Toward Interactive Social Stories for Children with Autism

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ABSTRACT

This paper proposes *Interactive Social Stories* (ISS), a new approach for enhancing traditional autism interventions to promote stimulus *generalization*. Using interactive narrative techniques of variability and branching structures, we designed a tablet-based ISS app called *FriendStar* to teach 9-13 year old children on the autism spectrum the social skills of greeting in the school context.

Author Keywords

Games for Health; Autism Intervention; Interactive Narrative

ACM Classification Keywords

H.5.2 INFORMATION INTERFACES AND PRESENTATION: User Interfaces

INTRODUCTION

Autism is one of the fastest-growing serious developmental disorders in the U.S. Deficits in social communication and reciprocity reflect a key feature of the autism disorder. Such deficits are associated with significant functional impairment and growing public health costs. It is estimated that nationwide each year 50,000 individuals with ASD turn 18, many lacking adequate social skills to function or live independently. There is thus a pressing need to understand how to improve the social skills of the youth so that they can better integrate into their family and community.

This paper proposes *Interactive Social Stories* (ISS), a new interdisciplinary approach for enhancing traditional autism interventions through computer games, especially interactive narrative. In particular, we aim to promote *stimulus generalization*, that is, helping children learn the behavior in response to varied stimuli as opposed to in one discrete circumstance or in response to a single cue [3]. How to promote stimulus generalization is a key challenge for teaching social skills. By incorporating interactive narrative techniques of variability and branching structure in the traditional ASD intervention of Social Stories, we aim to help children practice certain behavior in response to various similar, but not identical cues/ settings and hence help them generalize to the outside world.

Here, we describe our preliminary work in designing *FriendStar*, a mobile tablet-based ISS app that aims to help children on the autism spectrum to practice how to initiate social interaction, i.e., greeting, in the context of schools. We also briefly describe the design of our on-going feasibility study.

BACKGROUND

Among evidence-based interventions, Social Stories are commonly used to help individuals on the autism spectrum better understand the process of interpersonal communication [4, 7]. However, traditional Social Story formats lack flexibility as most of them are linear. These stories depict one particular sequence of events, leaving little space for variations or agency. For instance, when a Social Story teaches how to greet a classmate in school, a child with ASD may not understand how the same greeting can be generalized to others (e.g. a cousin at home) or comprehend how different behaviors (e.g., choosing not to greet) may result in different social consequences. As a result, these linear Social Stories have limited *generalizability* to novel, real-world social interactions with unexpected outcomes.

There have been many efforts to adapt Social Stories into digital media, by using video and computer graphics. Authoring tools such as StoryMaker[TM] have been developed for caregivers, educators, and clinicians to create their own Social Stories. While most digital Social Stories remain linear, researchers have looked into interactivity. For instance, the "I can Problem-Solve" program, with the help of human instructors, allows children to choose solutions or propose novel ones to problem situations[1]. The Refl-ex system, paired with its authoring tool, aims to help children with High-Functioning Autism through obstacle-based branching[2].

However, very little, if any, Social Story intervention has been designed to promote the *stimulus or response generalization*. Generalization is needed for social skills known to be difficult for ASD youth, such as responding to a variety of greetings in a variety of settings across multiple groups of people. We hence propose to extend Social Stories with interactive narrative techniques such as variability and branching structures [6]. Examples of interactive narrative are modern computer games that use the branching structure to model different user choices and their consequences in the fictional world.

INTERACTIVE SOCIAL STORIES

We built an interactive social story mobile app called *FriendStar*, as a prototype of our new approach. Our goal is to 1) explore a new way of modeling social skills in a fluid and flexible manner, 2) develop an interactive social simulation

Figure 1. A Screenshot from *FriendStar* on a Tablet.

wherein children can learn, test and adjust their generalization of the specific social skills in a less threatening environment, and most importantly, 3) promote stimulus generalizability.

Our target audience is children on the autism spectrum between the age of 9 and 13. They can use the app either with caregivers or on their own. We focus on teaching the social skill of greeting in the school context. Following the convention of traditional social stories, the user plays the role of himself. In order to help the user to identify with the cartoonish character, we incorporate a character personalization function where the user can adjust the skin tone, hair style, and clothing of the character to better match himself.

In order to facilitate generalizability, we divided the instructional content of *FriendStar* into three components, each represented as a week. A week is composed of five days. Following the errorless learning design paradigm [5], the user cannot move on to the next day unless he completes the current day's social challenge correctly.

In Week 1, the user practices how to greet the *same person in different contexts*. In Week 2, he practices greeting skills with *different people in the same context*. In Week 3, the user will encounter new combinations of person and context for further practice. It also allows us to measure how much he has formed a generalized understanding of greeting (generalization over people vs generalization over context) based on examples shown in the first two weeks.

Each day is a self-contained interactive social story, where the user can practice how to greet a particular person in a particular context. The user controls the development of the story by selecting different actions on the screen (Fig. 1). These choices, marking the branching points in the story, lead to different consequences. Different from many digital Social Stories, we incorporate a cascade of choices, allowing the player to "recover" from early mistakes. Every time a correct action is selected, it is reinforced through sound and animation (indicated by the star on the upper right corner of Fig. 1).

FEASIBILITY STUDY DESIGN

As our next step, we are designing a feasibility study to test the effectiveness of the ISS intervention. We plan to collect data from children, their caregivers, and clinicians. Parents and children will be invited to attend an hour-long session to play with *FriendStar*, where each child's interaction with the app will be logged to identify issues and potential interaction patterns. They will then be asked a series of questions by research staff about the usability and learnability of the ISS app in order to assess child comfort and rapport. Clinicians will participate in a focus group to discuss their impressions of the app. In addition, parents and clinicians will also be asked to complete a standard intervention acceptability measure: the Intervention Rating Profile (IRP-15).

CONCLUSION

In summary, we propose a new framework of Interactive Social Story to help children with autism to learn social skills. We focus on incorporating techniques from interactive narrative, particularly its branching structure and variability, to promote stimulus generalization. We designed and developed a tablet-based ISS application called *FriendStar*.

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