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[Original article]

Structural associations between self-perception of support and knowledge of disability characteristics of autism spectrum disorder among staff in facilities providing after-school day services

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Abstract

Background : We constructed a hypothetical model of the knowledge of autism spectrum disorder (ASD) and self-perception of support of staff working in after-school day services to clarify structural relationships.

Methods : A questionnaire survey was conducted at 194 facilities providing after-school day services in Fukushima Prefecture (October 2020), including a basic attributes questionnaire, the Literacy Scale of Characteristics of Autistic Spectrum Disorder (LS-ASD), and a staff questionnaire. We developed a hypothetical model of the relationship between self-perception and LS-ASD total scores of after-school service staff. To obtain latent variables for structural equation modeling (SEM) to confirm factor extraction and the interrelationships among variables, exploratory factor analysis was performed. SEM was used to examine the fit of the hypothetical model to the data and the relationships among variables.

Results : The study included 302 staff members from 58 of 194 facilities. Four factors (Factor 1, motivation ; 2, self-perception of knowledge ; 3, information sharing ; 4, self-confidence) were extracted. The final model showed that Factor 2 had a positive direct effect (path coefficient = 0.64) and Factor 4 had a negative direct effect (path coefficient = −0.22) on LS-ASD scores. The model goodness of fit was acceptable (Goodness-of-Fit Index = 0.890 ; Comparative Fit Index = 0.912 ; Root Mean Square Error of Approximation = 0.086 ; Akaike's Information Criterion = 392.7).

Conclusion : Self-perception of knowledge contributes greatly to knowledge acquisition, while excessive confidence may hinder knowledge retention.

Keywords : Autism spectrum disorder, after-school day services, self-perception, structural equation modeling, literacy scale

Introduction

Autism spectrum disorder (ASD) is a neurodevelopmental disorder that is associated with persistent deficits in interpersonal interactions and repetitive patterns of behavior, as well as limited interests or activities[1]. The Ministry of Education, Culture, Sports, Science and Technology stated that 6.5% of children with suspected developmental disabilities are enrolled in regular classes[2]. In addition, teachers responsible for classroom management are concerned about understanding the behavioral charac-

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teristics of individuals with ASD and how best to respond to them[3,4]. In Japan, after-school day services were newly established in 2012 to improve life skills and promote the social interactions of Schooling children with disabilities, including those with ASD. The three basic roles of after-school day services are as follows : (1) to guarantee the best interests of the child, (2) to provide logistical support for the realization of a symbiotic society, and (3) to support parents, staff members must understand the developmental characteristics and adaptive behaviors of individual children who need support. They must also serve as specialized agencies that provide developmental support through activities and creative activities to support independence and enhance daily life and as consultation agencies for parents[5].

These services have spread rapidly owing to the relaxation of regulations to allow children to receive full medical care in familiar areas, and as of 2022, 17,971 locations had been opened nationwide, with 276,793 people using these services[6]. In addition, the number of users in Fukushima Prefecture in 2023 is expected to be 4,724[7].

However, with the increase in the number of facilities and users, it has been pointed out that the staff working in facilities providing after-school day services lack understanding of disabilities and that the quality of the support provided is declining[8,9]. It is important for people providing support to have correct knowledge of ASD, and previous studies have revealed a relationship between the amount of knowledge, and support and attitudes[10-12]. Moreover, it has been reported that training to increase knowledge of ASD reduces stigma and increases positive attitudes[13,14]. Furthermore, having the correct knowledge has been reported to increase the empowerment of people providing support[15].

Children with ASD have various difficulties in social life, such as problems with physical functions like motor and sensory functions[16,17], and acquisition of daily living skills[18,19]. In addition, these children are more likely to develop psychological problems compared to children with typical development, and are at higher risk for secondary disorders, such as mood and anxiety disorders[20,21]. Staff working in facilities providing after-school day services are expected to play an important role as professionals in rehabilitation and education for children with ASD who face these various problems. Therefore, understanding the knowledge level of staff members regarding the characteristics of ASD is a useful perspective for understanding the quality of support. The authors also anticipate that higher self-perception of support by the staff will increase their knowledge of ASD and thus increase the likelihood that they will provide higher-quality support. However, the relationship between self-perception of support and knowledge of ASD remains unclear. Therefore, the purpose of this study was to construct a hypothetical model of the knowledge of ASD of staff members working in facilities providing after-school day services and their self-perception of support and to clarify the structural relationships. This study aimed to identify the structural relationship between the knowledge of ASD of staff members and their self-perception of support for ASD.

Methods

Research Design

This cross-sectional observational study used an unmarked, self-administered questionnaire survey method.

Participants and Procedures

The survey covered 194 facilities providing after-school day services (as of October 2020) listed in the information on designated daycare service providers for children with disabilities published by Fukushima Prefecture. The subjects of the study were staff members of the facilities, who took the survey. Initially, an explanatory document regarding the request for research cooperation and a survey research cooperation response form was sent to the facility administrators to investigate whether they would participate in the research. If the facility administrator consented, a new set of survey forms (survey form, consent form, and envelopes for collecting the survey forms), collection bags, and return envelopes were sent according to the number of staff members. The facility administrators were asked to distribute the survey forms, place the collection bags, and return the survey forms. The survey instruments used were a basic attributes questionnaire, the Literacy Scale of Characteristics of Autistic Spectrum Disorder (LS-ASD), and a self-perception questionnaire for staff support (staff questionnaire). The data collection period was from mid-February to late June 2021.

Measures

Basic Attributes Questionnaire

To determine the basic attributes of the subjects, we asked about their age, gender, highest educational level, occupation type, employment status, and work experience (years) (Table 1). Educational background was divided into the following five levels : "high school," "vocational/technical college," "junior college," "college," and "graduate school." Occupation type was divided into the following categories : "child development support manager," "nursery teacher," "child guidance teacher," "person with disability welfare service experience," "doctor (commissioned doctor)," "nurse," "physical therapist," "occupational therapist," "speech-language-hearing therapist," "staff in charge of psychotherapy," and "other occupation." If the respondent had multiple qualifications, he/she was asked to select one occupation in which he/she is mainly engaged. The respondents were asked to select either "full-time" or "part-time" as their employment status. Work experience (years) was divided into the following five levels : "less than 1 year," "between 1 and 3 years," "between 3 and 5 years," "between 5 and 7 years," and "more than 7 years."

Literacy Scale of Characteristics of Autistic Spectrum Disorder

The LS-ASD is a scale developed based on item response theory and is specifically designed to measure the degree of knowledge about ASD[22]. This scale is available only in the Japanese. However, it was developed using items from the DSM-IV-TR (American Psychiatric Association, 2000) and the ICD-10 (World Health Organization, 1992), which are global diagnostic criteria, and the Definitions and Criteria of Educational Countermeasures in Japan (MEXT, 2002). Moreover, the reliability and content- and criterion-related validity have been confirmed for students, medical and welfare professionals, and teachers. The scale comprises 44 questions about the knowledge of ASD disability characteristics, with the response format comprising "yes," "no," and "I don't know." The higher the score, the greater the knowledge of ASD disability characteristics.

Self-Perception Questionnaire for Staff Support

We developed a staff questionnaire to determine the self-perceptions of the after-school day-care service staff regarding their support. The questionnaire was based on the Sato[23] survey form for nursery teachers, where 22 item groups were considered necessary for obtaining self-perceptions regarding support. The content of the items was as follows. (1) Concerning the subject's self-perception of knowledge and attitude toward ASD, nine items related to "How do you perceive items related to children with ASD?" The respondents were asked to answer this question on a 6-point scale ranging from do not agree at all (1 point) to strongly agree (6 points) to the three items regarding (2) "How do you obtain information on children with developmental disabilities?" (3) The respondents were asked to answer this question on a 6-point scale ranging from not at all (1 point) to actively participating (6 points) to the two items regarding "how much do you participate in workshops and study groups." (4) Regarding collaboration with institutions outside the facility, respondents were asked to answer on a 6-point scale ranging from not at all (1 point) to very much (6 points) for two items on "How well are you implementing the initiatives?" (5) Regarding the practice of support, respondents were asked to answer on a 6-point scale ranging from not at all (1 point) to very much (6 points) to six items related to "how much you are working on."

Data Analysis

Phase 1 : Distribution of subjects

Simple tabulations of the basic attributes of staff in facilities providing after-school day services were conducted to determine the distribution of basic attributes among the survey respondents.

Phase 2 : Extracting the common factor according to exploratory factor analysis

Staff questionnaire items were checked for ceiling effects and multicollinearity, and factor analysis using the maximum likelihood method was used to obtain latent variables for structural equation modeling (SEM), and similar variables were extracted. Correlations between variables were also examined using the direct oblimin method. Variables with factor loadings greater than 0.4 were used. To determine the internal consistency of the questionnaire, we calculated Cronbach's coefficient alpha.

Phase 3 : Structural Equation Modeling Analysis

To examine the relationship between the self-perceptions of after-school day service staff and total LS-ASD scores, we developed a hypothetical

model (Figure 1). In addition, we examined the fit of the data and the relationships among the variables using SEM. The goodness-of-fit index (GFI) and comparative fit index (CFI), root mean square error of approximation (RMSEA), and Akaike's information criterion (AIC) were used and evaluated as goodness-of-fit indices for the hypothesized model. Standardized estimates (path coefficients) were also calculated to determine the relationships between the variables. In general, a GFI and CFI value greater than 0.90, a GFI and CFI value close to 1, and an RMSEA value less than 0.05 indicate a good fit, whereas an RMSEA value greater than 0.1 indicates a poor fit[24]. The AIC selects the model with the lowest value among several models. The path coefficient ranges from −1 to 1, with larger absolute values indicating a stronger impact. Statistical analysis was performed using IBM SPSS Statistics version 28.0 software (IBM Corp., Armonk, NY, USA) and AMOS version 28.0 software (IBM Corp.). Probability values of less than 5% were considered significant.

Ethical Considerations

The explanatory document enclosed within the survey included information on the purpose, freedom to participate, objectives and methods, survey items, protection of personal information, handling after collection, and contact information for inquiries. When participants responded to the survey, they were asked to place their responses in an enclosed collection envelope, seal it, and deposit it in the collection bag provided at the facility, so that the facility management could not confirm the contents of their responses. Once respondents deposited their responses in the collection bag, their consent to cooperate in this survey was deemed to have been obtained.

This study was approved by the Ethics Committee of Fukushima Medical University (reception number : General 2020-233 ; approval date : December 15, 2020).

Results

The study received consent from 62 of the 194 facilities that were requested to cooperate in the

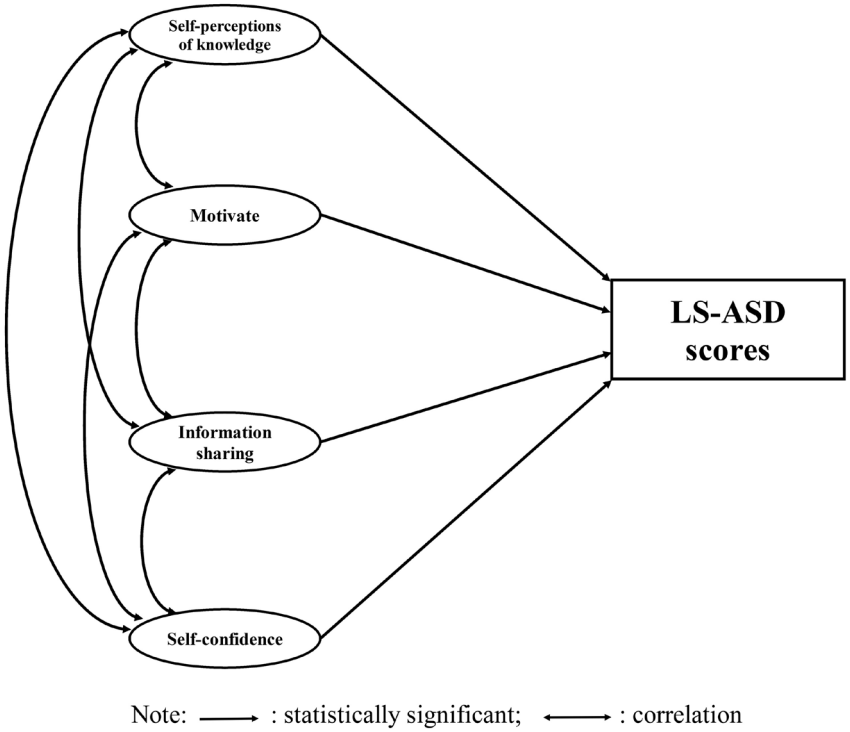

Fig. 1. Hypothetical model of staff self-perception that affects the Literacy Scale of Characteristics of Autistic Spectrum Disorder total scores.
A hypothetical model was presented in which factors comprising a self-perception questionnaire regarding staff support would influence staff knowledge of ASD. If staff members' self-perception of support is higher, their knowledge of ASD as a target of support will be higher, which in turn will increase the likelihood of providing good-quality support.

study (participation rate of 32.0%). A total of 452 survey forms, including preliminary questionnaires, were sent to the 62 facilities that provided consent, and responses were obtained from 315 staff members at 58 facilities (response rate of 69.7%). After excluding 13 people whose survey forms were seriously incomplete, 302 people (valid response rate of 95.9%) were finally included in the analysis. The attributes of the subjects are shown in Table 1. To obtain latent variables for SEM, we first calculated the mean and standard deviation of the 22 items in the staff questionnaire, checked the distribution of scores, and performed a ceiling/floor effect analysis, which revealed a ceiling effect in one item. The variance inflation factor was calculated, and multicollinearity was found in two items. Factor analysis was conducted on 19 items, excluding these three items, and four factors were extracted from the final 15 items selected. Table 2 shows the results of the factor analysis. The first factor (Factor 1) was named [motivate] as it included three items indicating a willingness to help, such as "I feel this job is worthwhile" and "I want to actively help," with high positive loadings (here, "" denotes observed variables and [] denotes latent variables). The second factor (Factor 2) consisted of four items of recognition of knowledge necessary for support, such as "I know how to support ASD children according to their characteristics" and "I know how to do assessment," and it was named [self-perception of knowledge]. The third factor (Factor 3) was named [information sharing], and it included six items related to efforts to exchange information among staff and cooperation with related organizations, such as "participate in liaison meetings and conferences" and "how much cooperation is there with school teachers and specialized organizations." The fourth factor (Factor 4) included two items expressing confidence in support, such as "I am confident in my ability to understand the challenges of ASD children," and it

Table 1. Attributes of the subjects (n = 302)

Variables	Categories	Value, n (%) or mean ± SD
Age (years)		41.9±12.5
Gender	Male	51 (16.9)
	Female	251 (83.1)
Highest educational level	High school	75 (24.8)
	Vocational/technical college	44 (14.6)
	Junior college	96 (31.8)
	College	79 (26.2)
	Graduate school	8 (2.6)
Occupation type	Child development support manager	32 (10.6)
	Nursery teacher	75 (24.8)
	Child guidance teacher	137 (45.4)
	Disability welfare service experience	7 (2.3)
	Nurse	12 (4.0)
	Physical therapist	1 (0.3)
	Occupational therapist	7 (2.3)
	Speech language hearing therapist	2 (0.7)
	Staff in charge of psychotherapy	2 (0.7)
	Other occupation	27 (8.9)
Employment status	Full-time	224 (74.2)
	Part-time	78 (25.8)
Work experience (years)	Less than 1	69 (22.8)
	Between 1 and 3	106 (35.1)
	Between 3 and 5	71 (23.5)
	Between 5 and 7	31 (10.3)
	More than 7	25 (8.3)

Descriptive statistics were used to organize the distribution of the basic attributes of the staff of facilities providing after-school day services in this study.

Table 2. Exploratory factor analysis (maximum likelihood method and direct oblimin rotation) and excluded item

Factor [Construct]	Item		Factor loadings				Contribution rate (cumulative)
			Factor 1	Factor 2	Factor 3	Factor 4	
Factor 1 [Motivate]	Item 8.	I find this job rewarding	**0.973**	–0.059	0.060	–0.047	33.1
	Item 9.	I feel I have a role to play in this work	**0.720**	0.168	0.027	–0.011	
	Item 5.	I want to actively support children with ASD	**0.593**	–0.059	0.012	0.257	
Factor 2 [Self-perception of knowledge]	Item 2.	I know how to support ASD children according to their characteristics	0.094	**0.891**	–0.063	0.001	11.1 (44.2)
	Item 3.	I Know how to assessment children with ASD	0.033	**0.879**	0.017	–0.012	
	Item 4.	I have knowledge of typical child development	0.032	**0.596**	0.044	0.094	
	Item 1.	I think there is a lack of knowledge regarding support for ASD children	–0.095	**0.545**	0.052	0.076	
Factor 3 [Information sharing]	Item 21.	To what extent do you communicate with parents about the developmental challenges of the target children?	0.052	0.075	**0.795**	–0.096	12.4 (56.6)
	Item 22.	To what extent do you incorporate individualized support into your support methods?	0.048	0.126	**0.715**	–0.048	
	Item 15.	To what extent do you collaborate with medical institutions regarding the support of the target children?	–0.042	–0.080	**0.658**	0.052	
	Item 16.	To what extent do you collaborate with school teachers regarding the support of the target children?	–0.095	0.059	**0.656**	0.073	
	Item 19.	To what extent do you and your staff have opportunities to discuss reflections on the support of your target children?	0.139	0.066	**0.641**	–0.127	
	Item 20.	To what extent do you participate in liaison meetings and conferences in your workplace?	0.032	–0.102	**0.623**	0.084	
Factor 4 [Self-confidence]	Item 7.	I have confidence in my ability to understand the challenges of ASD children	0.059	0.223	0.055	**0.707**	3.7 (60.3)
	Item 6.	I have the confidence to provide support for ASD children	0.171	0.160	0.034	**0.703**	
Excluded Item	Item 10.	I look up books to get information					
	Item 11.	I look on the internet to get information					
	Item 12.	I visit specialists to get information					
	Item 13.	To what extent do you participate in workplace training?					
	Item 14.	To what extent do you participate in training outside the workplace?					
	Item 17.	To what extent do you have opportunities to discuss with your staff the understanding of the problem of the target children?					
	Item 18.	To what extent do you have opportunities to discuss with your staff how to support your target children?					

Note: Kaiser-Meyer-Olkin score=0.85; Bartlett's sphericity test $p<0.001$
The "excluded items" column indicates items excluded from the factor analysis.
The results of the factor analysis (maximum likelihood method, direct oblimin rotation) conducted to obtain latent variables for structural equation modeling are presented. Of the 22 items, 15 were employed, and four factors were extracted. The Kaiser-Meyer-Olkin scale score was 0.85, and Bartlett's sphericity test showed a p-value of <0.001, assuring the validity of applying factor analysis.

was named [self-confidence].

The Kaiser–Meyer–Olkin scale score was 0.85, and Bartlett's sphericity test showed a p-value of <0.001, which ensures the validity of applying factor analysis. We have calculated Cronbach's coefficient alpha for the internal consistency of the four factors. The results showed that the alpha value was 0.88 overall, 0.83 for motivation, 0.84 for self-perception of knowledge, 0.85 for information sharing, and 0.88 for self-confidence, which are sufficient values[25].

SEM analysis was performed to examine the effects of the four factors obtained from the factor analysis on LS-ASD scores. First, a hypothetical model was created assuming that all factors had an impact on LS-ASD scores (The circle is the latent

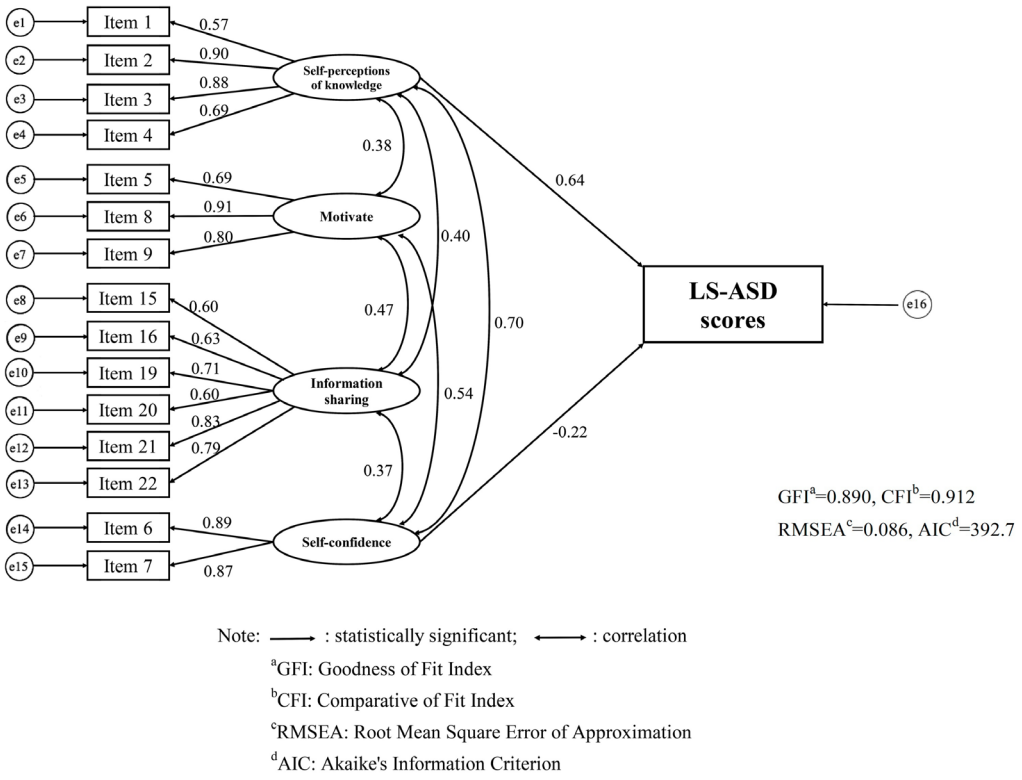

Fig. 2. Causal model of staff self-perception affecting the Literacy Scale of Characteristics of Autistic Spectrum Disorder total scores.
A causal model is presented for the presence or absence of knowledge of autism among staff and their perceptions of support. The "circle" is the latent variable, which is the common factor, and the "square" is the observed variable, which is the measured variable. In addition, "e" indicates error variables that represent factors other than those in the analysis. The path coefficient ranges from −1 to 1, with larger absolute values indicating stronger influence. For example, [self-perception of knowledge] shows a positive direct effect, indicating a relationship whereby a higher self-perception is associated with a higher score on the knowledge scale. All standardized coefficients for each arrow are significant at the 5% level.

variable, which is the common factor, and the square is the observed variable, which is the measured variable. In addition, "e" indicates error variables that represent factors other than those in the analysis.) The results showed that the path coefficients from information sharing to LS-ASD scores and from motivation to LS-ASD scores were not significant, and the goodness-of-fit findings were GFI = 0.890, CFI = 0.911, RMSEA = 0.097, and AIC = 395.8. Therefore, we created a model with the nonsignificant paths removed, and the analysis was performed again. The goodness-of-fit findings of the final SEM analysis model were GFI = 0.890, CFI = 0.912, RMSEA = 0.086, and AIC = 392.7, indicating an acceptable fit. Figure 2 shows the final model. There was a positive direct effect from [self-perception of knowledge] to LS-ASD scores (path coefficient = 0.64) and a negative direct effect from [self-confidence] to LS-ASD scores (path coefficient = −0.22).

Discussion

The study assessed how knowledge of ASD and staff self-perception for support is related among staff of facilities providing after-school day services. To this end, a hypothetical model was assumed and tested by path analysis using SEM to examine the relationship between LS-ASD scores and "self-perception of knowledge," "motivation," "information sharing," or "confidence," as revealed by the staff questionnaire.

The final model constructed by SEM revealed that "self-perception of knowledge" and "self-confidence" among the four factors obtained by factor analysis had direct effects on LS-ASD scores. Among these models, "self-perception of knowledge" showed a positive direct effect. The observed variables comprising "self-perception of knowledge" included items on an understanding of support and assessment methods for ASD, and self-perception of

understanding of typical development. The Japanese Ministry of Health, Labour, and Welfare (MHLW) has indicated in its guidelines that understanding the child's developmental stage, disability type, and disability characteristics is important to provide appropriate services[5]. According to the guidelines, many offices have reported holding training sessions and other initiatives[26]. Therefore, it is likely that this is influenced by the fact that there are many opportunities to participate in training sessions that approximate the content of the factor items. Furthermore, "self-confidence" showed a negative direct effect. This may be due to the tendency of some staff members, who perceived themselves as highly confident, to overestimate themselves because they did not correctly perceive the actual evaluation (score) and self-evaluation, or conversely, staff members with high knowledge perceived their self-evaluation as lower than the actual evaluation, resulting in a discrepancy in self-perception because they did not correctly view themselves objectively. Kruger and Dunning reported that overestimation of one's abilities tends to be greater for those with lower actual abilities owing to insufficient metacognitive ability to accurately self-evaluate[27]. Therefore, we believe that the same phenomenon was confirmed in this study.

In addition, the LS-ASD used in the present study was assumed to estimate the level of knowledge obtained from training sessions, classes, and books on ASD, while the influence of knowledge obtained from work experience in medical and welfare institutions was small[25]. Since the scale measures basic knowledge, it is assumed that "motivation" to work and "information sharing," consisting of items related to job content, did not affect LS-ASD scores, as these are more practical and pragmatic factors.

Thus, our model showed a strong influence of "self-perception of knowledge" on LS-ASD. Therefore, it was suggested that self-perception of knowledge, which is specifically needed for support, contributes to the acquisition of knowledge. Conversely, "self-confidence" showed a negative influence. This suggests that excessive self-confidence regarding problem identification and support may hinder knowledge retention. Therefore, we believe that it is important to work to increase self-perception of knowledge, while at the same time preventing the misalignment of self-perception that leads to overconfidence. In addition to conventional training sessions that focus on inputs to acquire basic knowledge as a foundation for enhancing technical and support skills, training sessions that focus on outputs and examine practical knowledge and attitudes, such as specific support measures and applied methods, should be enhanced to foster an internal sense that "knowledge is being acquired."

Limitations

This study has several limitations. First, this study only included facilities providing after-school day services in Fukushima Prefecture. In addition, given the low participation rate of the surveyed establishments, it may be difficult to generalize the results of this study. However, since the number of staff by occupation type per after-school day service office in the survey sample is similar to that in the MHLW's Fact-Finding Survey[8], there should be no problem in drawing general conclusions from the results of this study. Second, the results of this study are based on a hypothetical model, and only the relationship between staff self-perception and the model has been identified. Therefore, factors on the facility side, such as the work environment and the nature of work, were not considered. For example, in nursing care, in addition to wages and other compensation, the work organization environment and other factors are considered to affect work motivation[28]. It can also be inferred that the wage structure in childcare and kindergarten sites is similar in that it is lower than that of general employment, the work environment is harsher, and the workplace tends to be influenced by individual job satisfaction and other factors[29,30]. Therefore, incorporating facility factors is likely to affect the goodness of fit of the model. In addition, the staff questionnaire used in this study has been confirmed to have internal validity but not reliability or validity. Therefore, when interpreting the numerical values calculated from the staff questionnaire, caution is required. Third, after-school day services are unique to Japan and the number of developmentally disabled children eligible for these services is limited. Therefore, staff requirements and educational systems regarding children with developmental disabilities differ from those in other countries, which may affect knowledge acquisition. Therefore, it is difficult to generalize the results of this study to other countries.

Conclusion

Self-perception of knowledge necessary for specific support of children's typical development and assessment methods contributes greatly to knowledge acquisition, while excessive confidence

in understanding issues and support may hinder knowledge retention.

Conflict of Interest

This study has no conflicts of interest to disclose. This work was supported by Fukushima Medical University Research Support Program (KKI202019) (2020) and JSPS KAKENHI (grant number : JP21K02329).

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