A study on the scooping and serving Korean food using meal assistance robot

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Purpose Recently, increasing care requirements of the aging population has led to an increased demand for daily life support robots. Among them, the need for meal assistance robots for people with severe disabilities, including older adults, is increasing, and various meal assistance robots are being researched and commercialized worldwide [1]. A meal assistance robot is being developed in response to the Korean food culture; however, only few studies have analyzed Korean food scooping and serving using meal assistance robots [2]. Here, the usability test was performed on the success rate of Korean food scooping and serving for self-feeding, and improvement points were analyzed as basic information necessary for a meal assistance robot that can serve Korean food well. **Method** The study participants were five experts (three nurses, one physical therapist, one occupational therapist) with >15 years of experience who could better understand the physical and mental characteristics of people with severe disabilities. The meal assistance robot was used DESIN's Obi of the United States [3]. In the usability evaluation, 10 types of Korean food (including steamed rice, soup, and side dishes) were prepared, and 8 types were selected and tested. All food was cut into 1- × 1-cm sizes and placed on Obi's plate. Food scooping by the meal assistance robot was attempted three times for each food, and the number of successes was analyzed. **Results and Discussion** Table 1 shows the results of scooping and serving of Korean food by the robot. The food with the highest success rates of scooping and serving were kongjaban (black bean in soy sauce) (100%), jangjorim (braised beef in soy sauce) (100%), and danmuji (pickled radish) (100%). Curry rice (57.1%), steamed rice (77.8%), fried rice (88.9%), and gosarinamul (bracken salad) (88.9 %) had the lowest success rates. The success rate of obtaining sticky foods including steamed rice was lower than that of other foods because it could not be scooped due to the clumping of rice during scooping with a spoon by the meal assistant robot. Experts' rationale for this was as follows: 1) The spoon size is small, so food is often spilled during scooping and serving. 2) It is likely to be easily colored because the spoon material is plastic. 3) Depending on food shape or viscosity, it is difficult to decrease the amount of attempts to pick up lumps of rice and soup together. 4) As a solution, instead of picking up large amounts at once from the back of the bowl, if the spoon collects food in different positions where the spoon starts step-by-step, it will be possible to control the amount of picking. Conventional scooping-based commercial meal assistance robots have difficulty obtaining it for Korean main food such as rice, soup, and rice in soup. In the future, when developing a meal assistance robot suitable for Korean food, it is necessary to consider differences in spoon size and shape and the varying food sizes and viscosities to increase the success rate of obtaining rice and soup.

References

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Table 1. The food acquisition results of the meal assistance robot.

No.	Food	# of Success	# of Failure	Total number	Success Rate
1	Rice (steamed rice)	14	4	18	77.8%
2	Curry rice	8	6	14	57.1%
3	Bokkeumbap (fried rice)	16	2	18	88.9%
4	Doenjangjjigae (soybean paste Stew)	32	1	33	97.0%
5	Kimchi	23	1	24	95.8%
6	Kongjaban (black beans in soy sauce)	9	0	9	100.0%
7	Jangjorim (braised beef in soy sauce)	21	0	21	100.0%
8	Tuna can	11	1	12	91.7%
9	Danmuji (pickled radish)	12	0	12	100.0%
10	Gosarinamul (bracken salad)	16	2	18	88.9%
Total		162	17	179	90.5%