The Effectiveness of the Pragmatic Skills Intervention for Young Adults with Mild Intellectual Disability (with or without co-morbid Autism Spectrum Disorder).

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The Asian Conference on Education 2018
Official Conference Proceedings

Abstract
Background: Trainers and teachers provided feedback that students with Mild Intellectual Disability (with and without co-morbid Autism Spectrum Disorders) faced challenges demonstrating the pragmatic skills necessary for them to be work ready. These students were studying in a special needs vocational school for students, aged between 17 to 21 years old. A pragmatic skills programme was developed and dovetailed into their work skills training lessons. Purpose: This study explored the effectiveness of the pragmatic skills intervention. Methods: In a single group observational study using pre/post-test design with a three-month follow-up, six students received pragmatic skills intervention during their WST lessons once weekly for four months from a Speech and Language Therapist (SLT). Beyond SLT's presence, teacher and trainers would also request the students for the targeted pragmatic behaviours during their WST lessons. Results: All students utilised more pragmatic skills at post-test and 3-month follow-up, with notable improvements observed for the ability to initiate a simple speech act. When students showed regression in their scores at 3-month follow-up when compared to post-test scores, they were still an improvement of pre-test scores. The prevalence of students regressing in their newly learnt behaviours of nonverbal communication and speech intelligibility were much lower compared to speech acts at 3-month follow-up. Achieving significant improvement in a new skill might diminish skill regression. Conclusions: All students utilised more pragmatic skills behaviours after the programme. Dovetailing the programme in the natural learning environment with constant attention on requiring targeted pragmatic behaviours were possible attributing factors.

Keywords: Mild Intellectual disability, Autism Spectrum Disorder, pragmatic skills, workforce ready.

BACKGROUND

APSN Delta Senior School offers two pathways to eligible students with Mild Intellectual Disability from the age of 17 years to transit to the workforce or further training opportunities. First, a vocational certification leading to national certification in selected industry areas (horticulture, retail operations, food services, and hotel & accommodation services). Students who successfully complete the vocational certification programme will receive the Singapore Workforce Skills Qualifications (WSQ) that would facilitate their job applications in the open market, or further advanced vocational training at the Institute of Technical Education (ITE) to pursue the National ITE Certificate (NITEC) when they meet the pre-requisites admission criteria for the courses. Second, a 2-year progressive competency-cased curriculum called LEAD Programme (LP) to work-capable students. Students in this programme could progress to the School-to-Work (S2W) Transition Programme that offer more customised training cum work options beyond the vocational certification pathways, or sheltered workshops.

The Year-2 LP students undergo a work skills training (WST) programme in their second year to prepare them for placement at post-school pathways, where they need to secure further WST for employment placement. Some examples of the work skills includes sweeping and mopping the floor, wiping furniture, assembling and disassembling boxes, packing and unpacking items.

In the course of completing a vocational task, practically, the student would need to use their pragmatic skills to communicate with others, "knowing what to say, how to say it, and when to say it and how to 'be' with other people" (Bowen, 2011). For example, during public cleaning, a member of the public might be standing at the location that the student needs to sweep. The student would need to be able to gain the attention of that person and initiate a simple interaction with that person, verbally or nonverbally. Generally, it was observed that when the public was not aware of the student's presence and remained at that location, the students tend to either hover around the area for a while and leaves without sweeping or continue sweeping including sweeping the feet of the member of public.

LP teachers and trainers provided feedback that the pragmatic skills of their students were often observed to be inadequate and impeding their post-school placements.

Aim

This study explored the effectiveness of the Job Readiness Programme (JRP), a pragmatic skills intervention for young adults with Mild Intellectual Disability (with or without co-morbid Autism Spectrum Disorder).

METHODS

This was a single group observational study using pre/post-test design with a three-month follow-up.

Participants

The JRP was designed for the cohort of students from the Year 2 LP classes (n=13). Teachers divided the cohort into two groups depending on their readiness to attend WST lessons, with one group starting their WST lessons in January and the other group in March. Students with long term absenteeism (n=2), the group of students that were shortlisted to start their WST lesson in July (n=3), and students who exhibited pragmatic skills (n=2), were excluded from this study. Of the six students included in this study, five of them were available for the pre-test (in January), post-test (in May) and 3-month follow-up (in August) assessments and one student was only available for the pre-test and post-test assessments. The group of students who started their WST lessons in July, while excluded from this study, were provided support customised to their level of functioning when they started their WST lessons.

Interventions

The students had WST lessons twice weekly for two full days. Some examples of work skills training included sweeping and mopping the floor, wiping furniture, assembling and disassembling boxes, packing and unpacking items. Besides practicing to achieve competency in their work skills, they also need to demonstrate the ability to complete simple social interactions commonly necessary at the workplace, to increase their opportunities to secure further employment training placements. For example, initiate to inform their teacher/ trainer when they complete each task, ask their teacher/ trainer when they do not understand their work schedule, request for help when they require assistance.

The Speech and Language Therapist (SLT) joined the students in their WST lessons once weekly for one lesson block (1 hour and 50 minutes) in Semester 1 (February to May). The Enhanced Milieu Teaching (EMT) and Direct Instruction (DI) approaches were used to teach the students to utilise their pragmatic skills, and the prompt hierarchy was used to support the student to achieve independence in their task.

In addition to supporting the students in exhibiting appropriate nonverbal communication (eye contact, facial expression, gesture), and verbal communication (speak intelligibility, specifically speech volume, as well as speech acts, initiate to inform/request) to complete a simple social interaction, the SLT also at appropriate context created “road blocks” while they were trying to complete their vocational task. For example, while the student was practicing the skill of sweeping, the SLT would step on the litter that was on the floor and wait for the student to say “Excuse me please” before moving away.

Thus, besides having opportunities to practice their vocational skills, the students also had ample opportunities to practise initiating simple social interaction within their work stimulation context appropriately.

Available information showed that the enhanced milieu teaching approach improved the student’s social use of language (Hancock et al, 2016; Kaiser et al, 2013), direct instruction teaching approach had superior research compared with minimally guided instruction (Wheldall, 2014), and prompting had been effective in supporting young adults with or without ASD learn new skills (Neitzel et al, 2009). Besides availability

of evidences, these interventions were adopted because of their relative ease of implementation within the WST setting.

Beyond the SLT's presence at the WST lessons, teachers and trainers also consistently elicited the targeted pragmatic behaviours during their WST lessons.

Outcome measures

The students were rated on the pragmatic skill variables (nonverbal communication, speech intelligibility, and speech acts) using a 5-point pragmatic skill scale (1 = unable to elicit; 2 = required verbal and physical prompts; 3 = required verbal and gestural prompts; 4 = required gestural prompts; 5 = initiated independently).

Inter-Rater Reliability

Inter-rater reliability (IRR) measures were taken for all pragmatic skill variables on all students who participated in this study by two teachers at pre-test, post-test and 3-month follow-up, and two APSN SLTs (from another two schools) administrated their assessment at post-test and at 3-month follow-up. While statistical measures of agreement between raters were not obtained with Krippendorff's alpha of 0.402 among the teachers and SLT, and 0.339 among the three SLTs, all raters were in agreement in their rating directions as explained in Table 6.

RESULTS

In the analyses of this study of whether the JRP was effective, the students' pragmatic skills scores at post-test and 3-month follow-up were compared to their pre-test scores. For the JRP to be effective as the students' pragmatic skills intervention, their post-test or/and 3-month follow-up scores should be higher than their pre-test scores. The SLT's assessment of the students' pragmatic skills scores assessed at these three junctures were shown in **Figure 1**. Medians, ranges and standard deviations were provided in **Table 1**.

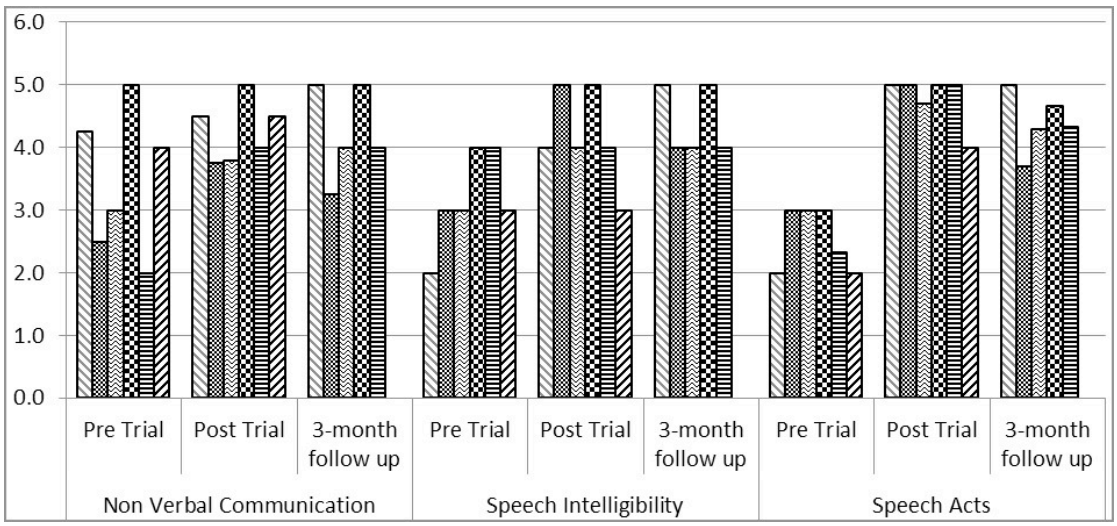

Figure 1: DSS SLT's rating of students' pragmatic skills at pre-test, post-test and 3-month follow-up

Table 1: Number (n), median raw score, range and standard deviation (σ) by Pragmatic skills variables rated by SLT 1

Rater: SLT 1	Pre-Test				Post-Test				3-month follow-up			
Variable	N	Median	Range	σ	N	Median	Range	σ	N	Median	Range	σ
Non Verbal Communication	6	3.50	2-5	1.145	6	4.25	3.8-5	0.490	5	4.00	3.3-5	0.750
Speech Intelligibility	6	3.00	2-4	0.753	6	4.00	3-5	0.753	5	4.00	4-5	0.548
Speech Acts	6	2.67	2-3	0.502	6	5.00	4.7-5	0.402	5	4.33	3.7-5	0.484

Nonverbal communication

Table 2 showed that the degree of the nonverbal communication scores relationship between the pre-test and post-test, as well as the pre-test and 3-month follow-up had strong statistical correlations and were statistically significant ($p<.05$). There was no statistical significance between the post-test and 3-month follow-up scores although there was strong statistical correlations. A student with high nonverbal communication scores at pre-test was a strong indicator to possibly achieve a high nonverbal communication scores at post-test as well as at 3-month follow-up.

Table 2: t-Test: Paired Two Sample (Nonverbal Communication)

Nonverbal communication	*Pre-Test*	*Post-Test*	*Post-Test*	*3-mth follow-up*	*Pre-Test*	*3-mth follow-up*
Mean	3.458	4.258	4.210	4.250	3.350	4.250
Variance	1.310	0.240	0.283	0.563	1.550	0.563
Observations	6	6	5	5	5	5
Pearson Correlation	0.905		0.893		0.853	
df	5		4		4	
t Stat	-2.67910		-0.24526		-2.79414	
P(T<=t) one-tail	0.02193		0.40916		0.02455	
t Critical one-tail	2.01505		2.13185		2.13185	
P(T<=t) two-tail	0.04387		0.81833		0.04910	
t Critical two-tail	2.57058		2.77645		2.77645	

Speech Intelligibility

Table 3 showed that the speech intelligibility scores between pre-test and post-test as well as pre-test and 3-month follow up were statistically significant ($p<.05$) while the scores between post-test and 3-month follow-up was not statistically significant ($p\geq.05$). Their strength of association between all scores was low. A high speech intelligibility score at pre-test had low indication that it would correspondent to high speech intelligibility at post-test or low speech intelligibility at 3-month follow-up.

Table 3: t-Test: Paired Two Sample (Speech Intelligibility)

Speech Intelligibility	*Pre-Test*	*Post-Test*	*Post-Test*	*3-mth follow-up*	*Pre-Test*	*3-mth follow-up*
Mean	3.167	4.167	4.4	4.4	3.2	4.4
Variance	0.567	0.567	0.3	0.3	0.7	0.3
Observations	6	6	5	5	5	5
Pearson Correlation	0.294		0.167		-0.218	
df	5		4		4	
t Stat	-2.73861		0		-2.44949	
P(T<=t) one-tail	0.02043		0.5		0.03524	
t Critical one-tail	2.01505		2.13185		2.13185	
P(T<=t) two-tail	0.04086		1		0.07048	
t Critical two-tail	2.57058		2.77645		2.77645	

Speech Acts

Table 4 showed that the speech acts scores between pre-test and post-test, as well as pre-test and 3-month follow-up were statistically highly significant ($p<.01$). And the post-test and 3-month follow-up were statistically significant ($p<.05$). The strength association between pre-test and post-test was moderate, between post-test and 3-month follow-up was low, between pre-test and 3-month follow-up was strong. A high speech acts score at pre-test was a good indication that a low speech acts score at 3-month follow-up would be unlikely. A high speech acts scores at pre-test had moderate indication that a high speech acts score at post-test was likely.

Table 4: t-Test: Paired Two Sample (Speech Acts)

Speech Acts	*Pre-Test*	*Post-Test*	*Post-Test*	*3-mth follow-up*	*Pre-Test*	*3-mth follow-up*
Mean	2.556	4.783	4.940	4.400	2.667	4.400
Variance	0.252	0.162	0.018	0.234	0.222	0.234
Observations	6	6	5	5	5	5
Pearson Correlation	0.418		0.116		-0.609	
Difference	0		0		0	
df	5		4		4	
t Stat	-11.03298		2.48088		-4.52431	
P(T<=t) one-tail	0.00005		0.03407		0.00531	
t Critical one-tail	2.01505		2.13185		2.13185	
P(T<=t) two-tail	0.00011		0.06815		0.01062	
t Critical two-tail	2.57058		2.77645		2.77645	

DISCUSSION

Changes in student's pragmatic performance between pre-test and post-test, post-test and 3-month follow-up, as well as pre-test and 3-month follow-up were shown in Figure 2. Medians, ranges and standard deviations were provided in Table 5.

Differences at Post-Test

It was observed that all students had shown improvements in their pragmatic skills at post-test when compared to their behaviours at pre-test. Notable differences were observed in all the students' ability to perform speech acts with greater independence.

When no difference was observed in a particular pragmatic variable between the three junctures of assessment, the intervention did not cause any student to exhibit

regression in his/ her pragmatic skills behaviours. It was noted that their pragmatic skills were at moderate to high levels before commencing JRP. Three such incidents were observed. Firstly, a student who obtained a 5-point rating for nonverbal communication score at pre-test, also obtained a 5-point rating for nonverbal communication score at post-test and at 3-month follow-up. Secondly, a student who obtained a 4-point rating for speech intelligibility at pre-test, also obtained a 4-point rating for speech intelligibility at post-test and 3-month follow-up. Thirdly, a student who obtained a 3-point rating for speech intelligibility at pre-test, also obtained a 3-point rating for speech intelligibility at post-test (the student was not available for assessment at 3-month follow-up).

Differences at 3-month follow-up

It was observed that all students had shown improvements or sustained their improvements in their pragmatic skills at 3 months follow-up when compared to their behaviours at pre-test.

When students showed regression at 3-month follow-up when compared to their post-test results, their results at 3-month follow-up were still an improvement compared to their pre-test results.

It was observed that comparatively students faced greater challenges sustaining their improved speech acts behaviour between post-test and 3-month follow-up, as opposed to improved nonverbal communication and improved speech intelligibility, a variable that shown notable improvements at both pre-test and post-test as well as pre-test and 3-month follow-up.

Nevertheless, there was an occurrence where the student was able to sustain a 3-point rating improvement for the speech acts variable at post-test to 3-month follow-up with no observable regression. This student exhibited the greatest improvement in speech act (from a 2-point rating to a 5-point rating) compared to his/ her peers. A significant improvement in the utilisation of the speech act might be an indication of the resistance level of regression for a newly acquired pragmatic skill.

It was also noted that the prevalence of students regressing in the utility of their newly learnt behaviours of nonverbal communication and speech intelligibility were shown to be low.

In addition, it was observed that the students could improve their pragmatic variables of nonverbal communication and speech intelligibility beyond the post-test phase.

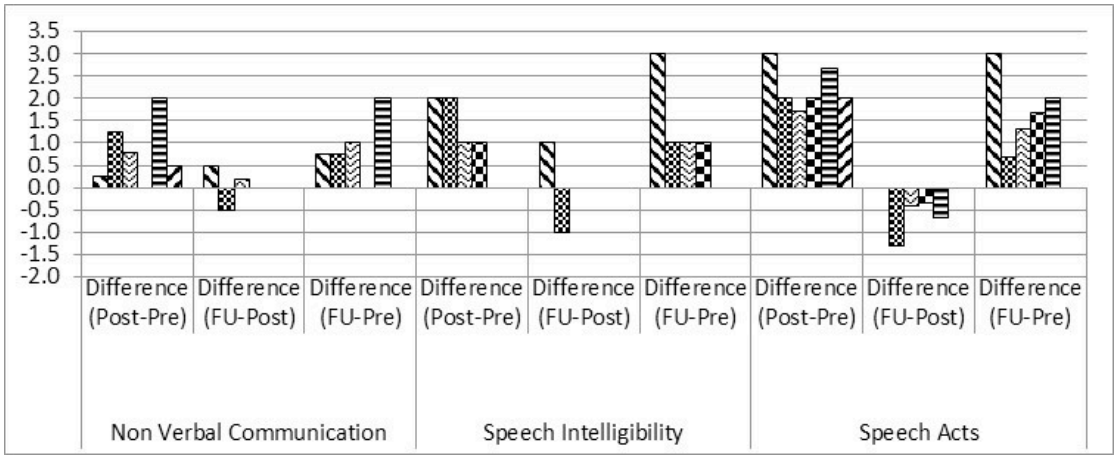

Figure 2: Changes in student's pragmatic performance between pre-test and post-test, post-test and 3-month follow-up, & pre-test and 3-month follow-up.

Table 5: Number (n), median raw score, range and standard deviation (σ) by Pragmatic skills variables of change in students' performance between pre-test and post-test, post-test and 3-month follow-up, & pre-test and 3-month follow-up.

Rater: SLT 1	Pre/ Post Differences				Post/ Follow-up Differences				Pre/ Follow-up Differences			
Variable	N	Median	Range	σ	N	Median	Range	σ	N	Median	Range	σ
Non Verbal Communication	6	0.65	0.3-2	0.731	6	0.00	-0.5 to 0.2	0.365	5	0.75	0-2	0.720
Speech Intelligibility	6	1.00	0-2	0.894	6	0.00	-1 to 1	0.707	5	1.00	0-3	1.095
Speech Acts	6	2.00	1.7-3	0.495	6	-0.40	-1.3 to 0	0.487	5	1.67	0.7-3	0.857

Differences in rating between APSN SLTs

While the inter-rater reliability measure among three SLTs was not in statistical agreement under Krippendorff's alpha, identical rating directions were commonly observed in this study as shown in Table 6. Such agreements in rating directions provided practical confirmation of students' learning and progression.

Possible reasons for not obtaining statistical agreement between raters included insufficient rater discussion prior to rating, different opportunities to ascertain target behaviours, and the use of a conservative measure (Krippendorff's alpha) to calculate inter-rater reliability.

Table 6: Rating directions among three SLTs

Student	**Agreements in rating directions among three SLTs**
1	Identical ratings in 3-month follow up
2	Identical observation of student's regressed behaviours in 3-month follow up
3	Identical 4-point & higher ratings in 3-month follow up
4	Identical 5-point ratings for nonverbal comm + Intelligibility, above 4-point ratings for Speech Acts in post-test and 3-month follow up
5	Identical 4-point ratings or higher in 3-month follow up
6	Identical 3-point & higher ratings in post-test (student not present at 3-month follow up)

Differences in ratings between SLT and teachers

Both teachers' ratings were in agreement with the study's finding that the student utilised greater pragmatic skills at 3-month follow up compared to pre-test although there was no statistical agreement on the inter-rater reliability measure. The medians, ranges and standard deviations by Teacher 1 and Teacher 2 were provided in Table 7 and Table 8.

Table 7: Teacher 1 rating of students' pragmatic skills at pre-test, post-test and 3-month follow-up

Rater: Teacher 1	Pre-Test				Post-Test				3-month follow-up			
Variable	N	Median	Range	σ	N	Median	Range	σ	N	Median	Range	σ
Nonverbal Communication	6	3.00	2.8-4	0.557	6	3.50	2.8-4	0.719	6	3.88	2.8-5	0.858
Speech Intelligibility	6	3.00	2-3	0.408	6	3.00	3-4	0.408	6	4.50	3-5	0.983
Speech Acts	6	3.00	3	0.000	6	3.33	3-4	0.502	6	4.00	3-4.7	0.723

Table 8: Teacher 2 rating of students' pragmatic skills at pre-test, post-test and 3-month follow-up

Rater: Teacher 2	Pre-Test				Post-Test				3-month follow-up			
Variable	N	Median	Range	σ	N	Median	Range	σ	N	Median	Range	σ
Nonverbal Communication	6	3.00	2-4	0.749	6	3.38	2.5-4.3	0.683	6	3.88	3.5-4.8	0.585
Speech Intelligibility	6	2.50	2-3	0.548	6	3.00	3-4	0.408	6	4.00	3-4	0.408
Speech Acts	6	3.00	2-4	0.712	6	3.34	3-4.3	0.587	6	3.85	3.7-4.7	0.384

CONCLUSIONS AND CLINICAL IMPLICATIONS

The results of this study showed that all students with MID (with or without co-morbid ASD) utilised more pragmatic skills behaviours after the programme. Notable improvements were observed in their ability to initiate a simple speech act. When students showed regression in their scores at 3-month follow-up when compared to their post-test scores, their scores at 3-month follow-up were still an improvement compared to their pre-test scores. The prevalence of students regressing in their newly learnt behaviours of nonverbal communication and speech intelligibility was much lower than speech acts at 3-month follow-up although they made notable improvements on their speech acts.

This study suggested that a student with high nonverbal communication scores at pre-test was a strong indicator to possibly achieve a high nonverbal communication scores at post-test as well as at 3-month follow-up. A high speech intelligibility score at pre-test had low indication that it would correspondent to high speech intelligibility at post-test or low speech intelligibility at 3-month follow-up. A high speech acts score at pre-test was a good indication that a low speech acts score at 3-month follow-up would be unlikely. A high speech acts scores at pre-test had moderate indication that a high speech acts score at post-test was likely. In addition, achieving a significant improvement in utilising a new skill might provide an indication of the resistance level of regression for that new learnt skill.

Issues relating to skill generalisation from clinical setting were minimised as pragmatic skills training was dovetailed into the students' work skills training. The students learnt and practised using their pragmatic skills in the course of carrying out their vocational task as one set of action, similar to how typical learners learn.

Further possible reason for improvements in behaviours might also attribute to the constant prompts by their teachers/trainers for beyond SLT's presence. The collaboration of this programme might have increased the awareness and attention of staff to request for students to use the targeted pragmatic behaviours. This was in line with Parons' (2017) meta-analysis which suggest that the person(s) of focus is a significant mediator of intervention effect.

In this study, the students' speech intelligibility was primary rated on their speech volume. Besides physiological organic factors (e.g. vocal folds, breath support), speech volume might also be dependent on variables such as personality traits and psychological factors (Roy et al, 2000). The statistical findings obtained in this study of low association and significant presence between the speech intelligibility scores was in line with this tenet.

As students' main educators, a reliable assessment of their behaviours by teachers, trainers, and allied health professionals would be essential in a transdisciplinary setting. Similarly, this same importance applies to caregivers (Stolarova et al, 2014). This study highlighted the need for continual collaboration between student's stakeholders. It would also be an important consideration when exploring the possibility of extending the programme beyond school setting.

ACKNOWLEDGEMENTS

The author gratefully thanks the APSN Delta Senior School staff and students (2017 Year-2 LP class) as well as APSN (Chao Yang School and Tanglin School) SLTs for participating in this study.

Declaration of interest: The author reports no conflicts of interest. The author alone is responsible for the content and writing of this paper.

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