


CASE REPORT

Training potential of a teleoperated humanoid robot for use by a young psychiatrist during childcare leave

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Abstract

Background: Childcare leave extensions can sometimes negatively affect the professional clinical training of early-career psychiatrists in Japan. During childcare leave, being able to learn in the examination room while staying at home would be useful. Therefore, we developed a training system using a teleoperated robot (Sota) for young psychiatrists who wanted to participate in the examination room during childcare leave while remaining at home.

Case Presentation: We report the case of a patient with autism spectrum disorder (ASD) comorbid with Tourette's disorders (P). A young female psychiatrist (D) used the training system to learn from a board-certified psychiatrist. In this case, the board-certified psychiatrist, P, and the robot were placed in the examination room. D teleoperated Sota from home, allowing her to talk to the board-certified psychiatrist and P. She learned about the clinical features of Tourette's syndrome by observing the examination of the board-certified psychiatrist and hearing the patient's distress. P was satisfied with the fact that he was seen not only by a board-certified psychiatrist but also by D.

Conclusion: These case findings suggest that our system is helpful for young psychiatrists who want to study in the examination room during childcare leave while staying at home. Future studies should include a single-case experimental design with information regarding key outcome variables and other relevant variables gathered regularly over time.

KEYWORDS

board-certified psychiatrist, childcare leave, clinical training, early career, examination room

BACKGROUND

Childcare leave extensions can sometimes negatively affect the professional clinical training of early-career psychiatrists in Japan. Even when they take a break from their work and career, some are unable to stop thinking about their work. Resuming work marks a

pivotal moment in both the personal and professional lives of women.¹ There is a known tendency for women on maternity leave to approach work with enthusiasm.² Learning from the examinations of a board-certified psychiatrist in a real clinical setting is particularly important for maintaining and improving clinical skills. During childcare leave, being able to learn in the examination room while staying

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at home would be useful. Therefore, we developed a training system using a teleoperated robot for young psychiatrists who wanted to participate in the examination room during childcare leave while remaining at home. Herein, we present the case of a patient with autism spectrum disorder (ASD) comorbid with Tourette's disorders. A young female psychiatrist used the training system to learn from a board-certified psychiatrist and the patient. The patient provided informed consent, and the study design was approved by the appropriate ethics review board.

CASE PRESENTATION

D is a young female psychiatrist who took maternity leave for 6 months before undergoing her board-certified clinical training in psychiatry. Although she was busy raising her child, she sometimes thought about her work after the childcare leave. Additionally, she wished to learn from an examination conducted by a board-certified psychiatrist in a real clinical setting.

Sota³⁻⁵ (Vstone Co. Ltd) is a humanoid robot with a small (280-mm tall) cartoon-like mechanical design, which is expected to help prevent interlocutors from feeling apprehensive around it. Its motor system is driven by silent servomotors corresponding to eight degrees of freedom (DoFs): three DoFs for the neck and one DoF for the base, left shoulder, left elbow, right shoulder, and right elbow, respectively. These DoFs enable the robot to exhibit simple but varied nonverbal behaviors, such as nodding and watching, and facial expressions, such as smiling, surprise, and sorrow.

For the remote system controlling Sota, the operator at home spoke into the microphone, which was equipped on a personal computer (PC). Sota, located in the examination room, then uttered the words. In addition, an operating screen present on the PC projected the examination room. If the operator touched the operation screen, the robot was directed toward the intended area. For example, if the operator touched an image of the patient on the operation screen, the robot would be directed toward the patient.

The operator could also replicate nonverbal behaviors and facial expressions by pressing the operation button on the PC. In addition, simple gestures and facial expressions were designed to be produced automatically in response to the words of the operator and interlocutor.

P, an 18-year-old male with ASD comorbid with Tourette's disorders that were diagnosed according to the DSM-5⁶ criteria and standardized criteria taken from the Diagnostic Interview for Social and Communication Disorders (DISCO),⁷ which has been reported to have good psychometric properties,⁸ was afraid of having a check-up at a psychiatric hospital. Considering the affinity of individuals with ASD toward robots⁹⁻¹¹ and their interest in robotics, we decided to introduce the system using the teleoperated robot Sota for this medical examination. We enabled D to attend examinations using this system while staying at home.

In this case, the board-certified psychiatrist, P, and Sota, were placed in the examination room. D teleoperated Sota from home, allowing her to talk to the board-certified psychiatrist and P (Figure 1).

Before entering the room, P was nervous. However, he became relaxed after entering the room and seeing the robot. His tics were less frequent than usual and he disclosed more than expected. He described how Sota's presence gave him more reassurance than expected. He was satisfied with the fact that he was seen not only by a board-certified psychiatrist but also by D. D learned about the clinical features of Tourette's syndrome by observing the examination of the board-certified psychiatrist and hearing the patient's distress. Above all, she could ask questions not only to the board-certified psychiatrist but also to P. When her baby was crying in her home and needed attention, she could move from the PC, and the robot converted to automatic mode and moved nonverbally, nodding and smiling. In her absence, the examination proceeded without hindrance to the board-certified psychiatrist and P. In general, psychiatrists, especially female ones, worry about how others perceive them. In this system, they can participate in the clinical setting without being seen by others. If her physical condition is poor, e.g., mild stomachache, this system enables

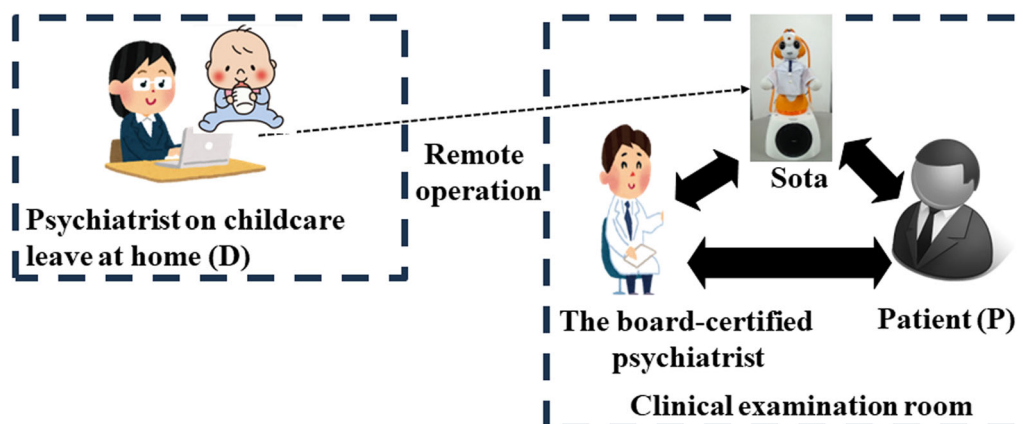


FIGURE 1 The board-certified psychiatrist, P, and Sota, which was teleoperated by D, who remained at home, are positioned in the examination room. Through operating Sota, D could participate in the clinical examination between the board-certified psychiatrist and P.



her to assume any posture during an examination and contribute to active participation in medical examinations without fear. The board-certified psychiatrist was satisfied with the fact that P was relaxed during the examination and could examine P while educating D in a real clinical setting.

P was asked the following questions: "To what extent were you reassured by the presence of Sota robot?" and "To what extent were you satisfied with the presence of Sota robot?" These questions were presented with a scale rating a sense of reassurance and satisfaction with the presence of Sota during the examination on a seven-point scale, with 1 being the lowest score and 7 being the highest. P answered the sense of reassurance and satisfaction as 7 (*Very reassuring*) and 7 (*Very satisfied*), respectively. D was asked the same questions: "To what extent were you reassured by the presence of Sota robot?" and "To what extent were you satisfied with the presence of Sota robot?" These questions were presented with a scale rating a sense of reassurance and satisfaction for attending the examination using Sota on the same seven-point scale. D answered that the sense of reassurance and satisfaction was 7 (*Very reassuring*) and 7 (*Very satisfied*), respectively. The board-certified psychiatrist was asked "To what extent did you think the presence of Sota robot was effective in education?" and "To what extent were you satisfied with the presence of Sota robot?" These questions were presented with a scale rating the effectiveness of using the robot in education on the same seven-point scale. The board-certified psychiatrist answered that the sense of effectiveness and satisfaction was 6 (*Moderately effective*) and (*Moderately satisfied*), respectively.

DISCUSSION AND CONCLUSION

We experienced a case that indicated that using a teleoperated robot was not only helpful to the psychiatrist on maternity leave but also helpful to the patient.

Previous studies have shown that robots can allow individuals with ASD to control and replicate a scene featuring smooth and exact conversation despite their reactions, thus contributing to a more structured and standardized intervention. Unlike human beings, humanoid robots, which operate within predictable and legal systems, provide a highly structured study environment to them, thus encouraging them to focus on relevant stimuli. Structured interactions with robots are highly likely to lead to the emergence of standardized social conditions in which certain social behaviors can occur.^{12,13} Given these factors, it is natural that Sota helped P receive a medical examination and feel reassured and satisfied.

For young psychiatrists, this system has the advantage of attending the examination positively because they can attend it while staying at home without being seen. The Proteus effect is the tendency of individuals to be affected by their digital representations, such as avatars.¹⁴ During the examination, D's personality became more sociable temporarily, partly because D could express her emotion freely without embarrassment. In addition, D judged Sota to have a very expressive face and to be good at communicating, which

may have contributed to the changes in her personality during the examination.

Robots are more persuasive and perceived more positively when physically present in a user's environment than when digitally displayed on a screen, either as a video feed for the same robot or as a virtual character analog.¹⁵ If interlocutors perceive and engage positively with the robot, the operator can potentially experience more realistic interactions. Additionally, in our system, the robot could be directed toward different individuals, which helped clarify with whom the interlocutors should interact with. These factors suggest that a real robot, and not one digitally displayed on a screen, is more useful for training a psychiatrist at home.

These case findings suggest that our system is helpful for young psychiatrists who want to study in the examination room during child-care leave while staying at home. Future studies should include a single-case experimental design with information regarding key outcome variables and other relevant variables gathered regularly over time.

AUTHOR CONTRIBUTIONS

Dr. Hirokazu Kumazaki designed the study, conducted the experiment, interpreted the data, and drafted the manuscript. Drs. Megumi Kawata, Yuichiro Yoshikawa, Jun Baba, Taro Muramatsu, Hiroshi Ishiguro, Mr. Nobukazu Kanchi, and Mrs Hiroko Kawahara conceptualized the study, participated in its design, drafted the manuscript, and critically revised the manuscript for important intellectual content. Dr. Hirokazu Kumazaki was involved in the final approval of the version to be published. All the authors have read and approved the final manuscript.

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CONFLICT OF INTEREST STATEMENT

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

DATA AVAILABILITY STATEMENT

The data sets generated and analyzed during the current study are available from the corresponding author upon reasonable request.

ETHICS APPROVAL STATEMENT

The patient and Dr. D provided informed consent, and the study design was approved by the Ethics Committee of Nagasaki University Hospital.

PATIENT CONSENT STATEMENT

The patient provided informed consent.

CLINICAL TRIAL REGISTRATION

N/A.

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