LOGGING AND VISUALIZING AFFECTIVE INTERACTION FOR MENTAL HEALTH THERAPY

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Abstract:
This paper presents a study of how to log and visualize affective interaction in mental health therapy. We present a platform under development that consists of a portable stone-like object and an application on an iPad. The design-oriented research presented in this paper concerns the design and evaluation of visualizations on the iPad app, that are intended to support communication between patient and caregiver in mental health therapy. The research and development is done from the perspective of affective interaction, and follows the guidelines for design provided in this perspective. We discuss to what extent these guidelines can be followed and how they apply to the sensitive context of mental health therapy.

Keywords:
Affective Interaction, Affect, Visualization, Mental Health Informatics, Human-Computer Interaction, Interaction Design

1 INTRODUCTION

To visualize affective interaction entails not only to provide a way of logging or registering affective interaction, but also a process of interpreting what the interaction can represent, and finally, finding a suitable and fruitful way of displaying the representations of interaction graphically. This paper describes the design of visualizations of affective interaction intended to be applied in a therapeutic setting as a means to facilitate communication between patient and caregiver in mental health therapy. The design is part of the Clutch platform (a pseudonym) that consists of a portable stone-like object that works as a tangible interface and an iPad application (Gjøsæter, Guribye & Fjøsne, 2014). The Clutch stone records squeezes via internal force sensors; these data are stored and later transferred to an iPad for graphical presentation. The platform is intended for use in a mental health therapy context to facilitate communication between the patient and the therapist, as well as help the patient get involved in their own therapy. The Clutch platform is currently under development by Bryggen Research, and is planned to undergo clinical trials during the spring of 2016.

In this paper we present a study that has been undertaken to create visualizations of the data recorded using the Clutch platform and presented on the iPad app. The study is carried out as research through design (Fallman, 2003) and the prototypes have gone through several iterations of design and evaluation. We use this research to illustrate the challenges of visualizing affective interaction in a therapeutic context, where the logging is done with a tangible interface that supports intentional, synchronous registration of affective interaction.

In the paper we first give an account of the theoretical backdrop of the study, affective interaction. Then we discuss different techniques and approaches to the logging of affective interaction, and present an overview of how such logs and data are visualized in a number of applications both in affective interaction and affective computing. The next section describes the Clutch platform. Then the research and design of the prototypes is presented, before we discuss the design and our findings and conclude the paper.
2 AFFECTIVE INTERACTION

Affect refers to the internal dynamics of a person’s emotions and moods (Picard, 1997). So affect is used to describe a state, which is viewed as a combination of temperament, moods, and emotions. Temperament is usually associated with personality or disposition, moods are longer-lasting states, and emotions are typically of a shorter duration (Lottridge, Chignell, & Jovicic, 2011, pp. 200–202). The field affective computing has been established to meet the challenges of creating computational systems that deals with emotions, including logging and visualizing affective states (Picard, 1997). This field has been grounded in cognitive perspectives on emotions.

Affective interaction is a research field and a perspective within HCI (Human Computer Interaction) that focuses on how to design for support the understanding and experience of affect (Höök, Boehner, Depaula, and Sengers, 2005). Affective interaction originated as a counterpart to affective computing and takes a different perspective, building on phenomenology, on what constitutes affect. Affective interaction is an explicitly non-reductionist approach where affect is viewed as constructed in and through social interaction, and as a means for social communication. It is also emphasized that the social and cultural setting is an integral part of the way we display emotions and the way we understand them (Boehner et al., 2005).

Boehner et al. (2005) argues that in affective computing emotions are seen as information to be measured, isolated and interpreted (see also Höök, Ståhl, Sundström, & Laaksolahti, 2008). In affective interaction, however, it is argued that formalizing emotions is not desirable and it is argued that systems should support understanding and reflection of emotions, not focus on the correct interpretation of an emotion (Höök et al. 2008).

Based on this perspective, Boehner et al. (2005) proposed a set of design principles for designing for affect as interaction (pp. 65–66). These were later modified by Höök et al. (2008) into six principles giving more emphasis to the non-reductionistic qualities and to embodied interaction (p. 652):

1. The interactional approach recognizes affect as a social, cultural and bodily product
2. The interactional approach relies on and supports interpretive flexibility
3. The interactional approach is non-reductionist
4. The interactional approach supports an expanded range of communicative acts
5. The interactional approach focuses on people using systems to experience and understand emotions
6. The interactional approach focuses on designing systems that stimulate reflection on and awareness of affect

A trend in affective interaction is to collect and display emotions in novel ways. The Affective Diary (Ståhl et al., 2008) is an example of the affective interaction approach. The Affective Diary is a self-reporting system that implements bodily memorabilia and mobile media. They had participants wear armbands that recorded pulse, steps and galvanic skin response. The participants added text from their own scribbles or SMS, as well as supplementing with photos and figures. One goal of Affective Diary was to offer their users a different way to re-experience their past. They also wanted to see how bodily representations could help user re-experience their past and if it could provide new ways of recollection (Ståhl et al., 2008). The participants in the study developed their own ways of interpreting their data, but not all the participants were able to make sense of all the parts of the system. Ståhl et al. (2008) state that “measurements read from the body are not necessarily linked to subjective experiences in straightforward ways” (p. 376) and argue that sometimes the Affective Diary would capture behaviors or patterns the participants were not equipped to deal with or interpret.

Boehner et al. argue (2005, pp. 66–67) that designing for affective interaction has certain challenges. They state that design strategies become more complex when introducing flexibility. Furthermore, rich and realistic contexts are necessary to be able to interpret the communication. Lastly, they argue that it’s
necessary to explore new evaluation strategies as existing models are based on the affective computing informational way of viewing emotions.

2.1 Logging affective interaction

In affective computing the logging or registration of data concerning affective states is often done through biometrics or other automatic methods. Based on cognitive science and experimental psychology, the goal is commonly to provide unobtrusive, non-invasive and objective measurements (Mauss & Robinson, 2009). In affective interaction, on the other hand, the goal is not to minimize the obtrusiveness, but to include the interaction with the technology in the affective experience and design with a clear aim to enable expressing and understanding feelings rather than creating objective measurements.

Data registration can be divided into two main approaches, passive and active. Kalnikaite et al. (2010) describe a passive approach as automatically logging data without user involvement, whereas active approaches require a user to be involved and actively construct the data. We want to add another distinction, which is related to the time of registration: asynchronous or synchronous logging. Asynchronous registration occurs after the event of interest has taken place, as opposed to synchronous registration where registration occurs as the event is taking place – in real time.

Kalnikaite et al. (2010) state that automatic logging “eliminates the burdens of users having to decide whether a particular incident is worth capturing, as well as the need to manually prepare and operate a capture device. One of the advantages is that no important moment gets missed, and users aren’t taken ‘out of the moment’.” (p. 2045). The disadvantages can be the sheer size of the logs, storing copious amounts of data that might not be relevant and may prove difficult to sort through. An example of using automatic logging is the use of data from sources like mobile usage. The MoodScope application (LiKamWa et al., 2013) is a mood sensing application that analyses the smartphone usage (like e-mails, phone calls, and text messages) to infer the user’s mood.

A set of techniques that are used in passive registration is biofeedback. These techniques focus on the registration of biological signals. Devices utilizing biosensors can measure body temperature, blood pressure, heart rate, galvanic skin response and more. Biosensors combined with mobile phones make it possible for data interaction to occur in real time (Kanjo & Chamberlain, 2015). Biosensors were previously mainly used in research, but presently biosensors are becoming available in many off-the-shelf interactive products such as wearables and fitness trackers. An example of a biofeedback application is the MoodWings system (MacLean, Roseway, & Czerwinski, 2013). It is a small butterfly meant to be worn on the wrist. The wing actuations of the butterfly works as a real time representation of the wearer’s stress-level based on electro dermal activity and electrocardiogram data (MacLean et al., 2013). Most biofeedback applications use automatic and synchronous logging.

In active registration, self-reporting is a common method for manually registering data about symptoms, experiences or behaviors. Synchronous logging data while experiencing the symptoms, experiences or behaviors is called, logging after the fact is called retrospective logging or asynchronous logging. Techniques for asynchronous logging include journal keeping or answering questions related to the specific challenges. A widely used method is the experience sampling method (Scollon, Prieto, & Diener, 2009). This method can be divided into three categories according to variations in the time of data registration: interval-contingent, event-contingent and signal-contingent sampling. Data collection occurs according to a set time interval, when a specific event occurs, or when prompted by a random signal (Scollon, Prieto, & Diener, 2009, p. 159). An advantage of this method is the possibility of seeing patterns around certain emotions, like situations or time of day (Scollon et al., 2009, p. 157).

The drawbacks of self-reporting, especially retrospective logging, are largely related to memory. The patient may choose to report at a later time than prompted, or may not remember exactly what they felt or did when reporting in retrospect. As opposed to retrospective logging, the Clutch platform applies an
active self-reporting method for intentionally registering data about affective interaction (Gjøsæter, Guribye & Fjøsne, 2014). The stone is meant to be used while experiencing the affective state, and can be used to log variations on intensity and the length of affected state. The intentional logging is started by low-threshold interaction where a squeeze of the stone will trigger the registration of data.

2.2 Visualizing affect

Data visualization is the graphical representation of generated data (Ware, 2004). By presenting a dataset in different ways, patterns and stories can be made visible in new ways. A suitable graphical representation can help a user interpret large amounts of data that otherwise would be difficult to understand. Good data visualizations allow users to see patterns and stories in these data, and form opinions about them. In affective computing and affective interaction a number of different visualizations of affect have been explored. In the table below (Table 1) we have listed a number of research-based applications and designs that in some way visualize affect. The table denotes the study in which the design is presented, provides a short description of each design, the type of visualization used, and the purpose of the design/use case. Table 1 presents studies that are categorized as belonging to affective computing. Table 2 presents studies categorized as based on an affective interaction approach.

<table>
<thead>
<tr>
<th>Study</th>
<th>Short Description</th>
<th>C</th>
<th>E</th>
<th>G</th>
<th>P</th>
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<tbody>
<tr>
<td>Adams et al., 2011</td>
<td>A two-dimensional mapping of color to emotion. Meant for information retrieval.</td>
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<td>Angelini et al., 2015</td>
<td>A lamp displaying colored smiley faces and collecting data through tangible gestures. Meant to communicate moods to the immediate environment</td>
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<td>Balaam et al., 2010</td>
<td>A small stone that displays different colors. Meant to display affective states in a classroom setting</td>
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<td>Dickerson et al., 2011</td>
<td>An overview of different metrics like sleep, weight, speech, and movement is shown with different colored bars. Meant as a real-time depression monitoring system for the home</td>
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<tr>
<td>LiKamWa et al., 2013</td>
<td>Colored smiley faces that indicate mood in a journal. Meant as a mood journaling tool</td>
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<td>Lin et al., 2009</td>
<td>A small robot with a LED display. Meant to communicate moods to the immediate environment and friends</td>
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<td>Matthews et al., 2011</td>
<td>Graphs and emoticons showing user’s mood. Meant to increase treatment adherence amongst adolescents</td>
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<td>Morris et al., 2010</td>
<td>Graphs that illustrate a user’s mood.</td>
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<td>De Choudhury, 2014</td>
<td>Colored Twitter data distributed on a graph. Meant to diffuse mood expression on Twitter</td>
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<td>De Choudhury et al., 2013</td>
<td>Moon phases indicate emotions based on Twitter data. Meant to be used for reflection and wellness, and social media trends</td>
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<tr>
<td>Frost et al., 2013</td>
<td>Shows bipolar moods via colors and graphs. Meant to support disease insight and management amongst bipolar patients</td>
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<td>Lee et al., 2014</td>
<td>A tree with falling leaves- the rate of falling tree leaves indicate arousal and the yellow-filter indicate valence. A proof-of-concept for emotional awareness in user interfaces</td>
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<td>Sánchez et al., 2005</td>
<td>Using emoticons in synchronous textual communication (chat). Meant to be used to communicate emotions</td>
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Table 1 – An overview of the kinds of visualizations used in affective computing applications. C = color, E = emoticons or icons, G = graphs, P = pictures, A = animations
In the comparison and review of the different applications that visualize affect, we see that affective states are typically represented via colors, emoticons, graphs, pictures or other methods. The most used elements in affective computing are colors, emoticons, and graphs. Emoticons (or variations of smiley faces) are also a popular choice. These findings resonate well with the idea that specific emotions correspond to given labels or elements in the system in a predefined way, which is common within affective computing. In the studies in affective interaction (table 2) the most used elements are colors and pictures, which also correspond well to the idea of supporting and nurturing expression, and the idea of user-defined systems. Pictures with colored motives of different objects or settings were also common. In general, animations were the least used technique.

### 3 THE CLUTCH PLATFORM

The Clutch platform (a pseudonym) consists of a portable stone-like object and an iPad application. The Clutch stone record squeezes via internal sensors; these data are then stored and later transferred to an iPad for visualization. Together, they are meant to be used in a therapy context to facilitate communication between the patient and the therapist, as well as help the patient get involved in their own therapy.

The stone-format is a deliberate design choice. First, by providing the patient with a tool that is small and inconspicuous the stone can be carried around at all times. This is intended to make data registration easier and the patients are able to register data more consistently. Second, as a familiar hand-held object, the act of squeezing it is a natural reaction and a low-threshold way of logging data. Finally, the stone can function as a transitional object (see Arthern & Madill, 1999). A transitional object is any object used with the intention to represents security or comfort for the patient. The object represents the relationship between the patient and the therapist. The stone can in this way serve as a reminder of a shared goal or a
shared bond. The stone responds to squeezes (Figure 1), which is stored in the stone’s internal memory as numeric values with a corresponding time stamp. To view the data, it must be transferred to an iPad application.

The visualizations of the data from the stone will be used in a therapeutic setting and is intended to support the dialogue between the patient and the therapist. The prospective users are divided into two groups; the therapists and the patients: i) A therapist is defined as any user helping the patient in a therapeutic setting, ii) A patient is defined as the user of the stone that registers the affective interaction.

The Clutch platform has multiple objectives. The main objectives of the stone are: i) To function as an extended memory, ii) To function as a transitional object. The stone is supposed to work as an extension of a patient’s memory by storing data about his/hers affective events. The patient doesn’t have to clearly remember the events as the stone will store a record of the events for him/her. A study into patients suffering from depression indicates that memory impairment is quite common (Shelton & Kirwan, 2013).

The main objectives of the data visualizations were outlined at the first brainstorming session with the stakeholders. They are: i) To provide the therapist and the patient with a quick overview of the patient’s affect over a period of time, ii) To provide the therapist and the patient with information about the patient’s development. If the patient’s data is presented in a suitable manner, it will quickly provide the therapist and the patient with a representation of the event, which can help as an aid for exploration. Furthermore, by providing the patients with information about their affective interaction and development they can take an active role in their therapy. Breen et al. (2008) argues that patient engagement is vital for the success of the therapy.

The Clutch platform’s main objective is to provide a tool that supports therapeutic dialogue. This differs from a trend in mental health informatics where users are provided with the data and responsibility of interpreting the data to help alleviate the workload on the health care system (Gillard et al., 2012).

The type of registered data is also different as the data’s meaning is agreed upon by the patient and the therapist. Other systems provide advanced registration of valence and intensity with regards to specific
emotions, moods, or challenges. Only a few of the systems reviewed provided a more generic registration of feeling something on a scale from good to bad, or high energy to low energy. In the Clutch platform the meaning of the registrations are meant to be determined in collaboration between patient and therapist. They can include any type of affect and be used in many contexts, from drug rehabilitation to bullying, and any affect, like pain or shame, or positive affect such as wellness, accomplishment and so forth. They also focus on a specific issue, as opposed to monitoring multiple issues at once. As previously discussed, active methods for synchronous data registration in other systems provide a prompting at random or set times during the day, and users log a snapshot of their current affect. The Clutch platform lets a user register as much data as they need at any time whilst experiencing the affect. A low threshold for registering data is common characteristic of tangible interaction in that can take advantage of the familiarity with common objects (Herstad & Holonen, 2012). Many of the reviewed systems used a mobile or web interface for registering and displaying the data. This technique can contribute to creating a higher threshold for making entries for some potential users. In the design of the clutch stone, it is important that the stone could be easily used when the patient feels the need to register an event; to have an event-driven approach to registration. This is in opposition to many other systems that prompt for registration at a given time interval. In addition, The Clutch stone only stores squeezes with a timestamp, if the stone is lost this data is nonsensical to a potential intruder as the meaning of the squeezes is not stored with the data, and this feature help safeguard users against breaches of their privacy.

4 DESIGN AND EVALUATION OF VISUALIZATIONS
As part of the design-oriented research, the different data visualizations were created in three iterations (see Kroger, 2015 for the full details). The problem identification phase included two 2-hour brainstorming sessions with the designers from Bryggen Research where the system’s requirements and design goals were discussed. Further, it involved making proto-personas and scenarios. The designers from Bryggen Research were involved during the process of defining the problem area and evaluating design solutions, however they were not part of the main prototyping phases. During the prototyping phase, the first two iterations utilized sketching as the main method of prototyping the visualizations. The final high-fidelity versions were created in a vector illustration tool. The evaluation phase involved Bryggen Research, a psychologist and five evaluators. The first two iterations were evaluated by the designers and the psychologist. The final version of the system underwent formative usability testing and a system usability survey with five evaluators.

Proto-personas and Scenarios
The proto-persona method is typically used when you don’t have firsthand knowledge about your users and are a modification on traditional personas. Personas are used to incite emphatic thinking when developing a system, to help the developers and designers get involved in the people they are creating the system for. Proto-personas can thus be utilized to prevent the design team from viewing themselves as the intended users, and to help guide them create a system suitable for their intended users or user groups (Buley, 2013, pp. 132–135). The proposed user groups in our case range from patients in drug rehabilitation to children being bullied, and to accommodate the variety of potential users, four proto-personas were made in line with guidelines recommended by Nielsen (2013).

Prototype/The Data Visualizations
The visualizations are divided into four components (see Figures 2-4) - a Day and Month view, and two month comparisons, named Bars and Dots. A Day view which provides the patient and therapist with an overview of the events on the selected day. The view also includes a weekly overview in the lower half of the screen to quickly compare data from different days in a week. The Month view displays a calendar version of an entire month, with the intent to provide a quick overview of the month. The Month view might also show patterns not visible in the Day view.
4.1 Evaluation

Usability testing was conducted to examine the last prototype iteration with five participants. The participants were introduced to a high-fidelity prototype of the system and asked to perform six different tasks. The user testing were formative in nature, and the emphasis in this stage of design and evaluation was to understand and uncover how the evaluators used and comprehended features of the prototype. Thus, the goal of the evaluations was to validate design decisions, to gather data on the users’ views and to gain an understanding of this specific design iteration. The evaluations revealed a range of issues with comprehension and interpretation of the prototype.

In the Month view, four out of five participants understood that the colors meant different intensity levels. However, none were sure what the data representing this information in the system was. All participants were able to determine which days were the worst in the Month view. The worst days were the highest red days or the days with more red bars. The best days were interpreted as both the low green days and the days with no data registration. When prompted, the reasoning differed, but all participants interpreted having none or a low data registration to be a good thing. The colors combined with height helped the user in their interpretation of the data. Another issue was the icon set which was difficult to interpret or discern for some users. One user thought it might be related to the weather, and another user had trouble discerning the night icon from the evening icon.
In the Day view (Figure 2) most participants agreed that the use of background colors to indicate time of day worked well. Three participants commented on the choice of numbering on the x-axis and lack of numbers on the y-axis, and wanted all the hours represented on the x-axis.

In the Bars compare (Figure 3) all participants were dissatisfied with the color choices on the months - low level of contrast made it difficult to distinguish the months from each other. Furthermore, no participant could tell with certainty which month was best, which indicates that the data visualization does not function as intended in this form. The white divider lines that are used to indicate the RAG-zones were not understood and needs to be labeled on the y-axis.
In the Dots compare (Figure 4) most users could tell which month were the best and worst with greater certainty than in the Bars version (Figure 3). The Dots compare version proved easier to read, but users still preferred the Bars version for comparing months. This might indicate that a redesign or providing the user with methods of filtering the data would be beneficial. In general the users indicated that they were satisfied with the system and the visualizations, only one user was dissatisfied with the graphical profile and color choices.

To provide more feedback about the prototype, the System Usability Scale (SUS) was used to get feedback on the users perception of the prototype after they had performed the assigned tasks. Three users gave the system scores equivalent to an A or B grade, two users gave the system an F, or fail, grade. Despite these responses, all users agreed or strongly agreed that they would use the system frequently, which might indicate that the system’s intent is considered useful, even if they didn’t understand or approve of the prototype in its current version. In general the feedback strongly indicates the need for a redesign.

5 DISCUSSION
Specialized systems in mental health care, such as MONARCA 2.0 (Frost et al., 2013 that are only suitable for patients suffering from bipolar disorder, have a limited and inflexible potential. With the Clutch platform, however, the patient can use the tool in any context defined in collaboration with the therapist. By allowing the Clutch stone data registration to include all types of affect via a single squeeze pattern. While this choice adheres to guideline two for the design for affective interaction (Höök et al., 2008), as presented above, in that it supports interpretive flexibility, it also carries with it certain
challenges for the design of visualizations. When creating a graphical representation to support communication, it is difficult to do so without locking the visualization to a specific use case or context. The icons created to reduce the amount of numbers in the interface did not function as anticipated, and will be replaced with a different approach in the next iteration. Some users misinterpreted the intended meaning of the icons, making interpreting the data more challenging. Also, the Bars view for comparing two months had issues related to readability. The Bars comparison proved too difficult to read and did not provide the user with the ability to discern between two months the design intended. For both compare views, Bars and Dots, the users requested filters to let them explore and navigate the data sets in different ways, which can be solved by creating an interactive version of the system. The third design guideline for affective interaction (Höök et al., 2008) suggests a non-reductionist approach to designing affective interaction. As the evaluations show, attempting to categorize and reduce emotions to representations as bars in labeled boxes may not be the most fruitful approach. While the visualizations are intended to support interpretation and communication, it may, at the same time, be too strict in enforcing categories and representations. In the Month view, the coloring and height illustrating intensity was well liked. The users interpreted the visualization as intended, with high, red columns as being the most active periods, and low, green columns as the least active periods. The background color in the Day view functioned well as a means to illustrate a time of day. In the Dots compare, all users were able to tell which months were the best and worst, which indicate that it functions as a tool for comparing two or more months. The SUS survey shows that the overall feedback and score of the system was good, suggesting that this tool is worth exploring further, however feedback indicate that the system would benefit from further design iterations. Examining other types of visualizations or modifications on the ones presented above should also be a priority. Lastly, the visualizations are only as good as the data, and testing the entire platform with real users and real data is a required.

The therapeutic context this system is intended for is very sensitive. The design goal for the visualization and the interface is to act as an intuitive entry point to the data in the Clutch stone, adhering to guideline six (Höök et al., 2008) to “...stimulate reflection on and awareness of affect”. Additionally it provides a mutual platform for dialogue and has the benefits of having the user actively involved in their own therapy (Breen et al., 2008). To approach this design task, the evaluation was performed with potential users from the therapeutic perspective as well as evaluators with a background from HCI. However, these evaluators represent only one side of the dialogue. We now have a basic understanding of the challenges in representing understandable visualizations of emotions to this user segment. The evaluations uncovered issues concerning representing the data through time-slotting via icons, the use of colors and information architecture through categorization. For the Clutch platform to be helpful in a therapeutic dialogue, the visualizations must be designed for the therapeutic context. This evaluation serves as a first step in shaping the intended user experience for this arguably complex and sensitive context. In a therapeutic context, we must design for users with mental health challenges impacting their ability to remember (Shelton & Kirwan, 2013), understand and reason about the reported emotional events. In this iteration, proto-personas were used intentionally to shield real users from an explorative phase of the visualization design.

If we are to take this user segment seriously, we cannot present them with even slightly incomprehensible graphical interface representations of these events. The intentional synchronous logging is designed to be a low threshold entry point to initiation of gathering data helpful in a dialogue with the therapist. As the Clutch platform ventures into informal trials and clinical trials, findings presented in this paper will serve as a basis for the next iteration of visualization design. An iterative design cycle is needed to ensure a favorable outcome for the design (see Fallman, 2003). At this point in the design and research process, we find that key features related to visualization (such as icons, graphs, use of colors and text) needs to be redesigned in its entirety. The overarching design goal of the platform is to provide a low-threshold entry point to both the intentional logging as well as an easy to understand visualization and an equally low-threshold entry point to the data that can be used in initial clinical trials.
6 CONCLUSION

In this paper we have presented a platform designed for use in mental health care and described and illustrated an approach to visualizing and using the data this platform provides for a therapeutic setting. The review and the design-based research have been used to address how to log and visualize affective interaction. When discussing the logging of affective interaction we introduced the differences between active and passive logging and elaborated upon the difference by introducing a distinction between synchronous and asynchronous logging. This discussion led us to explore the categories of intentional-in situ logging versus retrospective logging of affective interaction – which we find to be a promising conceptualization to guide the design of interactive artifacts that are to log user activities, especially affective interaction.

The literature review further uncovered that the use of visualizations of affect in a therapeutic setting is a largely unexplored area. A given perspective on affect (as in affective cognition or affective interaction) influences the way systems are designed with regards to data collection, data registration and data visualization. In this study, the research and design has been inspired by the perspective of affective interaction, and the proposed guidelines for designing for affective interaction. These guidelines argue that the design should support interpretive flexibility and expression of affect, and support a range of communications. Thus, the Clutch platform allows registration of any kind of affect where the meaning of the input is defined by the patient and the therapist. The platform expands the method of active data registration in two ways: firstly, it offers a lower threshold for data registration than many other reviewed systems, and secondly, it captures varying degrees of intensity over a duration determined by the patient. To design visualizations that allow for all types of affect a wide range of prototypes were developed. The prototypes were designed using proto-personas, a set of requirements from Bryggen Research, and the guidelines from Höök et al. (2008). This finally resulted in high-fidelity prototypes that underwent evaluation. The analysis of the evaluation reveals that a new iteration of design and evaluation is needed. This iteration, however, sheds light on some crucial issues we need to further consider in the next design iteration, but can also be interpreted as a proof of concept in that the evaluation revealed that the design – as represented by the prototypes – is understandable and considered useful.

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