Participatory Design of Computer Games to Support Adolescent Mental Health

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Abstract
Research suggests that games are an effective medium to support mental health interventions for young people who experience depression or anxiety. Nevertheless, little is known about the best way to optimize the games to enable widespread positive impact in an accessible and engaging manner. We believe it is worth investigating forms of adaptability in tools that support therapy, to increase helpfulness for a broader population. For example, the tools can be adapted to fit a variety of therapy delivery styles and customized to be as helpful as possible for varying individual client needs, different age groups and a range of mental disorders. In this paper, we describe our approach to perform user studies with two key user groups in the context of games for therapy: therapists who apply games in therapy and young people with mental health difficulties who are playing the games. We describe how we want to involve both parties in the assessment of current technology and how we plan to design, prototype and assess future tools.

Author Keywords
Adolescent Mental health; Computer games; Participatory design; User studies;

Pesky gNATs

Pesky gNATs is a game that is intended to be played by young people and therapists during therapy sessions. It assists therapists to deliver Cognitive Behavioral Therapy (CBT) to young people. The young person controls a character on a tropical island (**Figure 1**) and meets other characters who explain the CBT concepts using easy metaphors. For example, the characters talk about little stinging creatures called Pesky gNATs that affect our thoughts in a negative way. The game contains multiple levels which are intended to be played in consecutive therapy sessions to build skills and knowledge systematically.

Figure 1: Screenshot of the Pesky gNATs island

ACM Classification Keywords

H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous;

Introduction

Cognitive Behavioral Therapy (CBT) is a successful type of therapy to treat a wide range of mental health difficulties for adults (C.Butler, E.Chapman, M.Forman, & T.Beck, 2006). The intervention requires a high level of abstract thinking regarding the subject's own thoughts, feeling and behavior. This level of abstract thinking can be difficult for young people which in turn results in a challenge for therapists to successfully deliver the concepts of CBT to young people who experience mental health difficulties.

To make the abstract ideas of CBT more accessible to young people, a range of tools have been researched and developed in order to assist mental health professionals in the delivery of the concepts. Research shows that a collection of computerized CBT (cCBT) approaches all had positive results on treatment and prevention of children's depression and anxiety (Richardson, Stallard, & Velleman, 2010). Nevertheless, the results also show that non-completion rates of the programs is high. The work concludes that CBT seems to be an effective intervention for young people but also that the literature is limited and more research is needed.

In this paper we discuss the methods we use to assess Pesky gNATs, a CBT computer game that is based on a CBT workbook for children and adolescents (O'Reilly, 2016). The workbook is a digital or paper-based book with drawings and easy metaphorical explanations that mental health professionals can use to explain the concepts of CBT to young people. For example, CBT concepts like *negative automatic thoughts* and *core beliefs* are represented as little stinging creatures and the hives where those creatures originate. The CBT intervention explains how to recognize the automatic thoughts and beliefs, how they influence the subject's thinking patterns and suggests ways to address them. Pesky gNATs is a computer game that takes the metaphors from the CBT workbook and delivers them in the form of a PC game (Coyle & O'Reilly, 2015). More information about Pesky gNATs can be found in the sidebar.

Pesky gNATs was released in 2015 and is currently used by multiple therapists to deliver a CBT intervention to young people who experience anxiety or low mood. Preliminary responses from therapists who use the game indicate that the game is a helpful support when delivering the CBT intervention to young people. Also, the young people who played the game seem to be enthusiastic to use such a tool in therapy. These responses correspond to earlier evaluations of the predecessor of Pesky gNATs called gNATs Island (Coyle, McGlade, Doherty, & O'Reilly, 2011). Nevertheless, therapists have indicated that Pesky gNATs turned out to be ineffective or inappropriate in some cases. For example, the appearance and dialogues in the game focus on a certain age group (9-17) and it can be difficult to understand for younger players while being dull or unexciting to others. Also, among the players the literacy skills can vary and players' cultural differences could make the game more or less effective or fun. The type and severity of mental difficulties that young people face could even require other types of intervention than the game currently offers.

Adaptability
Since there can be significant individual differences among young people who face difficulties, we hypothesize that the game should not be a one-off game but a flexible tool. For example, therapists could be given the possibility to add, remove or repeat components of the game such as educative minigames or exercises to reinforce learning of the therapy concepts. Other flexibility could be introduced by allowing changes to the level order, appearance, dialogues or even the way that young people interact between the Pesky gNATs mobile app and the desktop game. The game could be programmed to make automatic adjustments by itself, based on the player's progress or understanding of the cognitive model. Players can be granted freedom to play the game in a way that they think it is most effective or enjoyable.

There are clearly a lot of options to make the game more flexible with potential benefits to a successful delivery of therapy. Nevertheless, changes should be applied with caution given the urgency to minimize any potential negative impact on the therapeutic alliance and the mental state of already vulnerable people.

User studies
To move forward we need to get a better understanding of the needs of both therapists and young people who use Pesky gNATs. We need to find out how the two user groups interact with the game, how they currently experience the game and what potential improvements they have as suggestions. Ultimately, we aim to describe the experience of therapists and young people who have used the game in real intervention settings, to synthesize evidence-based requirements for games that support mental health therapy.

As Pesky gNATs is used by both therapists and young people, we consider it essential to include the two groups in the design, prototype and assessment processes that are needed for the future development of therapy tools. Involving the therapists and young people as active partners and testers in the process allows the development to be informed by and for the users directly, instead of building on the researcher's approximation of a successful end-product.

Method
Research access to therapists and young people with mental difficulties is very limited. The number of therapists who currently have applied Pesky gNATs is small and ethical considerations make research access to young people with difficulties a challenge. The limited number of participants shifts our focus to qualitative research methods in order to learn as much as possible from the collaborating therapists and adolescents.

User studies with therapists
Over time, therapists have used Pesky gNATs to deliver therapy to a variety of young people with different ages, backgrounds and mental health difficulties. To discover their long-term experiences with Pesky gNATs in real intervention settings we invited the therapists for an online survey and in-depth interview. Topics of the studies include: the usage of Pesky gNATs, the helpfulness of the tool and the experiences with the tool from both therapist and child perspectives. The semi-structured interview covers the same topics in more depth to allow therapists to elaborate on

experiences they had while using the game. We also ask about the way they interact with the game and probe for ideas they have for future versions. The interviews will be recorded and transcribed.

The interview transcriptions and survey data will be thematically analyzed and used to summarize the actual usage of Pesky gNATs in intervention settings. We also aim to define the needs of therapist for games that support therapy.

User studies with young people
In addition to research with therapists, we plan research to understand the young peoples' perspective on Pesky gNATs. We organize focus group sessions and interviews to discuss Pesky gNATs. Additionally, to identify the young peoples' understanding and experience of Pesky gNATs we plan one-on-one playthrough sessions with *concurrent think aloud* and *retrospective think aloud* data collection methods (Fonteyn, Kuipers, & Grobe, 1993). This method will allow us to collect temporal data about the in-game decisions, reasoning, understanding of concepts, any existing misunderstandings and global experience. The method is suitable for small sample sizes. The data can also be used to identify commonalities and individual differences about the experience and understanding of concepts. The goal is to describe the experience and understanding of the current game and discover any pitfalls and individual differences that might exist.

Defining requirements
By combining the data of studies with both user groups and accounting for individual differences that can exist (in both therapist and young people), we aim to define a definitive set of suggestions and requirements for tools that support therapy. These can serve as guidelines for development of new tools. We will use the requirements and suggestions as starting point for participatory design and prototyping sessions with the end-users. We believe this strategy will have a strong potential to design helpful new technologies that support therapy.

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