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CASE REPORT

The potentiality of telepsychiatry using a teleoperated robot for a patient with alcohol abuse on an isolated island

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Abstract

Background: Providing medical care on isolated islands can be challenging in several ways. Telepsychiatry can potentially offer a solution for accessible psychiatric services on isolated islands. When video conferencing is used in telepsychiatry, the psychiatry specialist, who is remotely located, may find it difficult to establish trust. To address this, we developed a teleoperated robot system termed "Sota 100," which is equipped to convey various elements of nonverbal communication, such as eye contact, in remote settings.

Case Presentation: In this report, we introduce the case of a patient with alcohol use disorder who lived on an isolated island and received medical care from a primary care physician at the island's medical clinic and from Sota 100 teleoperated by a psychiatry specialist. Using this system, the patient admitted that he had developed a physical illness and had damaged his relationships partly because of alcohol abuse. At the conclusion of the three-way conversation, the patient understood that stopping drinking alcohol was the only way to prevent worsening his physical condition and damaging his relationships further. Concurrently, the primary care physician gained a deeper understanding of the etiology of alcohol use disorder and of how to support patients with alcohol dependency.

Conclusion: These case findings suggest that our system is helpful for patients with alcohol use disorder who need to receive telepsychiatry services. Future studies should include single-case experimental designs with regular measurements of key outcome variables and other relevant variables over time.

KEYWORDS
alcohol use, eye contact, isolated island, telepsychiatry, robot

BACKGROUND

Providing medical care on isolated islands can be challenging in several ways, such as the shortage of medical resources, inconvenience of access, and high operational costs. Telepsychiatry can potentially provide a solution for accessible psychiatric services on isolated islands.

Telepsychiatry refers to the use of electronic communication technologies to provide psychiatric services, such as assessment, diagnosis, treatment, education, and medication management.[1] Table 1 lists the potential differences, advantages, and disadvantages between telepsychiatry and conventional psychiatry.

The "Doctor to Doctor with Patient" model in telepsychiatry refers to an approach in healthcare where a physician remotely advises a primary care physician who is presently with the patient. This model has several distinct advantages, especially in complex cases where a multidisciplinary approach is beneficial. In this model, a primary care physician situated locally can monitor the patient's physical health and provide technical assistance during on-site medical examinations. The primary care physician can consult with a psychiatry specialist remotely in real time through telecommunication technology. Furthermore, in this setting, both local primary care physicians and patients can receive explanations and suggestions from psychiatry specialists.

Video conferencing is indeed a representative and widely used tool in telepsychiatry. However, there are problems associated with this approach. The psychiatry specialist who is remotely consulted may find it difficult to build trusting relationships with the patients partly because of limited nonverbal communication, such as eye contact, and partly because of physical distance.[2,3] Additionally, if the psychiatry specialist on the video screen speaks extensively, the attention of the local primary care physician and of the patient is expected to be focused on the psychiatry specialist. This unfavorable attention concentration disrupts the balance of three-way conversation (i.e., communication between the primary care physician and local patient, between the psychiatry specialist and primary care physician, and between the psychiatry specialist and local patient).

To address these issues, we developed a teleoperated robot system termed "Sota 100," which is equipped to convey various elements of nonverbal communication, such as eye contact, in a remote setting. Using this system in telepsychiatry is expected to help attenuate the negative effects of limited nonverbal communication and physical distance and to promote smooth three-way conversation. Sota 100 can attend to either the local primary care physician or to the patient. Thus, the issue of unfavorable attention concentration could be overcome. For example, if Sota 100 attracts the attention of the other conversation participants, Sota 100 shifting attention to the primary care physician will lead to the patient also focusing attention on the primary care physician.

In this report, we introduce the case of a patient with alcohol use disorder who lived on an isolated island and received medical care from a primary care physician at the island's medical clinic and telepsychiatry services using Sota 100 by a psychiatry specialist who was not on the island. All procedures were conducted in accordance with the ethical standards of the institutional and/or national research committee and the 1964 Declaration of Helsinki.

CASE PRESENTATION

Approximately 250 people live on the island, which is isolated and has only one medical clinic and doctor (i.e., primary physician). When people on the island need psychiatric treatment, they must take a boat once or twice. Patient A, a 75-year-old man with alcohol use disorder diagnosed according to the criteria of the *Diagnostic and Statistical Manual of Mental Disorders* (5th Edition)[4], lived on the island and had medical problems, such as liver dysfunction and digestive issues. He experienced memory loss after drinking as well as irritability and extreme mood swings. He had damaged his personal relationships partly because of drinking alcohol; however, he continued drinking despite health and relationship problems.

TABLE 1 The potential differences, advantages, and disadvantages between telepsychiatry and conventional psychiatry.

Category	Telepsychiatry	Conventional psychiatry
Access	Fewer geographical constraints, accessible from remote areas	Requires visiting clinics or hospitals in person
Cost	Requires no travel expenses, but involves cost for technological equipment	Requires travel expenses, but involves fewer technological equipment-related costs
Privacy	Ensures privacy by consulting from home	Potential exposure through the encounter of other patients in waiting rooms
Quality of care	Influenced by the internet connection	Allows for detailed face-to-face observation
Doctor–patient relationship	Difficult to build trust	Easy to build trust
Cultural/social acceptance	Faces resistance from older adults and those not familiar with technology	Faces resistance from patients who are highly sensitized to stigma
Emergency response	Difficult to quickly respond to emergencies	Easy to quickly respond to emergencies

Patient A attended the medical clinic on the island and received a medical examination from Physician P (primary care physician). Physician P could evaluate his physical condition but could not identify his alcohol use disorder because Physician P was not specialized in psychiatry, including the recognition of alcohol abuse. Considering the need to examine both the physical and the mental condition of Patient A, we decided to introduce the teleoperated robot system Sota 100 in the medical examination process.

Sota 100 (Figure 1)[5–7] (Vstone Co. Ltd) is used as a communication robot. The robot has a small (280 mm tall), cartoon-like, mechanical design, which was expected to create the impression of a friendly presence. Its motor system is driven by silent servo motors corresponding to the eight degrees of freedom (DoF): base (1), left shoulder (1) and elbow (1), right shoulder (1) and elbow (1), and neck (3). Notably, its face can only produce simplified expressions compared to real human faces given the lack of DoFs' ability for facial-part movement. However, the Sota 100 robot displays various expressions despite its simplicity, making it highly suitable for conversations with patients. The nonverbal communication features of Sota 100 were manipulated by the psychiatrist and were also automatically generated in response to the voice of the psychiatrist. We observed that the nonverbal communication ability of Sota 100 was attractive to the patient.

In this setup, when the operator (the psychiatrist) spoke through a microphone that was connected to a personal computer (PC), the robot, which was remote from the PC, repeated the words. Additionally, there was an operation screen on the PC that transmitted the examination room; when the operator pointed to an area on the operation screen, the robot changed direction and directly faced the indicated area. For instance, when the operator pointed to the patient on the operation screen, the robot directly faced the patient; this was expected to promote smooth conversation between the operator and patient. The operator could also replicate facial expressions, such as smiling, surprise, or sorrow, using the robot.

In our case, Physician P, Patient A, and Sota 100 were placed in the examination room of the isolated island's medical clinic. Psychiatry Specialist "S" teleoperated Sota 100 from a university hospital in a mainland city that is approximately a 4-h boat ride away. Through the teleoperation of Sota 100, Specialist S could talk with Patient A and Physician P.

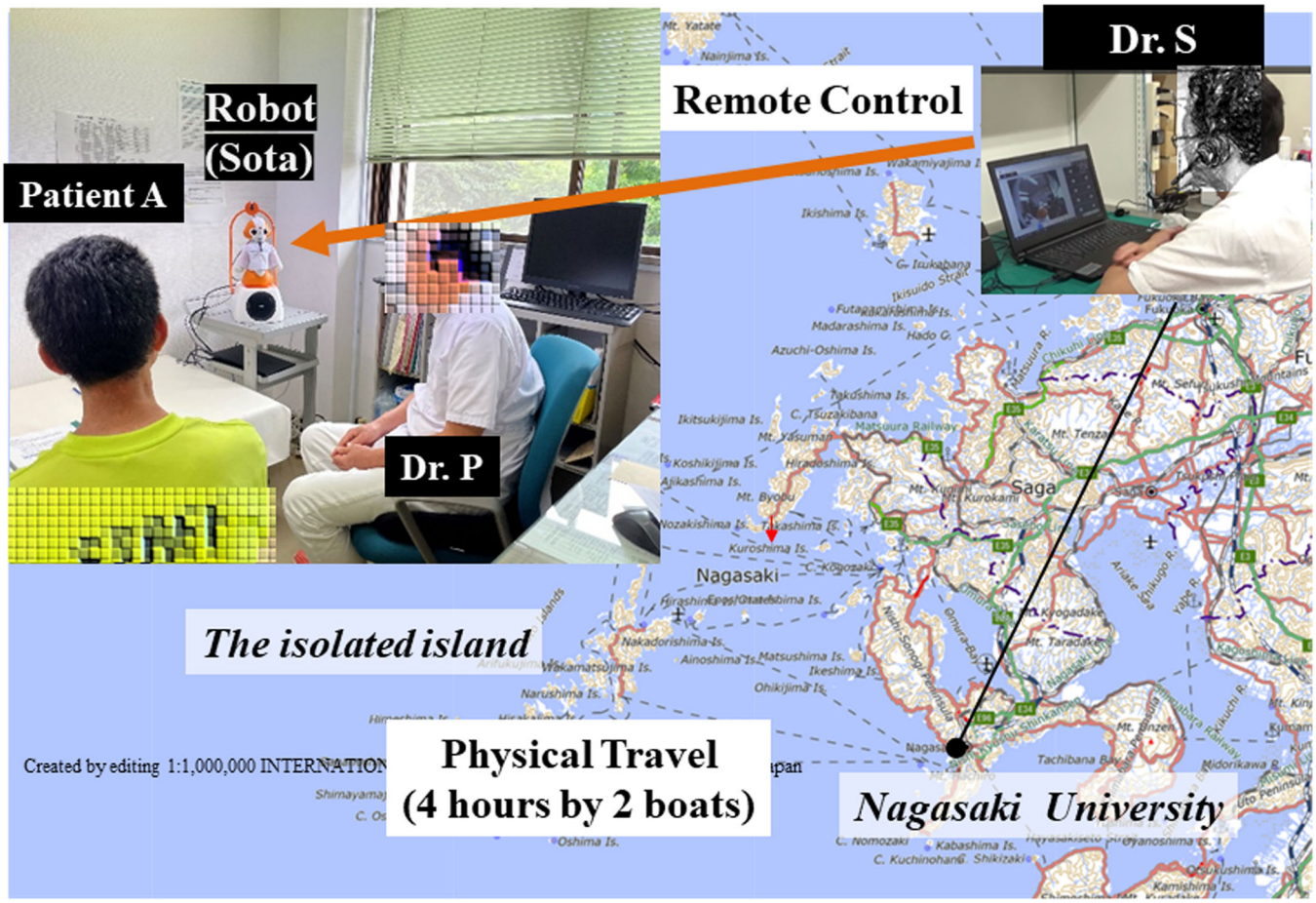

FIGURE 1 The primary care physician (P), patient with alcohol use disorder (A), and Sota 100, which was teleoperated by a psychiatry specialist (S) who was located on the main island, met in the examination room of the isolated island's medical clinic. Through the remote operation of Sota 100, Specialist S engaged in a smooth conversation with Physician P and Patient A.

Patient A entered the examination room without any particular tension, as usual. After entering the room and seeing the robot, Patient A became more relaxed. When Physician P asked Patient A questions, Patient A disclosed to a greater extent than usual, allowing Physician P and Specialist S a more thorough understanding of the patient's symptoms. Physician P explained his objective regarding Patient A's physical condition and advised Patient A not to drink alcohol. Physician P also asked Specialist S about the etiology of the patient's alcohol use disorder. Specialist S explained facts regarding alcohol dependence, and the prognosis of the condition if left untreated, to Patient A and Physician P. After 15 min of three-way conversation (i.e., the conversation between Patient A, Physician P, and Specialist S), Patient A admitted that he had developed a physical illness and had damaged his relationships partly because of alcohol abuse. He understood that stopping drinking alcohol was the only way to prevent worsening his physical condition and damaging his relationships. Concurrently, Physician P deepened his understanding of the etiology of alcohol use disorder and of how to support patients with alcohol dependency.

DISCUSSION AND CONCLUSION

We experienced a case indicating that the teleoperated robot system Sota 100 was useful in the treatment of a patient with alcohol use disorder who lived on an isolated island. Given that alcohol abuse is an important problem on isolated islands because of limited access to and unavailability of health and behavioral services, the significance of using this system is substantial. Through the smooth three-way conversation afforded via the use of the system, Patient A received both physical and psychiatric advice and understood the necessity of stopping alcohol use.

This study had many advantages. We used a teleoperated robot, instead of video conferencing, for telemedicine. When physically present, robots have a greater persuasive impact and are viewed more favorably and realistically compared to their digital representations on screens.[8] In addition, generally, patients on isolated islands tend to feel nervous in the presence of unfamiliar physicians because they have difficulty talking with strangers. This may also be true for encounters with unfamiliar physicians during video conferencing. Given these factors, it is natural that a physically present robot has several advantages over encountering unfamiliar psychiatrists via screens. Naturally, it is difficult to conclude that the relationship between physically present robots and virtual agents would be equivalent to the relationship between physically present robots and unfamiliar physicians encountered via screens. If the interlocutors perceive interactions with the robot more favorably and realistically, patients can potentially experience more realistic interactions and may be more inclined to accept advice offered in this manner by psychiatry specialists. Additionally, in alcohol use disorder cases, psychiatrists sometimes need to discuss matters in a simplified manner. The robot can assume various expressions and can also discuss the need to reduce alcohol consumption in a simple way, which may help patients recognize the necessity of quitting alcohol use. Furthermore, Sota 100 contributed to overcoming the challenge of limited nonverbal communication, such as eye contact; this promoted smooth three-way conversation and helped the patient understand that he needed to stop drinking alcohol.

These case findings suggest that our system is helpful for patients with alcohol use disorder who need to receive telepsychiatry services. Future studies should include single-case experimental designs with regular measurements of key outcomes and other relevant variables over time.

AUTHOR CONTRIBUTIONS

Dr. Nobukazu Kanchi and Hirokazu Kumazaki designed the study, conducted the experiment, conducted the statistical analyses, analyzed and interpreted the data, and drafted the manuscript. Drs. Megumi Kawata, Yuichiro Yoshikawa, Takahiro Miyashita, Atsushi Baba, and Hiroshi Ishiguro 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 no 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 Physician P 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

Not applicable.

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REFERENCES

1. Gude J, Subhedar RV, Zhang MH, Jain P, Bhela J, Bangash F, et al. Emerging needs and viability of telepsychiatry during and post COVID-19 era: a literature review. Cureus. 2021;Aug 13(8): 16974.
2. Wyler H, Liebrenz M, Ajdacic-Gross V, Seifritz E, Young S, Burger P, et al. Treatment provision for adults with ADHD during the COVID-19

pandemic: an exploratory study on patient and therapist experience with on-site sessions using face masks vs. telepsychiatric sessions. BMC Psychiatry. 2021;May 5 21(1):237.
3. Khan AW, Kader N, Hammoudeh S, Alabdulla M. Combating COVID-19 pandemic with technology: perceptions of mental health professionals towards telepsychiatry. Asian J Psychiatr. 2021;Jul 61:102677.
4. American Psychiatric Association. (2013). Diagnostic and statistical manual of mental disorders (5th ed.). Washington, DC: American Psychiatric Association.
5. Akiyoshi T, Nakanishi J, Ishiguro H, Sumioka H, Shiomi M. A robot that encourages self-disclosure to reduce anger mood. IEEE Robot Autom Lett. 2021;Oct 6(4):7925–32.
6. Baba J, Song S, Nakanishi J, Yoshikawa Y, Ishiguro H. Local vs. avatar robot: performance and perceived workload of service encounters in public space. Front Robot AI. 2021;8:778753.
7. Nakanishi J, Kuramoto I, Baba J, Ogawa K, Yoshikawa Y, Ishiguro H. Continuous hospitality with social robots at a hotel. SN Appl Sci. 2020;Feb 2:452.
8. Li J. The benefit of being physically present: a survey of experimental works comparing copresent robots, telepresent robots and virtual agents. Int J Hum Comput Stud. 2015;May 77:23–37.

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