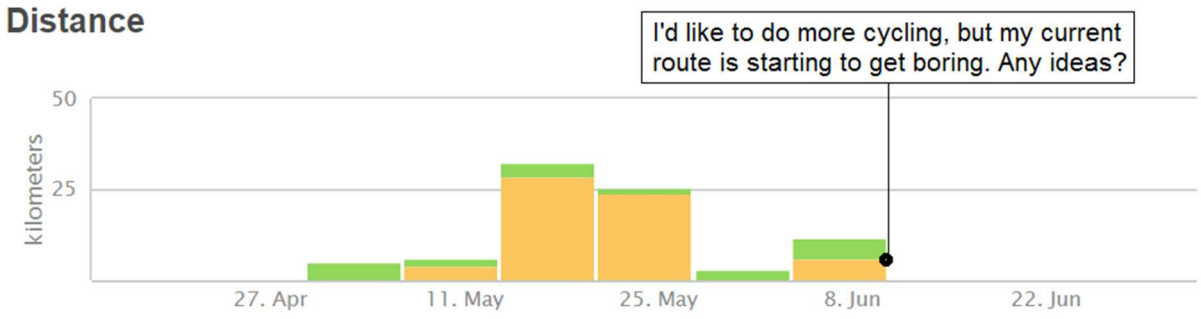


Figure 4.14: Suggested Implementation of Shout Out Feature in RunKeeper

Figure 4.14 shows how a shout out could be shown in a RunKeeper graph. To create one, the data owner could right click the data on which they would like to apply the shout out. From there, they enter the question they have. Once the question is completed, the user can choose to publish it at which time it will be pushed to the data feed of their network. People in their network can then respond.

4.5 Summary

This chapter presented a set of design recommendations for personal informatics tools extracted from the study presented in Chapter 3:

- Provide support for communication
- Provide a continuous data feed
- Provide additional contextual information
- Provide support for querying the network

Furthermore, suggestions on how these features could be implemented in already existing tools was presented. These recommendations fulfil Thesis Objective 3 (extracting a set of design recommendations for personal informatics tools based on shared reflection). To validate these design recommendations, they were presented to a set of potential users in a short interview, which will be covered in Chapter 5.

Chapter 5: **Preliminary Design Evaluation via Interview**

In Chapter 4, a set of four design ideas to support shared reflection were proposed based on the results of the six week data collection study – supporting communication, providing continuous data feeds, enhancing contextual information, and querying the network. To validate these designs and get feedback on the code categories, brief interviews were conducted. This chapter explores the results of the interviews.

This chapter explores the results of the interviews and addresses Thesis Objective 4 (conducting a preliminary evaluation of design recommendations). Section 5.1 outlines the interview structure and participants. Section 5.2 presents the participant responses to the code categories. Section 5.3 shows the participant responses to the four design ideas presented in Chapter 4. Section 5.4 summarizes this chapter. Overall, there were mixed reviews on the design ideas. One of the main issues emphasized by interviewees was privacy – most people expressed a strong interest in significant control over their data, who could see the data, and who could interact with the data. There were a number of suggestions made by participants on each of the design suggestions, so more work could be done to refine the ideas.

5.1 Interviews

Six participants were recruited to provide feedback on the design recommendations presented in Chapter 4. Four of the interviewed participants (two males and two females) took part in the data collection study and two (one male and one female) participants did not take part in the data collection study from Chapter 3. Interviewees new to the idea were included to get an outside perspective while interviewees who participated in the study were included to provide continuity and get expert insight. The interview was designed to last approximately half an hour during

which time participants were asked to provide comments and suggestions for each of the four design recommendations. Interviewees who participated in the data collection study were also asked some questions about the code categories. The interview script can be found in Appendix C.

5.2 Participant Responses to Code Categories

The first activity for the four participants who completed the data collection study was to review the code categories. This was done to determine which types of comments the participants found beneficial and which were not as important to them. Each code was listed with a description and example taken from the study. Participants were asked to indicate whether they recall providing that type of comment and also whether they believed it was helpful. For each item, they were also asked to explain why they answered the way they did.

5.2.1 Comments Provided to Others

Figure 5.1 shows the interviewees' thoughts on comments they recall providing to other people.

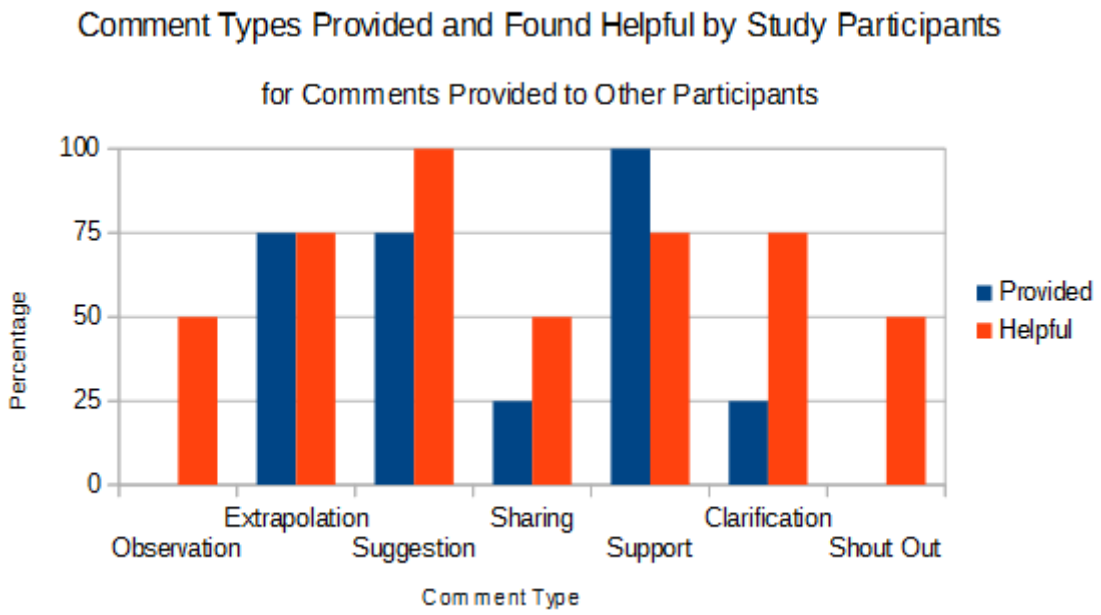


Figure 5.1: Helpfulness of Comments Provided to Other Participants

The interviewees felt that although they provided most types of comments, some comment types were more helpful than others.

Observation. Although none of the interviewees recalled providing observations themselves, they felt it could be helpful as a recipient to see what someone else observes, which could trigger a change in the way they are looking at their data. That said, one interviewee mentioned they did not feel comfortable providing observations to others as they did not feel they had a solid understanding of the person's goal.

Extrapolation. The majority of the interviewees recalled providing extrapolation comments and also found them to be helpful. One interviewee mentioned that it can help the data owner "understand how their data is being interpreted by others and can make improvements to be more readable etc in the future." Other interviewees mentioned that it could be a challenge to give a reasonable extrapolation as incorrect assessments could be made due to lack of knowledge or missing context.

Suggestion. Most of the interviewees also recalled providing suggestions, and all found suggestions received from others to be helpful. Some interviewees felt that it helped keep people motivated and accountable. Suggestions were also helpful in that they provided new ideas to refine processes or constructive criticisms to help keep others on track. One of the interviewees mentioned focusing most of their energy on providing suggestions as they felt it was one of the most beneficial ways they could assist other participants in the study:

> "This was where I focused. [I was] trying to give ideas to improve their data collection techniques."

Sharing. Only one of the interviewees recalled providing a sharing comment, and half of the interviewees thought sharing comments would be beneficial. Sharing was viewed as beneficial because it could provide more information to the data owner allowing them to succeed in their challenges by learning about tools and strategies about which they may not otherwise have known. That said, one of the interviewees mentioned not being a fan of the social aspect of this type of comment.

Support. All of the interviewees recalled providing supportive comments, but not all of them found them to be helpful. One interviewee mentioned making such comments only to be polite, but was not a big fan of the social aspect of this type of comment. Other interviewees enjoyed giving and receiving supportive comments as it helped keep them motivated to continue working toward their goals and provided support to push through as they overcame challenges.

Clarification. One interviewee recalled providing a clarification comment; however, most of the participants found clarification comments helpful. Interviewees felt having clarity was vital to the study. It helped them to provide more constructive feedback to the data owner. However, due to the study setup, it was impossible for data owners to respond to questions prior to receiving comments, so one interviewee did not feel as though there was a point in requesting clarification on the information they received.

Shout out. Although none of the participants recalled providing a shout out comment, some felt it would be beneficial. The main areas in which this was suggested as being helpful was to obtain knowledge about something the interviewee was having trouble with or eliciting opinions and resources that had not been previously considered.

5.2.2 Comments Received

Figure 5.2 shows the interviewee's opinions on the personal reflections they made during the study.

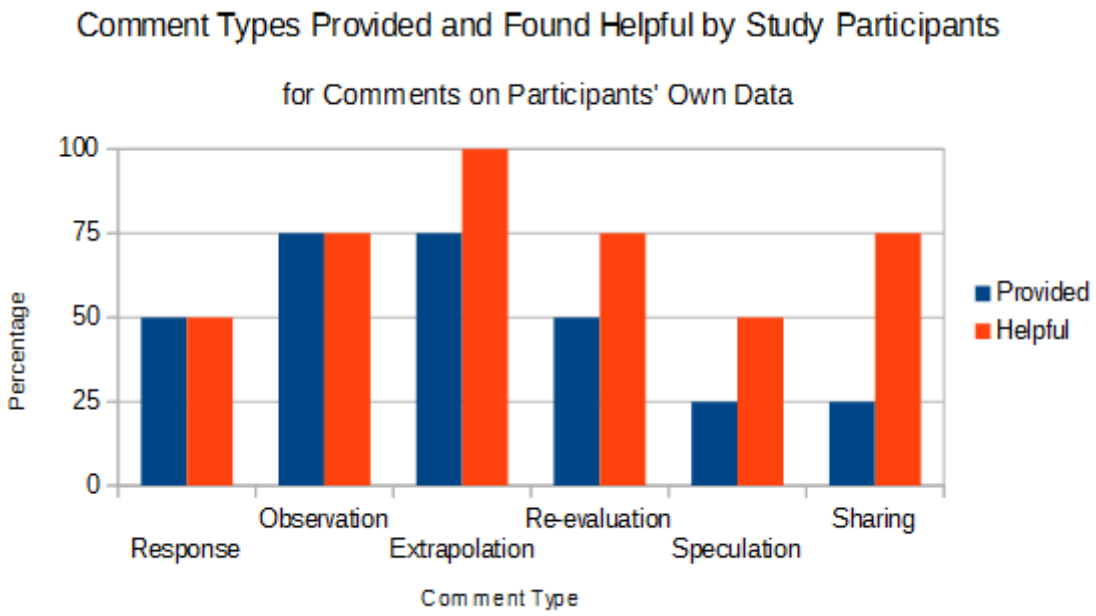


Figure 5.2: Helpfulness of Comments Provided for Personal Reflection

Among the four interviewees, all of the comment types were recalled as provided and the helpfulness of each was, on the whole, fairly well received.

Response. Equal numbers of interviewees who recalled providing responses felt that the responses were helpful. Interviewees who felt these comments were helpful expressed appreciation for being able to review comments from others, which generated ideas of resources to utilize.

Observation. Most of the interviewees recalled providing observations on their data and also found it helpful. Some of the highlights of this type of comment were determining where there

were flaws in the data collection and how they could be mitigated as the study progressed and also keeping track of what had been achieved and where the participant was headed.

Extrapolation. Most of the interviewees recalled extrapolating their data and all of them found it helpful to do so. Some interviewees found that extrapolation led to the study becoming easier as it progressed while others were more aware of patterns that helped them to achieve their goals.

Re-evaluation. Half of the interviewees recalled re-evaluating their processes and most found this to be helpful. By re-evaluating each week, interviewees found it easier to move toward their final goal as they tweaked methods of collection or evaluation as they went. One interviewee expressed that they regretted not re-evaluating more often as it could have changed how they physically felt at the end of the study.

Speculation. Only one interviewee recalled speculating on their data and half of the interviewees felt it would be beneficial to do so. One interviewee was not convinced speculation was helpful as it was just confirming whether the interpretation was correct. Another interviewee felt that speculation could be important in aiming for long term goals.

Sharing. One interviewee recalled sharing information while most of the interviewees felt that sharing information would be helpful. This type of comment was viewed by some interviewees as providing positive feedback and encouragement in obtaining goals and making changes. By sharing resources, they acknowledged the possibility of finding better tools for collecting data or reaching goals. One of the interviewees felt that sharing may not be as helpful in some types of data tracking.

In summary, most of the interviewees who also took part in the data collection study felt there were benefits and detriments to the comments they shared and received. There was a mixed response to the more social-like comments whereas many of the comments which could be completed in isolation were well received by everyone.

5.3 Participant Responses to Design Ideas

After the interviewees who participated in the data collection phase completed the evaluation of the comment codes, they were presented with four design ideas. For interviewees who did not participate in the data collection phase, this was the starting point of the interview. In this section, the comments and suggestions made by the interviewees for each of the design ideas are shared.

5.3.1 Communication Support

There were mixed reactions to the communication support in terms of whether or not to allow people to post comments anonymously or to require all comments to be associated with an identified account. Some interviewees felt more comfortable providing comments anonymously while others expressed concern over the types of comments they may receive if people are allowed to anonymously comment. Some interviewees suggested it could be useful to allow people to choose at the time of providing a comment whether they would like to appear under their account name or anonymously. Moderation was also suggested as a way to help control the quality of comments whether it is by a third party or by the data owner. Furthermore, an interviewee suggested it may be useful for the data owner to regulate who is allowed to comment (for example, only friends or friends and experts) if anyone (disable comments completely).

In terms of who is able to see the provided comments, interviewees again had a variety of opinions. Interviewee opinions ranged from believing it important to have all comments publicly available to make the best use of the network to completely disabling comments or only allowing comments from friends. Most interviewees were happy to keep comments completely open as they believed the network was a valuable resource to tap. Other interviewees preferred to choose which comment threads were public and private. Overall, customization appeared to be quite important for this feature to satisfy different types of users.

A couple interviewees mentioned the YouTube commenting structure as potentially useful whereas one interviewee was vehemently against it. Specific features that were identified as potentially helpful were pushing the most active comments to the top of the queue and supporting ordering (such as by date) as shown in the orange box of Figure 5.3.

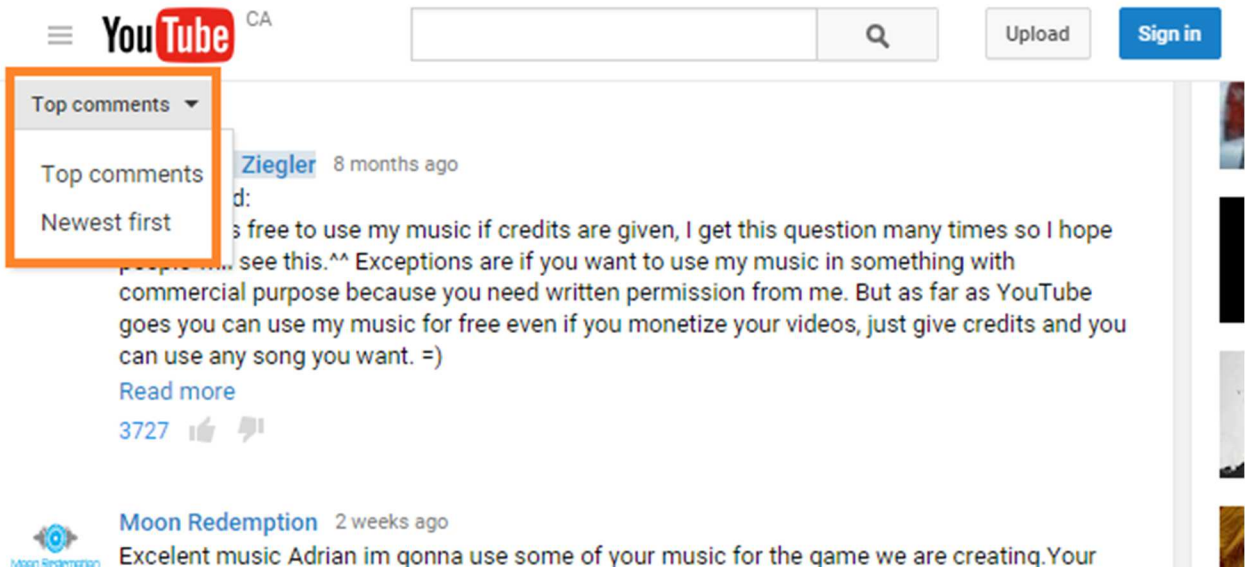


Figure 5.3: Two YouTube Sort Options

One interviewee also mentioned that the up and down voting feature in Reddit could also be useful to push the more relevant content to the top. Figure 5.4 illustrates how the voting system pushes relevant content to the top:

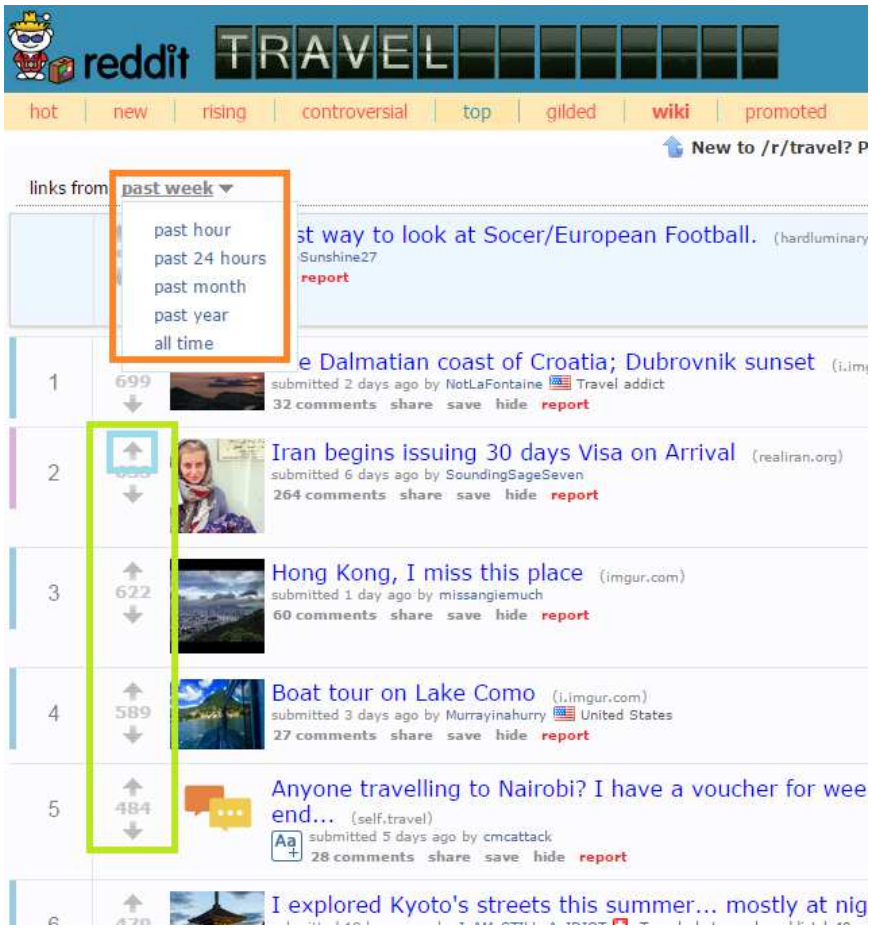


Figure 5.4: Reddit Voting

In this case, the top links from the travel subreddit have been selected from the past week (as shown in the orange box). The green box shows the number of votes a number of posts have received. The blue box shows the up vote arrow, which adds to the number of votes a post has received. The arrow below the total is the down vote arrow, which subtracts the number of votes

the post has received. Each user is allowed to vote once per post and can change their up or down vote (or remove it entirely) and all votes are equal.

In terms of the people who are commenting on the data, one interviewee suggested it may be useful to have dedicated lifestyle coaches for different areas (psychological and nutrition as two examples). This was envisioned to be somewhat similar to the Yahoo Answers feature that asked for a source when providing an answer (highlighted orange in Figure 5.5).

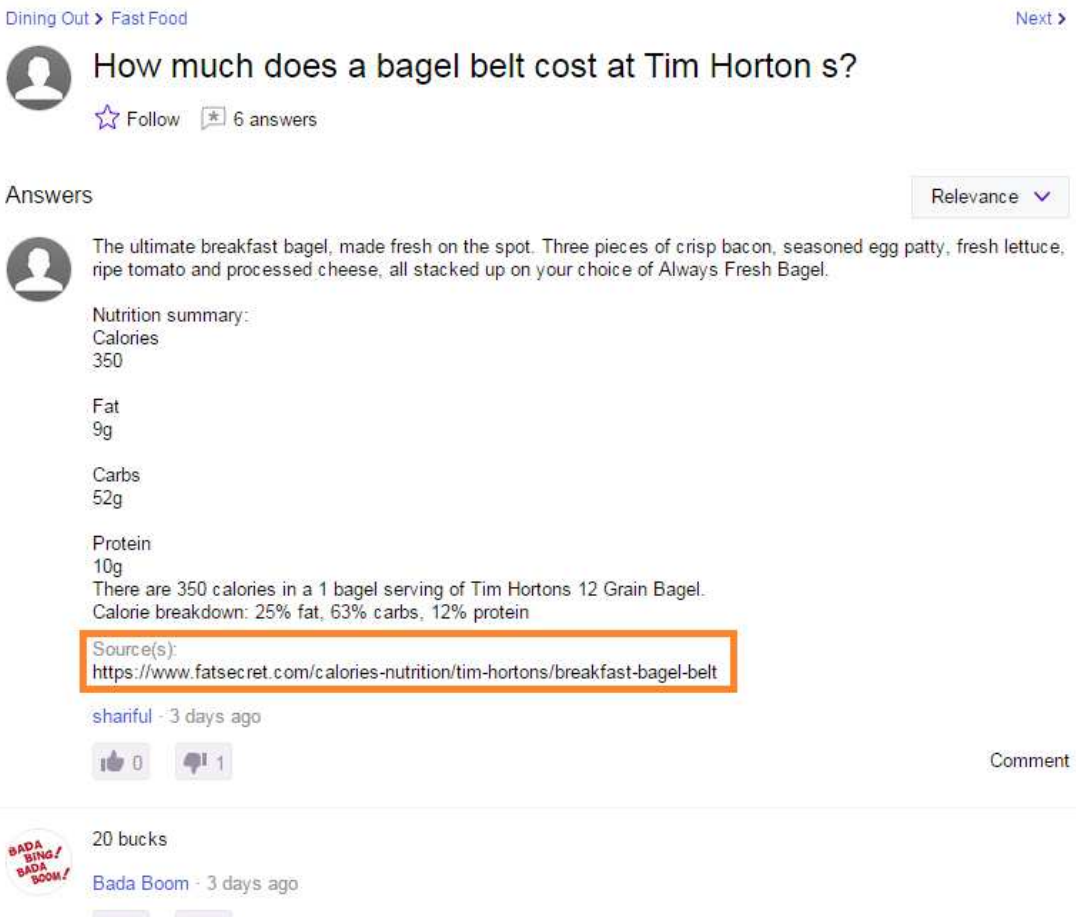


Figure 5.5: Yahoo Answers Source

Another feature of Yahoo Answers that could be helpful in determining who is an expert is by using a rating system based on activity (comments provided, usefulness of comments, questions asked and answered as well as the quality of the questions, and more) as shown in Figure 5.6.

Figure 5.6: Yahoo Answers Expertise

This way, people can leverage the crowd knowledge while also evaluating the trustworthiness of the source.

Most of the interviewees were interested in the SoundCloud-like commenting format on some level (Figure 5.7).

Figure 5.7: SoundCloud Comments

Figure 5.7 shows a music track on the SoundCloud website. As the track plays, users can provide comments on what is happening. For example, one user provided the comment, “Amazing song, very unique,” which has been highlighted in orange in the figure.

A couple interviewees felt it would be easier to relate comments to what is being commented on than the other commenting styles. One interviewee also felt it would be beneficial to merge the SoundCloud idea with the other commenting styles.

5.3.2 Continuous Data Feed

Most of the participants were in favour of some level of customization. Aspects which were important to control included what data is released (especially in the case of collecting multiple types of data), when the data is released (automated or manual time delay or an option for immediate release; supporting a continuous data stream), and who can see it. Different interviewees were interested in having different levels of control, so it is important to support novice as well as more advanced users. Another type of customization that was suggested was for the data log itself. One interviewee suggested allowing users to modify the columns in the data log for different types of activities. This ties in to feedback from another interviewee, who suggested accepting data streams from other services such as Nike+ (http://www.nikeplus.com) or Fitbit (http://www.fitbit.com).

Some interviewees expressed privacy and safety concerns. One interviewee suggested giving users the option to disclose their location. Further to this, they suggested an optional time delay for data release might be beneficial if the user wishes to disclose their location, but not in real time. Another interviewee suggested allowing the data owner to choose whether or not they want to be associated with a particular data log. In the case of an anonymous log, the data owner would be able to view their data and its associated comments, but it would show up as an anonymous data set to other people in the system.

Finally, in terms of dealing with historical data, some interviewees felt it was important while others did not think it was. Of those who commented on historical data, all believed it was important to limit the amount readily available. Some interviewees felt this to be sufficient while others felt historical data should be available by request only.

5.3.3 Additional Contextual Information

The majority of interviewees expressed a preference for providing context within the data log; however, some believed having the profile and context in the data log would be beneficial. One argument for providing context within the data log included the convenience of having the context available immediately rather than searching for it somewhere else. Some interviewees mentioned it could be beneficial to have a summary available on the data log with more details provided in a profile. Many of the interviewees were against the profile because they felt it was giving away too much information about themselves. Some interviewees mentioned they would be happier with the profile option if they had complete control over what information they provided.

Many interviewees explicitly mentioned the importance of goals. They felt that goals should be mandatory while the context provided additional support for the goals. Some interviewees felt the context should be free form with no space constraints while others felt it should be limited to support the commenters. In the case of having a context field in both the data log and a profile, one interviewee suggested treating the context like a status update and when it is changed on the data log, the data owner is given the option to also update their profile.

One interviewee suggested adding a query field to the data log to provide even more information to commenters. They envisioned this field as allowing the data owner to ask specific

questions or to tell commenters what kinds of feedback they are looking for. Another interviewee suggested adding a dropdown list for activities in the data logs rather than using a free form box.

One of the features on which a number of interviewees commented was the 'ask a question' feature on the profile page. Overall, interviewees thought it was a good idea if the profile owner could moderate the questions and choose not to provide information. To motivate people to ask and answer questions, one interviewee suggested including a point system similar to Yahoo Answers (refer to Figure 5.6) where people receive points for asking and answering questions with bonus points available for contributing quality.

5.3.4 Query the Network

Most of the interviewees liked the idea of asking questions, sharing personal experiences, and getting other people's opinions on either a subset of data or more generally. One interviewee expressed surprise at how much they liked the feature as they are normally averse to social media.

A suggestion made by a couple interviewees included support for tagging. One interviewee suggested allowing the data owner to tag specific people who they think may have the answer to the issue at hand while another interviewee took it one step further and suggested tagging groups of people (for example friends or experts in personal training).

Expanding on the tagging feature, one interviewee suggested integrating meet suggestions to take the social aspect into the real world. For example, someone may set up a meeting point for their run the next day and anyone interested in going along could show up at the prearranged time and location. There is also the possibility to integrate other social

applications such as Meetup (http://www.meetup.com). In this case, the data owner could receive suggestions for relevant Meetup groups in their area based on the data they are collecting.

One interviewee made a few suggestions on the execution of the comment section. One suggestion was to account for ease of navigation through the active queries such as by using filters. Another suggestion was to colour code the queries such that they change colour as they age or perhaps based on how active they are. Another interviewee suggested it might be useful to use a forum instead of or in addition to the presented design.

5.3.5 Other Comments

Some interviewees provided additional comments and suggestions as well as reiterated points they felt were of particular import. Interviewees felt that privacy and control were very important. They felt that they should have control over interactions with others including the ability to block people if they were not providing beneficial information and allowing people to be as private or open as they wanted. One interviewee also felt it would be interesting to know whether other users act on provided comments.

5.4 Summary

This chapter presented the results of a short interview study of four study participants and two non-study participants. For the first part of the interview, study participants evaluated the types of comments provided to other people and used in personal reflections. Individualistic comments were well received whereas more social-oriented comments were well received by some but not others. The second part of the interview allowed all interviewees to provide feedback on the design ideas presented in Chapter 4. The main findings include:

- Interviewees were concerned about privacy and control of data

- Many of the design ideas were positively received
- There were a number of suggestions to improve the designs
- Interviewees enjoyed receiving feedback from others
- Interviewees do not mind providing feedback to others
- Providing feedback to another person can be a challenge if the goals of the data collector are not clear

This addresses Thesis Objective 4 (conducting a preliminary evaluation of design recommendations). Chapter 6 will cover the key results from the data collection study and design evaluation and suggest future work.

Chapter 6: **Key Results and Future Work**

This thesis addressed the challenge of supporting reflection in personal informatics tools. Existing tools tend to focus on collection and integration rather than supporting insight generation through reflection. My approach to this problem was to introduce *shared reflection*, which was explored through a six-week study. The results of the study showed that shared reflection appears to be a promising method to support personal reflection in personal informatics tools. This chapter provides a summary of the key results, challenges, and suggested areas of future exploration.

Chapter 5 presented the results of the design evaluation interviews, which concluded the first round of feedback on the design ideas for shared reflection presented in Chapter 4. This chapter presents the key results from the data collection study as well as the interview results and suggests some areas for future exploration.

Section 6.1 reviews the major findings from the data collection study and interviews. Section 6.2 presents how the design ideas presented here could be integrated into an existing personal informatics tool. Section 6.3 discusses some of the limitations of this work and how they can be addressed in the future. Section 6.4 summarizes the main points of this thesis and how they were addressed. Section 6.5 summarizes the main conclusions of this thesis and provides suggestions for next steps in this research area.

6.1 Major Findings

Shared reflection supports users of personal informatics tools by providing accountability and ideas for participants to change their personal practices by allowing them to see other participants' data, provide feedback to other participants, and review feedback from other

participants. This type of reflection requires more effort than a simple personal reflection as participants are required to interact with their own data as well as that of others. There are also privacy concerns around how much data is shared and who is able to see the data.

Chapter 5 interviewed six people, four of whom participated in the six-week data collection study. The interviews yielded four main points:

- Privacy and data control was raised as a major issue
- Providing feedback for others and receiving feedback from others was well received
- Providing feedback was a challenge if goals were unclear
- Additional design refinement was needed

The participants were quite concerned about having control over privacy and their data. To address this issue, support for personalized control could be integrated into the design. This would allow people who wish to share more to do so and those who wish to share less to control what is shared and with whom. Some of the participants were interested in controlling their information at a very low level while others were interested in higher level controls, so support for both types of users would be necessary. From a technical standpoint, pleasing both types of users presents a significant challenge in terms of the time required to develop such a feature. One way in which this could be addressed is to address the needs of the users who would like high levels of controls. As time passes and more people use the application, feedback will demonstrate which features are most useful. These features can be developed on a rolling basis. Simple controls can be easily visible to all users while more detailed controls are less visible, but still accessible to advanced users.

Participants were happy to provide feedback to others and receive feedback about their data although it was a challenge to provide feedback if data collection goals were unclear. There were a number of suggestions on how to mitigate this issue, two of which were ensuring data logs have a required goal field or using a required goal field on a profile page. Both of these suggestions are viable as the user can be asked to update their goal(s) as they start a new log, which can be propagated through to their profile goal at the same time. In the case of users who collect multiple types of data, the goal field could update with the goals for each type of data collected and house it in categories to make it easier for visitors to the profile page to understand.

Apart from privacy and data control issues, other feedback was provided on the design ideas. Comment quality management was one issue brought up, which could be addressed by promoting more relevant content through a voting-based or activity-based system or by introducing moderators. Acknowledging expertise was also suggested. This could be addressed with profiles showing the activity of the user and any credentials they may have.

6.2 Revisiting the Learning Theories

For the most part, the learning theories used in the design of the six week data collection study worked well. Participants responded well to the weekly self-reflections and the post-study questionnaire prompting them to evaluate what they had learned. By providing participants with control over what they were collecting such that it was practical and valuable for them, I feel the study provided good value for the participants. However, I feel the goals could have been more prominent. Although participants were asked to identify some goals for the data collection part of the study in the pre-study questionnaire, the goals were at times ill-defined or even missing from the weekly data logs. Based on the weekly personal reflections, it appeared as though some

participants did not focus on their goals as much as they could have. Future work in this area could identify how often it is necessary for a person to revisit their goals in order to effectively work toward them whether it involves modification or simply remaining motivated. Also, it would be interesting to see whether increasing visibility of goals and improving support for providing context would help the data owner through shared reflection as other participants integrate this information in feedback.

6.3 Medical Application Example: BEAUTY

Although this work has focused on a broad perspective, I believe the concepts remain valid for more specific contexts including community health programs such as BEAUTY. In this section, I will focus on how this work could be integrated into BEAUTY.

First, the culture of BEAUTY is highly supportive and community-oriented. Participants in the program interact both in the program and outside. It is important to note that at times during treatment, it may not be possible for a participant to attend due to complications or side effects of their treatment. The work presented in this thesis provides one way for these participants to still participate in and feel supported by the community even though they may not be able to take part in person. On the mentorship side, it is possible for mentors to provide support to new participants whether the mentor is still part of the program or not. In short, the work presented here can enhance the existing program by providing another means for participants to interact within the community.

Another area in which this work can benefit the program is by expanding its reach. By creating a virtual community, there is the potential to increase reach to patients with mobility challenges, those who live in remote communities, and rural patients. Although they may not be

able to attend any of the in-person sessions, the online community can still provide peer support which may not otherwise be available. To further expand the program, potential participants could join the community prior to joining the in-person group to see whether it is a good fit for them and also help determine the best ways in which they can participate (whether it is joining the in-person group or participating remotely). Participants who have completed the program could also remain part of the community to offer mentorship, share experiences, and provide support for others as they transition out of the program. As the in-person program expands to other locations, it is also possible for the distributed groups to interact and collaborate in a common virtual space.

Two important considerations when dealing with clinical populations are providing support for high-risk patients and mortality. In this way, I believe the approach to designing a system for a more general population and a clinical population may differ. General populations will still be affected by these two considerations; however, they will not be present to the extent found in clinical populations. A design suggestion which may be useful for a clinical setting is to include special moderator roles for health care professionals such that they can intervene if a high-risk patient exhibits symptoms of requiring further assistance and also to provide grief support for the community in the case of a death. One feature which may be useful for both a general population and a clinical population is to provide the ability for members of the community to report behaviours they feel may indicate someone is at risk for harming themselves or others. A clinical expression of the ideas presented here may also be more controlled in that health care professionals may wish to encourage participants in their program to work toward specific objectives. Depending on the program, participants may be given goals

or required to identify goals within a very specific context. Furthermore, there is the possibility of more open sharing as the health care professionals have control over the community and there is a common context for all participants.

6.4 Limitations and Future Work

There were a number of limitations in this work and a plethora of opportunities for future work. This section identifies some limitations and provides suggestions for future exploration.

6.4.1 Recruitment Strategy and Scope

The sample size was small and a convenience sample limited to North America with most of the participants from Canada. Furthermore, the study was designed from a local perspective focusing specifically on the Alberta health system, so the results may not necessarily apply to national and international health systems. With more time and resources, it would be interesting to see the results of a similar study with more participants located globally. I would be interested to see if there are any differences when other cultures are involved and also how participants interact in a larger group. In order to improve recruitment for future studies, I would keep the overall target audience the same; however, I would be much more focused in advertising. For each group of interest, I would suggest creating a targeted advertisement for those specific demographics. This would result in different print and online advertisements. I would also find more opportunities to advertise the study via in-person presentations. Another strategy which may be useful could include paying for some advertisements on social media.

6.4.2 Long Term Engagement and Group Size

In terms of the data collection study itself, it would be interesting to know whether participants continue to refine their work if they collected data for longer than the six weeks studied here. Refinement happened around week three for most of the participants who changed their

practices, so it would be interesting to see if and when it occurred in a longer-term study as more time and resources allow.

It would also be interesting to see whether a larger group would affect long term engagement. One area which was not addressed in this study but would be interesting future work is supporting implicit roadblocks in a group setting. A couple of the participants in the study mentioned they were not gaining new knowledge from the information they were collecting, and they did not modify their practices or goals to take their activities to the next level. It would be interesting to see whether support from the community could help these people move forward by identifying a roadblock exists and also suggesting constructive changes to their goals or data collection practices.

6.4.3 Heterogeneous vs. Homogeneous Data Collection and Goals

Participants were allowed to identify their own goals and choose the type of data they collected, so the results could have been affected due to the variety of goals identified and the heterogeneous data types collected. With more time and resources, it would be interesting to see the results of a similar study where participants collect homogeneous data and have similar goals. An example of this could include studying a specific clinical population such as BEAUTY. With a group such as BEAUTY, I would expect participants to engage on a deeper level as there is some common context and understanding among the group.

6.4.4 Anonymity and Communication

Another potential limitation was the anonymity of the participants. Although participants remained anonymous due to ethical considerations, it would be interesting to see how they would respond in a less anonymous or non-anonymous environment. This would allow participants to

follow up with each other, which was mentioned by one of the participants as a frustration in this work. Furthermore, there can be the potential for group collaborations, which was suggested in the design recommendations for communication support and querying the network. Support for this was also demonstrated through the design recommendation for providing context, especially through the question box feature.

6.4.5 Design Recommendation Implementation

Another limitation to this work was that the design ideas were not integrated into a real tool. Again, more time and resources would be necessary for the implementation and study of the effectiveness of the tool. I would suggest identifying a specific group for whom a tool could be created and use user-centered design to refine the design ideas presented here further. This way, the tool can be built to support the specific needs of the target population.

6.4.6 Timely Responses

One of the challenges of shared reflection is the amount of time and effort required to achieve beneficial results. Participants in this study were not always able to respond promptly, which potentially affected their own and other participants' results.

6.4.7 Setting and Achieving Goals

Participants were prompted to set goals at the beginning of the study and were allowed to change them during the study; however, there was no explicit support during the study focused on goal changes. Furthermore, once a participant achieved their goal, there was no way to explicitly encourage them to set a new goal. This is important for long term engagement; however, the shared reflection approach may be more appropriate for short term use as a tool to get started. It would be interesting to include more support for goal setting throughout the data collection process.

6.4.8 SoundCloud-Like Commenting

Based on the results of the data collection study and subsequent design evaluation interviews, it would be useful to explore the SoundCloud-like commenting feature in more depth for use in communication support and also querying the network. It would also be interesting to further explore the integration of in-person support with the querying the network feature internal to the application or by using other services such as Meetup. A third avenue to explore is allowing commenters to know if and how data owners use their comments.

6.4.9 Socially Constructed Meaning

Another area which was not explored in this study is socially constructed or negotiated meaning [26]. Although participants created highly individualized knowledge structures, it is also important to communicate their knowledge to others to acquire multiple relevant perspectives. It would be an interesting exercise to explore this negotiation between participants in future work.

6.5 Summary

This thesis began by suggesting that current personal informatics tools focus on the collection and integration of data, but provide little guidance for reflection despite the importance of reflection. Four objectives were proposed and addressed throughout this thesis:

1. Synthesize literature on personal informatics and learning theories. This objective was addressed in Chapters 2 and 3. Based on existing literature, the method of *shared reflection* was proposed as one way to support reflection through a social environment.
2. Design and execute a study on shared reflection. This objective was addressed in Chapter 3. A study consisting of two questionnaires and a six week data collection period was designed and executed on the basis of shared reflection. During the six week data

collection period, participants took part in shared reflection on a weekly basis as they anonymously provided feedback on other participants' data as well as reflected on their own data given anonymous feedback from others. Based on participant experiences in the study, shared reflection appeared to be a viable option for facilitating reflection activities.

3. Extract a set of design recommendations for personal informatics tools based on shared reflection. Based on the results of the study conducted in Chapter 3, Chapter 4 presented a set of four design recommendations based on shared reflection. These recommendations were presented as low fidelity prototypes and also integrated into screenshots of existing personal informatics tools to demonstrate how they could be implemented.
4. Conduct preliminary evaluation of design recommendations. The low fidelity prototypes from Chapter 4 were presented to six interviewees for feedback, four of whom participated in the original six week data collection study. Chapter 5 illustrates the results of the interviews, the result of which show that although the ideas are a good start, further refinement is necessary.

The main contributions of this work include:

1. Synthesized personal informatics and learning theories literature.
2. Developed a six week study design based on the aforementioned synthesis.
3. Created four design recommendations for personal informatics tools based on the results of the six week study.
4. Obtained a preliminary evaluation of the design recommendations as low fidelity prototypes.

Chapter 2 explored the existing literature on personal informatics and learning theories. Based on this literature, a study design was created and presented in Chapter 3. This chapter also contained the results of the study. Chapter 4 presented a set of design recommendations based on the results of the study in Chapter 3. These design recommendations were presented to some participants from the original study and some participants who had not participated in the original study in an interview, which is contained in Chapter 5. The results of these interviews provided the preliminary evaluation of the design recommendations.

Although the work presented here had limitations, there are four important points to consider. First, privacy and data control is very important to users. Second, participants found providing and receiving feedback about their data to be beneficial. Third, it was a challenge for participants to provide feedback if a goal was not provided or if it was unclear. Finally, a number of design improvements were suggested, which should be taken into account in further design iterations.

6.6 Conclusions

Shared reflection appears to be a promising method to support reflection in personal informatics tools by providing accountability and means by which users can get ideas for their data collection and reflection practices. It is important to consider time commitment and privacy issues when integrating shared reflection in tool design. Although the design recommendations presented here are a valuable starting point, further iteration is required to ensure the design is useful for end users of personal informatics tools. This study was limited in scope, and there is a significant amount of work which can be done to validate and further the results presented here.

I think it would be most interesting to pursue further studies in the viability of a Soundcloud-like commenting platform and also whether shared reflection is suitable for long-term data collection on a larger scale. It would be interesting to see how a shared reflection-based community evolves over time without the interference of a third party such as the researcher in this study. Additionally, it would be interesting to see whether users organically interact amongst homogeneous data (such as people collecting data on physical activity only interacting with others who collect similar data) or if heterogeneous interactions commonly occur.

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APPENDIX A: STUDY DOCUMENTS

This appendix contains all of the material used in the personal data collection and learning study including recruitment materials, questionnaires, samples, and email templates.

A.1. Consent Form

Name of Researcher, Faculty, Department, Telephone & Email:
Lisa [redacted]

Schulich School of Engineering Biomedical Engineering

[redacted]@ucalgary.ca

Jennifer [redacted]

Computational Media Design

[redacted]@ucalgary.ca

Supervisor:
Dr. Anthony [redacted]

Department of Computer Science

[redacted]@ucalgary.ca

Title of Project:

Help Me Help You: Insight Through Shared Reflection of Personal Data

Sponsor:

GRAND NCE

This consent form, a copy of which has been given to you, is only part of the process of informed consent. If you want more details about something mentioned here, or information not included here, you should feel free to ask. Please take the time to read this carefully and to understand any accompanying information.

The University of Calgary Conjoint Faculties Research Ethics Board has approved this research study.

Purpose of the Study

This work is part of a master's project undertaken by Lisa Graham in the Biomedical Engineering program at the University of Calgary. This study investigates how learning and data collection are related. Through this research, I hope to understand how people learn from their data to better design tools to support their activities.

What Will I Be Asked To Do?

This study consists of 2 short surveys and 6 consecutive weeks of data collection. Data collection consists of completing and submitting to the researchers an activity log for an activity or activities of your choice. Additionally, you may be asked to participate in an interview with the researchers which will be audio and video recorded with your permission.

Example: Larry has chronic headaches, and he has learned that collecting information about when he has them, how long they last, and what his diet has been can help him learn more about his condition. To do this, Larry may record what he has eaten, whether he has a headache, and how long his headache has persisted. At the end of the week, Larry will submit his data to the researchers.

What Type of Personal Information Will Be Collected?

Should you agree to participate, you will be asked to provide a valid email address for the data collection portion of the study and the final survey. Your email will only be used for the purpose of this study and not shared with any third parties. Data collected during this study will be identified using a pseudonym and used and cited in my dissertation and perhaps publications submitted to academic journals.

We may be interested in contacting you for an interview for more details on the data collection associated with this study.

Are you willing to be interviewed? Yes ____ No ____

If you are willing to be interviewed, we would like to record video and audio of the interview.

I grant permission to be audio taped. Yes ____ No ____

I grant permission to be videotaped. Yes ____ No ____

Are there Risks or Benefits if I Participate?

Portions of your data may be shared with other study participants throughout the study. Any data shared with other participants will be anonymous.

All participants are eligible for reimbursement totaling $20CAD according to the following schedule:

Pre-study survey: $2

Week 1 submission: $1

Week 2-6 submissions: $3 ($1 for each of log submission, shared reflection, and personal reflection) Post-study survey: $2

Payment is made when the participant completes the study or when they withdraw in which case they will be paid out according to the tasks they have completed at the time of withdrawal.

Participants who complete the study will also be entered in a draw to win $100CAD. Odds of winning depend on the number of participants who complete the study. Participants who withdraw from the study will not be entered in the draw.

What Happens to the Information I Provide?

If you decide to participate in this study, someone from the research team will be in touch with you after completing this survey to get you started on the data collection component. Your participation is voluntary. You may decline to answer any or all of the questions and/or withdraw from the study at any time by contacting the researchers at personaldatastudy@ucalgary.ca prior to completing the second survey. By withdrawing from the study, all of your data that has not been viewed by another participant will be removed. Please note that once you finish the final survey, your data can no longer be removed from the study. The data from this study will be stored in a password protected location accessible only by the research team. If you decide to participate in this study, someone from the research team will be in touch with you after completing this survey to get you started on the data collection component. Your participation is voluntary. You may decline to answer any or all of the questions and/or withdraw from the study at any time by contacting the researchers at personaldatastudy@ucalgary.ca prior to completing the second survey. By withdrawing from the study, all of your data will be removed as well.

Please note that once you finish the final survey, your data can no longer be removed from the study. The data from this study will be stored in a password protected location accessible only by the research team.

Questions/Concerns

If you have any further questions or want clarification regarding this research and/or your participation, please contact:

Lisa [redacted]

Schulich School of Engineering Biomedical Engineering

[redacted]@ucalgary.ca

Jennifer [redacted]

Computational Media Design

[redacted]@ucalgary.ca

Dr. Anthony [redacted]

Department of Computer Science

[redacted]@ucalgary.ca

If you have any concerns about the way you've been treated as a participant, please contact the Research Ethics Analyst, Research Services Office, University of Calgary at (403) 210-9863; email cfreb@ucalgary.ca.

A copy of this consent form has been given to you to keep for your records and reference. The investigator has kept a copy of the consent form.

A.2. Pre-Study Questionnaire

[Page 1]

Help Me Help You: Insight Through Shared Reflection of Personal Data

Thanks for your interest in this study! Please review the following information to learn what this study entails. The University of Calgary Conjoint Faculties Research Ethics Board has approved this research study.

Purpose:

This study investigates how learning and data collection are related. Through this research, I hope to understand how people learn from their data to better design tools to support their activities.

What Will I Be Asked To Do?

This study consists of 2 short surveys and 6 consecutive weeks of data collection. Data collection consists of completing and submitting to the researchers an activity log for an activity or activities of your choice. Additionally, you may be asked to participate in an interview with the researchers which will be audio and video recorded with your permission.

Example: Larry has chronic headaches, and he has learned that collecting information about when he has them, how long they last, and what his diet has been can help him learn more about his condition. To do this, Larry may record what he has eaten, whether he has a headache, and how long his headache has persisted. At the end of the week, Larry will submit his data to the researchers.

What Type of Personal Information Will Be Collected?

You will be asked to provide a valid email address for the data collection portion of the study and the final survey. Your email will only be used for the purpose of this study and not shared with any third parties. Data collected during this study will be identified using a pseudonym and used and cited in my dissertation and perhaps publications submitted to academic journals. We may be interested in contacting you for an interview for more details on the data collection associated with this study.

Are there Risks or Benefits if I Participate?

Portions of your data may be shared with other study participants throughout the study. Any data shared with other participants will be anonymous.

All participants are eligible for reimbursement totalling $20CAD according to the following schedule:

- Pre-study survey: $2
- Week 1 submission: $1
- Week 2-6 submissions: $3 ($1 for each of log submission, shared reflection, and personal reflection)
- Post-study survey: $2

Payment is made when the participant completes the study or when they withdraw in which case they will be paid out according to the tasks they have completed at the time of withdrawal.

Participants who complete the study will also be entered in a draw to win $100CAD. Odds of winning depend on the number of participants who complete the study. Participants who withdraw from the study will not be entered in the draw.

What Happens to the Information I Provide?

If you decide to participate in this study, someone from the research team will be in touch with you after completing this survey to get you started on the data collection component. Your participation is voluntary. You may decline to answer any or all of the questions and/or withdraw from the study at any time by contacting the researchers at personaldatastudy@ucalgary.ca prior to completing the second survey. By withdrawing from the study, all of your data that has not been viewed by another participant will be removed. Please note that once you finish the final survey, your data can no longer be removed from the study. The data from this study will be stored in a password protected location accessible only by the research team.

Participation:

By participating in this survey, you agree that 1) you understand to your satisfaction the information provided to you about your participation in this research project, and 2) you agree to participate in the research project. In no way does this waive your legal rights nor release the investigators, sponsors, or involved institutions from their legal and professional responsibilities. You are free to withdraw from this research project at any time. You should feel free to ask for clarification or new information throughout your participation.

Questions/Concerns:

If you would like a copy of this form emailed to you, have any further questions, or want clarification regarding this research and/or your participation, please contact one of the researchers (Lisa [redacted] at [redacted]@ucalgary.ca, Jennifer [redacted] at [redacted]@ucalgary, or Dr. Anthony [redacted] at [redacted]@ucalgary.ca). If you have any concerns about the way you've been treated as a participant, please contact the Research Ethics Analyst, Research Services Office, University of Calgary at (403) 210-9863; email cfreb@ucalgary.ca.

[Button with text "I consent to participate in this study. Let's get started!"]

[Page 2]

Consent To Interview

We may be interested in asking you a few questions about your participation in this study through an interview. To do that, we first need your consent.

Are you willing to be interviewed?

Yes

No

No answer

Help text: If you consent to being interviewed, we may be in touch through the email you provide to determine the best way to conduct an interview with you.

I grant permission to be audio taped.

Yes

No

No answer

Help text: If you are willing to be interviewed, we would like to record video and audio of the interview (where applicable)

I grant permission to be videotaped.

Yes

No

No answer

Help text: If you are willing to be interviewed, we would like to record video and audio of the interview (where applicable)

[Page 3]

General

Your responses to the questions in this section will help us categorize the information we collect.

We will also need a valid email address to contact you for the next part of the study.

With what gender do you identify?

Choose one of the following answers

Male

Female

Other

No answer

In what year were you born?

Only numbers may be entered in this field.

Please provide a valid email.

Help text: To participate in the data collection component of this study, we'll need a valid email from you. This email will be used for correspondence throughout the study.

In what city do you reside?

Help text: If you do not reside in a city, let us know the nearest large centre.

[Page 4]

Data Collection Habits

In this set of questions, we are interested in learning more about your current habits.

Do you collect data?

Yes

No

No answer

This can include any kind of data. Some examples include food, physical activity, sleep, and more.

If you collect data, do you use sensors?

Yes

No

No answer

Help text: Sensors examples include GPS, FitBit, FuelBand, etc

If you collect data and DO NOT use sensors, when do you log your data?

If you collect data and DO NOT use sensors, where do you log your data?

Help text: This question includes where you are physically located when you log your data as well as what tools you use to record your data.

If you collect data, what do you do with your data?

If you collect data, do you review your data?

If you collect and review data, how often do you review your data?

Whether or not you currently collect data, what data are you interested in collecting?

Why are you interested in collecting this data?

What do you currently know about data collection?

What are you expecting to learn from this study?

[Page 5]

Thanks for participating in this survey. If you provided a valid email, one of the researchers will be in touch with you with details on next steps! If you don't receive the email in the next hour, please check your junk mail.

A.3. Data Collection

A.3.1. Welcome Email

Subject: Welcome to the Data Collection and Learning Study

Hi!

Thank you for agreeing to participate in this study on learning and data collection. Please note that you may withdraw at any time by emailing us at personaldatastudy@ucalgary.ca with your request. When you withdraw, all of your data will be removed from the study.

The remainder of this study consists of 6 weeks of data collection and a survey. You will receive periodic emails with further instructions, so please be sure to check your email regularly. If you complete the study, you will be entered to win $100CAD. If you withdraw from the study, you are not eligible for the draw. All participants are eligible for remuneration totaling up to $20CAD according to the following breakdown:

Pre-study survey: $2

Week 1 submission: $1

Week 2-6 submissions: $3 ($1 for each of log submission, shared reflection, and personal reflection)

Post-study survey: $2

Payment is made when the you complete the study or when you withdraw in which case you will be paid out according to the tasks you have completed at the time of withdrawal.

Your first task is to start collecting data. In the initial survey, you identified some types of data you were interested in collecting and reasons you wanted to collect it. Please use the attached template to start collecting your data. Feel free to use as many sheets as you would like. At least one sheet should be used for each type of data you are collecting. Here are some instructions on how to fill it out:

Week: Please enter the date of the week you are reporting on.

Activity Type: Please identify what type of data you will be collecting on this sheet.

Goal: Please identify a goal you would like to achieve by collecting this data. The goal can be short term or long term and does not have to remain the same throughout this study.

Date/Time: Enter the date and time of your activity

Activity Description: Enter a description for your activity (examples: crunches, run, sleep, ice cream)

Quantity: Enter the quantity you completed (examples: 8h (of sleep), 23 (crunches), 120 calories, etc)

Here's an example:

Larry has chronic headaches, and he has learned that collecting information about when he has them, how long they last, and what his diet has been can help him learn more about his condition. To do this, Larry may record what he has eaten, whether he has a headache, and how

long his headache has persisted. At the end of the week, Larry will submit his data to the researchers.

If you have any questions, feel free to contact us at any time at personaldatastudy@ucalgary.ca. Happy data collecting!

Lisa

If you are participating in this study and would like to be removed, please email personaldatastudy@ucalgary.ca at any point.

Still have questions?

1. What kind of data will I be asked to collect?

The data you will be asked to collect in this study is personal data, which may include physical activity, diet, sleep, and everything in between. Here are some examples of data I collect:

* Budget

* Hours spent playing music

* Time spent walking and doing yoga

There are two important considerations when choosing what type(s) of data you are going to be collecting:

* Is the data meaningful to you?

* Are you okay with another participant looking at your anonymized data?

Keep in mind that you do not have to collect just one type of data. It may be helpful to collect more than one type of data to reach the goal you have set. For example, diet and physical activity may both be important when your goal is to lose weight.

2. The data does not have to be manually collected either. Users of Fitbit, RunKeeper, or any number of apps and tracking tools often have a way to download data for submission each week (see question 3 below).I don't have any experience/I already collect lots of data. Is that okay?

The study has been designed to support people who are veteran data collectors as well as people who have never collected data before. We are here to answer your questions regardless of experience, so feel free to email at any time.

3. I already have my own format for collecting data/I don't like how the default log is set up. Do I have to use the supplied activity log?

No! If you already have a format you prefer or if you would like to modify the default log, feel free. It is most important for the log to integrate well within your daily life. For this study, we are interested in receiving two pieces of information from you each week:

* Collected data

* Goal for the data

Note: This question refers to the activity log which is emailed once you have completed the initial survey.

4. My question hasn't been answered! What do I do?

If you still have questions, please email personaldatastudy@ucalgary.ca

Attachment: Activity Log (see A.3.2)

A.3.2. Activity Log

Activity Log Date/Week #: _____ Page ____ of ____

Record your data in the activity sheet below. If the column titles are inappropriate for the data you are collecting, feel free to change the format, use multiple sheets, or to use your own template. In the box below, please tell us if you have some goal or intention in relation to the collected data.

Why are you collecting this data?			
Date/Time	**Description**	**Quantity**	**Notes**

A.3.3. Sample Week 1 Email

Hi!

It's the end of week 1, so it's time to submit the data you collected this week. Please email your completed activity log(s) to personaldatastudy@ucalgary.ca as soon as possible. Don't forget to start new sheets for next week!

It is important to submit your logs weekly because there are activities which depend on previously collected data.

If you have any questions, let me know.

Thanks!

Lisa

If you are participating in this study and would like to be removed, please email personaldatastudy@ucalgary.ca at any point.

A.3.4. Sample Week 2-6 Email: Shared Reflection

Hi!

It's the end of week 2, and this week I have a couple of activities for you. Attached is a week's worth of data from another participant in the study. What are your thoughts about it? Feel free to express yourself in a format of your choosing.

Don't forget to send your thoughts back to personaldatastudy@ucalgary.ca once you're finished! Your thoughts will also be anonymously sent back to the person who collected the data you reviewed.

Also, please don't forget to submit your week 2 data logs.

If you have any questions about this week's activity or the study in general, let me know.

Thanks!

Lisa

If you are participating in this study and would like to be removed, please email personaldatastudy@ucalgary.ca at any point.

Attachment: Data log from another participant.

A.3.5. Sample Week 2-6 Email: Self-Reflection

The last activity for this week is to let me know what you have learned about your data.

I've attached a couple of files here. One is a subset of your data another participant took a look at and the other is that participant's comments on your data.

If you have any questions, let me know.

Thanks!

Lisa

If you are participating in this study and would like to be removed, please email personaldatastudy@ucalgary.ca at any point.

Attachments: Comments from participant reviewing data log and a copy of data log to which the comments apply.

A.4. Post-Study Questionnaire

Data Collection Habits

In this set of questions, we are interested in what you learned from the study.

Recall your answers to a couple questions we asked you initially:

Question: What data are you interested in collecting?

Your Answer:

Question: Why are you interested in collecting this data?

Your Answer:

Did you fulfill your objectives? Why or why not?

Last time we asked you about your currently knowledge of data collection and here's what you answered:

Has your understanding changed? How?

Last time, we asked what you expected to learn from this study. Here's what you said:

Do you feel your learning expectations were met?

What did you learn during this study?

Please provide comments on your experience during this study.

Do you have anything else you'd like to share?

If you are interested in hearing the results of this study, please leave an email at which you can be reached here. Otherwise, just leave it blank.

Thanks for participating in this study! You have been entered to win $100CAD. If you indicated you were interested in hearing the outcomes of this study, we will let you know when the results are available.

APPENDIX B: EXEMPLARS

This appendix contains a select number of data sets from participants in the study. Each section consists of the data collected, comments from another participant, and the participant's own comments.

B.1. Esther

Week 1

Goal: My goal is to perfect my performance, so that I can play smoothly and without mistakes.

Date/Time	Description	Quantity	Notes
11/27/14 11:15 a.m.	Practice my songs on piano	5 songs X 3 each	I finished before noon; will do others tonight
11/27/14 8:45 p.m.	Practice my other songs on piano	7 songs X 3 each (or until my back gives out)	I finished by 9:55 p.m.
11/28/14 8 p.m.- 9 p.m.	Practice my songs on piano	Practiced 3 songs 3 X and 2 songs 1 X	My back was killing me, so I had to cut short the repititions on the last 2 songs. My arthritis is bothering my hands, plus eczema has ravaged them with a vengeance due to the recent cold weather.
11/29/14 7-7:20 p.m.	Plractice my songs on piano	Practiced one song 3 times	My back was really bothering me, so I switched to practicing the uke, so that my back could rest against the back of a chair.
11/30/14 12:10 – 12:40 p.m. & 5:30 – 7:30 p.m.	Practice 12 of my songs on piano	Practiced 3 songs 3 X and one song once; then practiced the rest of them 3 X each.	I had my son-in-law and grandson over, so had to break up my practice session. Took several breaks during early evening session to ease my back. Eczema on my hands is still a problem to practice.

12/1/14 4:15 – 5:15 p.m.	Practice my songs on piano	Practiced 3 songs 3 X and 1 song 1 time	My back was bothering me, so I switched to the Uke Played only "Bye Bye Blues" in C & F – added a Em7 to the former after seeing a Gm7 in the sheet music of the latter.

Goal: My goal is to perfect my performance, so that I can play smoothly and without mistakes, as well as to better memorize chord progressions and positions.

Date/Time	**Description**	**Quantity**	**Notes**
11/27/14 10:00 p.m.	Practice songs on ukelele	Bye Bye Blues (in C and F), A Foggy Day, I'm Always Chasing Rainbows (2 versions), Aloha Oe, Running Wild, Darktown Strutters Ball	I finished by 11 p.m.
11/29/14 7:20 p.m.	Practice songs on ukelele	Bye Bye Blues (2 keys), A Foggy Day (did some chord research), Over the Rainbow, Aloha Oe	Stopped by 8 p.m. to be able to watch a 4-star movie (1946), "La Belle et La Bete" by Jean Cocteau. I'm trying to get rid of eczema on my hands without using my RX cortisone creams/ointments because of being sscheduled to participate in a paying study in January which requires that I not use any products containing cortisone for a month beforehand.
11/30/14	Practiced songs on Uke	Bye Bye Blues and A Foggy Day	I should have logged these times right away – they were late at night
12/01/14	Practiced songs on uke	Bye Bye Blues	Ditto

Response: I didn't practice piano or ukelele for the last couple of days because after I washed my hair on Tues., my eczema was really rampant and I was just not up to it. I'm getting back to it today, since my symptoms seem to have subsided by wearing Aquaphor under cotton gloves at

night and sometimes during the day -- can't practice w/gloves on or with my hands slathered with that greasy stuff!

Comments: So I'm wondering what kind of musician specializes in both piano and ukelele. Also, the eczema sounds painful. Is the back pain caused by extensive practice?

Response: So I'm wondering what kind of musician specializes in both piano and ukelele. Also, the eczema sounds painful. Is the back pain caused by extensive practice?

I learned the ukelele when my dad taught my sisters and me as kids -- the chords but not what they were or what key the songs were in. I got more interested in pursuing ukelele studies when I lived in IL in 2012 (which is also when I came down with eczema, which I'd never had before -- must be the climate!) -- took lessons from a guitar specialist in a local music store, but because of a fall which injured my hands, couldn't pursue it until much later. I gave my old D-tuned uke to my grandson and bought a C-tuned one with a built-in tuner from The Guitar Center. Had to learn to shift my thinking between songs that were chorded for D-tuned ukes & those chorded for C-tuned ukes. Some of the sheet music shows chords which are too difficult for me to use because of the fingering positions, so I have to try to figure out simpler chords which sound okay.

My back problems were caused when I was a passenger in my daughter's car in 2007, and we were hit on the passenger side slightly back of the front seat door. Even several sessions of physical therapy have not done much to improve the pain when standing or sitting without support, although it has gotten much more manageable and less in degree.

As far as "specializing in both piano and ukelele" goes, I think that my experience with the uke has helped me with songwriting. And my piano experience has and still helps me with figuring out which chords to use on the uke. I'm still trying to use my "ear training" to figure out what chords Stravinsky used with he performed his orchestral version of "The Star-Spangled Banner" in the 1940s, which was "Banned in Boston!" (See attached article re my wanting to play piano by ear -- this was my "15-minutes-of-fame article_ -- I'm still "ASPIRING!")

Edit in second email:

I should have said,"... what chords Stravinsky used WHEN he performed, etc." I hate it when I don't proofread before I hit the "SEND" button on my computer!:(

Hope you enjoyed the article -- the Pan Am jingle title left off the "On" mentioned in the article -- it was just "Wings of Wonder" but maybe Pan Am would have accepted it if the "ON" HAD been in the title! Here's the demo version with changes made by the guy who did the demo. Can you hear the engines of a jet plane revving up as ihe last line fades out?

Included files: article (Highwood Songstress Waits for Break) + sound clip (Wings of Wonder)

Week 2

Goal: My goal is to perfect my performance, so that I can play smoothly and without mistakes.

Date/Time	**Description**	**Quantity**	**Notes**
12/04/14	Practice my songs on piano	N/A	My left thumb felt ss though there was a pinched nerve or a pulled muscle. So I let my hands rest.
12/05/14 11 a.m. -12 noon	Practice my songs on piano	4 Songs 3 X and 1 song 1 X	I had to give time to my daughter for her errands and activities, so I had to cut my practice short.
12/06/14 6:30 a.m. – 7:30 a.m.	Practice my songs on piano	8 Songs 3 X including “My Love”(not completed yesterday)	I did my 7-song series plus the one from yesterday which I had not finished.
12/07/14	Plractice my songs on piano		Dogsitting for my daughter, so have to wait until dog is picked up.
12/08/14 11:00 -12:00 p.m.	Practice my songs on piano	5 songs X 3 times	
12/09/14 11:00 – 12:00 p.m.	Practice my songs on piano	Several songs (7) X 3 each	I was interrupted by a phone call from my daughter but managed to get in an hour of practice.
12/10/14	Practice my songs on piano		Busy with many frustrations the entire day. Was up past midnight doing hair and dealing with challenges.

Goal: My goal is to perfect my performance, so that I can play smoothly and without mistakes, as well as to better memorize chord progressions and positions.

Date/Time	Description	Quantity	Notes
12/04/14	Practice songs on ukelele		
12/05/14	Practice songs on ukelele		
12/06/14	Practice songs on Uke		
12/07/14 3:40-3:50 p.m. and 4:00-5:45 p.m.	Practice songs on uke	Bye Bye Blues, A Foggy Day, Aloha Oe, I'm Always Chasing Rainbows	Serenading the dog on the couch for 10 minutes before my daughter called to say, "Be outside with him!!" Worked on 4 songs, mainly first 2, working out different chord progressions, both my own and those on the sheet music, which have more difficult fingerings. Had to quit when my left wrist started hurting. I don't want carpal tunnel syndrome again (got it from repetitive motion/too much typing at my last job).
12/08/14	Practice songs on uke.		
12/09/14 9-10:05 p.m.	Practice songs on uke	Bye Bye Blues (in C and F), A Foggy Day, I'm Always Chasing Rainbows (2 versions), Aloha Oe, Running Wild, Try to Remember, Someone to Watch Over Me, Show Me the Way to Go Home	My daughter interrupted with a phone call, but AI managed to get in an hour's practice.
12/10/14	Practice songs on uke		

Comments: 1. Piano Log

I'm interested to have more context. I'd like to know what all conditions the person experiences. This will help me understand what they are recording.

It's hard to see any patterns in the data given the style it is written in. I'd like to see some checkboxes, such as: Back Pain, Eczema, etc.

I'd be also interesting to see what each would be rated on for a pain scale or annoyance threshold. So, for example, if for each piano practice, you could say, Back Pain = 7 (1-10 pain scale).

I'd also like to know if they can define their goal more specifically. What does it mean to "perfect your performance?" How can you judge that? When is it "perfect"? You say that you want to play smoothly without any mistakes, but is that ever possible? Maybe be easier on yourself, e.g., 1 mistake per song at the most.

2. Ukelele

I have similar thoughts about the ukulele log. There is a lot in the notes that would be nice to see broken into separate column. This would make it easier to analyze across different days.

Overall, well done on practicing so much. This shows a lot of dedicate despite the health problems you report.

Response: Thanks for the comments, which, obviously, someone put a great deal of thought into before expressed. Am I supposed to respond to them?

I'm not that computer literate that I would be able to provide checkboxes for type of discomforts experienced while practicing (back pain, eczema, arthritis, fatigue, etc.) If someone can design a data sheet for me that would show those items for me to check off, I'd try to accommodate their curiosity as to the degree of discomfort or pain for each ailment, although it isn't that easy for me to quantify with a number -- I've never been good at being able to do that sort of thing. (I think I have my eczema under control by sleeping with Aquafor slathered on my hands and cotton gloves over regular gloves -- although as the weather gets colder, I might have to resort to my prescription cortisone cream and ointment.)

My goal, more specifically, is if anyone who can help me with my "songwriting career" wants to hear me play my songs, I can accommodate them without being embarrassed at my performance (or lack thereof). I was trying to deal with the problem of losing my singing voice by attending therapy sessions at a local Voice Clinic, but the exercises were annoying, especially since I was unable to do one of them, plus I didn't see much improvement or even the point of them -- guess when my voice gets bad enough, I'll make more of an effort to deal with it and suspend my disbelief in the helpfulness of the exercises -- I was given a CD to listen to that was supposed to help me with my exercises, but I have nothing to play it on, since it won't work in my computer).

Another goal is to be able to send a copy of my performance(!) of one or more of my songs to a friend who said he'd like to hear me play them. My digital piano can record my performance, but whenever I turn it on to do so, I freeze up even more than usual and make too many mistakes for it to be acceptable to let anyone hear. Also, I don't know how to put it on a CD to send to him, or how to make an MP3 file on the computer, so that I could e-mail it. I don't

think he has any "musical connections" which might be useful in promoting my songs, although he used to sing in a NY men's chorus.

Other than those two rather vague goals, I haven't got any more concrete goals, like being able to audition acceptably to be granted entrance to a special arts school, like my daughter is trying to do with her son by having him practice piano an hour a night, so he will be able to get into (Per WIKIPEDIA: The School for the Creative and Performing Arts or SCAPA is an arts-oriented school in Fayette County Public Schools in Lexington, Kentucky which provides students who are especially talented and/or interested in the arts the opportunity to further develop and enhance their abilities. SCAPA consists of grades 4-8 at the middle school level and continues on with the SCAPA program at Lafayette High School (grades 9-12). It was the top performing school in Kentucky for 2005-2006 in the CTBS scores and in writing.) My grandson is age 5 and has been studying piano for a year. He has no fear of performing in front of other people and is not self-conscious about possibly making mistakes -- his last performance, uncharacteristically, had some, which he admitted, but he didn't seem particularly upset about them. I noticed that it seemed to be an off day for just about every other performer at that particular holiday recital -- maybe the season had something to do with it! One thing he likes to do is compose his own songs -- his other grandparents gave him some music paper for the holidays, so maybe I can live vicariously through his efforts, especially if he is more successful than I have been!

I was also inspired to read online that André Previn used to practice up to 6 hours a day and is regarded as accomplished in many musical genres-- a real example for me to follow! I just wonder sometimes whether it's too late for me to be able to make my mark in music, or has my

laziness and dilettante approach irreparably handicapped me, as one of my piano teachers once told my late husband (he said that I started too late to seriously tackle piano for me to ever be any good as a performer, whether on the cocktail circuit or in the concert hall -- not that I ever had ambitions in either of those directions!).

Still, I don't want to forget what I've invested in with so much of my "blood, sweat, and tears" which is another reason I practice my songs on the piano.

As I may have mentioned, nostalgia for my dad teaching my sisters and me how to play the uke is a big factor in taking up that instrument again, trying to perfect the performance of the songs he taught us, as well as expand my repertoire. Maybe some day, I'll take group uke lessons (tried this at Guitar Center, but I'm the only one who has shown up several times, and the solo lesson kind of falls flat!) or join a group of amateur uke players to try to perfect my skills and enjoy the camaraderie and expertise of others who appreciate this instrument

Week 3

Goal: My goal is to perfect my performance, so that I can play smoothly and without mistakes.

Date/Time	**Description**	**Quantity**	**Notes**
12/11/14 12:00 p.m.= 12:	Practice my songs on piano	12 xongs X 1; then started with 12 song working backwards, made it through "Rigor Mortis Blues" only. Had to retrain my brain – many mistakes.	Several interrupting phone calls from my daughter; quit @ 12:50 to get reaqdy for visit from KY Utilities. The rep called @ 12:59 to say he would be about 40 minutes late. Then my daughter called with an emergency which took up the time between 1-1:30 p.m.
12/12/14 8:45 p.m.	Practice my other songs on piano	7 songs X 3 each (or until my back gives out)	I finished by 9:55 p.m.
12/13/14 8 p.m.- 9 p.m.	Practice my songs on piano	Practiced 3 songs 3 X and 2 songs 1 X	My back was killing me, so I had to cut short the repititions on the last 2 songs. My arthritis is bothering my hands, plus eczema has ravaged them with a vengeance due to the recent cold weather.
12/14/14 7-7:20 p.m.	Practice my songs on piano	Practiced one song 3 times	My back was really bothering me, so I switched to practicing the uke, so that my back could rest against the back of a chair.
12/15/14	Practice my songs on piano		
12/16/14	Practice my songs on piano		
12/17/14 8:30 – 9::15 p.m.	Practice my songs on piano	Practiced 5 songs 3 X each	Really got into it tonight! Used my headphones so as to not disturb neighbors.

Goal: My goal is to perfect my performance, so that I can play smoothly and without mistakes.

Date/Time	Description	Quantity	Notes
12/11/14 9:15 p.m.--10:30 p.m.	Practice my songs on uke	Several songs, including Bye Bye Blues, A Foggy Day, the first verse of Someone to Watch over Me, Aloha Oe, Running Wild, I'm in Love with You, Honey.	Hoping that figuring out chords on the uke will improve my understanding of piano, and vice versa.
12/12/14 8:45 p.m.	Practice my other songs on uke	7 songs X 3 each (or until my back gives out)	I finished by 9:55 p.m.
12/13/14 8 p.m.- 9 p.m.	Practice my songs on uke	Practiced 3 songs 3 X and 2 songs 1 X	My back was killing me, so I had to cut short the repititions on the last 2 songs. My arthritis is bothering my hands, plus eczema has ravaged them with a vengeance due to the recent cold weather.
12/14/14 7-7:20 p.m.	Practice my songs on uke	Practiced one song 3 times	My back was really bothering me, so I switched to practicing the uke, so that my back could rest against the back of a chair.
12/15/14 9:15 – 10;30 p.m.	Practice my songs on uke	Practiced several songs several times.	Figured out transition chord for one sone on piano. Felt as thogh I had a productive practice session.
12/16/14	Practice my songs on uke		
12/17/14 9:20-10:30 p.m.	Practice my songs on	Practiced several songs several times	My wrists hurt afterwords – got a good workout.

Comments: n/a

Response: n/a

Week 4

Goal: My goal is to perfect my performance, so that I can play smoothly and without mistakes.

Date/Time	**Description**	**Notes**
12/18/14	Practice my songs on piano	Did Not Practice
12/19/14 8:15-8:45 and 10:10-10:25 p.m.	Practice my songs on piano	6 songs 3 X each, broken up into 3 songs each practice session on piano
12/20/14	Practice my songs on piano	
12/21/14 8:45-9:30 p.m.	Practice my songs on piano	5 songs X 4
12/22/14 1:50 – 2:10 p.m.	Practice my songs on piano	5 songs 2 X each
12/23/14	Practice my songs on piano	
12/24/14	Practice my songs on piano	

The following study, which I just completed, inspired an engrossing piano practice session afterward -- most likely because it allowed and even encouraged more opportunity for self-expression than the usual multiple choice online psych questionnaires offer, and therefore, I feel, it was more effective in eliciting a well-thought out & heartfelt response from me:

Thank you for your interest in this study.

In this questionnaire, we are interested in how people view their surrounding world. You will be asked to recall a particular experience, afterwards you will be asked to answer a series of questions about your perception of the world, in a broad sense. Your participation will last approximately 15 minutes. We do not anticipate any risks to you participating other than those encountered in daily life.

Your responses are completely anonymous and no information that would allow us to personally identify you will be collected. If you become uncomfortable feel free to stop answering the questionnaire. However, we encorage you, if possible, to completely fill it. This will help us to collect better data. No benefits are expected from participation in this study. However, your taking part in this study may advance lnowledge in the field of social psychology.

This study is supervised by [redacted] ([redacted]) and is part of a large research project of the University of Louvain (Belgium).Thank you for your interest in this study.

The study has been reviewed and approved by the university's ethics committee. If you have any question or concerns regarding your right as a subject in this study, you may contact the Institutional Review Board (IRB) of the university by accessing their website on:http://www.uclouvain.be/328320.html.

If you have any questions concerning this survey , please feel free to contact Claire [redacted]:[redacted]

To proceed, please complete the consent form below:

We would like you to remember a particular event during which you were in the presence of a natural landscape that was really beautiful. This might have been a sunset, a prestigious view, or any other moment when, in nature, you felt awe. Try now, for a few moments, to immerse yourself again in this event, to remember what you felt and how you lived this experience. Close your eyes for one minute and try to immerse yourself in this experience. Afterwards, describe in 3-5 lines this event and the awe you felt.

One particular sunrise and the events which preceded its viewing inspired me to write the following song:

There is promise in the dawn;

Hope is reborn every morn;

Challenge rises with the day --

If we let God light the way,

Stress and Strife could soon be gone.

When the silver of a cloud

Meets the radiance of the sun,

The horizon's sky-blue pink --

Hallelujah! We can think,

Feel, and make God's will be done!

The Common Ground wherein we dwell

Is the Earth and the fullness thereof;

It could become like Eden again

If we cultivate

It and each

Other with

Love!

For each sorrow, there's a joy;

Truth will triumph over Lies;

Beauty on the inside's best;

Less is more, more or less!

No time wasted in God's plan

When we help animals as we can

And our fellow Human!

The Common Ground wherein we dwell

Is the Earth and the fullness thereof;

It could become like Eden again

If we cultivate

It and each

Other with

Love!

For each sorrow, there's a joy;

Truth will triumph over Lies;

Beauty on the inside's best;

Less is more, more or less!

No time wasted in God's plan

When we help our fellow Man

and Woman!

Smell the rain and feel the thunder;

Earth of fullness, full of wonders --

Cherish Her!

Cultivate and love each other,

And live in peace together --

Promise Him,

Promise Her!

Where there's sorrow in the day,

Love will surely find a way!

When there's trust and honesty,

Then we truly can be free!

Hear me, hear US make a plan --

Helping Woman,

Helping Man;

Loving Woman,

Loving

MAN!

(The part from "Smell the rain" until "Loving MAN!" was the latter part of a revision by a guy who collaborated with a singer and another musician to do their demo of my song. The song was then adapted for performance in a humanistic church, so "Hear me, Hear US make a plan" was added to the ending, and other changes were made to the revision to remove references to any Deity, for the benefit of atheists and agnostics who attended, since the humanistic approach seems to be more "making a better world is in our hands."

I kind of grafted the original, revision, and adaptation together, making modifications, to come up w/the above song, which tries to get across the idea that Humanity must assume "Stewardship," not "Dominion" over the Earth in order to work toward making it "like Eden again" -- a place full of Love and Appreciation for an "Earth of fullness, full of wonders" and for each other who dwell together in/on this "Common Ground" -- for better or for worse!)

Goal: My goal is to perfect my performance, so that I can play smoothly and without mistakes.

Date/Time	Description	Notes
12/18/14.	Practice my songs on uke	.
12/19/14 8:45-10:00 p.m.	Practice my other songs on uke	Several songs -- the usual “Bye Bye Blues” in C & F, “A Foggy Day,” “I’m Always Chasing Rainbows,” “Aloha Oe,”& more.
12/20/14.	Practice my songs on uke	
12/21/1410:40 p.m.- 11:40 p.m.	Practice my songs on uke	Practiced several songs several times
12/22/14 2:15 – 2:35 p.m.	Practice my songs on uke	Practiced a few songs on my uke.
12/12314	Practice my songs on uke	
12/24/14	Practice my songs on	

Comments: There is an obvious drive for this person to learn more about music and really improve. From the start of the study they showed a lot of consistency in their approach to practicing both instruments. The goal was well thought out and seems to have been very well executed! Congrats!

There is no pretence to this, but as a musician myself I think this person may get something out of it. I started a goal a couple years ago of learning classical violin, after 8 years of a fiddle background I did some research on practicing habits and such when I was starting out and I found this helpful article on making the most of practice time, it is attached, maybe it will help this participant as well.

Attachment: Article 'How to practice!'

Response: I really appreciated the comments of the "fiddle player" and his article on how to practice most effectively, which I read and passed on to my daughter to use with her 5-year-old son, who takes Suzuki piano lessons and is making preparations to audition for SCAPA ("The School for the Creative and Performing Arts or SCAPA is an arts-oriented school in Fayette County Public Schools in Lexington, Kentucky which provides students who are especially talented and/or …" Wikipedia: http://en.wikipedia.org/wiki/School_for_the_Creative_and_Performing_Arts). I have found, myself, that there are times of the day when I don't feel as much pain when I practice, or get more into the "Zen" of it -- I like mornings better than evenings, but since my piano is electronic and accommodates headphones, I often find myself practicing when others in my apt. complex are needing "quiet time" so I use the headphones. My piano also records, but unfortunately, whenever I try to record myself, I get so self-conscious that I make too many mistakes and have to stop and start over.

Week 5

Goal: My goal is to perfect my performance, so that I can play smoothly and without mistakes.

Date/Time	**Description**	**Notes**
12/25/14	Practice my songs on piano	Did Not Practice
12/26/14	Practice my songs on piano	
12/27/14 8-8:30 p.m.	Practice my songs on piano	5 songs X2
12/28/14	Practice my songs on piano	
12/29/14 4:45-5:45 p.m.	Practice my songs on piano	7 songs X3 plus one song once
12/30/14	Practice my songs on piano	
12/31/14 11:45-12:30 p.m.	Practice my songs on piano	5 songs X3

Goal: My goal is to perfect my performance, so that I can play smoothly and without mistakes.

Date/Time	**Description**	**Notes**
12/25/14	Practice my songs on uke	Did Not Practice
12/26/14.	Practice my songs on uke	
12/27/14	Practice my songs on uke	
12/228/14	Practice my songs on uke	
12/29/14	Practice my songs on uke	
12/30/14	Practice my songs on uke	
12/31/14 8:30-9:30 p.m.	Practice my songs on uke	Several songs (10-12) about 3-4 times each

Comments: I think that the notes section of these data files would benefit from a bit more direction and focus. If the goal is to play through songs without any mistakes, perhaps by recording trouble sections, areas where you'd like to improve on, etc, it could help pinpoint

exactly where you most need to improve. Things like "I keep fumbling on the run of sixteenth notes on bar 13" might help you to pinpoint where you'd like to focus your rehearsal times. Many of the existing notes reflect upon physical and mental well being, so perhaps comments on each practice session might be an interesting companion column to these notes. Comments such as "My back hurt and I felt dizzy from a temp and sinus infection" may go hand in hand with "I couldn't get this run of notes" to help pinpoint the time when you receive the most benefit from your practice sessions and thus spend your time most effectively.

Response: "More direction and focus" is exactly what my practice needs, plus clear insights into "trouble" sections of various songs -- certain areas where I repeatedly find myself stumbling and making the same mistakes over and over again. I acknowledge that in the "repeat" sections of some songs, I sometimes forget whether I've even done the "repeat" or not, so I just do it again. (Often I feel as though I'm on "automatic pilot" or "cruise control.") I will try to record more, since my digital piano has that capability, so I can be more aware of when and where my mistakes are most likely to occur, in order to work on those sections. I will also try to be more "mindful" of my physical and mental responses, so I can correlate them with the likelihood of fumbling, as well as whether my pain levels affect my playing ability, or whether I'm able to "play through" them.

I appreciate that anonymous participant's well-thought-out comments.

I forgot to add that I will keep those above comments about my diaries, along with those of the person who sent the article on how to practice, by my piano for handy reference. I appreciate "constructive criticism" when it is precise and truly "constructive."

Week 6

Goal: My goal is to perfect my performance, so that I can play smoothly and without mistakes.

Date/Time	**Description**	**Notes**
1/1/15	Practice my songs on piano	Did Not Practice
1/2/15	Practice my songs on piano	Didn't practice
1/3/15 4:30-5:20 p.m.	Practice my songs on piano	5 songs X3
1/4/15 11:45-12:15 p.m.	Practice my songs on piano	3 songs X 3
1/5/15 4-5 p.m.	Practice my songs on piano	10 songs X 2
1/6//15 11:10-11:30 p.m.	Practice my songs on piano	3 songs X 3
1/7/15 12-12:20 p.m. 4:40-5:10 p.m. 5:50-6 p.m.	Practice my songs on piano	Got all 12 of the songs I usually practice done 3-4 times each.

Goal: My goal is to perfect my performance, so that I can play smoothly and without mistakes.

Date/Time	**Description**	**Notes**
1/1/15	Practice my songs on uke	Did Not Practice
1/2/15	Practice my songs on uke	
1/3/15	Practice my songs on uke	
1/4/15	Practice my songs on uke	
1/5/15	Practice my songs on uke	
1/6/15 10-11 p.m.	Practice my songs on uke	5 songs approx 3 or 4 times each

1/7/15 7-8 p.m.	Practice my songs on uke	10-12 songs several times

Comments: Wow! This person sure has a busy but dedicated life! I certainly hope that I can learn from her dedication and determination to keep on keeping on as things usually get better and if they don't, you find alternative ways to make positive changes to make them work. Quite the inspiration in life!

Response: The comments you sent me were as follows:

Wow! This person sure has a busy but dedicated life! I certainly hope that I can learn from her dedication and determination to keep on keeping on as things usually get better and if they don't, you find alternative ways to make positive changes to make them work. Quite the inspiration in life!

The part about ***things usually get better*** (above) didn't exactly materialize that way, in my case, as far as my practicing the uke went. As you know, I've managed to develop carpal tunnel syndrome in my left hand, so I don't dare practice the uke until I can get some guidance as to how to change my style of holding it with my left hand and doing the chords, so that I don't aggravate my condition. I did come up with a cock-up splint for my left hand, which I had saved from the last time I needed one, when I fell and sprained my left hand. So last night, I wore it to bed, and I will continue to do so for the next few weeks, in order to see if that helps to improve my pain, numbness, and tingling in my left hand, especially my thumb.

I did a little online research and found out that CTS is common among musicians, and that they benefit from doing stretching exercises before practicing, like athletes do before they work out. I did some of the exercises suggested in a couple of online articles before I practiced the piano today (1/2 hour) to see if that helped. I noticed that my left hand ached from arthritis, and my back ached, as well -- maybe because I practiced late in the day. I've learned that I do better practicing in the morning, but I seemed to be busy today, catching up on "stuff." My fingernails keep getting in the way and clicking noisily on the keys because they are too long. As much as I know that I should trim them more (I try to file them regularly), I'm reluctant to lose what I've worked so long and hard to acquire -- long, glamorous fingernails -- especially because I used to bite my nails as a kid and had to use the utmost self-discipline and control to break that habit. (I've often thought that self-discipline is the key to success in any area.) I guess I have to choose my priorities and decide if it's really worth playing badly to keep my nails -- I notice that my nails often get in the way, catch on the keys, cause me to make mistakes, etc.

The part (above) about ***find alternative ways to make positive changes to make them (things) work (if they don't get better)*** is valuable advice and what I'm trying to do by searching for solutions on the Internet. My last resort is to consult my primary care dr., who will probably refer me either to an orthopedic surgeon (who will, undoubtedly, order all those painful tests which I mentioned in previous comments and then recommend surgery) or to a neurologist (who will also probably order those painful tests and then refer me to an orthopedic surgeon). Physical or occupational therapy might be helpful, if I can persuade one of those doctors to prescribe it. Otherwise, I might try some sort of alternative medicine, since I really hate to give up the uke permanently, as it has nostalgic ties to my childhood, as mentioned before. My dad taught my

sisters and me to play the uke when we were kids, so in a way, I feel connected to that era and to my family when I play the uke, especially when I play "You Took Advantage of Me" (from the show "Present Arms" [1928]), which I recently learned on the uke by searching for it online, because it was a song that my mom used to sing (in her inimitable, cute way) to my dad, which both my dad and I got such a kick out of. It's got some GREAT chord progressions, which I find exciting, but the fingering of a couple of the chord changes is so difficult for me that I was probably pressing too hard in an awkward position to try to get them down, which may have precipitated the CTS. I need to find a uke teacher/player who can correct my wrist and finger positions, so that I can play pay-free. I will also miss playing "A Foggy Day" and "Bye Bye Blues" -- both "uppers" for me -- songs which I learned in the last couple of years -- "Bye Bye Blues" from a uke/guitar teacher in IL in 2012, and "A Foggy Day" last year here, which I downloaded and taught myself, as well as other songs which my Dad taught my sisters and me.

I also note that performing on both the uke and the piano really raises my endorphin level -- physically, I may be a wreck afterwards, but mentally and emotionally, I'm on a "high" -- the piano songs all mean something to me because I wrote them, so they all bring back memories, both happy and not-so. I was close to tears at one point today when playing a song which consisted of a poem which an ex-boyfriend wrote for another woman when they were in college together. Even though it wasn't originally intended for me, I took it and made it my own by putting it to music. We broke up years before he died, but the song is a permanent part of his and my life together, memories of which I shall always treasure. That life and love are so transitory is probably what made me sad, but the song/poem is a permanent memento, which, I suppose, is a positive outcome.

I mainly play my songs on the piano, so that I don't forget them -- so much effort for so many years put into them shouldn't go down the drain, to my way of thinking -- and so that if someday, someone comes along who is interested in them and thinks that they might have potential, I will be able to give an approximation of how they should sound. But as F. Scott Fitzgerald said in "The Great Gatsby" (recently saw the 1974 version on TV -- with Robert Redford and Mia Farrow, after seeing the 2013 version w/Leonardo DiCaprio, which I liked better), which could apply to me, as well:

...his dream must have seemed so close that he could hardly fail to grasp it. He did not know that it was already behind him...

Gatsby believed in the green light, the orgastic future that year by year recedes before us. It eluded us then, but that's no matter — to-morrow we will run faster, stretch out our arms farther. . . . And one fine morning ——

So we beat on, boats against the current, borne back ceaselessly into the past.

B.2. Sarah

Week 1

Goal: Because I need to use my aligners 20 to 22 hours a day

Date/Time	Description	Quantity	Notes
July 31st	Aligners out	206 min	I need to take the aligners out to eat or drink anything other than water
August 1st		198 min	
August 2nd		165 min (2hr, 45 min)	
August 3rd		153 min (2hr, 33 min)	

Goal: My ear hurts from time to time but quite often. I have associated with cold weather but I had ear ache this week but it was warm.

Date/Time	Description	Quantity	Notes
July 26th	Ear ache		Warm weather. It hurt since morning and lasted almost all day

Goal: I want to strengthen my arms so I want to do push ups and increase the number of repetitions

Date/Time	Description	Quantity	Notes
August 2nd	Push ups	6	

Comments from another participant (aligners): To me, this data seems captured by someone who just had dental aligners installed. I assume it's a teenager or young adult. I can see that the first days are very painful and that s/he is subject to ego depletion, thus progressively reducing the time during which the aligners are on.

I can further speculate that it took a lot of effort from this person to make the decision to get aligners (near-term comfort vs long-term benefits), and thus July 31st may have been the peak of his/her willpower capital.

Response after given other participant's comments: Not much.

My ear ache is not as frequent as I thought. I am not very good at push ups or at keeping a commitment with myself specially if I do not exactly like the commitment.

About keeping time on my aligners, I have learned that there is no point in doing it. The only way to increase the time with them on, is not eating as much but I like to eat and I like my

scheduled snacks and do not see the point on decreasing them. Still I am using my aligners more than 20 hours a day, I think that is enough. Also it is stressing to keep this information and I have bad memory (this I already knew).

What it is interesting is what other people make up of your data.

Week 2

Goal: I need to use my aligners 20 to 22 hours a day (Aligners are clear braces to help straighten my teeth – Invisalign)

Date/Time	Description	Quantity	Notes
August 4th	Aligners out	144 min/day	
August 5th	Aligners out	163 min/day	
August 6th	Aligners out	220 min/day	
August 7th	Aligners out	155 min/day	
August 8th	Aligners out	180 min/day	
August 9th	Aligners out	120 min/day (2 hrs)	Travel day to Houston
August 10th	Aligners out	95 min/day (< 2 hrs)	I slept too much, so I did not eat as much

Goal: My ear hurts from time to time but quite often. I have associated with cold weather but I had ear ache this week but it was warm.

Date/Time	Description	Quantity	Notes
Aug 8th	Ear ache	Half a day pain	Warm weather. The doctor gave me drops to use; as soon as I put the drops this Friday, the pain started. It was ok before the drops. I forgot to use the drops Wednesday and Thursday.
Aug 9th	Ear ache	A couple of hours	It hurt during my flight to Houston. I put different type of drops to fix it. It does not always hurt during flights.

Goal: I want to strengthen my arms so I want to do push ups and increase the number of repetitions

Date/Time	Description	Quantity	Notes
August 7th	Push ups	36	I had TRX class and we did series of Push ups with TRX
Aug 8th to 11th	Push ups	0	Too sore to try again, I will start again tomorrow

Comments from another participant (aligners): I thought it was kind of weird they are measuring this in minutes, when all of the quantities are over an hour. I wasn't sure if maybe they were using a timer or something, but I wondered if that level of precision was really necessary? I also wasn't sure if the "travel day" was related to them having their aligners out somehow? or if that was just to help them remember what they did that day?

Response after given other participant's comments: I have learned that the only way to keep my aligners more time during the day is to avoid snacks and just eat breakfast, lunch and dinner, then I would achieve the goal of using them 22 hours a day. But I like my snacks, one in the mid-morning and one in the afternoon, so I will just be happy with 20 hours of using my aligners.

Week 3

Goal: I need to use my aligners 20 to 22 hours a day (Aligners are clear braces to help straighten my teeth – Invisalign)

Date/Time	Description	Quantity	Notes
August 11th	Aligners out	164 min/day	Breakfast, lunch and dinner. No snacks. Makes for more time using my aligners
August 12th	Aligners out	153 min/day	
August 13th	Aligners out	185 min/day	
August 14th	Aligners out	210 min/day	Dinning out (120 min).

August 15th	Aligners out	160 min/day	
August 16th	Aligners out	260 min/day (> 4 hrs)	Had dinner with friends and red wine. I could not use my aligners and I am missing the red!
August 17th	Aligners out	110 min/day	Travel back to Calgary. Difficult to keep the routine on airplanes or airports. I better did not eat much.
			I have to floss, brush my teeth and aligners after any meal.

Goal: I want to strengthen my arms so I want to do push ups and increase the number of repetitions

Date/Time	Description	Quantity	Notes
August 12th	Push ups	6	
Aug 13th	Push ups	10	I stopped doing this

Comments from another participant: n/a

Response after given other participant's comments: n/a

Week 4

Goal: I want to know what kind of food affects my ear problem. I suffer from Tinnitus (ringing in the ears) and some people claim that food makes the tone louder. I already know that coffee, wine and fatty food makes my noise worse but apparently there's more to know.

Date/Time	Description	Notes
Monday	Breakfast: Granola Cereal and tea Lunch: Tuna Sandwich Dinner: Salad (Arugula, Spinach, mushrooms, tomatoes, feta cheese)	I always have the noise in my ears but the intensity varies. Today was normal noise. From 1-10 would be a 3

Tuesday	Breakfast: Miniwhets Cereal and tea Lunch: Indian food Dinner: Sandwich (Ham, Tomato, cheese, Mushroom, avocado, lettuce)	Today was normal noise. From 1-10 would be a 3
Wednesday	Breakfast: Musli Cereal and tea Lunch: Indian food Dinner: Salad	Today was normal noise. From 1-10 would be a 3
Thursday	Breakfast: 3 biscuits and tea Lunch: Lasagna with lots of cheese Dinner: Indian food	This day my ears were crazy noisy during the evening. A level 8 today. I wonder if it is the biscuits or the cheesy lasagna.
Friday	Breakfast: Bread with Philadelphia cheese, Peanut butter and tea Lunch: Benedict eggs at Oasis Dinner: Sandwich (my style: Ham, Tomato, cheese, Mushroom, avocado, lettuce) I had a couple glasses of wine	Wine makes my noise worst. I know that already, so today the noise was a 7 by bedtime.
Saturday	Breakfast: Bread with Philadelphia cheese, Peanut butter and tea Lunch: Iranian food (~meat balls in bread) Dinner: Snack, crackers with Philadelphia cheese and coffee	Today was normal noise. From 1-10 would be a 3
Sunday	Breakfast: Granola Cereal and tea Lunch: Rice, chicken, Cinnamon Roll Dinner: Bean soup and salad	Today was normal noise. From 1-10 would be a 3
		I have snacks at midmorning and mid afternoon but they are always the same. Morning is coffee with a cookie (morning) and fruits (afternoon).

Comments from another participant: This appears to be a good way to test whether food affects Tinnitus intensity. One aspect worth considering is whether preconceptions regarding certain foods influences the perceived intensity of the ringing, acting as a placebo. It would be difficult to assess this without a blind test. It is just worth noting however to be careful of creating a conformation bias and creating the problem, or non-objectively associating the problem with the food because the food was known about before the ringing started. It may also be worth noting what sorts of activities or other stimulus are associated with these 'problem' foods that may be contributing factors. For example if these foods are consumed in a noisy area, or there's some sort of stress associated with it (social situations, preemptive dread of the ringing coming on, strenuous activity, etc.). The amount of data collected is sustainable, but if other sorts of data could also be collected known to be associated with Tinnitus, it may help narrow down causal variables. Are there any medical studies published in peer-reviewed journals that have evaluated these variables? Even if these additional variables aren't collected in the short term, the current level of data collection appears to be sufficient to investigate the correlation of food and ringing in this instance, while being low-intensive enough to allow for a higher likelihood of long term data collection.

As a note on the ringing scale. The values go from 3 to 7 to 8. I may suggest changing the ringing scale to 5, with 5 being worst and 0 being non-existent. I make this suggestion simply because the variable cannot be measured, and a smaller scale may help reduce ambiguities in the intensity between close values. If the 10 point scale is meaningful however, don't bother changing it—only a suggestion.

Response after given other participant's comments: I have learned to keep track of my food to know what can make worst my ear problem. I have learned to write down the information quickly, otherwise I forget to do it and is more difficult to keep track. I have learned to make tries to see what is the origin of the worsening in the noise.

Week 5

Goal: I want to know what kind of food affects my ear problem. I suffer from Tinnitus (ringing in the ears) and some people claim that food makes the tone louder. I already know that coffee, wine and fatty food makes my noise worse but apparently there's more to know.

Date/Time	Description	Notes
Monday	Breakfast: Granola Cereal and tea Snack: Muffin and coffee Lunch: Chicken Wraps Dinner: Butternut squash Soup	I always have the noise in my ears but the intensity varies. Today was normal noise. From 1-5 would be a 2
Tuesday	Breakfast: Mini-wheat Cereal and tea (English breakfast+milk) Snack: Yogurt + fruits Lunch: Food from OPA! Salad, potato, rice, chicken and lamb skewer Dinner: Sandwich (Ham, Tomato, cheese, Mushroom, avocado, lettuce)	Today was normal noise. From 1-5 would be a 2
Wednesday	Breakfast: Musli Cereal and tea Snack: Coffee and cookie Lunch: Ham Sandwich and Cranberry juice Dinner: Salad	Today was normal noise. From 1-5 would be a 2

Thursday	Breakfast: 3 biscuits and tea Snack: Coffee and cookie Lunch: Salmon, couscous with veggies Dinner: Noodle Soup	Today was normal noise. From 1-5 would be a 2 Testing the Biscuits. Las time I had a very strong ear-noise, one of the different foods I ate were biscuits. Today the noise was normal
Friday	Breakfast: Bagels with Philadelphia cheese and tea Snack: Yogurt + fruits Lunch: Sandwiches (Ham and tuna) Dinner: Pizza I had some shots of spirits (liquor)	Liquor makes my noise worst. I know that already, so today the noise was a 4 by bedtime. This day started a cold and I think this may affect my ears as well
Saturday	Breakfast: tea Brunch: Eggs at Oasis restaurant Dinner: Snacks at a friend house (chips, crackers with cheese, mini-tacos of beef) and some wine	Today was normal noise. From 1-5 would be a 4
Sunday	Breakfast: Bread with cream cheese/peanut butter and tea Lunch: Bagels with Philadelphia cheese and tea Dinner: Chicken with rice, veggies and avocado	Today was normal noise. From 1-5 would be a 2

Comments from another participant: Nicely detailed and appears to help target her hearing issues. I did similar food tracking while doing trimgym (UofC weighloss/fitness program) and it helped a lot.

Response after given other participant's comments: Learning: It has been nice to keep a record of my food even if sometimes is very repetitive, but I have not been able to spot other kind of food that make the noise worst. I still have to try the lasagne I ate some weeks ago and that coincidentally, that day my noise increased. I have had pizza with a lot of cheese and my noise was normal, so maybe cheese is not the reason.

Week 6

Goal: I want to know what kind of food affects my ear problem. I suffer from Tinnitus (ringing in the ears) and some people claim that food makes the tone louder. I already know that coffee, wine and fatty food makes my noise worse but apparently there's more to know.

Date/Time	Description	Notes
Monday Nov 24th	Breakfast: Granola Cereal and tea (English breakfast+milk) Snack: Nutri-grain bar and coffee Lunch: Salmon,rice, squash acorn Dinner: Big sandwich, crackers with Philadelphia cheese and tea	Normal noise level in my ears. From 1-5 would be a 2
Tuesday Nov 25th	Breakfast: Mini-wheat Cereal and tea (English breakfast+milk) Snack: Nutri-grain bar and coffee Lunch: Chicken, rice, squash acorn, tomatoes and green tea Dinner: Sandwich (Ham, Tomato, cheese, Mushroom, avocado, lettuce)	Today was normal noise. From 1-5 would be a 2
Wednesday Nov 26th	Breakfast: Musli Cereal and tea Snack: Nutri-grain bar and coffee	Today was normal noise. From 1-5 would be a 2

	Lunch: At restaurant. Beef Tenderloin with veggies Dinner: Sandwich (Ham, Tomato, cheese, Mushroom, avocado)	
Thursday Nov 27th	Breakfast: Bagels with Philadelphia cheese and tea Snack: Nutri-grain bar and coffee Lunch: sandwich from subway and coke Dinner: Pizza with extra-cheese and Beer	Today was normal noise. From 1-5 would be a 2 Testing if cheese affects the ringing in my ears, but no
Friday Nov 28th	Breakfast: tea with crackers and Cream cheese Lunch: eggs, rice and veggies Dinner: Sandwich and coffee	
Saturday Nov 29th	Breakfast: tea with crackers and Cream cheese Lunch: Vegetable soup and tea Dinner: Pizza and beer	Today was normal noise. From 1-5 would be a 2
Sunday Nov 30th	Breakfast: Bread with cream cheese/peanut butter and tea Snack: Coffee and Banana bread Lunch: Chicken sandwich and juice Dinner: Beans soup with cabbage salad	Today was normal noise. From 1-5 would be a 2

Comments from another participant: I'm not sure I got everything, but what I got was related to aligners being in or out, pushups, what foods were affecting tinnitus. The one about the pushups looked pretty incomplete, the one about the diet as related to tinnitus symptoms looked

pretty detailed, and the aligners one i think was just about amount of time they were out because of eating & drinking.

I don't understand quite what these daily diaries are supposed to accomplish; for me, they almost make my music-making less enjoyable because I feel that I have to document everything I do, and when circumstances prevent me from practicing, I feel guilty and as if I weren't fulfilling some sort of responsibility. Yes, I want to get better at what I do, but it doesn't seem to be happening, whether I practice or not. I think it just be for enjoyment, since i'm not taking lessons or doing it for a living or performing in a recital. I just want to get discovered as a songwriter, but I'm afraid that I started too late in life to ever be confident in my ability to perform my songs for others, so how else are they going to get "out there?"

I hope the person with tinnitus figures out what is aggravating the condition and can come up with a treatment, with or without the help of a doctor. The person doing pushups -- is he/she in some sort of a competition, or is this just for self-improvement? The person keeping track of the aligners in and out of the mouth -- hope his/her teeth get straightened out. I once looked into getting aligners, but my cross bite is too extreme, and aligners wouldn't be enough -- I'd need braces, and at my age and in my present financial condition, it would e a waste. I'll just have to learn to accept myself as I am and have become, I guess. (Maybe I should be the one doing push-ups, but having had a broken wrist, as well as carpal tunnel surgery on both wrists, I wouldn't chance it. Maybe some other form of exercise..

Response after given other participant's comments: I have not learned anything new from the subjects I picked for data collection. I know almost everything that makes my tinnitus get worst

(wine and fat food) and also what to do to have my aligners in: eat less, which I will not do. I'd better be happy with 20 hours a day and relaxed the time I do not have the aligner in.

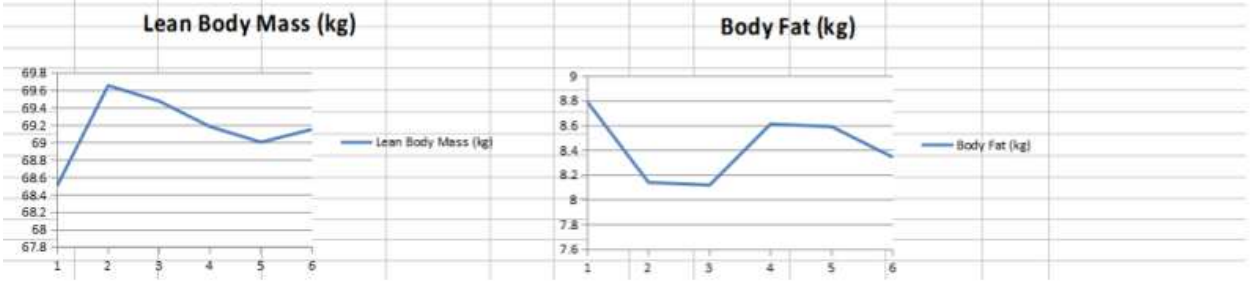
I know that data collection is important, per example to keep track of my expenses. Knowing how I spend my money I can try to save a little bit more.

B.3. Tarquin

Week 1

Age	26	*Why are you collecting this data?*	*I want to track my fat loss, muscle gain, daily net calories, and exercise type to determine whether my current activity level is moving me toward my goal of losing fat and gaining muscle. I am using an app to track my daily net calories by recording all of my meals, and tracking my calorie expenditure as a rough estimate of my net caloric values. That data is not recorded here. The skin thickness measures are used in combination with my gender, weight, and height to calculate my body fat %, which is used to determine the other metrics (lean body mass, body fat, and fat free mass index). All measurements are taken after waking up, without clothes, and after urinating.*
Height	167.64		
Sex	Male		

Date	Weight (kg)	Skin Thickness 1: chest (mm)	Skin Thickness 2: abdominal (mm)	Skin Thickness 3: thigh (mm)	Body fat %	Lean Body Mass (kg)	Body Fat (kg)	Fat Free Mass Index (FFMI)	Food Calories	Approx Exercise	Daily Net Calories	Exercise Type
9/3/2014	77.9	9	19	11	11	68.51	8.79	25.13	2453	805	1648	Squash (45 min)
9/4/2014	77.8	7	19	10	10	69.65814	8.14186	25.540537645	2527	508	2019	Running (1.5 mile, 11 min)/Resistance (shoulders, traps, core)
9/5/2014	77.6	7	19	10	10	69.47907	8.12093	25.476818936	3453	870	2583	HIIT
9/6/2014	77.8	8	19	11	11	69.185437	8.614563	25.372335133	1985	122	1863	Walking (45 min)
9/7/2014	77.6	8	19	11.5	11	69.007583	8.592417	25.309048821	na	na	na	Off
9/8/2014	77.5	7.5	19	11	10	69.153718	8.346282	25.361048613	1989	368	1621	Legs
9/9/2014	na	na	na	na	na	na	na	na	1815	579	1236	Chest



Comments from another participant: This is a great data sample. Male, 26, 167.64 cm (.64 seems important), 78 kg. This person doesn't seem to have a real problem. According to many, 168 cm / 78 kg is a good tradeoff as long as he can maintain it. However, his goal seems to look better than average, possibly look athletic. So, to me, this project is more about reaching a new level of excellence than meeting standards.

I can see a great deal of rigor to capture data, but I am afraid this person would be disappointed to realize that his instruments and observations do not allow for that level of precision. Most scales have a margin of error of about 1% (often due to temperature and

barometric pressure), which makes it unnecessary to track weight down to 0.1 kg. Approximate calorie intakes and exercises also introduce errors that are beyond this person's expectations.

An important question I would have is: How long this person has been collecting data? Does he have 20, 40, 60 weeks worth of data?

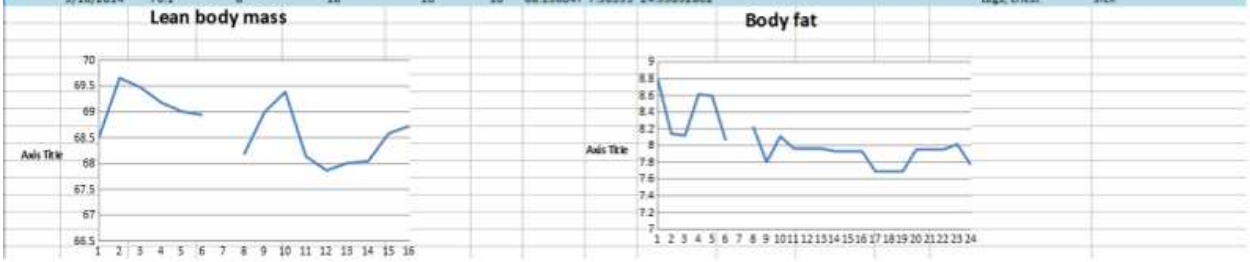
With so much effort spent to capture imprecise metrics, I bet this is a new initiative and he will not be able to sustain it in the long run if he doesn't make the process more automatic and more relevant.

Response after given other participant's comments: To date, I have learned what proportion of my daily caloric intake comes from alcohol, which has lead me to have a more strict diet in that regard. I've also found that I am not gaining muscle to the degree that I can detect over such a short period of time, but am loosing body fat. I've become more aware of my diet, and have increased my protein consumption post-workout. The details on my daily nutrition are not included in the documents I'm preparing for you, but are in the applications on my phone. My new goal is to reach ~8% body fat in a sustainable manner.

As for the participant remarks, I may have not fully explained the purpose of my data collection in a coherent manner, which led to some misunderstandings. I understand the accuracy restrictions of my method. Although the values are specific, that is simply because I didn't alter the significant digits. The values are all taken as approximations. I disagree with the other comments made by the other participant for this reason, although I'll keep them in mind.

Week 2

	Age	26	*Why are you collecting this data?*	*I want to track my fat loss, muscle gain, daily net calories, and exercise type to determine whether my current activity level is moving me toward my goal of losing fat and gaining muscle. I am using an app to track my daily net calories by recording all of my meals, and tracking my calorie expenditure as a rough estimate of my net caloric values. That data is not recorded here.*									
	Height	167.64		*The skin thickness measures are used in combination with my gender, weight, and height to calculate my body fat %, which is used to determine the other metrics (lean body mass, body fat, and fat free mass index). All measurements are taken after waking up, without clothes, and after urinating.*									
	Sex	Male											
	Date	Weight (kg)	Skin Thickness 1: chest (mm)	Skin Thickness 2: abdominal (mm)	Skin Thickness 3: thigh (mm)	Body fat %	Lean Body Mass (kg)	Body Fat (kg)	Fat Free Mass Index (FFMI)	Food Calories	Approx Exercise	Daily Net Calories	Exercise Type	Notes
Week 1	9/3/2014	77.9	9	19	11	11	68.51	8.79	25.13	2453	805	1648	Squash (45 min)	
	9/4/2014	77.8	7	19	10	10	69.65814	8.14188	25.54053764	2527	508	2019	Running (1.5 mile, 11 min)/Resistance (shoulders, traps, core)	The early variability in thickness measures is likely due to inexperience. I was still likely at 11% body fat during most of this time
	9/5/2014	77.6	7	19	10	10	69.47907	8.12093	25.47681894	3453	870	2583	HIIT	
	9/6/2014	77.8	8	19	11	11	69.185437	8.61456	25.37233513	1985	122	1863	Walking (45 min)	
	9/7/2014	77.6	8	19	11.5	11	69.007583	8.59242	25.30904882				Off	Day off, ate out, couldn't track calories. Likely 3000+
	9/8/2014	77	7.75	18.75	11	10	68.94186	8.05814	25.28566281	1989	368	1621	Legs	
	9/9/2014									1815	579	1236	Chest	
Week 2	9/10/2014	76.4	8	18.75	11	10	68.172182	8.22782	25.01178671	2159	341	1818	Back	
	9/11/2014	76.8	8	18.5	9.5	10	68.99722	7.80278	25.3053615	3075	700	2375	Squash (45 min)	
	9/12/2014	77.5	8	18.5	10	10	69.389535	8.11047	25.44495958				Off	Sick, the following days were not recorded because I was sick, and was not eating food that I prepared
	9/13/2014												Off	Sick
	9/14/2014												Off	Sick
	9/15/2014													Sick: Calories likely mid range, 2000-2500
	9/16/2014	76.1	8	18	10	10	68.136047	7.96395	24.99892862				Legs, chest	Sick



Comments from another participant: n/a

Response after given other participant's comments: n/a

Week 3

	Age	26	Why are you collecting this data?	I want to track my fat loss, muscle gain, daily net calories, and exercise type to determine whether my current activity level is moving me toward my goal of losing fat and gaining muscle. I am using an app to track my daily net calories by recording all of my meals, and tracking my calorie expenditure as a rough estimate of my net caloric values. That data is not recorded here. The skin thickness measures are used in combination with my gender, weight, and height to calculate my body fat %, which is used to determine the other metrics (lean body mass, body fat, and fat free mass index). All measurements are taken after waking up, without clothes, and after urinating.										
	Height	167.64													
	Sex	Male													
	Date	Weight (kg)	Skin Thickness 1: chest (mm)	Skin Thickness 2: abdominal (mm)	Skin Thickness 3: thigh (mm)	Body fat %	Lean Body Mass (kg)	Body Fat (kg)	Fat Free Mass Index (FFMI)	Food Calories	Approx Exercise	Daily Net Calories	Exercise Type	Notes	
Week 3	9/17/2014	75.8	8.5	18.5	10.5	10	67.867442	7.932558	24.903350559	-	-	-	Off	Sick	
	9/18/2014	75.7	8.5	18.75	9.5	10	68.008979	7.691021	24.95371382	-	-	-	Squash (45 min)	Sick	
	9/19/2014	76	8.5	18.5	10.5	10	68.046512	7.953488	24.967069267	-	-	-	Back	Sick	
	9/20/2014	-	-	-	-	-	-	-	-	-	-	-	Off	Sick	
	9/21/2014	-	-	-	-	-	-	-	-	-	-	-	Off	Sick	
	9/22/2014	76.6	8	18.5	10	10	68.583721	8.016279	25.158225393	2111	691	1420	HIIT		
	9/23/2014	76.5	7.75	18.25	10	10	68.7277	7.7723	25.209457586	1966	708	1258	Squash (45 min)		

Comments from another participant: The file with data collection received looks pretty amazing. I wonder how this person can have so much data. Looks a person very determined to reach the goal and also very organized. I hope she/he gets her/his goal.

Response after given another person's comments: The commenter was very kind, although I wish they were a bit more critical to force me to re-think my procedure. Although I feel like the previous commenter was wrong in some regards, they did make me adjust aspects of my protocol and encourage me to be self-critical.

As for what I've learned so far, it is very hard to put on muscle mass. I don't have the data recorded here, but I've been continuing to lift heavier in my resistance training, but my lean muscle mass has either fluctuated widely or gone down. I'm not sure if this is due to inaccurate

or imprecise data collection, or if it is an accurate reflection. Either way, I continue to visually look more muscular because of the fat loss, which is what I wanted. It has made me realize how snap-shot data collection is not useful, long term data is far more useful in establishing trends.

I've found that recording all of my food intake can lead to problems. First, sometimes I've I'm too low on my calories, and at the end of the day I feel that I deserve more food. If I didn't know, I probably wouldn't have eaten and slowed down my fat loss. Second, sometimes on days that I know I'm way too high I just call it a 'failed day' and eat/drink more anyway, which also doesn't help. I don't want my body goals to get in the way of having a fun life, so failed days are fine, I just should try to mitigate those more than I currently do.

My weight fluctuates a lot, which is why I'm glad I've been looking at body fat % rather than weight or BMI alone. My BMI for instance says that I'm quite overweight.

I've also found that I don't think I can get a 6-pack. I have a well defined 4-pack, but my lower abs wont show. I've re-addressed my goal to make it aiming for 8% body fat to see if I can see my lower abs then. I doubt 8% body fat is sustainable, but I figure I might as well push for now while I can.

I've found that my diet preferences have adjusted, and I now feel sick if I have heavily processed fast food or things that are really fatty. This has helped me try to eat sustainably healthy. I don't feel so bloated any more as I used to when I weighed ~45 lbs more two years ago.

I have also reduced my beer consumption to lower my calories.

Week 4

	Age	26	Why are you collecting this data?	I want to track my fat loss, muscle gain, daily net calories, and exercise type to determine whether my current activity level is moving me toward my goal of losing fat and gaining muscle. I am using an app to track my daily net calories by recording all of my meals, and tracking my calorie expenditure as a rough estimate of my net caloric values. That data is not recorded here. The skin thickness measures are used in combination with my gender, weight, and height to calculate my body fat %, which is used to determine the other metrics (lean body mass, body fat, and fat free mass index). All measurements are taken after waking up, without clothes, and after urinating.
	Height	167.64		
	Sex	Male		

	Date	Weight (kg)	Skin Thickness 1: chest (mm)	Skin Thickness 2: abdominal (mm)	Skin Thickness 3: thigh (mm)	Body fat %	Lean Body Mass (kg)	Body Fat (kg)	Fat Free Mass Index (FFMI)	Food Calories	Approx Exercise	Daily Net Calories	Exercise Type	Notes
Week 4	9/24/2014	75.9	8	18	10	10	67.956977	7.943023	24.935209913	-	-	-	Running (6 km)	
	9/25/2014	75.5	8	17.75	10	10	67.829298	7.670702	24.889777879	-	-	-	Off	
	9/26/2014	-	-	-	-	-	-	-	-	3000	-	3000	Off (walked to grocery store)	Calorie estimate
	9/27/2014	-	-	-	-	-	-	-	-	2187	397	1790	legs	
	9/28/2014	-	-	-	-	-	-	-	-	2257	455	1802	chest	
	9/29/2014	75.9	8	17.5	10	10	68.188659	7.711341	25.017649761	2106	181	1925	Off (walked to grocery store)	
	9/30/2014	76.3	8	17.75	9.75	10	68.548019	7.751981	25.145521644	1786	657	1129	Squash (45 min)	

Note: Weeks 1-3 are omitted here, but exist in the original spreadsheet (data in charts is from all weeks)

Comments from another participant: As for comments on the sample log sheets that were provided to us:

* wow, very detailed

* wish I had the kind of time it must take to create, compile and maintain this type of log

* the individual has lost some weight, and some body fat. Lean body mass has remained virtually unchanged. Interesting.

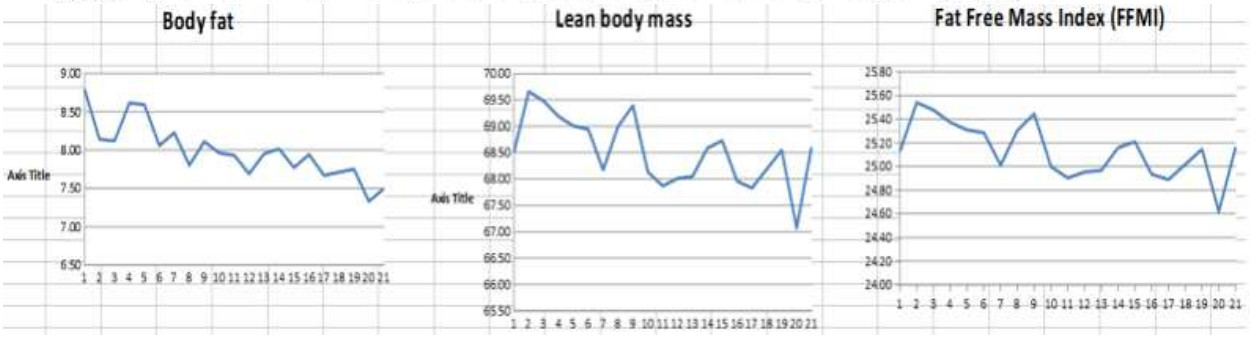
Response after given another participant's comments: I don't really have any more comments based on what this person said. I've already said my thoughts in previous reports. It doesn't take that long to collect the data, and I don't do it every day. I am also surprised by my lack of muscle gains; not sure if there's a problem with the calculations i'm using or if I really haven't gained much of any muscle.

Week 5

	Age	26	*Why are you collecting this data?*
	Height	167.64	
	Sex	Male	

I want to track my fat loss, muscle gain, daily net calories, and exercise type to determine whether my current activity level is moving me toward my goal of losing fat and gaining muscle (with 8% body fat). I am using an app to track my daily net calories by recording all of my meals, and tracking my calorie expenditure as a rough estimate of my net caloric values. That data is not recorded here and is intended to be an estimate.
The skin thickness measures are used in combination with my gender, weight, and height to calculate my body fat %, which is used to determine the other metrics (lean body mass, body fat, and fat free mass index). These calculations are completed in a web-based calculator that I have not transferred to this document; only the final values appear here. Consistency is measurement is difficult, so three measurements (and weights) are taken, then averaged. The rapid fluctuations in the values (especially early on) are likely due to this lack of consistency and inexperience. All body measurements are taken after waking up, without clothes, and after urinating.

		Body Metrics								Diet and Exercise				Notes
Week	Date	Weight (kg)	Skin Thickness 1: chest (mm)	Skin Thickness 2: abdominal (mm)	Skin Thickness 3: thigh (mm)	Body fat %	Lean Body Mass (kg)	Body Fat (kg)	Fat Free Mass Index (FFMI)	Food Calories	Approx Exercise	Daily Net Calories	Exercise Type	
Week 5	10/1/2014	-	-	-	-	-	-	-	-	1798	429	1369	Back	Low weigh-in may be due to a bowel-movement pre-measurement
	10/2/2014	74.4	8	17.5	9.5	9	67.07	7.33	24.62	2158	524	1634	Legs	
	10/3/2014	-	-	-	-	-	-	-	-	2355	334	2021	Running (5 km)	
	10/4/2014	-	-	-	-	-	-	-	-	2521	449	2072	Chest, concert mosh-pit	
	10/5/2014	-	-	-	-	-	-	-	-	2700	74	2626	None	Thanksgiving dinner
	10/6/2014	-	-	-	-	-	-	-	-	2040	39	2001	Legs	
	10/7/2014	76.1	8	17	9.5	9	68.60	7.50	25.16	2180	625	1555	Squash (45 min)	



Note: Weeks 1-4 are omitted here, but exist in the original spreadsheet (data in charts is from all weeks)

Comments from another participant: The stated goal is increased lean mass and decreased fat mass. The spreadsheet titled 'Line graphs of progress' show a decrease of both body fat and lean

mass. Looking at the table of raw data, I think I see a 1 KG loss of fat mass and a 2 KG loss of lean mass. The participant reports being sick for two of the five weeks.

For this sort of data, I prefer weekly data points (or weekly averages). This smooths out daily fluctuations and make it easier to overlook being sick for one or two weeks.

Response after given another participant's comments: I agree with this person's comments. I only took daily measurements because that's what this particular study required. I've switched to weekly recording now for my own purposes.

Week 6

	Age	26	Why are you collecting this data?
	Height (cm)	167.64	
	Sex	Male	

I want to track my fat loss, muscle gain, daily net calories, and exercise type to determine whether my current activity level is moving me toward my goal of losing fat and gaining muscle. My current goal is 8% body fat. I am using an app to track my daily net calories by recording all of my meals, and tracking my calorie expenditure as a rough estimate of my net caloric values. That data is not recorded here and is intended to be an estimate.

The skin thickness measures are used in combination with my gender, weight, and height to calculate my body fat %, which is used to determine the other metrics (lean body mass, body fat, and fat free mass index). These calculations are completed in a web-based calculator that I have not transferred to this document; only the final values appear here. Consistency is measurement is difficult, so three measurements (and weights) are taken, then averaged. The rapid fluctuations in the values (especially early on) are likely due to this lack of consistency and inexperience. All body measurements are taken after waking up, without clothes, and after urinating. Net calories are recorded throughout the day.

		Body Metrics								Diet and Exercise				
Week	Date	Weight (kg)	Skin Thickness 1: chest (mm)	Skin Thickness 2: abdominal (mm)	Skin Thickness 3: thigh (mm)	Calc: Body fat %	Calc: Lean Body Mass (kg)	Calc: Body Fat (kg)	Calc: Fat Free Mass Index (FFMI)	Food Calories	Approx Exercise	Daily Net Calories	Exercise Type	Notes
Week 6	10/8/2014	-	-	-	-	-	-	-	-	2355	117	2238	walking	Stressed: too tired to exercise/take measurements
	10/9/2014	-	-	-	-	-	-	-	-	2058	530	1528	walking	Stressed: too tired to exercise/take measurements
	10/10/2014	-	-	-	-	-	-	-	-	1542	339	1603	Resistance: Chest/Back	Late for appointment, no time to take measurements
	10/11/2014	75.6	8	17	9.5	9	68.15	7.45	25.00	3000	150	2850	Walking/Setup	Thanksgiving dinner
	10/12/2014	74.8	8	17	9.75	9	67.43	7.37	24.75	3200	150	3050	Walking/Setup	Thanksgiving dinner
	10/13/2014	-	-	-	-	-	-	-	-	2683	343	2340	Resistance: Legs/Chest	Thanksgiving dinner
	10/14/2014	-	-	-	-	-	-	-	-	2004	462	1542	Cardio: HIIT	

Note: Weeks 1-5 are omitted here, but exist in the original spreadsheet (data in charts is from all weeks)

Comments from another participant: This data is extremely comprehensive. When I compare this data to my own, I see that my own is much more general and summarized compared with theirs. In terms of personal preference, I find that the level of detail in this data would be exhausting in my case. I don't really perform any sort of disciplined data measurements in my day to day life, and the data tracking that I do do is primarily to make myself feel accomplished ("oh wow, look how far I ran! I'm so happy with myself!"). I'm actually a pretty lazy person and

I would probably record this amount of data once or twice before forgetting and abandoning the project. I think that this data is pretty interesting, but if it were mine, I would probably look at it, say to myself that it was pretty neat, and then file it in "My Documents" never to be examined again.

Response after given another participant's comments: I've learned that tracking this much data can be difficult. I'm only tracking weekly or bi-weekly now to gauge my progress. I'm not tracking my calories anymore as that took way too much time. Taking the time to track all those values did give me a good sense of my average caloric intake and how many calories I expend exercising. I'm still confused why I apparently lost lean mass, but I'm stronger and look much more muscular. I'm not sure if the loss in fat coincided with a loss in lean muscle mass, or if the body fat percentage method I used doesn't properly account for my lean body mass very well. Overall, I'm very happy I took on the project as it has really helped me restructure my goals and put some values to my ongoing goal to eat healthier and exercise often. Knowing how many calories certain foods are has helped me rethink snacks, and also take more time assessing the nutritional value of the food that I eat.

APPENDIX C: INTERVIEW SCRIPT

This appendix contains the interview script used for the post-data collection study interviews. All interviewees reviewed the design recommendations and interviewees who also completed the data collection study were also asked to fill out the form on code categories.

C.1. Interview Introduction Script

Thank you for agreeing to be interviewed for this study. The interview should last approximately 30 minutes and we are interested in getting your thoughts on a concept for social interaction in personal data collection applications.

What is personal data collection? Personal data collection is data people collect for themselves to track an activity of personal interest. Some examples may include sleep, weather, diet, physical activity, practice hours, and more.

Where does social interaction come in? We have just completed a six week study where participants were asked to collect personal data and reflect on it. Each week, participants were asked to look at another person's data and provide comments on it. These comments would be sent back to the owner anonymously at which time they would provide their own comments. Our goal was to see what happens when people are able to anonymously interact with personal data.

So what's next? Based on the results of the study, we've come up with a few design ideas that could be used when creating a tool to assist with personal data collection. We'd love to get your feedback on our ideas and also hear your suggestions as well!

Let's get started!

C.2. Code Category Questionnaire for Study Participants Only

Think back to when you were providing comments to other participants in the study. Which types of comments do you remember providing or do you think would be helpful? Why?

Comment Type	Description	Example	Provided	Helpful
Observation	Re-iterating the data	I'm not sure I got everything, but what I got was related to aligners being in or out, pushups, what foods were affecting tinnitus.		
Extrapolation	Interpreting the data	I assume it's a teenager or young adult.		
Suggestion	Ideas to make changes to data collection or interpret data	I may suggest changing the ringing scale to 5, with 5 being worst and 0 being non-existent.		
Sharing	Providing resources such as books, articles, etc or referencing personal experience	I did similar food tracking...and it helped a lot		
Support	Providing words of encouragement	This is a great data sample.		
Clarification	Asking questions to better understand the data or person collecting the data	How long has this person been collecting data?		
Shout Out	Request for information from others	Anyone know any exercises to relieve the symptoms ... in my thumb, especially?		

Think back to when you were reflecting on your own data during the study. Which types of comments do you remember providing or do you think would be helpful? Why?

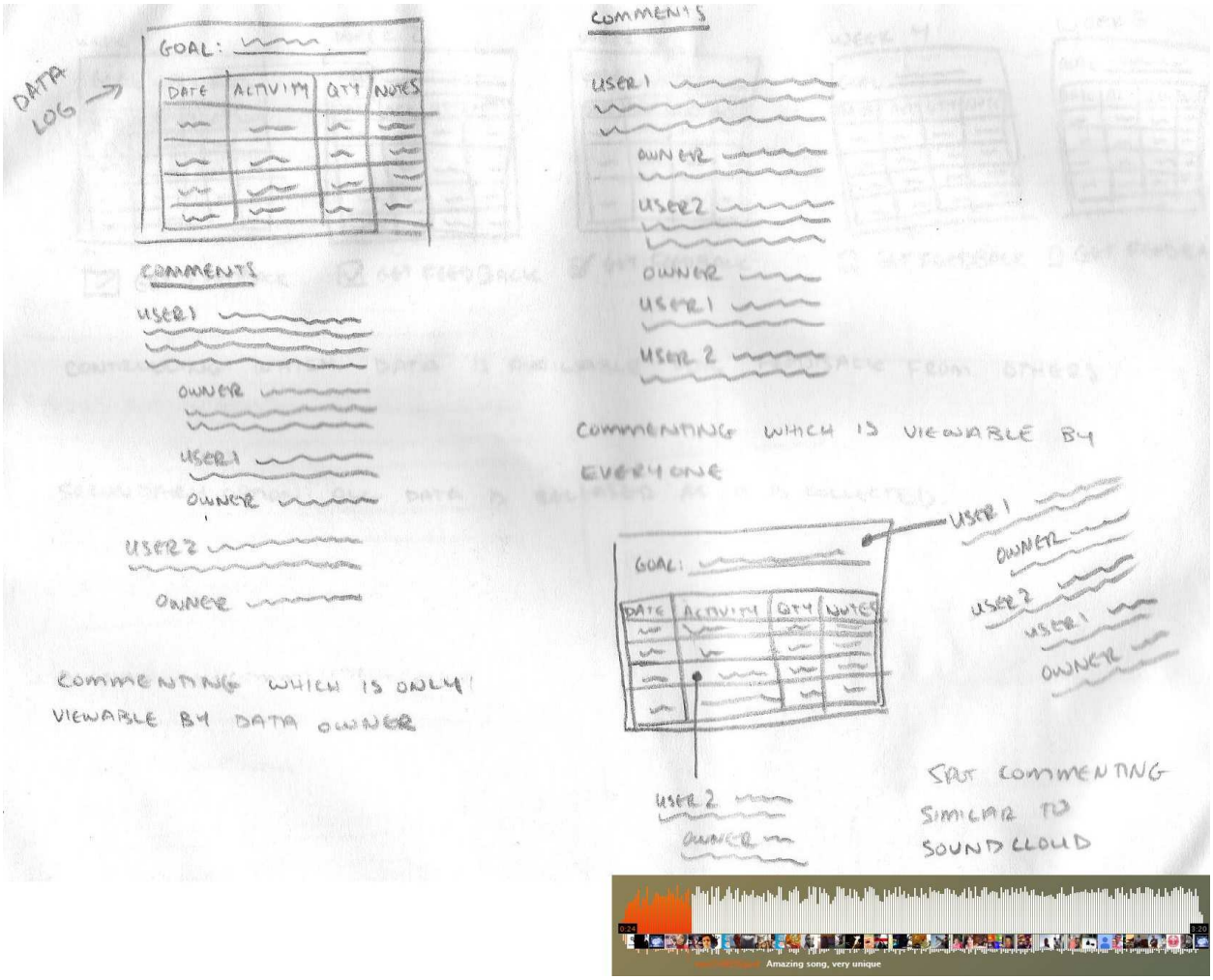
Comment Type	**Description**	**Example**	**Provided**	**Helpful**
Response	Addressing comments provided by another participant	Thanks for the comments, which, obviously, someone put a great deal of thought into before expressed.		
Observation	Re-iterating the data	The main data I'm concerned with is distance and speed		
Extrapolation	Interpreting the data	While the scale doesn't show much improvement, I believe my energy level and overall health and well-being has improved		
Re-evaluation	Revising data collection or evaluation methods	The first ...offered some time management advice, where the second...offered a method of improving my training tracing through the addition of including comments. I am hoping to put both into practice.		
Speculation	Guessing what could happen in the future	I had hoped that adding exercise, without changing my diet, would result in more weight loss		
Sharing	Providing resources such as books, articles, etc or referencing personal experience	The following study, which I just completed, inspired an engrossing piano practice session afterward		

C.3. Design Recommendation Evaluation

I'm going to present you with a design idea we've come up with and I'd like you to think about what you like, don't like, or would improve for that idea. If the idea makes you think of another idea (related or not!), please tell me that as well!

Design Idea 1: Communication Support

When someone sees your data, they can make comments on it. From here, the data owner can ask for clarification or provide their own thoughts to that person.



1. What do you think of this idea?

2. Would you prefer anonymous chats or identified chats?

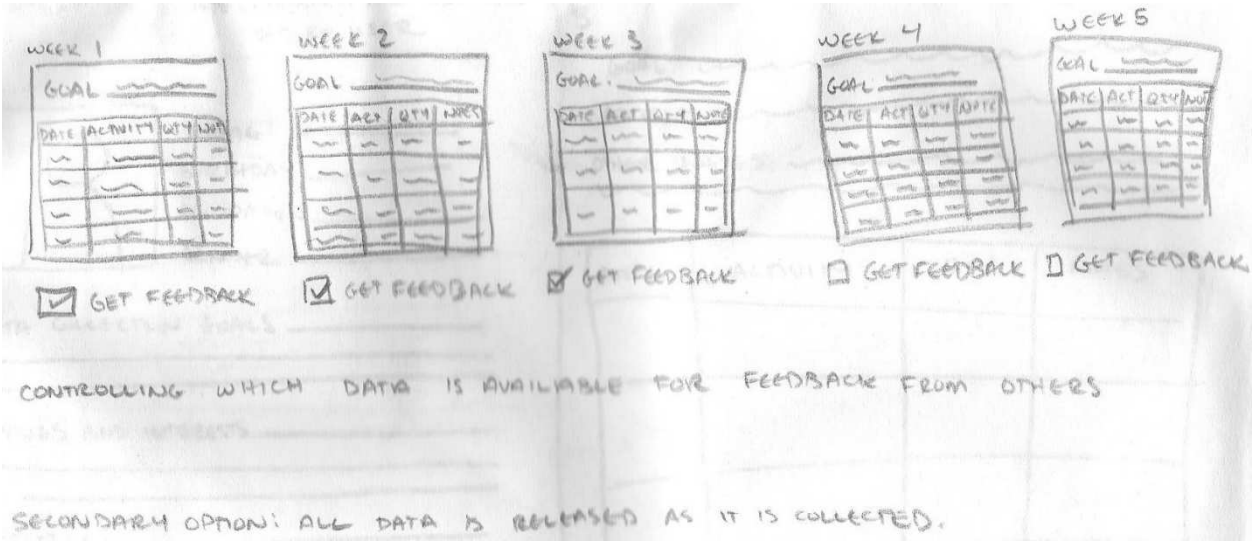
3. Would you prefer the chats to be available for everyone to see or private?

4. Would you do something differently?

5 Any other thoughts?

Design Idea 2: Continuous Data Feed

As you collect data, it is immediately available for others to see.



1. What do you think of this idea?

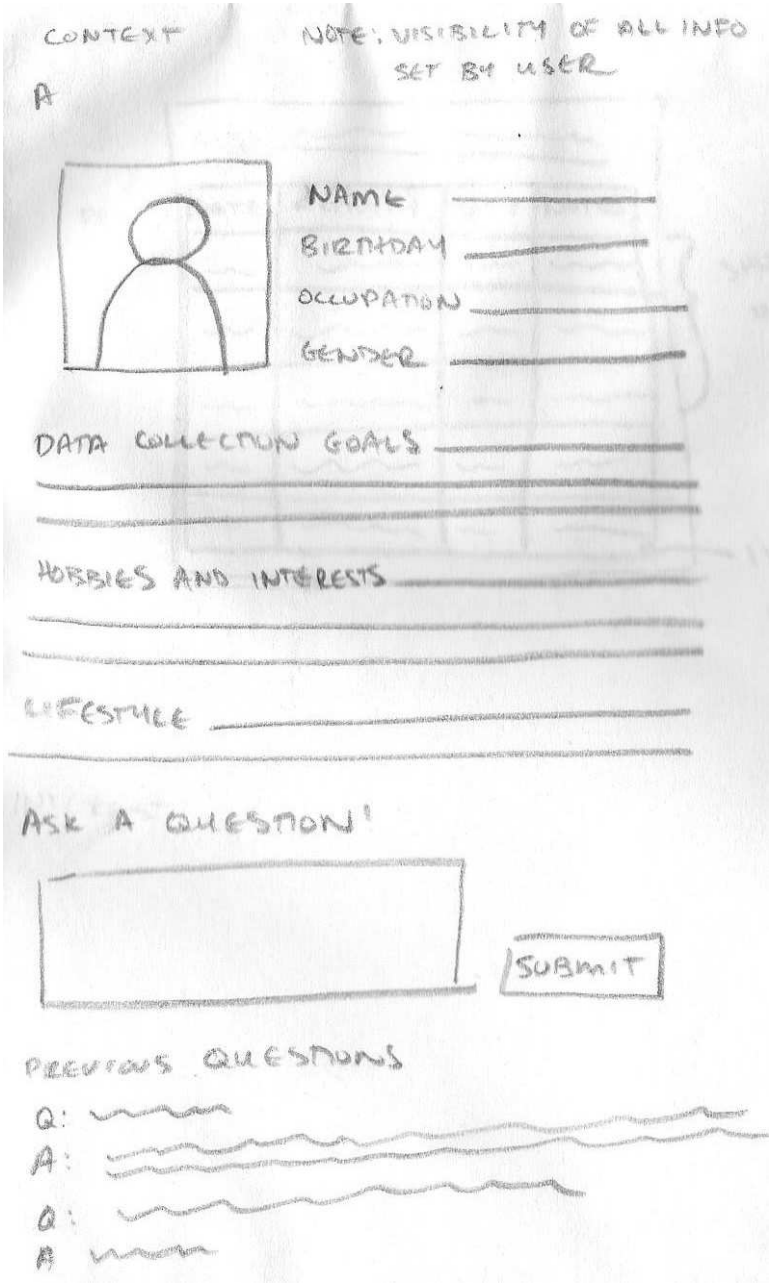
2. Would you prefer to have more control over the data (such as choosing how much data to release manually rather than having it automatically update)?

3. Would you do something differently?

4. Any other thoughts?

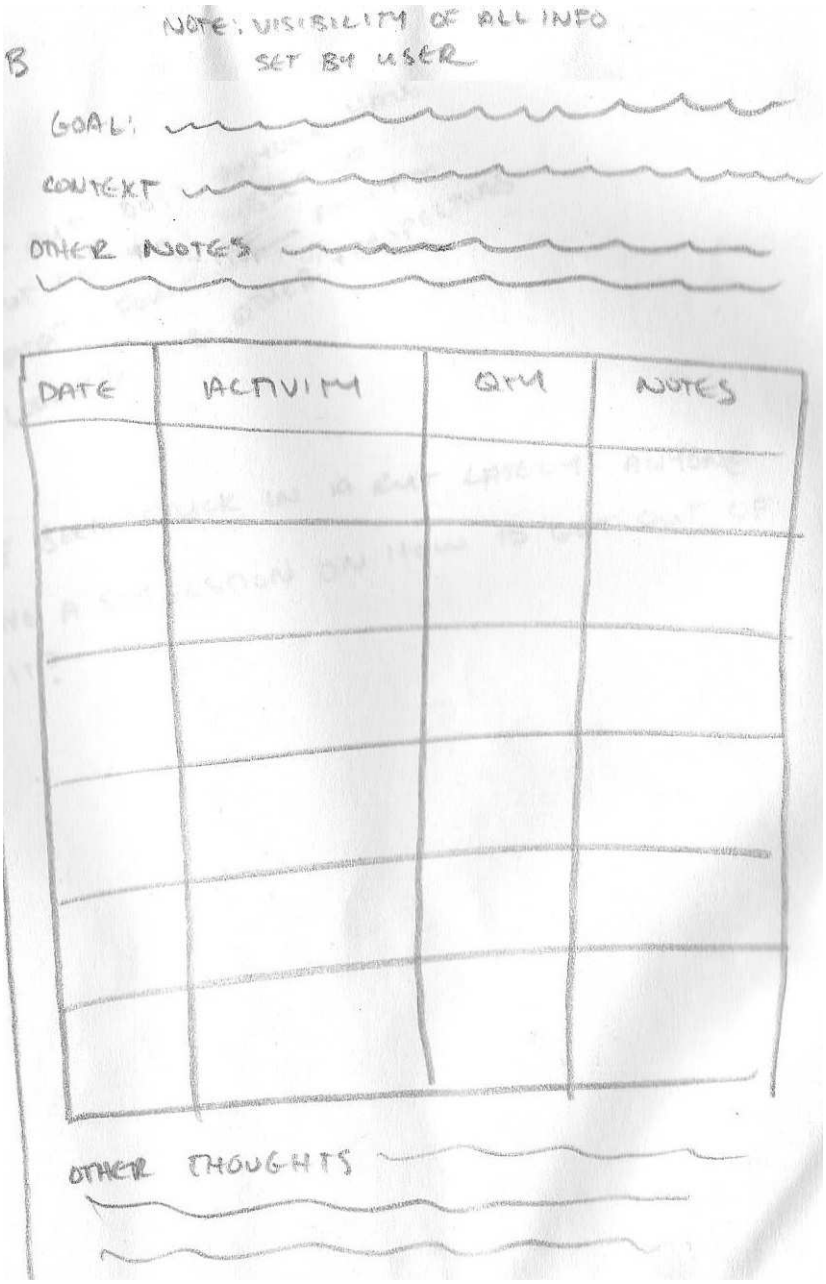
Design Idea 3a: Providing Context

When someone sees your data, they can learn more about the context by reading your profile.



Design Idea 3b: Providing Context

When someone sees your data, they can learn more about the context by reading a note at the beginning of the log.



1. What do you think of this idea?

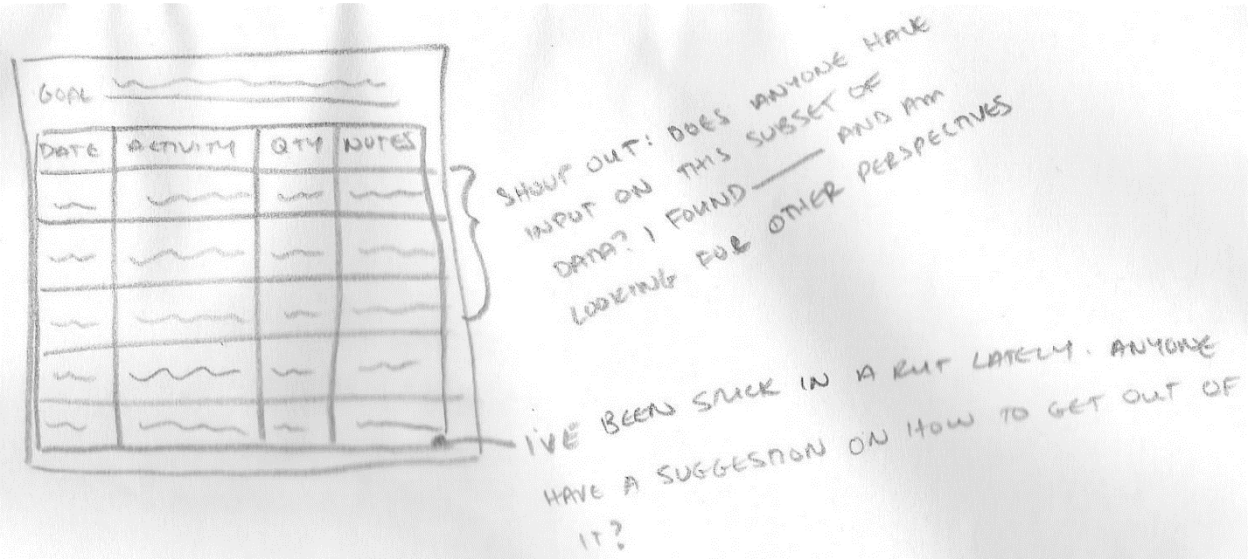
2. Would you prefer 3a, 3b, both, neither?

3. Would you do something differently?

4. Any other thoughts?

Design Idea 4: Shout Out

When you want to see what others think of a particular aspect of your data, you can create a question to get the conversation started.



1. What do you think of this idea?

2. Imagine you have been collecting the same data for awhile and you're not learning anything new. Can you think of a way this might help get you out of a rut? (Remember crazy ideas are welcome!)

3. Would you do something differently?

4. Any other thoughts?

Thanks again for participating in this interview. We really appreciate your time!