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Interactive storytelling for the retelling of autobiographical memory in children: A social robotics approach

Leire Ozaeta [a 1], Computer Science Researcher, AIN, Spain

Itsaso Perez [b], University of the Basque Country, Didactics and School Organization, Biscay, Spain

Itziar Rekalde [c], University of the Basque Country, Didactics and School Organization, Biscay, Spain

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Abstract

Memory is one of our fundamental mental functions, which allows us to revive the past in our minds. When memory is mentioned, we usually want to refer to a particular kind of memory, which is autobiographical memory. Access to these memories can be altered by various affective disorders, especially depression. Regarding these techniques, this study aims to focus on storytelling to contribute to the resilience of children using a social robot approach, as they do not perceive the robot as a figure of superiority, but as a peer. The article follows a literature review method. This paper presents a preliminary scenario for child-robot interaction in three phases, using interactive storytelling as a way to review the children's past experiences. To help those people, particularly children who have faced trauma, to remember the past in a structured and positive way, life review techniques have been developed.

Keywords: Autobiographical; memory; robotics; storytelling.

* ADDRESS FOR CORRESPONDENCE: Leire Ozaeta, Computer Science Researcher, AIN, Spain.
E-mail address: Ozaeta@gmail.com

1. Introduction

In parallel with digital developments, information technologies, which have become a part of human life, are used for all kinds of purposes (Uygarer and et all, 2017) Autobiographical memory represents a set of information and memories of ourselves, accumulated since we are born, and allows us to build a feeling of identity. This is part of the long-term memory that allows us to store information for a long period of time, if not for a lifetime (Jensen, 2016). Using our autobiographical memory, we can remember what has happened to us in the past. These memories can refer to an event that occurred at a specific time and place, although they do not have to be specific events, as this memory also helps us retain and recover general memories too (Navarro et al., 2008).

Autobiographical memory, by definition, is not objective, as it is based on one's perception of the events and has a prospective function: depending on how we remember our past, we project and act in the future (Gismero et al., 2020). We can say that we are what we are because of what we learn and what we remember from our experiences (Westerman, Cobham & McDermott, 2017) and thus our perceived life story can heavily affect the reaction and perception of new memories.

The adequate process of this life story is especially important in children as their autobiographical memory does not go as far as an adult's, shapes their character sharply as it is not fully formed, and they lack many cognitive and introspective skills. The importance of processing this particular memory lies in the evolution of going from victim to controlling your story and understanding it in depth. These are the types of work that interest us, since this is the objective of our work, for the child to develop and improve his or her resilience through building and sharing her/his story (Stork, 2020).

1.1. Purpose of study

Intended contribution In this work we discuss a proposal for an intervention focused on the development of joint attention in ASD children using a NAO robot. ASD students are especially lacking joint attention skills. Joint attention is one of the basic areas of development. Thus, we hypothesize that the intervention would be of benefit to people in different cognitive situations, especially for those with special education needs.

2. Method

This research uses a literature review. It presents storytelling as an educational tool and the benefits of adding ICT to storytelling. The paper also presents the proposed interventions.

3. Results

3.1. Autobiographical memory and resilience

Resilience is the normative response to experiencing traumatic and victimizing events; these events can be natural, fortuitous, or carried out by the human being. Most individuals, families, and communities show the ability to adapt to ongoing adversities. Not all people are equally resilient, but this is a skill that can be worked on and improved (Bolívar, 2016; Granados Ospina et al., 2016).

Various studies have linked traumatic experiences with the generalization of people's autobiographical memory. That is, the bigger the suffering, the less specific the autobiographical memory becomes (Crespo, & Fernández-Lansac, 2016; Pasupathi, Fivush & Hernandez-Martinez, 2016; Cili & Stopa, 2018). As Palombo, Sheldon and Levine say (Palombo, Sheldon & Levine, 2018), the poor recovery of specific memories is a mechanism we use to avoid high levels of negative acts. Indeed, they claim that being less specific in memories is related to a lower effective impact of the event. Furthermore, the tendency to overgeneralize and the frequency of stressful events have been measured, as well as their relationship with depressive symptoms (Peltonen, Kangaslampi, Qouta & Punamäki, 2017).

It is now commonly accepted that subjects who show greater overgeneralizing, and who report more frequency of stressful events, are likely to suffer more depressive symptoms (Toki & Pange, 2014). Being able to generate higher levels of specific autobiographical memories is associated with the ability to successfully solve interpersonal problems (Hamlat & Alloy, 2018). Despite the fact generalization is considered a stable trend, it has been verified that this trend can be reduced through the use of different types of training (Crespo & Fernández-Lansac, 2016; Cox & McAdams, 2019; Granados Ospina et al., 2020). Autobiographical memory can be changed through educative intervention, thus improving the quality of life for those who have suffered trauma (Navarro et al., 2008).

3.2. Life review technique

As we mentioned before, access to autobiographical memories can be altered by various affective disorders. To help those people, especially children who have faced trauma, to remember the past in a structured and positive way, life review techniques have been developed (Jensen, 2016; Hamlat & Alloy, 2018; Gismero et al., 2020).

These technique focuses on successful experiences, reinforcing a greater sense of continuity between the events lived, helping to give meaning and coherence to one's life, and even resolving unresolved conflicts (Lempert et al.,2017). The life review technique not only serves to encourage the person to do the cognitive exercise and the effort to remember past events, but it helps reflection and acceptance of their own life thanks to the topics covered during the intervention. As Lempert explains (Lempert et al.,2017), the life review technique is full of four sessions; in each of them, a phase of life is analyzed. This process is carried out between the patient and the therapist.

Further to improving generalized symptoms of depression, the live review technique is also beneficial for people who show symptoms of post-traumatic stress, that is, for those who have experienced a recent or non-recent traumatic situation. During the review of life, a more positive coping with past experiences is reinforced, promoting life satisfaction and emotional well-being (Cili & Stopa, 2018). The life review technique is not the only methodology capable of modifying autobiographical memory.

In a more informal context, we can find life stories (Lin, 2016; Peltonen et al., 2017; Westerman, Cobham & McDermott, 2017). This methodology is approached from a more educational than a therapeutic point of view (Ioannidis et al., 2013). With their similarities and differences, both of them are beneficial to reinforce identity and self-esteem, as well as to work on specific moments (Granados Ospina et al., 2016).

3.3. Life story technique

The construction of a life story is a methodology that is used to recreate our biography itself (Thambu, 2017). The biggest difference from the life review technique is that in life stories we create a story, that is; we write it as a story (Pasupathi et al., 2016).

A life story is built by integrating all those elements from the past that the subject considers relevant to describe, understand or represent the current situation and prospectively face the future. Life stories make explicit and visible (for himself and others) that set of perceptions, interests, doubts, orientations, milestones, and circumstances that have significantly influenced and shaped our identity, actions, and decisions (Navarro et al., 2008).

The main characteristic of (self) biography is to be a construction and configuration of our identity, more than a faithful account of our life, which is always in the process of becoming. This self-interpretation of life itself makes it intelligible or gives it meaning. This way, it brings order to the set of past events, finding a thread conductor or plot that establishes the necessary relationships between what the narrator was and what it is today (Bolívar, 2016). The narration mediates between the past, present, and future, between experiences lived and the meaning they have now acquired for the narrator in relation to future

projects (Jensen, 2016).

For this reason, a life story is not just a collection of memories (an exact reproduction of the past) or an action story. It is a reconstruction of the present, based on a future trajectory. Telling our own stories is how we give ourselves an identity because we recognize ourselves in the stories we tell. The story of the individuals is a basic constituent of our identity, as we represent our lives in narrative form (Cox & McAdams, 2019).

Furthermore, Granados, Alvarado, and Carmona claim (Granados Ospina et al., 2016) that life stories help us become more resilient people: "Resilience has to do with telling stories, with the way the subjects tell stories from life experiences resulting from coping with adversity. Access to humanity as a subjective construction passes through that ability to relate one's life, crossed by limited experiences, which configures dense plots, immersed in social, economic, and cultural contexts complex due to their diversity and plurality. Living is telling. An authentic life without a story is not possible (p.2)"

Compiling what we have seen so far, the life review technique contains a structure; it is divided into four sessions, and in each of them a part of the person's life is reviewed. However, life stories are less structured narratives, where the person tells her/his story as she/he remembers it and how she/he feels it.

3.4. Storytelling as a sociology-educative intervention

Human beings are storytellers. It is human nature to make meaning of our lives by organizing what happens to us into stories. We live our stories as if they were true. We tell stories to understand what happens to us and provide us with a framework to shape our new experiences (Jensen, 2016). As Pasupathi, Fivush, and Hernandez-Martinez say (2016) storytelling is used with children to achieve two main goals; the first goal is to teach values, and the second goal is to improve resilience (Lin, 2016; Stork, 2020; Lan, Xu & Cao, 2021).

3.4.1. Storytelling as a sociology-educative intervention

Storytelling has been used by religions since the beginning of time in all civilizations, as a way of teaching values, morals, etc. Through stories, the main codes of social conduct to be followed have been transmitted, as well as the consequences of not doing so (Thambu, 2017). It is a very powerful tool that when used incorrectly can perpetuate negative values, but if used correctly, it will enhance positive values, thus creating personal growth and community improvement (Esteban Núñez & Gómez Ríos, 2019).

Storytelling and storybook reading is widely used in the school system, both in the early childhood stage and in the primary education stage (Esteban Núñez & Gómez Ríos, 2019). In this educational context, the teacher reads a story to the students. This is usually a story where the main character faces an adverse situation, makes right or wrong decisions, and learns a moral from this situation.

Depending on the age of the students, the teacher may open a debate, so that the content worked in the story sinks in her students, and make sure that they internalize them correctly and share different points of view. These stories are used to develop values such as generosity, empathy, solidarity, equality, etc (Thambu, 2017).

3.4.2. Storytelling as a methodology to improve resilience

Storytelling contributes to the emotional well-being of children because every good narrative has a character that solves a problem by taking strategic action, a character they can relate to (Geres, 2016). Engagement in activities such as oral traditions, storytelling, and talking circles can result in a change of perspective. Thinking about the story to tell, puts kids in control because to plan means to put our ideas and experiences in order.

Storytelling offers children adaptive strategies to face challenges and build a sense of hope by examining

the past (Lin, 2016). Storytelling can be a way of helping children explore emotions that are too difficult to understand. Narratives buffer risk as kids explore identities and retrieve a sense of wholeness after experiencing loss or trauma. Storytelling helps children temporarily avoid their reality, look at their grief, explore their emotions, and focus on their strengths (Peltonen et al., 2017). Children are interested in sharing their stories because they mean something to them.

3.5. In Class Technologies (ICT) on storytelling

ICTs have long been applied with great success within the field of formal education, in both preschool and primary education (Colbert, 2006; Toki & Pange, 2014; Røkenes, 2016). By making correct use of them, technological tools can facilitate the educator's work. When it comes to the storytelling methodology, technology helps us create an interactive experience, where students can create their own stories, and go from being passive listeners to active protagonists. As Toki and Pange (2014) assure, including ICT in storytelling helps to develop the imagination and creativity of our students.

Overall research suggests that ICT enhances the storytelling practice with children (Ioannidis et al., 2013). The desire to tell their stories and to communicate their ideas independently of text conventions leads children into greater experimentation and exploration. Stories increase in complexity when ICT is introduced, as well as the length of the stories and the time and perseverance required to complete them also (Røkenes, 2016).

3.5.1. Social Robotics and storytelling

When we talk about technology within the classroom or educational technology, we usually refer to devices such as tablets, computers, etc. This is what rest comes to mind since they are the technological tools that are mostly presented in the field of education and childhood (Esteban Núñez & Gómez Ríos, 2019).

The application of robotics in storytelling intervention offers a number of benefits i.e., the children do not perceive the robot as a figure of superiority, but as a peer, making it a less scary, and more approachable intervention (Angel-Fernandez & Vincze, 2018) . Our target population is children in situations of vulnerability and/or who have been exposed to trauma, it is understandable that they find it difficult to open up to an adult even in a therapeutic environment.

Nevertheless, scientific literature says that they will easily engage with a robot, in a shared playing environment, because they can relate to it (Geres, 2016). Thus, our reason to use robotics as a complement to storytelling is that robots allow us to make the whole process of storytelling interactive while using a nearly natural social interaction without adding stress to the situation by maintaining the conversation between peers. That is, a switch is made from a scenario where the teacher tells a story and the child listens to it, to another scenario where the child builds her/his own story, along with the robot (Lan, Xu & Cao, 2021).

Once the story is created, they listen to it together. The subject goes from a passive process to an interactive one, making the child the focal point of the sociology-educational intervention (Angel-Fernandez & Vincze, 2018).

3.6. Proposed intervention

The proposed intervention is composed of the four activities presented below moving the child from a passive subject to fully interactive transforming the storytelling into a story debate. The leveling up would be linked to the children's evolution and observed reactions to the stories, as well as discussed with the professional and tutors, going back to Level 1 if the interaction seems to distress or upset the participant at any level.

As it is obvious a social professional and a technician are required during the full extent of the intervention for safety even if they are not present or do not engage at all.

Level 1: Meeting

In this scenario, the robot interacts a bit with the child. It presents itself and is the meeting where the child meets the robot, previously explained by the tutor or the professional in charge. The robots offer some game to play, for the child to touch the robot and get a feeling of the interaction. Then the robot offers to tell a story. If the child reacts in a negative way the story is not told, and the same games are offered in another meeting if the child accepts until a sense of safety and kinship is developed.

The games of this stage are to sing along, dance together, and identify and touch the robot's hands and feet.

Level 2: Storytelling

This is the starting point of the actual storytelling. At this point, the gameplay is still at the child's request, but the storytelling is becoming a fundamental part of the interactions. The child listens to the robot's stories and these range between therapeutic and non-therapeutic ones. The focus of this level is to make the child keen on hearing the robots' stories and be an integrated part of the sessions.

Level 3: Child-directed storytelling

In this level, the gameplay is minimally or just not present. The robot offers the child to make a story together. If the child accepts the offer the robot starts a story and asks the child for solutions to the presented situations. In the end, the robot tells the full story to the child.

In these interactions, the retrieval of information is more important than the adequateness of the story itself as the robot builds a log of the stories told and the elections of the child for the professional to review to get a peek view of the child's mental state and decide which stories can be tried for the child to benefit or to get more information on the child mental structure.

The robot's role in the storytelling is quite passive at this level and can be repeated for as long as it is considered necessary by the professional or tutors.

Level 4: Robot-directed storytelling

In the final level, the child and the robot interact solely on a storytelling basis. The story is offered immediately, much like on level 3, and if the child accepts the robot starts the story. However, using the previous information about the child and the professional's recommendations the robot would select stories previously marked and direct the child's response to the most adequate trail, challenging the child's answers (i.e Oh, I don't think it happened that way..., Are you sure? I think this is what happened... etc.). After the full story is built the robots tell it in its full length for the child to hear and process the final result.

In this scenario, the robot has a more proactive role in the storytelling interaction, and so, it can result in negative or distress in the child so the iteration must be closely monitored. Is not advised to keep at this level for long, mixing some Level 3 meetings between Level 4 meetings.

4. Conclusions

We are entering an era where society is giving mental health the importance it deserves. Mental health is imperative. New generations are raising awareness about mental health, and we, as education professionals, must join this movement. Our ultimate goal has always been and will be the well-being of our students, and in this sense, ensuring their emotional well-being and mental health is essential. Telling stories has always been important to humans. Throughout history, different civilizations have had their versions of storytelling, be it oral or written. Telling stories is essential to preserve the collective memory

but also to create a community.

As seen in this paper, there are different storytelling techniques. This article collects those that we have found most appealing and on which we have based our proposal. Social robotics is a growing area, offering promising results. This paper collects the design of a proposal that combines robotics and storytelling. This proposal is in the initial phase, and our goal is to apply it in the future. In these uncertain times that we live, we look forward to carrying this project out, evaluating it, and making various improvements to create a program that helps our students.

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