Family Interventions to Prevent Mental Health Disorders

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OVERVIEW

Our research investigates how socio-technical interventions might be deployed in families to promote resilience of those at risk and mitigate the occurrence of mental illness later in life. Our specific case study (cf., the upcoming full paper at CSCW available here) is focussed on supporting innovative mechanisms to deliver emotion self-regulation intervention to families. Our main argument is that emerging ubiquitous technologies and soft electronics could to enable a shift in how prevention interventions are designed and delivered: empowering children and parents through a new model of 'child-led, situated interventions', where participants learn through actionable support directly within family life, as opposed to didactic in-person training sessions and a subsequent 'skills application'.

The work presented in the CSCW paper describes our year long user-centred approach to combine an understanding of lived experiences within families (interviews, design workshops) with an expert-led understanding of what makes interventions psychologically effective. The resulting intervention—taking the form of a plush toy imbued with a wide range sensors—has been deployed with more than 20 families for multi-day trials (14 in the data reported in the CSCW paper; and another 8 for week long deployments since). The data from these preliminary trials suggests highly positive responses from the families (described below), indication of substantive effects on child self-regulation, as well as strong and sustained engagement from the children.

The next step within this research agenda is starting to understand how we might utilise the data traces generated by children when interacting with the toy. Specifically, we will aim to investigate how such 'behaviour traces' could lead to (i) opportunities to drive engagement in emotion-oriented discussion between parents and children, which is one of the greatest challenges in the prevention intervention space; as well as (ii) facilitate and enhance the family-oriented intervention, bringing in new mechanisms for personalised interactions and context-sensitive support. We would be would be delighted to have the chance to discuss these themes with the workshop participants. We also hope that by the time of the workhop, we will already be able to present initial data from the upcoming round of co-design workshops focussing on the data presentation questions.

In the rest of this position paper, we first outline a short background for the specific case study, our preliminary prototype and findings, and finally a set of questions that we would be bringing into the workshop.

BACKGROUND

Mental health problems represent the largest single cause of disability in the UK, with the cost to the economy is estimated at £105 billion a year — roughly the cost of the entire national health service [15]. Most mental health disorders are chronic and begin early in life (75% before the age of 18 years), and this realisation is fuelling calls by national governments and international organisations for preventative interventions in childhood [17, 18, 26]. Although the psychological mechanisms to develop protective factors against mental health disorders are relatively well understood and evidence-based interventions exist (see [8, 24] for reviews), only little is known about the potential of technology to address some of the critical challenges remaining – including those of access, engagement, and training costs that prevention programs face when trying to reach families of young children [21, 23].

As such, it is not clear if/how technology could be used to facilitate transfer of such learning from school into families (cf. [22]); or to enable new types of interventions that would empower parents and children to further develop protective competencies independently on formal training programs.

This work focuses on *emotional regulation (ER)* as a specific instance of a protective factor. We chose emotion regulation as it is a fundamental life skill, with effects on life outcomes comparable in size to those of IQ or family social status [1, 16]. Research shows that these effects are wide reaching: if ER is poorly developed, it leads to increased chances of developing mental health disorders [2, 5, 10, 13, 14] as well as societal problems such as criminal behaviour [6], low personal wellbeing [16], and academic under-achievement [7].

Self-regulation is malleable

A body of literature in Educational psychology and Prevention Science shows that emotional-regulation—as well as other social-emotional competencies—are malleable: there are evidence-based interventions that can change people's ability to regulate their emotions (e.g., [7, 25, 27]). Moreover, even small improvements in self-regulation in early years can lead to large positive differences in individual life outcomes for both at-risk and general populations [16], with accumulating impacts at the societal level [4].

This has led to a research focus on *universal prevention programs* which are deployed to whole populations (e.g., as whole school approaches) to promote and reinforce personal strengths, rather than being targeted to

Figure 1. (a) The technology probe design; (b) Overview of the interactive components in the technology probe

children already manifesting problems (see e.g., [8] for a review). While effective, the existing prevention programs are however very resource intensive. The key challenge is that they *lack scaleable techniques to get beyond classroom-based learning and support the in-the-moment reinforcement and scaffolding of the learnt self-regulation techniques*, which are needed for the skills to be transferred from intervention to practice [3, 9, 11, 19, 27]. The critical role of providing this scaffolding and support is currently left to teachers and parents, requiring extensive training to do effectively: For example, a shortened version of the Incredible Years program [20, 25] still required 12-24 weeks of parent training in groups of 6-10 parents for 2.5 hours, once a week.

CHILD-LED, SITUATED INTERVENTION
Due to space reasons, we refer to the CSCW paper (here) with regards to the intervention logic model as well as how the presented solutions was responding to in-depth interviews with families and co-design workshops. In summary, the intervention was designed so that: (i) it would fit into the existing practices and moment when children need to calm-down; (ii) would have immediate soothing effects when the child interacts with it; and (iii) the resulting experiences would offer alternative calming down strategies and narratives used within the family.

Prototype overview
The current prototype takes the form of a hand-crafted plush toy (see Fig 1-a), which was designed to travel home with the child from school and support in-the-moment calming down strategies. The interaction relied on a number of sensors embedded in the 'creature' that registered haptic interactions with the toy – see Figure 1-b. In addition, a small vibration motor was used to indicate the creature's state by mimicking a frantic 'heartbeat'. If the creature was calming down in response to the child's touching of the sensors, the heartbeat slowed down and eventually turned into happy purring. These haptic interaction patterns were designed drawing upon research with children in our initial target age group (8-10) concerning their preferred fidget materials and fidgeting patterns, as well as research concerning fidget materials and their link to self-regulation in adults [12]. This evidence suggested particular kinesthetic and tactile affordances that would facilitate soothing effects. We hypothesised that interacting with a toy that made use of these affordances would aid in the child's self-regulation.

We envision that such sensed patterns could be utilised as a form of social personal informatics data as described below, both to support the child in understanding/developing calming strategies as well as surfacing these to the parents to facilitate parent-child discussion.

Findings
The post-deployment interview data with children and parents suggest that children drove the interaction with the toy at home by incorporating it into their daily routines and frequently engaging with it throughout the day (situated & child-led). Moreover, the probe appeared to be conducive to facilitating a relationship and emotional connection from the children, which gave meaning to the soothing interactions (child-led). All of our child participants have asked to keep the toy at home for longer during the post-deployment interview. What was particularly interesting was the large proportion of children reporting that the physical, in-the-moment interactions were effective in helping them calm down and relax (situated). Despite the short time and only initial intervention design, the data suggest that the toy was interacted with naturally when some of our participants perceived the need to calm down (situated, child-led); and was seen as a positive change in how the child copes with stress.

MOVING TOWARDS SOCIAL PERSONAL INFORMATICS
By the nature of its interactivity, each engagement with the creature generates trace data that has not been utilised; but clearly could have much value if designed for well. Some of the specific questions we are planning to explore in the next round of work include:

− How can we provide conversation starters for parents/children or teachers/children that emerge out of the data, that protect the caring and empowering relationship that we are cultivating between the child and the anxious creature?
− How might a parent intervention rely on such data to empower them to learn and engage in more empathic conversations with their child?
− How might we facilitate storytelling about own experience that would be using the data as a starting point for the child? How might such engagements scaffold self-reflection and—over time—perception of self efficacy?
− How can the data be incorporated into the narrative of the creature (e.g., skills building) and still allow for the ambiguity that affords the child's productive projection upon the creature?
− How can we fruitfully combine this sensor data with other data collection strategies to give teachers/parents/caregivers good insight into how a child is doing with the skills we are hoping to scaffold?

More broadly, we are interested in discussing the mechanisms through which such 'interaction trace data' could drive innovative mental health interventions, empowering both children and parents to learn from the naturally occuring 'teachable moments'.

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