

# Social Skill Profile in Children with Low Function Autism Spectrum Disorder: Descriptive Analysis of Communication Levels, Understanding of Shopping Activity and Skill of Shopping in School Canteen

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**Abstract:** One of the problems of children with low function autism (LFA) – is the lack of social skills. Social skills are understood as the right set of behaviors in a certain situation. With a case study strategy, this study explored the profile of social skills possessed by seven children with LFA aged between 14 - 21 years in shopping for food in the school canteen. The study findings showed diverse abilities in research subjects in communication skills level, understanding of shopping activities, and shopping skills. The findings also concluded the absence of the association between the communication levels of research subjects and the understanding of shopping activities and shopping skills.

**Keywords:** low function autism, social skill, communication

## 1. INTRODUCTION

Children with autism spectrum disorder (ASD) are generally characterized by limited social interaction, communication, behavioral disorders, repetitive behavior patterns, and excessive attraction to one object. This condition is understood as a disorder with a long-range and of grades ranging from mild to severe. It means that even if someone has the same symptoms, the ways and consequences that appear in autism will vary. Similarly, cognitive abilities potential is varied from above average to mental retardation. ASD conditions will be more severe when accompanied by comorbid. About 30% of ASD children are estimated to have comorbidities with ADHD, and 50-70% of others have comorbidities with intelligence disability [1].

Based on intellectual function, ASD can differ into high function autism (HFA) and low function autism (LFA). ASD children are said to be LFA when they have an intellectual disability or IQ below 70. Although intelligence measurement in ASD children is still in the debate, some researchers still use an IQ test to predict the ability of ASD children, especially in academic aspects [2]. Light-level LFA allows for social training and sufficient opportunities to obtain specialized education designed for people with ASD. At a severe level, they can live fully independently, despite their need for much help from others.

One of the problems faced by children with low-function autism is the mastery of social skills. Social skills

develop gradually over the ages resulting from dynamic interactions between individuals and their environment. Children with the autistic spectrum have serious challenges in mastering social skills. Social skills are a set of behaviors that a person displays in a situation [3]. The social skills including (1) the ability to select information and use it in interpersonal relationships; (2) the ability to use the information to direct appropriate behavior; and (3) the ability to determine verbal and nonverbal expressions in maintaining interpersonal relationships [4].

The development of social skills in children can be explained through Social Information Processing (SIP) theory. SIP theory provides plots in every situation that occurs in the process: interpreting instructions, clarifying objectives, seeking a general response, choosing and implementing a specific response, and evaluating its achievements [5]. From birth, the child dynamically, in interaction with his environment, continues to use the flow. It aims to test and continue to improve their social skills in dealing with various situations as the process progresses. From there, the child has a wealth of experience and ultimately behaves appropriately in the right situation.

As described according to SIP theory, the development process does not occur in children with the autistic spectrum. They draw from interactions with others, whereas social skills occur in the context of interactions with others. According to Rutherford et al. [6], the fundamental problem in children with autism lies in their inability to imitate and play symbolically.

A capacity does not develop well in children with autism spectrum, namely Theory of Mind (ToM). ToM refers to the socio-emotional function of each individual. Through ToM, a child develops their ability to understand facial expressions, voice intonation, pay attention and give attention (example, through eye contact, smiles, and other nonverbal expressions). In children with ASD, the capacity does not develop, so they do not have the skills to understand and express emotions [7], [8], are incapable of bonding with others [9], [10], and it looks like it does not have empathy [11], [12].

Social skills development interventions for children with autism spectrum are highly recommended before age 5 [13]. However, many studies have found that social skills development interventions are implemented at ages between 6 to 9 years [14].

The need for social skills intervention is increasingly urgent as children progress into school age. The heavier the level of intellectual disabilities, the more severe children's social skills [15]. The increasingly severe condition of autism requires different intervention programs and strategies. Children with low function autism need adaptive behavioral exercise programs, including social skills integrated with school programs [16].

From a literature review, Matson et al. [17] concluded that interventions in the development of skills of ASD are widely performed by a teacher in a school activities setting.

This study was a preliminary step to identify social skill profiles in children with LFA. The findings of this study serve as the basis for developing social skills intervention strategies in children with low-function autism.

## 2. METHOD

This research approach is qualitative with a case study research strategy. The data collected is quantitative and qualitative data analyzed with Chi-squared. The study subjects consisted of seven students with low-function autism diagnoses aged between 14 and 21. This research was located at an SLB Autis Laboratorium Universitas Negeri Malang, East Java.

Qualitative data is obtained through participant observations and semi-structured interviews with teachers. Quantitative data is collected using structured interviews with students and observations when students buy food in the school canteen. on of principal performance is presented in Table 1. The mean of principal performance is 85.86; it can be concluded that the principal's performance is in the medium category. Furthermore, the item mean is compared with the total mean. The results of these comparisons are as in Table 2. Referring to Table 2, it can be seen that items included in category R are items that must be improved by the principal. Whereas items included in category H are items that must be maintained by the principal.

## 3. DISCUSSION

Many factors support employee performance, The data obtained consists of three main topics: communication level, understanding of shopping activities, and shopping skills. Then they were analyzed using the Chi-squared Test.

### a. Communication Level

Seven research subjects were between 14 and 21 years old. The functional communication capabilities of the research subjects were categorized into three levels: Level 1, subject understands and conveys desire in daily communication; Level 2, subject understands simple instructions with a little help and is done on a limited basis with simple language; Level 3, subject have much difficulty understanding both verbal and nonverbal languages (both expressive and receptive).

Subject W has excellent functional communication skills. He can do two-way communication. For example, when asked to talk about his activities at home and school, W can do well. What W wants can be communicated well. Subject B can be doing two-way communication functionally. He can provide answers to the questions and express his opinion and convey his wishes with understandable language. For example, when a teacher gives a worksheet, he can explain the task to be done. Subject J has good communication skills. He can explain what he knows. For example, J can tell stories enthusiastically about things he likes, such as games and movies. He can understand the instructions well. Subjects W, B and J are grouped at level 1 in terms of functional communication.

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Subject D can speak, although the answers are given often do not correspond to the question. The question must also be repeated several times. Subject D has a habit of repeating the words he conveys. These words often do not relate to the context of the conversation. Subject D can understand instruction with little verbal assistance and needs an example or model. Subject J has better communication skills than D. Each J's speech can be easily understood. Subject A has functional communication skills such as D. Where questions or instructions must be repeated several times, then the subject can understand.

Subject A looks quiet. He need help to be able to ask or express his wishes. The functional communication ability levels of subjects A and D are grouped at level 2.

Subject R seemed very quiet. R has difficulty in understanding verbal and nonverbal language. For example, when communicating using images, he is less consistent in responding. In daily activities at school, subject R is much helped physically (hand on hand). Subject H can speak, although very limited, but cannot communicate. He can follow simple instructions with verbal assistance several times and sometimes needs physical assistance. The functional

communication capabilities of subjects R and H are grouped at level 3.

**b. Understanding Shopping Activity**

In this study, understanding shopping activities is understanding behaviors that conform to social norms related to shopping activities. Five shopping activities were selected that revealed their understanding to the research subjects. These five shopping activities are chosen as the norm agreed by the public when doing shopping activities. The five shopping activities are queuing, paying, choosing an empty seat, sitting while eating, and throwing away food wrapper waste. These five activities are considered important to be understood and mastered by children as part of social skills to be able to behave appropriately in shopping situations.

This understanding of shopping activities is revealed through interviews with students and teachers. Interviews with students are conducted in a structured manner using the help of drawing cards. In comparison, interviews with teachers are conducted by semistructured interview method.

Subjects W and B showed a good understanding of all five shopping activities.

They can understand the importance of queuing in rows of buyers. When buying snacks, buyers have to pay with some money. Finding an empty seat before eating snacks, to throw garbage in the trash.

Subjects D and J could understand the five shopping activities in question. However, they need verbal assistance that is repeated two to three times. For example, D can identify images of queuing activities. However, when asked by the researchers, "What to do when queuing?" D struggled to choose the answer "queue" or "wait for a turn". Similarly, understanding the activities of paying, choosing a seat, eating while sitting, and throwing garbage in the trash can.

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Subject A is very difficult to understand the activity of choosing an empty seat and eating while sitting. Even with subject R and H that are not easy to understand the five shopping activities asked. The interview process was disrupted because subjects R and H had problems in communication, both verbally and nonverbally (in the picture). During this interview, the teacher accompanied and explained the questions asked by the researchers.

This "understanding shopping activity" is categorized into four: self-reliant, less help, more help, and unable or unwilling. Subjects W and B are categorized as self-reliant. Subjects D and J are in the "less help" category. Subject A is classified as "more help". At the same time, the subjects R and H include "unable" to follow every step.

**c. Shopping Skill**

Shopping skills are known through observation of research subjects when buying food in the canteen. In this activity, each subject is provided with 10,000 rupiahs to buy two kinds of snacks. In general, research subjects have not

been able to recognize the value of money. Subject R has not been able to follow the stage at all. He tends not to want to engage in activities in the canteen. Subject H can participate in queuing, choosing menus, paying, and disposing of garbage. Nevertheless, he still needs the help of teachers, except when disposing of garbage.

Subject A can shop in the school canteen. It is just that he still needs to be reminded to pay for his snacks first. It is also found in subject D. As a result of haste when buying, subject D must be physically assisted (demonstration) to pay - hand over money. Subjects W, B and J can do the shopping stages independently. Starting from queuing, choose the menu, pay, choose a seat, eat while sitting and throw garbage in its place.

In this study, the level of shopping skills was categorized into four levels: (1) self-reliant, (2) less help, (3) more help, and (4) unable or unwilling. Subjects W, B, and J are self-reliant. Subject A falls into needing less help, while subjects D and H need more help. Subject R refuses or is unwilling to participate in activities in the school canteen.

**d. Chi-Squared Test**

Based on data from the seven subjects above, further descriptive statistical testing was conducted. Testing was conducted with Chi-Squared to determine the correlation between communication levels, understanding of shopping activities, and shopping skills.

TABLE I. COMMUNICATION LEVEL AND UNDERSTANDING OF SHOPPING ACTIVITY

Description	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	11.083	6	0.086
Likelihood Ratio	12.333	6	0.055
Linear-by-Linear Association	5.255	1	0.022
N of Valid Cases	7		

Based on table 1, Chi-Squared and df values are 11.083 and 6, respectively. If using a Chi-Squared table with a significance level ( $\alpha$ ) = 5%, the value obtained is 12.59. Thus, there is no relationship between communication levels and understanding of shopping activities.

TABLE II. COMMUNICATION LEVEL AND SHOPPING SKILL

Description	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	10.500	6	0.105
Likelihood Ratio	12.333	6	0.055
Linear-by-Linear Association	5.263	1	0.022
N of Valid Cases	7		

In table 2 is known Chi-Squared value of 10.500, with df 6. Chi-Squared table value with significance level ( $\alpha$ ) = 5% is 12.59. It can be concluded that there is no relationship between communication level and shopping skills.

TABLE III. SHOPPING SKILL AND UNDERSTANDING OF SHOPPING ACTIVITY

Description	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	12.833	9	0.170
Likelihood Ratio	12.333	9	0.195
Linear-by-Linear Association	3.998	1	0.046
N of Valid Cases	7		

Based on table 3, it is known that the value of Chi-Squared is 12.833, with df 9. Chi-Squared table value with a significance level ( $\alpha$ ) = 5%, known as 16.92. It indicates there is no relationship between understanding shopping activities and shopping skills.

#### 4. DISCUSSION

Each research subject has a diverse profile of social skills. Three subjects have good functional communication skills, namely W, B, and J. They can express desire and understand commands verbally. In understanding shopping activities, W and B are self-reliant, which means understanding the whole well. Subject J needs a little help in understanding shopping activities. While also in a real simulation of shopping in the school cafeteria, these three subjects could do it independently.

Subjects D and A have different characteristics of speech ability. Subject D can speak and has echolalia tendencies, so his speaking ability is not used appropriately in functional communication. Subject A is very quiet, able to speak on a limited basis if stimuli are obtained. Both subjects had functional communication levels where they still needed help from adults. In understanding shopping activities, subject D needs little help. While he needs much help in real simulation. Subject A is so well understood about shopping but needs much help in real shopping activities.

Subjects H and R have functional communication skills with much help, likewise in understanding shopping activities. In the real simulation in the school canteen, H still needs much help. In contrast, subject R refused to take part in the simulation.

Based on the data, functional communication skills become very important. It can be seen in the profiles of subjects W, B, and J. However, the Chi-Square test does not provide similar evidence. Functional communication skills in children with low-function autism contribute to teaching social skills. Functional communication skills become a very important part of predicting the learning achievements of autistic children [18], [19].

The most popular intervention for developing social skills in children with autism spectrum disorder is applied behavior analysis (ABA) through modeling and reinforcement [17]. Rogers [20] stated the necessary interventions for developing social skills include: peer intermediaries, peer tutors, social games, pivotal response training, video modeling, direct instruction, visual cues, circle of friends, and

social-skill groups. Although many studies were conducted for children with high function autism [21], with functional communication skills in the study subjects, the recommendations of such interventions can be considered.

Subjects D and A have functional communication with less help. In knowing shopping activities and shopping skills, subject D needs less help, and subject A needs more help. Subjects D and A can be given interventions using video modeling, direct instruction, and visual cues.

These three intervention models can be alternative by considering the functional communication capabilities that subjects D and A have.

Subjects H and R require more careful consideration in social skills development interventions. The use of communication aids, such as images or visual cues, becomes a good option in developing functional communication. Based on SIP theory, at least the practice of shopping in the school canteen can be processed using task analysis [20] into three stages. First, the skill of understanding the instructions or the situation at hand - shopping for food in the school canteen. For example, students are trained to recognize the school canteen room and recognize the menu.

Second, students are trained to set goals when going to the school canteen and determine the appropriate follow-up actions. Students are trained to understand the order of activity when buying food at the school canteen. In the first and second stages, the image media or visual instructions are very appropriate to use.

Third, students are trained in the hands-on practice of buying food in the school canteen and activities in the second stage. Interventions with modeling can be used in this stage. It can be combined with direct (verbal) instructions or using visual cues. In this stage, if students have consistently mastered shopping skills in the school canteen, then it is necessary to generalize in different situations. For example, shopping at a food court or restaurant.

Samson & Bui [22] are using a peer-mediated intervention (PMI) strategy. This intervention strategy can work well in a regular school setting – where there may be peers who can act as active peers – resulting in the mediation of social interactions. As in this research, in the context of special schools, it is unlikely that strategy can be implemented. It is due to the absence of peers who can perform the role of mediator.

The use of virtual reality (VR) technology in interventions in ASD education began to rise. Development of ASD children's communication skills through VR technology [23], [24], to train social expression skills [25], to develop joint attention, and social adaptation in inclusive schools [26], [27]. The use of VR technology for children with low-function autism is also possible [28].

#### 5. CONCLUSION

The seven research subjects had functional communication skills, understanding of shopping activities, and diverse shopping skills. The Chi-Square test concluded no link between functional communication levels, understanding of shopping activities, and shopping skills. The diversity of profiles of research subjects becomes the basis for

choosing strategies or models of intervention in the development of social skills. Functional communication capabilities are a very decisive part of choosing the appropriate intervention model.

Various intervention models are widely used for children with high function autism, allowing it to be an intervention option for children with low function autism.

When they have good functional communication skills or are independent, for subjects experiencing functional communication disorder, intervention models that use visual aids or images are highly recommended. The use of task analysis to create simpler learning stages is urgently needed. The use of technology such as VR is an alternative that can develop children's social skills with low-function autism.

Further research is needed to dig deeper into interventions for ASD with low function. Experiments on various models of intervention and development of assistive technology need to be conducted, taking into account the diversity of children with low-function autism profiles.

## REFERENCES

- [1] Matson, J. L., & Goldin, R. L. (2014). Diagnosing young children with autism. *International Journal of Developmental Neuroscience*, 39(C), 44–48. <https://doi.org/10.1016/j.ijdevneu.2014.02.003>
- [2] Mayes, S. D., & Calhoun S. L. (2003). Ability Profiles in Children with Autism Influence of Age and IQ. April 2003. *Autism* 7(1): 65-80 DOI:[10.1177/1362361303007001006](https://doi.org/10.1177/1362361303007001006)
- [3] Gresham, F. M. (2015). Journal of Clinical Child Psychology Conceptual and Definitional issues in the Assessment of Children's Social Skills : Implications for Classifications and Training Conceptual and Definitional Issues in the Assessment of Children's Social Skills. *Im.* (April), 37–41. <https://doi.org/10.1207/s15374424jccp1501>
- [4] Bedell, J. R., & Lennox, S. S. (1997). *Handbook for communication and problem-solving skills training: A cognitive-behavioral approach*. New York, NY: Wiley.
- [5] Crick, N., & Dodge, K. (1994). A review and reformulation of social information-processing mechanisms in children's social adjustment. *Psychological Bulletin*, 115, 74–101.
- [6] Rutherford, M. D., Young, G. S., Hepburn, S., & Rogers, S. J. (2007). A longitudinal study of pretend play in autism. *Journal of Autism and Developmental Disorders*, 37, 1024–1039.
- [7] Dawson, G., Webb, S. J., Carver, L., Panagiotides, H., & McPartland, J. (2004). Young children with autism show atypical brain responses to fearful versus neutral facial expressions of emotion. *Developmental Science*, 7, 340–359.
- [8] Mazefsky, C. A., & Oswald, D. P. (2007). Emotion perception in Asperger's syndrome and high-functioning autism: The importance of diagnostic criteria and cue intensity. *Journal of Autism and Developmental Disorders*, 37, 1086–1095.
- [9] Campbell, R., Lawrence, K., Mandy, W., Mitra, C., Jeyakuma, L., & Skuse, D. (2006). Meanings in motion and faces: Developmental associations between the processing of intention from geometrical animations and gaze detection accuracy. *Development and Psychopathology*, 18, 99–118.
- [10] Klin, A., & Jones, W. (2006). Attributing social and physical meaning to ambiguous visual displays in individuals with higher functioning autism spectrum disorders. *Brain and Cognition*, 61, 40–53
- [11] Blair, R. J. (2005). Responding to the emotions of others: Dissociating forms of empathy through the study of typical and psychiatric populations. *Consciousness and Cognition*, 14, 698–718.
- [12] Dapretto, M., Davies, M. S., Pfeifer, J. H., Scott, A. A., Sigman, M., Bookheimer, S. Y., & Iacoboni, M. (2006). Understanding emotions in others: Mirror neuron dysfunction in children with autism spectrum disorders. *Nature Neuroscience*, 9, 28–30.
- [13] Krantz, P. J., & McClannahan, L. E. (1998). Social interaction skills for children with autism: A script-fading procedure for beginning readers. *Journal of Applied Behavior Analysis*, 31, 191–202.
- [14] Matson, J. L., & Minishawi, N. F. (2006). *Early intervention for autism spectrum disorders: A critical analysis*. Oxford, UK: Elsevier Science.
- [15] Matson, J. L., Misnawi, N. F., Gonzales, M. L., and Mayville, S. B. (2006). The Relationship of Comorbid Problem Behaviors to Social Skills in Persons with Profound Mental Retardation. *Behavior Modification*, vol. 30 no. 4, July 2006 496-506 doi: 10.1177/0145445505283415.
- [16] Gabriels, R. L., Ivers, B. J., Hill, D. E., Agnew, J. A., & McNeill, J. (in press). Stability of adaptive behaviors in middle-school children with autism spectrum disorders. *Research in Autism Spectrum Disorders*.
- [17] Matson, J. L., Matson, M. L., dan Rivet T., T. (2007). Social-Skills Treatments for Children with Autism Spectrum Disorders an Overview. *Journal Behavior Modification*. Volume 31 Number 5, September 2007, 682-707. <http://dx.doi.org/10.1177/0145445507301650>.
- [18] Boucher, J., Bigham, S., Mayes, A., and Muskett, T. (2008). Recognition and language in Low Functioning Autism. *Journal Autism Development Disorder* (2008) 38:1259–1269. DOI 10.1007/s10803-007-0508-8
- [19] Ray-Subramanian, C. E., & Weismer, S. E. (2012). Receptive and Expressive Language as Predictors of Restricted and Repetitive Behaviors in Young Children with Autism Spectrum Disorders. *Journal Autism Development Disorder* (2012). 42:2113–2120
- [20] Rogers, S. J. (2000). Interventions that facilitate socialization in children with autism. *Journal of Autism and Developmental Disorders*, Vol. 30, No. 5, 399–409.
- [21] Kaat, A. J., & Lecavalier, L. (2014). Group-based Social Skills Treatment: A Methodological Review. *Research in Autism Spectrum Disorder*. 8 (2014), 15-24. <http://dx.doi.org/10.1016/j.rasd>.
- [22] Simpson, L., A., & Bui, Y. (2016). Effects of a Peer-Mediated Intervention on Social Interactions of Students with Low-Functioning Autism and Perceptions of Typical Peers. *Education and Training in Autism and Developmental Disabilities*, vol. 51, no. 2, 2016, pp. 162–178., [www.jstor.org/stable/24827545](http://www.jstor.org/stable/24827545). Accessed 9 July 2021.
- [23] Halabi, O., Elseoud, S. A., Alja'am, J. M., Alpona, H., Al-Hemadi, M., & Al-Hassan, D. (2017). Immersive virtual reality in improving communication skills in children with Autism. *International Journal of Interactive Mobile Technologies*, 11(2), 146–158. <https://doi.org/10.3991/ijim.v11i2.655>
- [24] Kuriakose, S., Kunche, S., Narendranath, B., Jain, P., Sonker, S., & Lahiri, U. (2013). A step towards virtual reality based social communication for children with Autism. CARE 2013 - 2013 IEEE International Conference on Control, Automation, Robotics and Embedded Systems, Proceedings. <https://doi.org/10.1109/CARE.2013.6733744>.
- [25] Yuan, S. N. V., & Ip, H. H. S. (2018). Using virtual reality to train emotional and social skills in children with autism spectrum disorder. *London Journal of Primary Care*, 10(4), 110–112. <https://doi.org/10.1080/17571472.2018.1483000>
- [26] Cheng, Y., & Huang, R. (2012). Using virtual reality environment to improve joint attention associated with pervasive developmental disorder. *Research in Developmental Disabilities*, 33(6), 2141–2152. <https://doi.org/10.1016/j.ridd.2012.05.023>
- [27] Cheung, S. K. S., Kwok, L. F., Shang, J., Wang, A., & Kwan, R. (2016). Virtual Reality Enabled Training for Social Adaptation in Inclusive Education Settings for School-Aged Children with Autism Spectrum Disorder (ASD). *Lecture Notes in Computer Science (Including Subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)*, 9757, V. <https://doi.org/10.1007/978-3-319-41165-1>
- [28] Junaidi, A. R., Alamsyah, Y., Hidayah, O., & Mulyawati, N. W. (2020). Development of Virtual Reality Content to Improve Social Skills in Children with Low Function Autism. 2020 6th International Conference on Education and Technology (ICET), Malang, 2020, pp. 115-119, doi: 10.1109/ICET51153.2020.9276607.