

# Tactile Music Toolkit: Supporting Communication for Autistic Children with Audio Feedback

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**Abstract**—We propose the Tactile Music Toolkit, a wearable device that delivers audio feedback to aid in communication and interaction for autistic children. The toolkit is wireless and is packaged into a compact module to promote more physical interaction among autistic children which can aid in their communication and social development. Our preliminary observations showed that our toolkit was fun to use and it helped them in their willingness to engage in physical contact.

## I. INTRODUCTION

Autism spectrum disorder (ASD) is a neurological disorder that includes impairments in social communication, attention deficits, and repetitive behaviors [1].

In the studies with autistic children, it has been reported that communication through physical contact is more effective in attracting attention [2], and the effects of physical contact in developing social relationships have been proven in various fields [3]. However, these studies focus on the childcare providers and not the children themselves.

Music therapy is also often used for children with autism, and it is effective in promoting social interactive communication, building relationships, and developing emotions [1]. Therefore, we propose the Tactile Music Toolkit with the following goals: 1) to aid children with autism in social interaction and communication, and 2) to design a wearable device that promotes physical interaction.

## II. CONCEPT DESIGN

The toolkit is primarily designed to encourage physical interaction using audio feedback. Following the design requirement for children with autism [4], we designed the toolkit to be easily recognizable and with simple interaction mechanics, as shown in Fig1. We used conductive material as the touch sensor connected with ESP32<sup>1</sup>. Furthermore, we used several pitches within the key of G major to give the sound interaction a positive and uplifting feel. All of the samples play for 1 second and are unique for each toolkit.

## III. WORKSHOP DESIGN

We conducted a 15-minute workshop with nine autistic students (9 males) who are in the first grade of the elementary school section of Tokyo's Aomi Rinkai Special Needs School<sup>2</sup>. The children were divided into groups of three. We conducted two sessions for each group. In the first session, every child was attached with one toolkit to his body (they were free to choose where to attach) and was asked to experience the physical and musical interaction by

touching the toolkit. The audio output was from an external Bluetooth speaker. In the second session, we attached three toolkits on one child's body (arm, back, leg) and let the other two children interact with them.

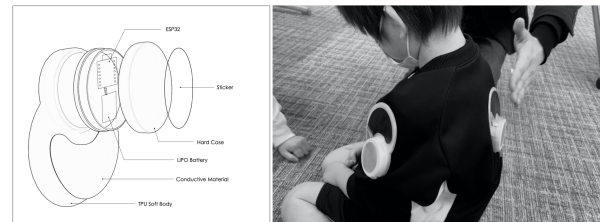


Fig. 1: Tactile Music Toolkit.

## IV. PRELIMINARY OBSERVATIONS

Eight out of nine children kept touching until the teacher told them to stop. They also did not show any antipathy towards physicality, which shows that the toolkit could be effective in promoting the willingness of autistic children towards physical contact. According to the teacher, the toolkit could assist them with bodily self-awareness. It was also easy for the children to attach and remove the toolkits from their bodies. Seven of them also understood how to interact with the device easily. However, five children could not understand if the sounds were produced by their actions, leading to confusion.

## V. CONCLUSION AND FUTURE WORKS

We found that our toolkit effectively promotes the willingness for physical contact between them. For our future work, we will look into more quantitative evaluation on user behavior, such as measuring touch frequency and pressure.

## VI. ACKNOWLEDGEMENT

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<sup>1</sup> <https://www.switch-science.com/catalog/6262/>

<sup>2</sup> <http://www.rinkai-aomi-sh.metro.tokyo.jp/site/zen/>