VNU Journal of Science: Education Research, Vol. 37, No. 4 (2021) 49-59

VNU Journal of Science: Education Research

Journal homepage: https://js.vnu.edu.vn/ER

Original Article

The Effectiveness of Applied Behaviour Analysis Training Program for Intervention Staff in Vietnam

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Received 08 November 2021
Revised 04 December 2021; Accepted 05 December 2021

Abstract: Applied Behaviour Analysis (ABA) is demonstrated as the most efficacious intervention for autism spectrum disorder in many pieces of paper [1]. However, ABA has been neither officially educated in Vietnam nor studied to examine the ability of intervention teachers. In order to enhance the quality of intervention teachers in specialized centers, a basic training program was conducted, including a two-week tutorial and a three-month supervised practicum. One hundred thirty-one intervention teachers in Vietnam participated in this training, which comprised general knowledge, fundamental skills, and on-site practicing. The finding indicated that the knowledge about ABA is limited; there are differences between staff with different specialties. The training has a positive impact on raising awareness of ABA even though it was a short-period program. These findings serve as the foundation for introducing evidence-based methods such as ABA into practice for autism spectrum disorder and other developmental disorders in Vietnam.

Keywords: Applied behavior analysis; autism spectrum disorder; intervention staff; intervention teachers; training program.

1. Introduction

Applied behavior analysis (ABA) is defined as the process of utilizing principles of behavior to improve specific behaviors and simultaneously evaluating behavioral changes [2]. The implementation of this process is characterized by a considerate presentation of stimuli with responses followed by immediate feedback, an intense schedule of reinforcement, data collection, and systematic instructions. Up to now, the efficacy of ABA methods in the education of children with autism spectrum disorder and other developmental disorders has been evidenced by many studies [3, 4]. After further examination, it is clear that the successful education of autistic students partly depends on the skills of intervention teachers working with them [5]. It also illustrated that knowledge and application ability in ABA enables teachers to make intervention plans and implement plans more effectively [6-8]. In addition, Luiselli et al., identified that intervention staff in organizations specializing

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https://doi.org/10.25073/2588-1159/vnuer.4603

in ABA should understand basic learning principles, terminology, and procedures [9]. Therefore, it is apparent that ABA training programs for intervention staff are essential.

However, In Vietnam, ABA training programs for intervention staff are not standardized and systematic, only organized, and take place on a small scale. As a result, the effectiveness of ABA training programs is a research gap that deserves attention and meets the requirements of teachers, children, and families. The results in this paper recommend some foundation basis for future training programs.

2. Literature Review

An ABA staff training programs have included several methods such as reading assignments with verbal instructions, performance feedback, behavior-specific checklists, collaborating supervision, coaching, technical support [10]. Training programs usually merge more than one method and typically are conducted with multiple staff in a group format.

In some countries, Government-supported in-service models and specific university training are the most likely delivery mechanisms for teacher training in ABA [10]. However, such courses may be required to follow the Behavior Analyst Certification Boardstandards®'s for minimal educational, experiential, and examination conditions to practice as a behavior analyst [11]. This is currently the sole accrediting authority for ABA practitioners, and it is anticipated that the board's criteria will become the standard for qualification of training and supervision Applied Behaviour Analysis in clinical and educational contexts [12].

Many studies have attracted and reflected in the effectiveness of ABA training programs. According to the National Research Council (2001), most educators receive minimal instruction in evidence-based research procedures such as ABA when they graduate from preservice teacher education programs [13]. A survey in 2000 indicated that half of the participants never had the opportunity to develop skills in implementing interventions for children with autism spectrum disorder. Meanwhile, demands for teachers with competence in applied behavior analysis will continue to increase as more children with autism are enrolled in inclusive education in public schools [14]. The deficiency in training programs can create difficulties and confusion for teachers to intervene and support for special needs of autistic students [15]. Like teacher education preparation, ongoing and on-the-job training is beneficial for intervention staff; thus, in-service training is crucial as official university courses [10]. McCabe (2008) suggested that short-term courses on a specific topic should be replaced by extensive in-service training with staff from various disciplines, including education, speech pathology, and psychology [16]. There is also evidence that the most frequent forms of professional development, such as one-day workshops, have little effect on practitioners' capacity; on the other hand, in-service training provides opportunities for learners to practice continuously and over the long term, to receive supervision and feedback [10].

In Vietnam, ABA has not been officially involved in the curriculum of Colleges and Universities. However, the contents in the curriculum for intervention teachers is quite limited, focusing mainly on the introduction and foundational knowledge about disability types; especially, the content of instructions for practical intervention is very narrow [17, 18]. Today's most popular form of training is on-site training and short-term training through workshops on specific topics. These training programs are not systematic, only organized, and take place on a small scale; furthermore, the content is not specialized in evidence-based intervention methods and techniques [19]. In addition, the absence of regulations and criteria for assessing the quality of intervention staff in Vietnamese makes it more challenging to measure the quality of training programs [20].

3. Research Design and Methodology

3.1. Procedures and Design

This study was conducted within one year in Hanoi. Three specific phases were proceeded to answer the following research question: In the first phase, 199 intervention staff agreed to participate in the study and performed the first ABA self-assessment; in the second phase, 131 participants were randomly selected into two groups: i) 61 staff in the experimental group; and ii) 70 staff in the control group. After that, we organized an ABA training program for the experimental group in two weeks with 08 modules. All modules include both theory and on-site practice. While the intervention staff on the waiting list (control group) did not participate in any training modules of this study, whether these staff received training programs other than the study is not determined. The third phase was after 03 months of supervised practicum; 131 participants performed a second ABA self-assessment. The research progress is illustrated in the Diagram 1:

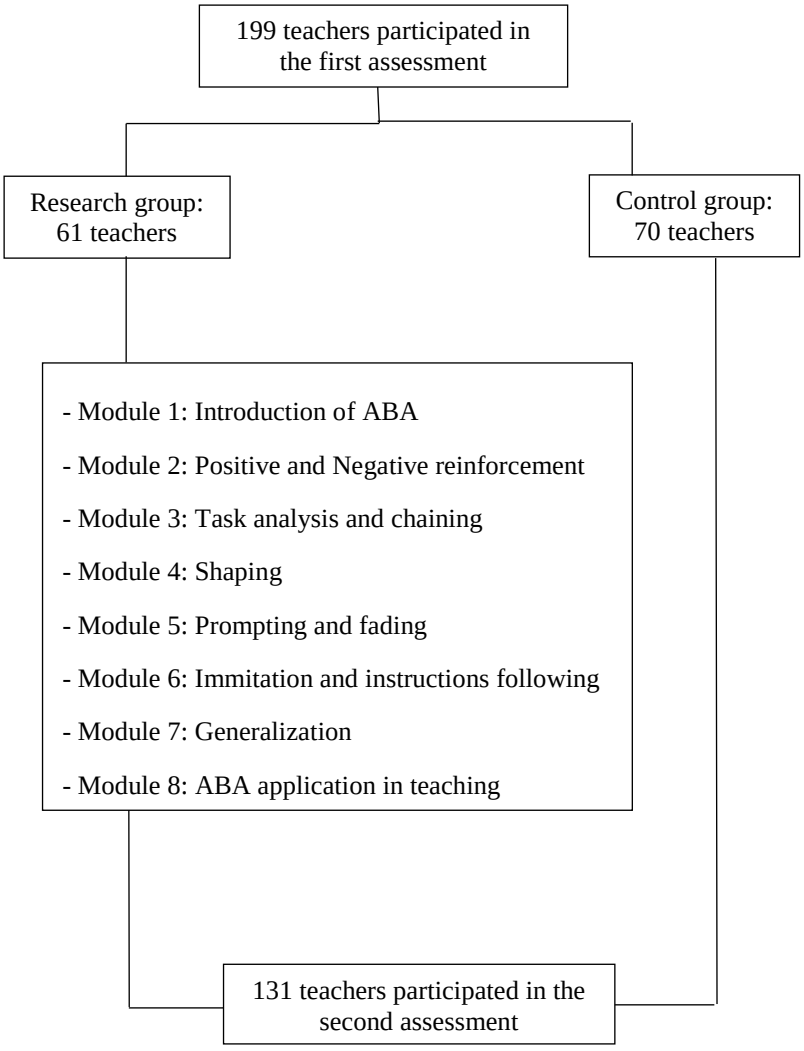

Diagram 1. Research progress.

3.2. Research Methods

A 15-item questionnaire was introduced, including four content areas: i) Demographic information; ii) General knowledge about ABA; iii) the situation of applying ABA in intervention; and iv) The demand in training/educating ABA. Finally, data were collected and analyzed on SPSS 25 statistical software.

3.3. Participants

There were 199 participants; nine participants were male. The average age is 26.11; the oldest is 40, and the youngest is 19. Specific data are presented in the table below (Table 1):

4. Results

The initial analysis results showed that out of 199 participants: 182 staffs reported that they had heard of ABA methods used in intervention for developmental disorders. The sources of information they have access to are majorly through the experiences of other teachers and the press, the internet, and the mass media. Meanwhile, information sources from learning programs and seminars about developmental disorders account for minorities, at 16.1% and 32.7%, respectively. Complete information is presented in the chart below (Figure 1):

Table 1. Characteristics of participants

Frequencies		Frequencies	Percent
Group	Once-surveyed group	68	34.2
	Experimental group	61	30.7
	Control group	70	35.2
Gender	Male	9	4.6
	Female	185	95.4
Educational level	High school	1	0.5
	Intermediate	15	7.7
	College	38	19.6
	Bachelor	120	61.9
	Post-graduated	16	8.2
	Other	4	2.1
Speciality	Psychology	28	14.4
	Special education	20	10.3
	Social work	60	30.8
	Educational psychology	34	17.4
	Medical	5	2.6
	Other	48	24.6

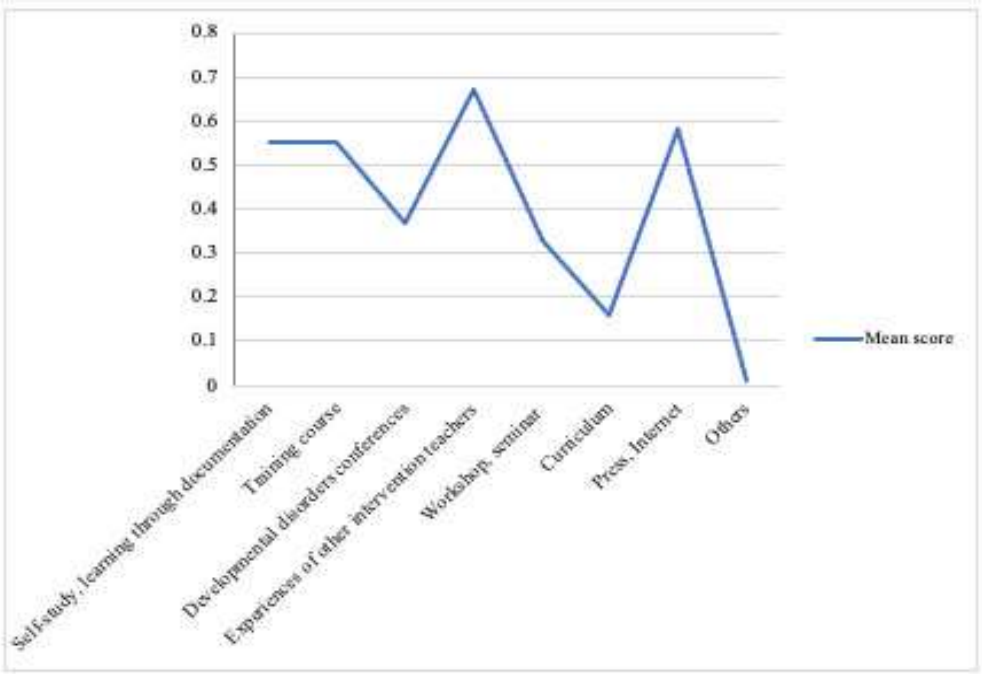

Figure 1. ABA information sources.

4.1. Level of ABA Knowledge and Implementation

Evaluate the Knowledge of ABA

In order to evaluate the general understanding of the intervention staff about ABA, a list of ABA and non-ABA elements was created. The results showed that most of the participants chose three correct items about ABA. However, there are also many intervention staff who believe that methods such as picture card switching (24.2%), belt exercises, cross-training, mask breathing (6.4%), and speaking loudly (6.3%) also belong to ABA.

The points that each participant achieved in this section was determined as the following rule: In the correct assessment items about ABA, if the participant thinks that it is the correct answer, they will receive 1 point; and vice versa for items that incorrect assessment items about ABA. Therefore, the score will range from 0 to 6 points. The results show that the average score of all subjects for knowledge of ABA *is M=4.16 (SD=1.30)*. The highest score was 6 points *(accounting for 17.8%)*, and one teacher misidentified or was uncertain about all items.

The results indicated that there was a statistically significant difference in the level of general understanding of ABA among intervention workers with different specialties ($p<0.05$). Specifically, staff with a major in Psychology had a statistically significant higher score than most of the remaining majors: social work, educational psychology, medical, and other disciplines.

Conducting correlation analysis between age, education level, and general knowledge of ABA illustrates a minimal positive correlation between age, education level, and general understanding level. on ABA with correlation coefficients *r=0.216*** and *r=0.206***, respectively.

Regarding to each item, the identification of ABA is a method based on the principles of behavioral theory, in order to form behavior,

intervene, and change behavior as the most correctly done item *(M=0.90, SD=0.30)*, followed by the assumption that ABA is an intervention method that scientific studies have proven effective *(M=0.79, SD=0.41)*. The most misunderstood or uncertain item is "*the method of picture cards switching to teach autistic children*" with *M=0.55, SD=0.50*, and "*the method of speaking loudly to attract child's attention*" (*M=0.63, SD=0.49*).

Self-assessment in knowledge and implement

Participants were asked to self-assess their own level of knowledge and implementation ABA techniques. The seven core techniques of the ABA accompanied by explanation were mentioned. The results showed that for the level of knowledge, "prompting", "fading", and "shaping" are techniques that were pointed to have the best knowledge, the average score is Mprompting=2.27 (SD=0.54); Mfading=2.45 (SD=0.68) and Mshaping=2.41 (SD=0.59). Generalization, meanwhile, is the technique have the least knowledge with Mgeneralization=2.14 (SD=0.69). The self-assessment of proficiency in use of the above techniques is similar to the level of knowledge, specifically the level of proficiency in techniques from high to low in the following order: Prompting (M=2.57, SD=0.59); Fading (M=2.35, SD=0.69); Reinforcement (M=2.28, SD=0.74); Shaping (M=2.28, SD=0.60); Task analysis (M=2.26, SD=0.61); Chaining (M=2.25, SD=0.65) and Generalization (M =2.07, SD=0.65).

When assessing the ABA techniques knowledge, participants majoring in psychology has a higher score than educational psychology and other specialties ($p<0.05$). Hence, it appears to be quite similar to the findings in the level of ABA knowledge; precisely, the individual majoring in psychology and special education has a better insight about ABA than the rest of the others. However, the measurement in this study is limited and superficial. Thus, studies in the future need an advanced method to examine this result. While the ABA general knowledge has a significant positive correlation to their age and education level, the level of self-assessment in knowledge and implementation of ABA techniques only correlates to participants' age with r=0.255** and r=0.295**, perspectively. Furthermore, no correlation to the education level was found.

The situation of applying ABA in the intervention

- Frequency of use and level of necessity and effectiveness

When asked, "*Are you currently using ABA to help children with developmental disorders in the classroom or center*?" up to 96.7% of the total participants reported using it. In the 194 staff who used ABA in intervention for children with autism spectrum disorder, two staff (accounting for 1%) thought that ABA was not helpful at all; 20% found ABA helpful, 50.3% think ABA very helpful. Specific results are presented in the table below (Table 3):

There is a significant positive correlation between frequency of use, the necessity, and the effectiveness of the ABA techniques. The correlation coefficient between frequency of use and level of necessity is *r=0.694***, between frequency and effectiveness, is *r=0.662***, and between necessity and effectiveness is *r=0.723***.

- Compare the effectiveness of ABA to other methods: The result indicated that over 50% of the total participants pointed out that ABA was more effective than other methods; to be more precise, 15.2% thought it was slightly more effective, 49.5% said it was more effective, and 21.2% said it was much more effective.

- Level of interest in ABA training program: The results demonstrated that a significant part of the respondents interested in applying ABA in intervention, as follow: i) Interested (56.0%); ii) Somewhat interested (34%).

Table 2. The reality of applying ABA techniques in the intervention

ABA techniques	Frequency				Level of necessity				Level of effectiveness			
	1	2	3	4	1	2	3	4	1	2	3	4
Prompting	0 0.0%	13 6.8%	102 53.7%	75 39.5%	1 0.5%	7 3.7%	62 32.8%	119 63.0%	0 0.0%	13 7.1%	87 47.3%	84 45.7%
Shaping	4 2.2%	33 17.8%	93 50.3%	55 29.7%	1 0.5%	13 7.1%	86 47.0%	83 45.4%	5 2.8%	17 9.4%	90 49.7%	69 38.1%
Reinforcement	3 1.6%	10 5.3%	62 33.2%	112 59.9%	0 0.0%	8 4.3%	50 27.2%	126 68.5%	0 0.0%	14 7.8%	62 34.6%	103 57.5%
Chaining	2 1.1%	43 23.5%	80 43.7%	58 31.7%	0 0.0%	17 9.4%	88 48.6%	76 42%	2 1.1%	27 15.3%	86 48.6%	62 35.0%
Task analysis	4 2.2%	34 19.0%	75 41.9%	66 36.9%	3 1.7%	10 5.7%	76 43.4%	86 49.1%	3 1.7%	20 11.5%	88 50.6%	63 36.2%
Generalization	16 9.1%	36 20.5%	84 47.7%	40 22.7%	8 4.6%	23 13.2%	75 43.1%	68 39.1%	9 5.4%	37 22.0%	81 48.2%	41 24.4%
Fading	6 3.4%	23 12.9%	73 41.0%	76 42.7%	1 0.6%	13 7.3%	72 40.4%	92 51.7%	5 2.8%	24 13.6%	65 36.9%	82 46.6%
	1 = Never; 2 = Rarely; 3 = Often; 4 = Always				*1 = Not necessary at all; 2 = Slightly necessary ; 3 = Necessary; 4 = Very necessary*				*1 = Not effective at all; 2 = Slightly effective; 3 = Effective; 4 = Very effective*			

4.2. The Effectiveness of the ABA Training Programs

After the three-month training program, the study conducted a second data collection to determine participants' knowledge, skills, and attitudes. In addition, the study focused on comparison to examine the difference between the experimental and control groups in their knowledge, implementation, frequency of using ABA, and other related factors.

Before conducting the test to compare the difference after a 3-months experiment, the pre-experiment results revealed no statistically significant difference between the two groups in all aspects of knowledge, skills, and attitudes towards ABA, $p>0.05$. All analyses below were generated by using repeated measures.

The ABA knowledge of participants

i) Knowledge test results

After the training, the mean score of ABA general knowledge in both groups is shown in the table below:

It is indicated that after the training, the general knowledge of participants in both groups has changed significantly; in particular, the mean score before training was M=4.08 has increased to 4.49 with p=0.009. According to the group, the experimental group's mean score of general knowledge was higher than that of the control group with $M_{Exp.gr}$=4.68 and $M_{Cont.gr}$=3.88. Moreover, this difference was statistically significant with p=0.002. The results also exposed an interaction between time and group with p=0.005, which indicates that the change in knowledge of intervention staff after training depends on which group the participants belong to. The finding is also illustrated in the figure below (Figure 3);

ii) Self-assessment results

- Regarding knowledge: In the experimental group, the mean score before training was M_{before}= 17.10, and after training was M_{after} = 19.68. Otherwise, the mean score before training of the control group was M_{before}=17.19, and after training was M_{after}=17.30. There is a statistically significant difference between the mean scores of both groups before and after training with $p<0.01$. The analysis results also revealed a significant difference in knowledge between the two groups with $p<0.05$. In addition, an interaction between time and the group was reported with $p<0.01$. Thus, the change in

participants' knowledge of ABA depends on which group they belong to.

- Regarding proficiency: In the experimental group, the mean score before training was M_{before}=16.18, and after training M_{after}=17.79. In the control group, the pre-training mean score was M_{before}=16.64, and post-training was M_{after}=16.86. A statistically significant difference between the skills of intervention staff before and after training with p<0.05 was revealed. However, there was no significant difference between the experimental and control groups with p>0.05. *The results also demonstrated that there is an interaction between group and time with* p < 0.05.

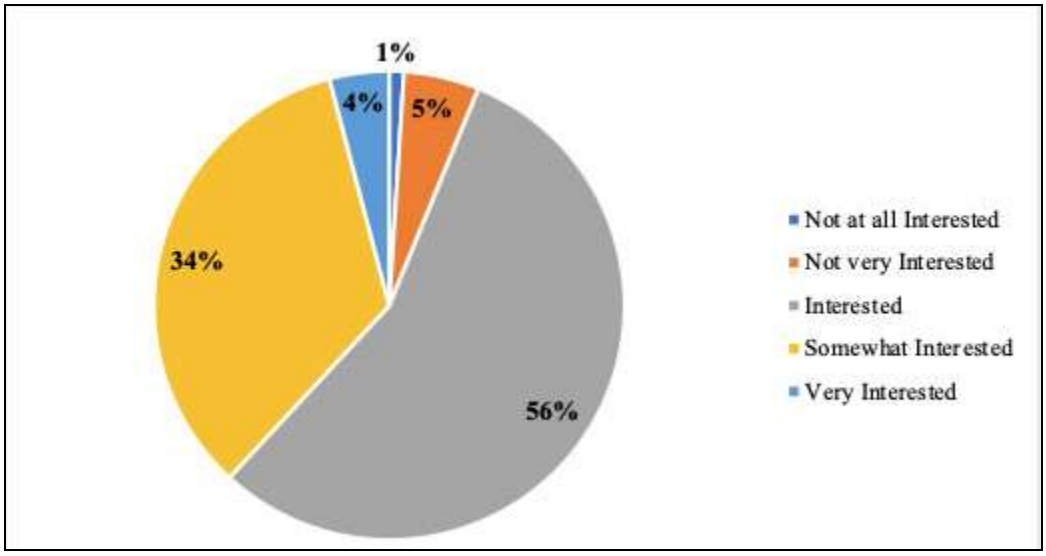

Figure 2. Level of interest in using ABA in intervention.

Table 3. Pre-training and post-training mean score of ABA general knowledge in both groups

Group	Pre-training		Post-training		Pre and post	
	Mean	*SD*	*Mean*	*SD*	*Mean*	*SD*
Experimental group	4.26	1.29	5.11	1.01	4.68	0.17
Control group	3.90	1.21	3.87	1.25	3.88	0.19
Both group	4.08	0.15	4.49	0.14		

4.3. The Situation of Applying ABA

- The frequency of applying ABA: The analysis results showed a change in the frequency of applying ABA in participants' practice with *p<0.01*. The test also indicated that there is an interaction between time and group with *p<0.05*. Thus, the change in frequency of ABA application depends on which group the intervention staff belongs to.

- The evaluation of ABA necessity and effectiveness: Although the overtime-change in the evaluation of ABA necessity with *p<0.05*, there was no interaction between time and group with *p>0.05*. This result was similar to the evaluation of ABA effectiveness: the change over time was significant but did not depend on whether the intervention was in the experimental group or the control group, with *p>0.05*. In contrast, regarding evaluating the ABA effectiveness, the change over time is not significant with *p>0.05*, but there is an interaction between time and group with *p<0.05*.

The level of interest: After the training period, the participant's level of interest increased significantly with $p<0.05$. Additionally, there was an interaction between time and group ($p<0.05$).

Figure 3. The over-time changing in ABA general knowledge of participants.

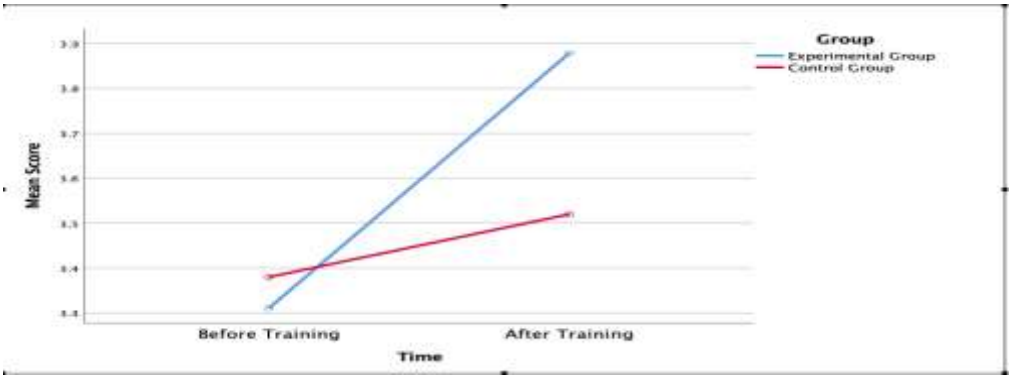

Figure 4. The over-time changing in ABA interest of participants

5. Conclusion and Discussion

5.1. Conclusion

This study was performed in order to; i) Explore the current situation of knowledge and implementation of ABA techniques in intervention for children with autism spectrum disorder in Vietnam; ii) Evaluate the effectiveness of a short-term training program on ABA in raising awareness of intervention teachers about evidence-based program's importance in intervention for children with autism spectrum disorder. The main results show that: Most of the intervention staff participating in the study have heard of the applied behavior analysis by the primary source of information coming from the experiences of other teachers and other less formal sources such as newspapers, the internet. The general knowledge about ABA of the intervention staff is quite limited when only 18% of the total answered correctly six items about ABA; almost half of the subjects answered correctly half of the items. Age and educational level are found to be positively correlated with knowledge of ABA. Staff majoring in psychology have a higher level of knowledge than most other disciplines. Over 95% of the

total respondents reported using ABA in their intervention. Regarding self-assessment results, "prompting", "fading", and "shaping" are techniques that were pointed to have the best knowledge and proficiency. The tests to compare the difference showed that: the self-assessment results are pretty similar to the evaluation results on the level of ABA knowledge of the intervention staff. More than 80% of the total respondents want to be trained in ABA as much as possible. Nearly 50% of the total participants reported that it takes much formal training to apply ABA in intervention for autistic children. None of the respondents chose to learn through experiences without training.

5.2. Discussion

It is illustrated that specialty is a variable that affects knowledge of interventions. This opinion was also supported by [21] when conducting research and finding out that special education teachers have a better insight into ABA than others [20]. Regarding ABA applied in intervention practice, the three most commonly used ABA techniques are reinforcement, prompting, and fading. Cormick's (2011) study conducted on a sample of 369 teachers supported that reinforcement, prompting, and fading were the three frequently used ABA techniques. Similarly, research by C. V. Tran (2017) surveyed a group of 103 intervention teachers in Vietnam also explored that reinforcement is the technique that teachers rate as predominant [22]. The study also indicated that the more often teachers use ABA in the intervention, the more highly they appreciate the necessity and effectiveness of these techniques. Thus, it can be seen that when individuals value an intervention's goals, progress, and effectiveness, they tend to apply, implement, and engage consistently. According to Kaff et al., (2007), the level of assessment of an intervention's effectiveness is connected to its application in practice [20]. Although the training program took place quickly, it covered ABA's primary contents entirely at a fundamental level and has achieved positive initial effects. After the training period, the general knowledge of the intervention staff in both groups has changed significantly; especially, there is an interaction between time and group. It showed that the change in knowledge of intervention staff after training depends on whether the intervention staff belongs to the experimental group or the control group. This result was similar to their self-assessments of both knowledge and skill proficiency, both of which were time-group interactions. The training program also helped the intervention staff reduce the difficulty in practice and increase the level of interest in ABA. However, the study has some limitations: the training program took place in a short time, with a relatively large number of students and a significant amount of knowledge; therefore, it will be challenging to ensure quality assurance training. Results from the study would be more convincing if participants were assessed post-training by a practical skills test. In addition, the research needs to collect additional data from the interview to explain further the results obtained from the self-assessment questionnaire.

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