Robot-based psychological intervention program for the prevention of child sexual abuse: An overview

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Sexual abuse of children is an important issue with severe consequences, so self-care education programs increase children's awareness, knowledge, and skills against sexual abuse. It has been considered as one of the priorities of health and treatment issues in different countries of the world. The purpose of the present study is to investigate the program of psychological interventions with a robot on the sexual care of children. The results showed that psychological interventions with robots are effective on children's sexual care. The prevention program is to prevent sexual victimization of children by helping them learn skills to protect themselves and teach them to recognize good and bad contact and seek a trusted adult for help and can be considered as a treatment method by counselors and psychologists.

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INTRODUCTION

Sexual abuse of children is a global issue especially in females which affects near about 18-20% of the female population; 7-8% female's reports about being abused before the age of 18 (Dunn, Gilman, Willett, Slopen and Molnar, 2012). It has been reported that sexual violence is undoubtedly associated with a long-lasting impact on the overall health of children who have been abused, which alleged involves risky sexual behavior, chronic pain syndromes, anxiety, and depressive disorders including post-traumatic stress disorder, substance abuse, suicide attempts, and sexually aggressive behavior (Testoni, Mariani and Zamperini, 2018). The high prevalence of adverse consequences due to sexual abuse increased the warrant for investment in the development of preventive and therapeutic strategies. Addressing gender-based violence among adolescents has become impactful on human rights and public health imperative. Adverse consequences with significant sexual and reproductive health outcomes are seen more commonly in female adolescents on a lifelong trajectory of violence, either as victims or perpetrators (Wegner, Pierce and Abbey, 2014).

Previously conducted research studies demonstrated intimate partner violence committed in 81 countries among the girl's age (15–19 years) and young women (20–24 years) (Clark, Ferguson, Shrestha, et al, 2019). Sexual violence can occur at any age and can be perpetrated by parents, family members, teachers, peers, acquaintances, and strangers, as well as intimate partners (Du Mont, Woldeyohannes, Macdonald, Kosa and Turner, 2017). As children grow into puberty, they may experience sexual harassment in their home, community, or school or forced first sex. In the United States, dating violence is evident more in females (Hien & Ruglass, 2008). There is growing recognition that boys are sexually victimized than men and may be severe, yet these are invisible or may be unveiled. A particular group of adolescents, who are especially vulnerable to violence such as working children, mental disabilities, homeless youth, and youth, was living in conflict-affected settings and children who have dropped out of school (Shastri, 2009).

Pieces of evidence show that risk factors included exposure to violence as a child, prior victimization, bullying, and homophobic teasing, poor parental practices, harmful alcohol and substance abuse, unequal social norms that condone gender-based violence, lack of empowerment among women and girls, controlling male behavior, and laws and policies that perpetuate gender inequality (Higa, Hoppe, Lindhorst, et al, 2014).

Sexual crimes are related to an antisocial orientation and unstable lifestyle in individuals, who are willing to hurt others or feel unable to stop themselves. The sex-offenders have impulsive and reckless behavior, crime-prone personality, hostile, resentful attitude. Sexual crimes invoke high levels of public concern followed by the legislative policy (Bonnar-Kidd, 2010). Psychiatrists have an essential role in providing medical interventions for sexual offenders, which involves conducting evaluations and provide psychotherapy and counseling services to this population. A significant small proportion of hormone deprivation therapies along with the use of sex-drive reducing medications provided to sexual offenders are considered to be appropriate (Forsberg & Douglas, 2017).

Implementation of treatment program is required to develop for sexual offenders to reduce the risk of sexual violation and recidivism. The several treatment programs based on factual evidence include cognitive–behavioral methods, classical behavioral, insight oriented, hormonal medication, the formation of therapeutic communities, faith-based treatment, and intensive supervision (Eliason, 2006). An application of cognitive-behavioral interventions helps offenders to seek different thoughts of engagement of pro-social activities apart from irrational thoughts and beliefs of offenders that lead them to engage in antisocial behaviors (Burke & Loeber, 2016). The traditional psychotherapy includes talk therapy and exploring the underlying causes of malicious thought related to offending behavior (National Collaborating Centre for Mental Health (UK), 2010). Finally, the medical treatment of sex offenders involving surgical castration, hormonal therapy, neuro-therapy, etc. is needed to minimize their risky behavior. These treatment programs often depend on the eligibility to participate in a treatment program and on several factors, such as willingness to participate, risk level, the seriousness of the current sex offense, or availability of treatment slots (Lee & Cho, 2013).

As per the U.S. Department of Health and Human Services' Children's Bureau report Child Maltreatment 2010, the prevalence of child sexual abuse has increased to 9.2% of victimized children (Burneo-Garcés, Fernández-Alcántara, Marín-Morales and Pérez-García, 2018). Crimes against Children Research Center have studied it on two primary strategies:

1. Offender management and
2. School-based education programs.

Recently major offender management initiatives have included initiatives against sex offenders, individual awareness in social communities, background employment verifications, and punishing longer prison sentences for sex-offenders. Recently the reports of pedophilia are often reported. Such types of sexual abusers are not strangers and are getting sexually attracted to prepubescent juveniles. Many of them were noted with relatively low risks for re-offending once caught and punished (Finkelhor, 2009).

Child population above the age of three years can efficiently learn some of the concepts about personal safety skills and increase their knowledge related to safety skills. This training can be made available in a short amount of time for these children (Dautenhahn, 2007). Through the process of education and advising through psychological interventions (like behavioral, cognitive, cognitive-behavioral approaches, supportive therapies, interpersonal psychological interactions, mindfulness, etc.) the children have communication skills, interpersonal problem resolution, and coping skills (Churchill, Moore, Caldwell, et al, 2010).

Recently conducted research studies have demonstrated that human-robot interaction can play a vital role in the education, awareness and therapeutic management of many disease conditions. Studies conducted by Diehl et al. (2012) demonstrated that the use of a robot in the diagnosis and treatment of autistic children is sufficient (Dautenhahn, 2007). Research studies also demonstrated that the application of social aids helps children to develop and improve their emotional and social behaviors. The prime goal of the researchers is to employ these robots to help children, discover communication and emotions in them, and learn the physical oppositions. Since robots are quite attractive to children, they can be considered as good models for educating children through entertainment, and children can learn more advanced coping skills against the possible dangers of sexual abuse through observational learning and imitation (Office of the Surgeon General (US), 2001).

Sexual abuse is one of the most devastating and dangerous forms of child abuse in Iran that has increased considerably in recent years. Child population from many parts of the world are involved in the war, rape, and domestic violence and trafficking. The child abuse of any type (physical, emotional, sexual, neglect, and negligence) is discriminatory in various societies and is considered a crime in many countries, and legal consequences for its perpetrators are considered (Jannone, 2011). Considering from sociologists' point of view, child abuse and other social damages are a violation of the high culture, and it is based on the fact that the fight against different types of violence, the use of force and harm to others, among the primary concerns of societies in the present era are considered. Therefore, one option to deal with the social harm phenomenon, like child sexual abuse, can be to educate children and their parents. In this regard, educating the child population about the care of the sexual intelligence by the intelligent robot is essential with the help of appropriate education for children in the form of educational and presentation programs and it can help in further reduction of the risk of sexual abuse (Kennedy, Baxter and Senft, 2015).

New Robotic science no longer focuses only factory applications, but also the use of robotics in a more complex and unstructured outside world, that is, the automation of multiple human activities, like caring for the sick person, driving a car, making love, and killing people. New robotics, therefore, literally focuses on automation from love to war (Van Wynsberghe & Aimee, 2013). More prominently, a robot makes use of the existing Information & Communication Technology (ICT) infrastructure and also implies a continued technological evolution of these networks. Through robotics, the Internet has gained, as it were, 'senses and hands and feet.' Two long-term engineering ambitions also drive new robotics. Firstly, there is the engineering dream of building machines which can move and further act autonomously in complex and unstructured environments. Secondly, there is the dream of building machines that are capable of social behavior and have the ability for moral decision-making system. The notion that this may be technologically possible within a few decades is referred to as the 'strong Artificial Intelligence' view (AI). It was considered highly doubtful that this would indeed happen in reality (Van Oost, Ellen, and Darren Reed, 2010).

New robotics offers the number of possibilities for making human life more pleasant and comfortable, but it also raises many severe societal and ethical concerns. The recent debate on the use of robotics to distant battlegrounds is very current, while the employment of care robots appears on the horizon. Prompted by the arrival of new robotics, the Rathenau Instituut in 2011 and 2012 investigated the social meaning of robotics for years to come in Europe and the US by studying robotics developments in five application domains like health care, the home, traffic, the police, and the army (Royakkers, Van Est and Daemen, 2012). Robots are currently playing an essential role in speech recognition, face recognition, quizzes, game playing, and limited conversation to capture the preschool child's interest and attention. Mobility and semi-autonomous functioning of robots combined with facilities for visual and auditory monitoring are designed to keep the child from harm. Most are prohibitively expensive at present but prices are falling drastically, and some cheaper and simpler versions are already becoming available in the market. Children love to play and interact with robots as observed numbers of children participating in robot competitions globally. There is a growing number of research studies demonstrating positive interactions between children and robots in the home and the classroom (Baxter, Ashurst, Read, Kennedy and Belpaeme, 2017). Robots have also been shown to be very useful in therapeutic applications for children. The natural engagement value of robots makes them a great motivational tool for education in science and engineering.

To be commercially comfortable, in future robot carers will be required to enable considerable longer parent/carer absences that can be obtained from leaving a child sitting in front of a video or television programme. Television and video both have long been employed by busy working parents to entertain their children for shorter periods (Veruggio & Operto, 2008). However, these are a passive form of entertainment and children get fidgety after a while and become irritated and unsafe. Children need to be monitored with frequent "pop-ins," or the parent has to work in the same room. The robot can extend the length of parent absences by making the child safe from any harm, keeping them entertained and, ideally, by creating a bond of relationship between child and robot (de Graaf, 2016).

Perseverance of human motion and non-verbal communication is an essential aspect of human-robot interaction. For robots to be a part of or to become functional collaborators in human society, they must be capable of making decisions depending on their perception of individual states. Additionally,

knowledge and perception about the human state are very much crucial for robots to learn and control policies from direct observations of the human being. Human state, however, consists of a large and diverse set of variables, including kinematic, practical, and goal-oriented information, which has proved quite challenging to model and further infer. Part of this problem is that the relationship between such decision-related variables and a robot's sensor readings is challenging to infer directly. Our more magnificent view is that socially interactive robots will need to maintain estimates, or beliefs as probabilistic distributions, about all of the components in a human's state in order to make effective decisions during the interaction (Thring, 1964). Humans take decisions to drive their muscles and affect their environment. A robot can only capture and sense limited information about this control process (Royakkers, Lambèr, and Rini and van Est, 2015). This information is often incomplete observations about the human's kinematics and appearance over the period, like images from a robot's camera. To estimate a human's decision making policy, a robot must attempt to invert this incomplete information back through its model of the human control loop, maintaining beliefs about kinematic movement, actions performed, decision policy, and intentionality (Shaw-Garlock & Glenda, 2010).

In response to the growing awareness of the scope and consequences of child sexual abuse (CSA), many programs like employment of robots to prevent its occurrence have been studied and developed and disseminated since the 1980s. Unlike efforts to prevent the physical abuse or neglect of children (which focus on modifying adult behavior), the focus of CSA prevention efforts with the application of robotics has been primarily to alter the knowledge and skills of children, through group-based instruction on personal safety, usually conducted in educational settings (Tanaka, Fumihide, Aaron Cicourel, Javier and Movellan, 2009). Reviews have been relatively consistent in showing that these types of programs produce significant gains in knowledge and skills thought to be useful in helping children avoid sexual victimization. Although child-focused sexual abuse (CSA) prevention programs have become the strategy of choice used by communities to protect children from being sexually abused, there are fewer consensuses in the research community as to whether preschool-aged children should receive CSA prevention training with the involvement and participation of robots (Levy, 2009).

The present review was conducted to study the available literature and research studies primarily focusing on the Robot-based psychological intervention program for the prevention of child sexual abuse. Our review focuses on the additional need for the conduct of more and more number of research studies pointing towards the implementation of intelligent robot systems in the prevention of child sexual abuse.

METHODOLOGY

Tahan's research (2019) was a quasi-experimental study with a pretest/posttest control group design and a follow-up stage. This study was conducted at two stages. At first, a qualitative method based on the Delphi technique was utilized, and the second stage was completed quantitatively using a quasi-experimental method with a pretest/posttest design and follow-up. Moreover, after three months, the follow-up was implemented (table 1).

The statistical population of this study consisted of all children aged 8-12 years enrolled in primary school (for boys and girls) in the city of Ghaenat, Iran, in the 2018-19 academic year. In this study, the statistical sample included 80 children aged 8-12 years, selected by the stratified random sampling method and divided into experimental and control groups (each one with 40 people, 20 girls and 20 boys). In this study, the localized Children's Knowledge of Abuse Questionnaire was also administered for data collection purposes (Leslie Totti, 1995). The robot-based psychological intervention program was also designed with reference to the related research.

The study was conducted in such a way that after receiving the code of ethics in research, the experimental groups underwent 10 sessions of 45 minutes during five weeks (two days a week) of psychological interventions with a robot.

In order to analyze the research data obtained from the questionnaires completed by the children at the pre/posttest stages with the cooperation of the researcher, the descriptive statistics were used. To examine the research questions, inferential statistics such as independent- and paired-samples t-test, analysis of covariance (ANCOVA), and repeated measures analysis of variance (ANOVA) were employed. The significance level of $p \geq 0.05$ was also used in three situations: pretest, posttest, and follow-up for both groups. As well, the data analysis was performed using the SPSS Statistics software (version 25).

Table 1. A Summary of the Content of the Program of Psychological Intervention with Robot for Sexual Care in Children (Tahan, Afrooz and Bolhari, 2020)

Sessions	Content
Session 1	Starting the training program - introducing the robot - pre-testing: First, two groups (namely, experimental and control) complete a researcher-made questionnaire (Tahan, 2019) on the prevention of child sexual abuse. The experimental group will then receive talks separately in a classroom about the educational program within a short period of time for a few days per week and for a few hours in each session, and they finally get acquainted with the training robot and the tasks performed by it during the sessions.
Task	Pre-testing
Session 2	Introducing and explaining the body parts: The therapist first talks briefly about the body parts and the way each part is capable of performing a series of tasks. Various parts from head to toe are then described to the children by the robot as their functioning.
Task	Displaying the photo of a girl/boy's body Writing the name of each body part separately, coloring it, and talking about the functioning and efficiency of each one
Session 3	Identifying and gaining knowledge of important parts of the body as well as intimate ones: Therapist: Describes a body part that is particularly important to other ones in such a way that if they are not available, some parts of the individual's life is disrupted or they are unable to live Therapist: Explains the body parts and the fact that some are personal and no one has the right to look at or touch them except the individual by oneself Robot: Introduces the important body parts, e.g., eyes, hands, legs, head, and abdomen Robot: Provides a general introduction of the intimate parts
Task	Photographing the whole body, separating each body part, naming each part independently, identifying the position of intimate parts, and distinguishing the sensitive and important ones
Session 4	Learning to recognize family members, acquaintances, and strangers: Therapist: An explanation of the people around an individual Who do you know? Family 1: father - mother - sister - brother Family 2: grandparents - uncle - aunt Acquaintances: neighbors, mother or father's friend, and sibling's friend Stranger: People you do not know Robot: Talks about family members, acquaintances, and strangers and tells the difference between them
Task	Displaying the photos of family members, acquaintances, strangers - a photo of a hypothetical person, family introduction, as well as getting to know acquaintances and strangers, and identification of the person in each of the sections
Session 5	Learning how to communicate with family members, acquaintances, and strangers: Therapist: Explains how individuals relate to those around them. To what extent? Explaining and introducing interactions with others, how to communicate with them, and the type of communication with others (touch, sight, and talking) Robot: Explains how to communicate properly with family members, acquaintances, and strangers (how to communicate by touch, sight, and talking with family members, acquaintances, and strangers)
Task	Displaying the photo of how a person communicates with family members, acquaintances, and strangers
Session 6	Diagnosing risky and traumatic situations and moments: Therapist: A brief description of the moments and situations that can occur to anyone The robot fully explains these moments: Family: Being alone at home and the situations that may arise in terms of touch, sight, and talking Acquaintances and strangers: Situations that may take place outside the home Conditions noticed by children: Showing dissatisfaction with some actions, and having prolonged and frequent upsetting situations leading to disgust
Task	Displaying the photos of dangerous, sensitive moments - family members, acquaintances, and strangers
Session 7	Recognizing and introducing risky and traumatic situations and moments and how to deal with them (family members): Therapist: A description of situations, places, moments, and all things an individual might be exposed to Robot: Practices all the dangerous moments with an expert and what should be done as their reactions at these moments
Task	Dealing with a risky and sensitive moment with family members What is the right thing to do? Two modes: Right / Wrong
Session 8	Recognizing and introducing risky and traumatic situations and moments and how to deal with them (acquaintances): Therapist: A description of situations, places, moments, and all things an individual might be exposed to Robot: Practices all the dangerous moments with an expert and what should be done as their reactions at these moments
Task	Dealing with a risky and sensitive moment with acquaintances What is the right thing to do? Two modes: Right / Wrong
Session 9	Recognizing and introducing risky and traumatic situations and moments and how to deal with them (strangers): Therapist: A description of situations, places, moments, and all things an individual might be exposed to Robot: Practices all the dangerous moments with an expert and what should be done as their reactions at these moments
Task	Dealing with a risky and sensitive moment with strangers What is the right thing to do? Two modes: Right / Wrong
Session 10	Overviewing past sessions and reviewing all items in question - assessing all stages - post-testing
	Post-testing

DISCUSSION

Child sexual abuse is one of the most common and complex psychosocial problems in society. This phenomenon has an unquestionable effect on the mental health of children and it is also devouring thousands of children around the world as a daily social problem (Tahan, Afrooz and Bolhari, 2020). This problem continues to grow and the future of hundreds of children is in doubt. Certainly, no event can change their lives and future as much as the sexual abuse. Research and prevention of child sexual abuse is thus becoming more widespread in all societies, but there are no accurate statistics on this phenomenon in Iran, and the reported published through some media are very unrealistic and untrue, because child sexual abuse is not regarded as a crime committed in public and families who face it hide the problem for cultural and religious reasons and the lack of sex education, so there is no possibility of monitoring, legal interventions, and education, protection of the victims, as well as the rule of law (Yousefzadeh, 2012; Jaberzadeh-Ansari, 2016).

In Tahan's research (2019), other findings were further experienced as follows. The reluctance and concerns in some of the subjects' parents were observed, because they found the work difficult due to their misconceptions and shame about sexual issues, sexual care, and ignorance of raising sexual issues with their children. Sex and any related subjects, even in the field of research and prevention could also produce special fears, concerns, taboos in most managers, while welcomed by many parents and teachers. Creativity in education could thus lead to indefinable excitement in the students, and what was not so much a taboo could be the ugliness of the words, sexual and immoral. The feeling of the researcher and the colleagues, like many parents, was a kind of transformation of joy and hope, while at the same time, impression and disgust was lost from the lack of such methods and experiences in families and schools (Tahan, 2019).

CONCLUSION

Child sexual abuse is one of the most common and complex psychosocial problems in society. As a phenomenon with an incontrovertible effect on the mental health of children, this social problem is engulfing thousands of children worldwide. The growing number of this crime along with the unknown future has also left hundreds of children in doubt. certainly no event can change their lives and future as much as the sexual abuse. Although research and prevention targeting child sexual abuse are becoming more widespread in all societies, there are no accurate statistics on this problem in Iran. The role of specialists and the efforts they make to prevent the occurrence of this crime are thus essential. Evaluations together with psychotherapy and counseling services to avoid child sexual abuse are also more cost-effective than post-traumatic therapies to reduce the rate of injuries and disorders in this age group (Forsberg & Douglas, 2017). Children aged over three can thus learn about some concepts such as sex and related care, and broaden their personal and knowledge-related safety skills (Dautenhahn, 2007). Through education and counseling based on psychological interventions (such as cognitive-behavioral approaches, supportive therapies, interpersonal psychological interactions, mental imagery, etc.) children can develop communication, interpersonal problem-solving, and coping skills to deal with this problem (Churchill, Moore, & Caldwell, 2010). Education is accordingly the most effective and factor in preventing child sexual abuse, and it has been established that children and adolescents receiving education from an early age can benefit trainings well. If education is provided to children in an attractive modern way via robots, it will surely bring positive results.

Ethical approval: Ethical approval was obtained from the Research Ethics Committee of Islamic Azad University- Bojnourd Branch.

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: The raw data supporting the conclusions of this manuscript will be made available by the authors, without undue reservation, to any qualified researcher.

Conflict of interest statement: The authors of this study certify that they have NO affiliations with or involvement in any organization or entity with any financial interest (such as honoraria; educational grants; participation in speakers' bureaus; membership, employment, consultancies, stock ownership, or other equity interest; and expert testimony or patent-licensing arrangements), or non-financial interest (such as personal or professional relationships, affiliations, knowledge or beliefs) in the subject matter or materials discussed in this manuscript.

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Robot-alapú pszichológiai intervenciós program a gyermekkori szexuális abúzus megelőzésére: áttekintés

A gyermekkori szexuális abúzus számos súlyos következménnyel járó fontos téma, így az öngondoskodással kapcsolatos edukációra fókuszáló programok növelik a gyermekek tudását, tudatosságát és készségeit a szexuális abúzussal szemben. Ezt a világszámos országában az egészségügy egyik prioritásaként kezelik. Jelen kutatás célja a gyermekek szexuális gondoskodására irányuló, robotokkal végzett pszichológiai intervenciós program vizsgálata volt. Az eredmények szerint a robot alapú pszichológiai intervenció hatásos volt. A program lényege a gyermekek viktimizációjának megelőzése azáltal, hogy olyan szkilleket tanulnak, melyek segítségével megvédhetik magukat, megtanulják felismerni a jó és rossz kapcsolatokat, valamint azt, hogy hogyan kérjenek segítséget egy olyan felnőttől, akiben megbíznak. A módszer így alkalmas pszichológusok és tanácsadók általi alkalmazásra.

Kulcsszavak: prevenciós program, szexuális gondoskodás, pszichológiai intervenció, szexuális abúzus, robot