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Observed changes in the alertness and communicative involvement of students with multiple and severe disability following in-class mentor-modelling for staff in segregated and general education classrooms **(Revised: Version 3)**

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Method. Observational data was collected on eight students with MSD and their 16 teachers and teachers' aides (paraprofessionals), using a multiple baseline across students design, replicated across special and general school setting types.

Results. Results indicated variable improvements in student alertness and increased communicative interactions. In some cases significant differences in communicative involvement and awake-active-alert activity were observed.

Conclusions. These findings underline the complexity of variables involved in delivering educational and communicative interventions for staff working with this population. Implications for further research and application to daily practices in classrooms are discussed.

Keywords multiple disability, severe disability, behaviour states, communication, professional development, educational settings

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Introduction

Improvements in medical intervention over the last 20-30 years have resulted in more children with multiple and severe disabilities (MSD) surviving birth and having a longer life expectancy (Author I). It is now widely accepted that every child, regardless of the degree or complexity of their disability, is entitled to the best possible educational program. In the case of students with MSD, the goals of that program will generally be very different from those of a typical school program, and will tend to focus on assisting children to communicate their wants and needs, to participate in choice-making about issues relating to all aspects of their life quality, and to interact with those around them (Munde, Vlaskamp, Ruijssenaars, & Nakken, 2009a). Importantly, educational goals set the scene for the individual student to thrive in both their current and future environments, and typically they will focus on strategies for communication, socialisation and independence (Author I, 2009). Ideally, education for individuals with MSD commences shortly after birth and continues throughout adulthood. At the heart of educational programming for students in this group is the process of communication and the vital role of interactive partners such as teachers, aides, peers and family members. Communication in individuals with MSD is typically non-verbal, and relies heavily on other people understanding idiosyncratic forms of communication such as facial expressions, body gestures and sounds. Whilst we have a burgeoning data base on evidence-based approaches to communication supports, including strategies to improve prelinguistic interactions and the systematic introduction of augmentative and alternative communication (AAC) modalities, translational issues from research to practice continue to confront the field in this and many related areas (Author J, 2008; Cook & Odom, 2013).

With this point in mind, the design and uptake of practical, reliable and personalized assessment and intervention practices in classrooms supporting students with MSD continues to be a major challenge. **What can educators do to maximise the engagement and communicative involvement of their students with MSD?** At a broader systemic level, it would be helpful to identify the relative effectiveness of professional development techniques that directly result in planning for student growth and development in the crucial areas of engagement and communication. Specifically, this paper presents observational data from a recent project that examined whether an in-class mentor-model approach to professional learning

for educators supporting students with MSD would produce increases in observed alertness and engagement in these individuals.

Professional development as an intervention to support engagement in students with MSD

Professional development is generally regarded as essential to the task of increasing the knowledge and skills of all teachers. However, research over the years has highlighted the difficulties of translating best practice research into classroom practices (Cook & Odom, 2013; Durlak & DuPre, 2008; Fixsen, Blase, Naoom, & Wallace, 2009; Odom, 2009). Teacher preparation, the type of professional development provided to teachers, and the context in which the innovations are implemented, have been cited as influences on the effectiveness of such programs (Jones, 2010; McLeskey & Waldron, 2004). Relatively large numbers of teachers of students with MSD have not undertaken special education training (Carter, Chalmers, Clayton & Hook 1998; Lang & Fox, 2004).

A major impediment to the development of effective programs for students with MSD has been the need for tailored and sustained support for those in the position of preparing goals and strategies, including appropriate assessment and program development protocols that address the needs of individuals with MSD (Melstrom, Saunders, Saunders & Olswang, 2005: Stephenson, Carter & Arthur-Kelly, 2011). An important factor is the existence or otherwise of teacher skills, knowledge and support for the intervention (De Bortoli et al., 2012). To date there has been only a handful of studies that specifically explore the reports and active input of teacher participants alongside observational student and classroom data (see Stephenson et al., 2011; Author E, 2007). Author E noted that teachers and aides who had participated in a professional development program designed to improve their communicative interactions with students with MSD reported improved skills and knowledge at the end of the training program. However, this did not lead to changes in student behaviour. Observations of students showed no general increase in communicative interactions following the training program. In some cases, paradoxically, communicative interactions decreased.

Components of effective professional development for educators

The content of a professional development program may be sound, but it needs to be delivered in a way that facilitates participants' ability to promote positive change in their students. It should provide teachers and support staff with the necessary skills not only to be successful partners in communicative interactions, but also to program for positive change in the communicative abilities of students with MSD. From the literature, it would appear that a successful

professional development program incorporates: 1) theory; 2) strategy instruction; 3) modelling; 4) practice with feedback; 5) general feedback; and 6) follow up (Coleman, 2000; Leech & Conto, 1999).

To address the six effective elements mentioned above, a model of in-class mentoring was used in the study reported here, with the intention of providing relevance through proximity to staff and students. This potentially allowed the development of individualized communication strategies relevant to classroom routines and students' needs. In the present study, this model was delivered to teachers and teachers' aides of four students with MSD in segregated settings and four students with MSD in mainstream classes in general education.

Behaviour state assessment

The use of behaviour state assessment for individuals with complex needs has emerged in the last three decades, based on the early work of Brazelton and applied to the profiles of students with the most severe and multiple disabilities by Guess and others (Author B 2003; Guess, Roberts, & Rues, 2002; Guess, Roberts, Siegel-Causey, & Rues, 1995). By gauging the level of involvement and responsiveness of individuals with MSD, educators can design interventions that maximise engagement and participation, in the context of variables such as diet, medication and a range of socio-communicative factors. Examples of behaviour states used in such studies include *asleep-active; drowsy; daze; awake-active-self stimulatory;* and *awake-active alert*. Communication codes that have been utilised include *communicative interaction; partner cue: no student response;* and *student cue: no partner response* (Author B; Author C 1999).

Several authors have attempted to explore the link between behaviour states and educational factors originally conceptualised and explored by Guess et al. (1995). For example, in a study of students with MSD in special school classrooms, Author D (2004) observed a positive relationship among awake and alert behaviour states and the presence of educational activities and communicative opportunities, based on the systematic collection of descriptive data. This finding supported the conclusions reported by Ault et al. (1995) in relation to the positive introduction of individualized interventions for students with MSD, centred on improvements in demonstrated alertness, communication and participation in everyday activities.

This work is not without challenges, as indicated by researchers such as Mudford, Hogg and Roberts (1997) and Woodyatt, Marinac, Darnell, Sigafoos, and Halle (2004). In their recent review, Munde et al. (2009a) highlighted both the importance and the difficulties inherent in defining standard terms for alertness and behaviour states, and identifying reliable measures in

complex contexts. One tool these researchers have developed and used in Dutch classrooms is an observation list that categorises the alertness of students with MSD into one of four levels of alertness. As well as achieving high inter-observer reliability scores, this technique is quite practical and will no doubt facilitate teacher involvement in gauging times when students with such complex needs are more (and less) alert and responsive (Munde, Vlaskamp, Ruijssenaars, & Nakken, 2011). Mattie and Kozen (2007) described a series of case studies involving students with MSD in a special school setting, and focused on the degree to which staff were embedding behaviour state goals into individualized educational programs. Their paper aptly points to the importance of better identifying ways to assist staff working in this challenging area to set goals for behaviour state and communication improvements in their students. Interestingly, Mattie and Kozen (2007) developed and utilised an individualized educational program (IEP) evaluation checklist to assist in the task of clarifying planning evident in student programs in relation to preferred behaviour states. The case studies reported by Mattie and Kozen illustrate variability in teacher practices, and the central role of observed behaviour states as a keystone in programming for students with MSD.

Setting differences

Despite a general increase in awareness over the past decade regarding the role of inclusion as an educational variable (Author I 2009), the issue of setting choice for students with MSD is controversial, and there continues to be little Australian research available. Author F (2004) reported an investigation in which a sample of 16 students, comprising eight students with MSD in regular classrooms and eight students with MSD in special school classrooms, matched for age and gender, were each observed for one full school day. The level of student alertness and contextual data about communicative activity, social groupings and other defined variables indicated statistically significant differences between participants in the two settings. Specifically, students in the regular classroom, as a group, were more actively alert and experienced more communicative involvement and interaction than their peers in special schools.

Our current and previous research has shown that special and regular school programs for students with MSD tend to focus a large amount of time on personal care needs, and that many students spend a large part of each day in behaviour states that are less than optimal for interaction and communication, consistent with the findings of Guess and his team. Our earlier research has shown that children with MSD can spend up to 70% of their school day with no communicative interactions (Author B; Author F). In addition, as Munde et al. (2009a, 2011)

have highlighted, it is important that tools that measure alertness are both reliable and practitioner-friendly if they are to truly impact on educational planning and instruction for students with MSD.

The present study was developed in an attempt to investigate strategies for translating research on best practice in teacher professional development into classrooms supporting students with MSD. We asked: how can teachers and aides be supported in a practical way to trial and adapt teaching strategies that impact on the communicative involvement of their students and maximise their engagement? Educators are faced with the challenge of providing an education that ensures students reach their full potential and have an optimal quality of life. The ability to interact with the environment and communicate wants and needs are integral factors in the improvement of an individual's quality of life. The provision of an adequate communication system and transactive ecology which provides students with the ability to interact positively with their environment and engage socially with others is paramount to the enhancement of their quality of life. The skills of the communication partner involved in an interaction with a student with MSD will have a significant effect on the success of the interaction (Kent-Walsh & McNaughton, 2005; Sigafoos, Arthur-Kelly & Butterfield, 2006). It is therefore important that professional development provides teachers and other communication partners with the knowledge and skills to ensure quality education for their students. The relevance, practical integrity and delivery mode of a professional development program are likely to be deciding factors in the program's ability to promote positive changes for staff and students.

Research question

- Does the provision of a partner training and mentor modelling program in communication support have a positive impact on the observed behaviour states and contextual conditions experienced by students with multiple and severe disabilities enrolled in special school and regular class programs?

Method

Research Design

A single-subject multiple baseline design across participants approach was used in both phases of this study. The elements of a multiple baseline design allow for an experimental question to be answered by establishing a stable baseline for each participant and concurrently introducing the

intervention to each student (Kennedy, 2005). In Phase 1 (special schools) baselines were established concurrently for each of the four students' awake-active-alert (AWAA) behaviour state and communicative interactions (CI), and the intervention was introduced one student at a time, following a change in the observed behaviour from baseline levels. Because of the multiple-baseline design for data collection, there was one student per class in four classes. This design was replicated in Phase 2 in four general education settings.

Participants and settings

The study involved eight students aged from 5-13 years with MSD and their teachers and paraprofessionals. In Phase 1, participants were four students who attended segregated classes in separate special schools. Each class comprised up to six students with MSD staffed by a teacher and teachers' aide. In Phase 2, participants were four students with MSD who were included in a mainstream (regular) class, with an average enrolment of 28 peers. A full time paraprofessional was assigned to meet the daily needs of the student with MSD within this classroom. In total then, four students were enrolled in special schools and four were enrolled in mainstream classes in the XXXXX Region of New South Wales, Australia.

The in-class mentoring model was delivered to the 16 primary in-school communication partners of the eight students: teachers and paraprofessionals. Participation in this study was on a voluntary basis. The school principal was asked to identify suitable students with an identified severe intellectual disability who also met three out of the four adaptive criteria for individuals with MSD, as identified in the research literature (Guess et al., 1995). These criteria are: a) Dependence on others to meet basic daily needs b) An absence of verbal skills, c) Sensory loss, and d) Severe motoric difficulties. Participating staff and family members agreed to participation in the research study in line with ethical protocols of informed consent, as approved by The University of XXXX and the relevant educational authority.

Instrumentation

Each participating student and staff member was involved in the collection of relevant background and educational data at the commencement of the study.

Vineland II Adaptive Behaviour Scale

Students with MSD typically score in the very early developmental bands on most standardised forms of assessment. The Vineland II Adaptive Behaviour scale (Sparrow et al., 2005) reports on adaptive and behavioural skills in the form of a questionnaire. To confirm the students' functional level, the Vineland II was completed jointly by the project manager and classroom

teacher before observations commenced (Table 1).

TABLE 1 ABOUT HERE THANKS

Observational Codes: Students and Staff

The observational codes for behaviour state and contextual variables used for data collection were developed and used by investigators such as Guess et al. (1993) and Author B (2003), and include the behaviour states, social context, communication partners, and communication strategies and indicators.

Behaviour states

The behaviour state codes collect information relating to the levels of alertness of the target student and their levels of engagement with their environment. In a manner similar to that reported by Munde et al. (2011) states were divided into four main categories;

1) The preferred awake states; including awake-active-alert and awake-inactive-alert
2) The less desired awake states: awake-active-self-stimulatory, awake-active-self-injurious, and crying
3) Sleep states; asleep-inactive and asleep-active
4) Indeterminate states; daze, drowsy and seizure

The contextual codes collected data from four areas; communication indicators, communication partners, social context and partner interactions, described below.

Communication indicators and partners

The *communication indicator codes* consist of four codes designed to provide information relating to the communication patterns of the target student. The codes report on the observed communication interactions between the target student and potential communication partners. These include a communication cue from either the student or the partner, which was not responded to, or a communicative interaction (CI) that involved an exchange of meaning between the student and their partner. The *communication partner codes* are a subset of the communication indicator codes, providing observational information on the communication partners involved in a communicative interaction, or the presence of a potential partner. The codes provide information as to the type of communication partner observed in an interval (for example, teacher, aide, peer or other).

Social codes

The social codes aim to observe the social context experienced by the student, describing the grouping in which the student is positioned; whether they are part of a large group, small group, close to one other person, or by themselves. Such information is relevant to the communication opportunities for a student.

Partner interactions

The *partner interaction codes* were developed for this study and are designed to collect information on the staff participants and their use of the strategies developed during the collaborative professional development program. In line with the goals of the study, each classroom context involved different tailored strategies to meet the needs of the target student. Full details for the codes are available from the second author.

Procedures

The study reported here was conducted in two phases, involving the provision of a communication mentor model program to the educational partners of students with MSD in two distinct setting types. Phase 1 was delivered to students and their communication partners from special schools (segregated settings) and Phase 2 involved students and their communication partners in regular classrooms. The professional development program involved a suitably experienced and qualified researcher attending the school in which the student was enrolled and providing instruction and strategy development in classrooms as well as in adjoining rooms as necessary. Most sessions involved the mentor-model engaging with staff and students in natural learning settings, although from time to time staff discussions were held in adjacent classrooms or the school staffroom. An important factor in the efficacy of the study was the experience and abilities of the mentor model. In all eight classrooms, the same person performed this role. This researcher had extensive experience as a teacher of students with MSD in several schools, and was completing her doctoral study on this project.

Partner interaction codes were designed and used to collect observational data on the 16 communication partners of the target students, both during and after the professional development program. Observational behaviour state and contextual data was collected on the eight target students, before, during, and after the implementation of a collaborative communication professional development program. A large amount of data was collected and continually analysed before the intervention to ensure the establishment of a stable baseline. Data was analysed continually throughout the intervention project and used to provide relevant information for feedback to the communication partners. This feedback included the graphed

data showing the use of the communication strategies, changes in the observed behaviour state of the student, and observed changes in the nature and frequency of communicative interactions between the communication partners and the student.

Observer Training. Issues of reliability and validity in the collection of behaviour state data have been discussed in a robust manner in the research literature (see Arthur, 2000; Mudford et al., 1997; Woodyatt et al., 2004). Questions about the phenomenon of behaviour state as a viable construct and challenges in defining each behaviour state code operationally highlight the central importance of ensuring that observer training using these codes is both rigorous and extensive. Seven observers were trained in the collection of observational data for this study. The observer training program comprised of three training sessions held at the University and field trials in the classrooms of some of the students involved in the study. The observers were trained using video footage and training exercises developed for this study, presented by several of the lead investigators on the project, who had extensive experience in this type of fieldwork using behaviour state and contextual codes and definitions. In line with usual practice in this type of observational study, all observers were required to meet an 80% criterion for agreement in a minimum of four of the six observed variables, before formal data collection commenced. Six of the seven observers achieved the 80% criterion in all six observed variables. A percentage agreement was calculated using the formula: agreements/ (agreements + disagreements) X 100% (Alberto & Troutman, 2003). Prior to the main data collection round, the observers were exposed to field trials in the classrooms of the student sample. This provided an opportunity for the students and staff of the class involved in the study to become familiar with the presence of the researchers and their team of observers.

Data Collection. Observational data was collected using 10-second interval measures with a 10-second rest. This provides 15 intervals of observation in every five minute period. Each observational session was 90 minutes in duration. Following a 10-second observation, the observers were required to mark their finding on an observational grid in a 10-second recording rest. The observational sessions were selected from a period in the individual classroom timetable less prone to disruptions and when movement of the staff and students would be minimal, depending on negotiation on a class by class basis. This resulted in the selected observational sessions occurring primarily in the morning sessions between the hours of 9am and 11am and the middle session between 11am and 1pm. For each of the two phases (special schools and regular schools), data collection began simultaneously in each classroom of the four

students and eight staff participants involved. Observational data was collected twice weekly, until a stable baseline was established for each student.

Once a stable baseline was established for student one, the intervention began, and data was collected twice weekly until a change in the partner interaction codes was observed. Once this change occurred, the intervention moved to the next student. Maintenance and follow-up data was collected following the intervention phase for all students. Baseline data continued to be collected twice a week prior to the intervention with students 2-4.

It was not possible to collect a stable baseline on the complete set of partner interaction codes. The partner interaction codes were designed to capture the use of the communication strategies developed during the professional development intervention. As the strategies were developed collaboratively after baseline ended, baseline data was collected only on those partner interaction codes that did not involve the specific strategies. For example, these base codes included partner working with target student, partner working with other student, partner not working with students, and partner absent. These data will be reported in a subsequent paper.

Inter-observer and procedural reliability checks. Inter-observer agreement checks were performed on a minimum of 25% of the observational sessions for each class team. Each inter-observer session comprised the main observer and a second trained inter-observer independently coding the same 90 minute observational session. Both observers were connected to the same iPod device to ensure the 10-second interval tones were synchronised. Because of various school-based scheduling constraints, it was not possible to randomly select the inter-observer sessions. The inter-observer sessions were selected taking into consideration researcher and school availability. The inter-rater observation checks were used to determine mean percentage agreements between observers, with the further addition of the Kappa correction for chance agreement in order to improve the rigor of the data set.

Procedural Checklist. The procedural checklist was developed to collect information from the partners involved in the collaborative development program, following the intervention. It was designed to independently check the degree to which each participant in the study was provided with identical information and experiences. The procedural checklist also questioned the partner participants on their opinions of the mentor-model professional development program. The project manager conducted one randomly scheduled visit during the intervention phase to observe the current phase of the project and to verify that the mentor had implemented all components of the initial phase of the professional development program. During this visit, the

project manager informed the classroom team of a further procedural reliability check involving a phone interview. The procedural checklist was subsequently conducted by the project supervisor without the presence of the program mentor-model.

Intervention: Professional Development Program

The intervention used in this study was in the form of a collaborative professional development program consisting of five general steps, delivered by a mentor-model with extensive expertise in the area of education for students with MSD. The program was designed to incorporate the six features of successful professional development referred to earlier: theory, strategy instruction, modelling, practice with feedback, general feedback, and follow up. To provide an effective model of delivery, the professional development in this study occurred in the classrooms of the participating students, allowing the in-class mentor the opportunity to develop and model specific communication strategies. The cyclical nature of the model ensured the continuation of feedback and strategy development until a positive change occurred for the target student. Subsequent papers will provide detailed analyses of the specific strategies and supports that were introduced in each participating classroom in the context of the following general intervention steps.

Step 1: Provide the participating staff members with a detailed description of the intervention, highlighting their involvement in the collaborative process. Seek commitment from the participating staff members to participate to the best of their ability in all aspects of the intervention.

Step 2: The collection of background data. The intervention and classroom team met to collect information relating to any medical conditions that may be relevant to data collection, and complete the Vineland II Adaptive Behaviour Scale (Sparrow et al., 2005). Wherever possible, parents and caregivers were directly involved in this phase of the intervention.

Step 3: The intervention team provided the classroom staff with a workshop on general communication programming, assessment and strategies.

Step 4: The intervention team met to develop and implement strategies for the target student.

Step 5: The intervention and classroom team met to review progress. If the chosen strategies were not successful in improving the communicative abilities of the target students, new strategies were developed and implemented.

This model was delivered to teachers and teachers' aides of four students in segregated settings (Phase 1) and four students in regular classrooms (Phase 2).

Results

Inter–Observer Agreement

Inter-observer agreement checks were performed on a minimum of 25% of the observational sessions for each class team. Each inter-observer session comprised the main observer and a second inter-observer independently coding the same 90-minute observational session. The inter-rater observation checks were used to determine mean percentage agreement levels between observers (Table 2). The Cohen's Kappa coefficient is an index of inter-rater reliability and was calculated for each of the variables to adjust for expected agreements by chance (Cohen, 1968; Melstrom et al, 2005; Wood, 2007). A Kappa statistic is considered to be of adequate reliability if the value is between 0.6 and 0.79 (Wood, 2007). Table 2 indicates uniformly pleasing levels of observer agreement across settings.

TABLE 2 ABOUT HERE THANKS

Procedural Checklist

Results of the procedural checklist revealed that the 16 participants felt that all items included in the checklist had been addressed during the intervention phase. The teachers and paraprofessionals also informally noted the benefits gained from the involvement of an in-class mentor to provide immediate feedback and strategy development. However, a problem noted by the staff of the final student in each phase was the length of their involvement. Due to the multiple baseline design of this study, they had observers visiting their room twice a week for a considerable number of months before the intervention commenced. A further factor in the extended length of the study was the incidence of student illness.

Observational data entry and analysis

The observational data reported here was analyzed twice. In the first procedure, following the approach utilized by Author G (2010) observations with missing values were entered as a non-event. This achieved the purpose of providing conservative analysis outcomes when reporting variables such as awake-active-alert and 'communicative interaction', both of which were potential targets for improvement following intervention. For example, in a hypothetical mini-data set with 5 observation points (where 1 represents an event of interest), a missing score in column 4 (011-0) would be entered as 01100, producing a 2/5 or 40% record of instances. In the second analysis, using the more conventional approach, missing cases were excluded from

analysis. In the example provided above, therefore, 01100 would therefore transform into 0110 (2/4 or 50% observed). Results from the second analysis are shown here, with the findings from Analysis 1 included for information and comparison purposes only. In the following sections, means are tested for Standard Mean Difference (SMD, Olive & Smith, 2005) and graphs illustrate observed changes across the various phases of the study.

Phase 1: Segregated Settings

Table 3 provides overall data for the two variables of interest here in relation to students in segregated settings: awake-active-alert and communicative interactions. Mean scores for baseline and the combined phases of intervention, maintenance and follow-up are listed, with missing scores excluded. Standard Mean Difference (SMD) scores are provided in each case to test for any contrasts between the baseline mean and the overall mean for the intervention/maintenance and follow-up phases where available. For information purposes, means and SMD coefficients are also provided from Analysis 1 (missings included) in the right hand columns of Table 3.

TABLE 3 HERE THANKS

Behaviour state: Awake-Active-Alert (AWAA)

Figure 1 represents the data collected in Phase 1 of the study, conducted in special school classrooms where the participating student was typically one of up to six students with MSD, taught by a teacher and a paraprofessional. The data includes all available baseline, intervention, maintenance and follow-up data collected in segregated settings. Figure 1 focuses on the behaviour state of awake-active-alert (AWAA) in order to demonstrate the possibility of optimal outcomes for the students' engagement with their environment. Overall, students 1-3 displayed statistically significant improvements in the observed levels of AWAA following intervention. In contrast, Student 4 was observed to display reduced AWAA during intervention, with some marginal improvement in the maintenance checks.

Student 1 demonstrated reasonable stability in baseline levels of AWAA, with the exception of session 3. During the follow-up observation, four weeks following the intervention, the student was observed to be in the optimum behaviour state of awake-active-alert for around 60% of the observations. Student 2 was observed in moderate to high baseline levels of the AWAA

behaviour state, with considerable volatility noted (Figure 1). The percentage of observed AWAA dropped initially following the commencement of the intervention, followed by a steady increase in the percentage of time the student was observed to be in this optimal condition. Immediately after the intervention had finished, the student was observed to be AWAA for improved amounts of time during maintenance sessions. For the follow-up observational session, four weeks post intervention, the student was in an awake-active-alert behaviour state for over 80% of the time. During baseline observations, Student 3 was observed to be in the optimal behaviour state AWAA for moderate proportions of time, with sharp peaks and troughs noted. During intervention and maintenance this figure increased and remained stable, aside from a downturn on the final observation. As indicated in Figure 1 it is clear that the intervention had little or no impact on the observed level of AWAA activity for Student 4.

FIGURE 1 ABOUT HERE THANKS

Communicative Interactions (CI)

The data paths shown in Figure 2 provide the percentage of each observational session where the students were observed to be involved in a communicative interaction (the optimal communication code used in the study). The data was collected prior to, during, and following the collaborative professional development intervention. The intervention involved the development of tailored communicative strategies for individual students that were designed to increase their communicative involvement with their surroundings. An increase in observed communicative interactions was evident following the intervention for students 1-3. As indicated in Figure 2, Student 4 did not demonstrate improved levels of communicative interaction following the intervention.

FIGURE 2 ABOUT HERE PLEASE

For Student 1 stability was evident early on for communicative interactions. An ascending trend in subsequent phases of the study was noted. In contrast to the AWAA state, however, there was a sharp decline on the specific follow up scores for communicative interactions. Nevertheless, when considering aggregated changes, Table 2 indicates a significant and positive difference in mean scores for both AWAA and CI, when comparing baseline levels with overall means for

intervention/maintenance/follow-up. Student 2 was observed to be involved in a communicative interaction for varying proportions of time in baseline, followed by gradually increasing and sustained levels of communicative engagement in intervention and subsequent phases of the study. Interestingly, for Student 3, a large increase in communicative interactions was noted in the maintenance check followed by a sharp drop. It was not possible to conduct a follow-up observation session for this student due to end of year activities in the school. Student 4 was unwell through the year and was absent from school for 4 weeks. A total of 19 baseline observational sessions were conducted, with a lengthy pause after session nine, due to illness. Due to the end of the school year, it was not possible to collect the monthly follow-up observations for Student 4..

Phase 2: General Classroom Settings

Table 4 provides overall data for the two variables of interest here: awake-active-alert (AWAA) and communicative interactions (CI) observed for four students in regular classrooms. It is important to note that with the exception of CI for Student 8, no significant differences between baseline and intervention/maintenance/follow-up mean scores were noted. This overall finding contrasts with the results reported above for four students in special schools.

TABLE 4 ABOUT HERE THANKS

Behaviour state: Awake-Active-Alert (AWAA)

Figure 3 depicts the mean AWAA data collected in Phase 2 of the study, where the delivery of the intervention procedures and the focus of the observational data remained the same as Phase 1. This phase of the study was conducted in regular classrooms where the student with MSD was one of 26-30 students and the classroom teacher received fulltime paraprofessional support. Student 5 presented as engaged with her surroundings during baseline and was observed to be in the awake-active-alert state at consistently high levels (Figure 3). The student responded well to the intervention phase, with a low of under 70% AWAA (due to illness) and a high of close to 100% AWAA scored during two maintenance observation sessions. Illness on the final observation of the maintenance phase may have functioned to reduce the mean AWAA score at that time. Post-intervention observations maintained a high proportion of observed Awake-Active-Alert behaviour state activity. The results for Student 6, like Students 7 and 8, below, are quite erratic. Student 6 experienced a period of illness and hospitalization during the intervention

phase and the resulting observational data (Figures 3 and 4) reflect this. Like Student 6 and Student 7, Student 8 displayed no sustained improvement in the optimal AWAA state following intervention.

FIGURE 3 ABOUT HERE THANKS

Communicative interactions (CI)

Figure 4 describes patterns in the observed communicative interactions involving the four participating students in general education classrooms. CI represents the optimal communication code utilised in the study.

FIGURE 4 ABOUT HERE THANKS — —

For Student 5 communicative interaction levels at baseline and intervention were variable, and this may be attributed to student illness during intervention. Student 6 was hospitalized during intervention and results following intervention are erratic. The observed communicative involvement of Student 7 was similarly variable. In contrast, the level of communicative engagement for Student 8, as measured by the CI code (Table 4), improved significantly following intervention, although it is important to note the late baseline spike prior to gains made in the intervention phase (Figure 4). Field notes indicated the presence of two paraprofessionals working in contrasting styles with Student 8 in baseline, a factor that may serve to explain (at least in part) such variability in communicative activity. It is also vital to recognize the large number of baseline sessions and relatively small number of intervention and post-intervention observation sessions, as a function of practical end of year school constraints and teacher fatigue.

Discussion

This paper has reported the results of an investigation into the impacts of a tailored mentor-modelling professional development strategy on both the observed alertness of a sample of students with multiple and severe disability and their communicative engagement, before, during and following an individualized in-class intervention involving staff partners in communication.

In sum, as indicated in Figures 1-4, the results were variable, and sometimes, puzzling. For some students, pleasing improvements in the percentage of intervals in the measure of alertness used awake-active-alert (AWAA) were noted. Likewise, in several classrooms, the level of communicative interactions observed rose steadily, both during and following intervention. However, the patterns demonstrated through this replicated multiple baseline design are not consistently positive. Several explanatory issues can be explored.

First, our findings underline the complex and highly individualized profiles of people with MSD. It may be that such patterns of responding or non-responding, evidenced in low levels of awake-active-alert during baseline and throughout the study phases, reflect an intractable phenomenon that is not readily amenable to change. In other words, some participants (for example, Student 4) may have learnt patterns of non-engagement that are very difficult to interrupt. Second, the levels of uptake of agreed strategies by teaching staff, and their use of them with the target students, could confound observed impacts in the alertness, engagement and responsivity of individuals with MSD. Several teacher and aide participants were casual employees and may not have enjoyed a long-term commitment to the classroom or student(s) they were supporting, nor the research program they consented to. In our view it is likely that the process of adopting new practices and sustaining them in the milieu that is the modern classroom, in either special or general education schools, is a challenging process. Third, it is possible that, even with the best will in the world, teachers of students with MSD are so consumed with attending to the essential medical and hygiene needs of their students that factors such as communication and engagement receive low priority.

The contrast in results between the special school participants and those in regular classrooms deserves discussion. A possible reason for this is that, as suggested by Author F (2004), students with MSD in regular classes may already be in a position where the presence of typical peers encourages optimal alertness and communicative interaction. As such, the potential for improvement is more limited.

Constraints and future directions

It is important to highlight several constraining factors that should be considered when interpreting the results of this investigation. First, student illness and other adventitious events such as teacher absences interfered with the continuity of the study on several occasions. The importance of maintaining regular baseline checks wherever possible, and delaying intervention in the subsequent setting until positive results were noted in the earlier setting meant that for

some students and staff, intervention did not commence until late in the school year. No doubt this may have played a part in the disposition of staff in these schools when the researcher who was the mentor-model arrived to work with them. Second, the small and intact sample of participants (students and staff) was not randomly selected, and they may not be typical of the wider group of students with MSD and their educational partners. Third, the study was limited to in-classroom and school contexts and therefore, although in some cases informal family input was contributed by interested family members/caregivers, the central focus was what happens in classroom and school settings. Finally, and importantly, although as much background information as possible was collected, in line with ethical processes, detailed information about intra-individual factors, such as diet, medication, and health complications was not included in the scope of the study methodology and the data reported here. As others have argued in the past (Guess et al., 2002) and more recently noted again (Vos et al., 2012; Author H), knowledge of physiological variables (blood pressure, heart rate), neural processes (for example, emotional responses to various stimuli) and other personal complexities can assist in better addressing the total life experiences of people with MSD and understanding their behaviour states. Likewise, it was not possible to obtain further detailed information on the background profiles of participating educational staff in the study.

Further research is urgently needed in this complex and multi-dimensional area. Individuals with MSD have a raft of needs that encompass medical, therapeutic, educational and other domains. They are at once highly vulnerable and yet as a group, they attract relatively few studies on strategies for improving their quality of life and socio-communicative participation. Along with the work of the team in Groningen and others who have published recently in this area (Vos et al., 2012), we hope our findings and subsequent papers from this project will contribute to the worldwide effort to address this research and practice priority area. Despite considerable variability in outcomes, it did appear to us that the mentor-model of professional development was both well-received and more importantly, effective in stimulating changed communication practices in classrooms supporting students with MSD. We are, nevertheless, conscious of the need for a sustained research agenda beyond this current work. In particular, longitudinal studies are needed to explore the complicated cycles of engagement and responsiveness in people with MSD in various settings and under a range of conditions. Thanks to the pioneering work of Doug Guess and his team in the 1980s and 1990s, systematic data-based approaches to teaching and interacting with students with MSD have become better

understood and adopted as part of general good practice. Our data tells us that whilst intensive in-class efforts can make a powerful difference, we also have much more to learn about the totality of life experiences for some of the most vulnerable members of our society.

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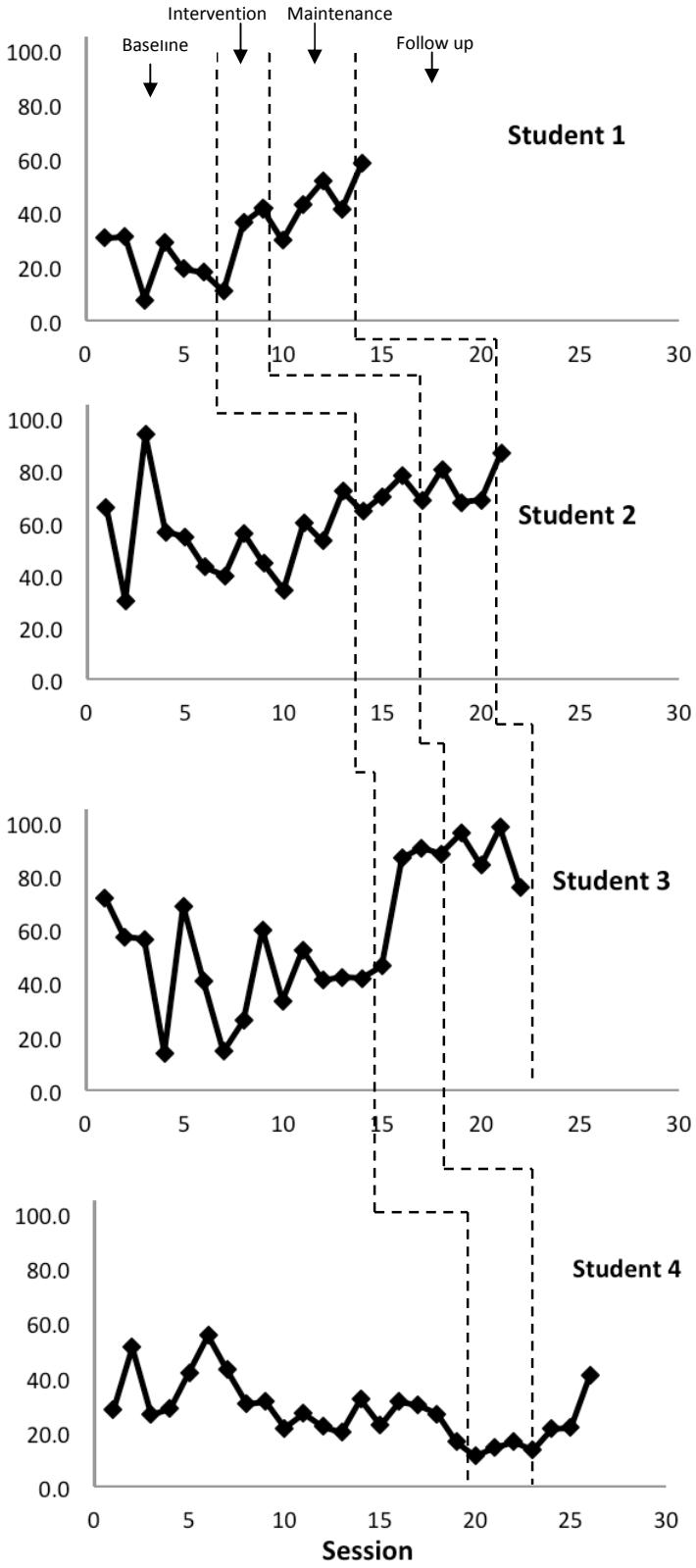
Child	Age	Sex	Communication Standard Score	%ile rank	Socialisation Standard Score	%ile rank	Composite Standard Score	Composite %ile rank	Deviation from mean
Student 1	6.4	M	23	< 0.1	48	<.01	27	< 0.1	>-4SD
Student 2	13	F	36	< 0.1	38	<.01	34	< 0.1	>-4SD
Student 3	5.4	M	41	< 0.1	53	0.1	32	< 0.1	>-4SD
Student 4	12	M	34	< 0.1	36	<.01	31	< 0.1	>-4SD
Student 5	8	F	48	<0.1	50	<0.1	50	< 0.1	>-3SD
Student 6	6	M	38	<0.1	46	<0.1	36	<0.1	>-4SD
Student 7	11	F	29	<0.1	42	<0.1	32	<0.1	>-4SD
Student 8	12	M	34	<0.1	38	<0.1	32	<0.1	>-4SD

	Special schools	Regular schools
Behaviour State	.74	.82
Communication indicators	.79	.87
Communication partners	.79	.87
Teacher partner interaction codes	.83	.91
Teacher aides/partner interaction codes	.78	.90

Student	Measure	Treatment	n	Mean	SD	Missings Excluded SMD	p	Missings = 0 SMD
1	Awake-active-alert	Baseline	6	22.6	9.30	1.77	0.02	1.62
		Intervention Maintenance Followup	8	39.0	14.3			
	Communicative Interaction	Baseline	6	15.7	7.1	1.93	0.03	1.92
		Intervention Maintenance Followup	8	29.4	13.2			
2	Awake-active-alert	Baseline	13	54.0	17.1	1.11	0.003	0.98
		Intervention Maintenance Followup	8	73.0	7.8			
	Communicative Interaction	Baseline	13	20.8	10.9	1.76	<.001	1.71
		Intervention Maintenance Followup	8	40.0	7.9			
3	Awake-active-alert	Baseline	14	44.3	18.14	2.14	<.001	2.16
		Intervention Maintenance Followup	8	83.1	16.45			
	Communicative Interaction	Baseline	14	12.7	6.3	1.63	0.10	1.63
		Intervention Maintenance Followup	8	23.0	15.0			
4	Awake-active-alert	Baseline	19	30.8	10.3	-1.06	0.03	-1.10
		Intervention Maintenance Followup	7	19.9	10.0			
	Communicative Interaction	Baseline	19	9.5	3.8	-0.63	0.10	-0.65
		Intervention Maintenance Followup	7	7.2	2.8			

Student	Measure	Treatment	n	Mean	SD	Missings Excluded SMD	p	Missings = 0 SMD
5	Awake-active-alert	Baseline	6	99.2	1.47	-2.32	0.32	-0.23
		Intervention Maintenance Followup	10	95.8	10.0			
	Communicative Interaction	Baseline	6	77.8	3.3	2.12	0.06	1.53
		Intervention Maintenance Followup	10	84.8	9.7			
6	Awake-active-alert	Baseline	14	53.2	26.9	0.07	0.82	0.34
		Intervention Maintenance Followup	16	55.3	18.1			
	Communicative Interaction	Baseline	14	31.0	18.2	-0.54	0.08	-0.61
		Intervention Maintenance Followup	16	21.2	7.2			
7	Awake-active-alert	Baseline	21	58.5	17.8	0.48	0.10	0.49
		Intervention Maintenance Followup	25	66.9	16.0			
	Communicative Interaction	Baseline	21	26.9	16.2	0.12	0.69	0.15
		Intervention Maintenance Followup	25	28.8	14.6			
8	Awake-active-alert	Baseline	29	26.8	17.8	-0.16	0.67	-0.11
		Intervention Maintenance Followup	5	23.9	12.3			
	Communicative Interaction	Baseline	29	28.5	20.9	0.87	0.007	0.95
		Intervention Maintenance Followup	5	46.8	9.3			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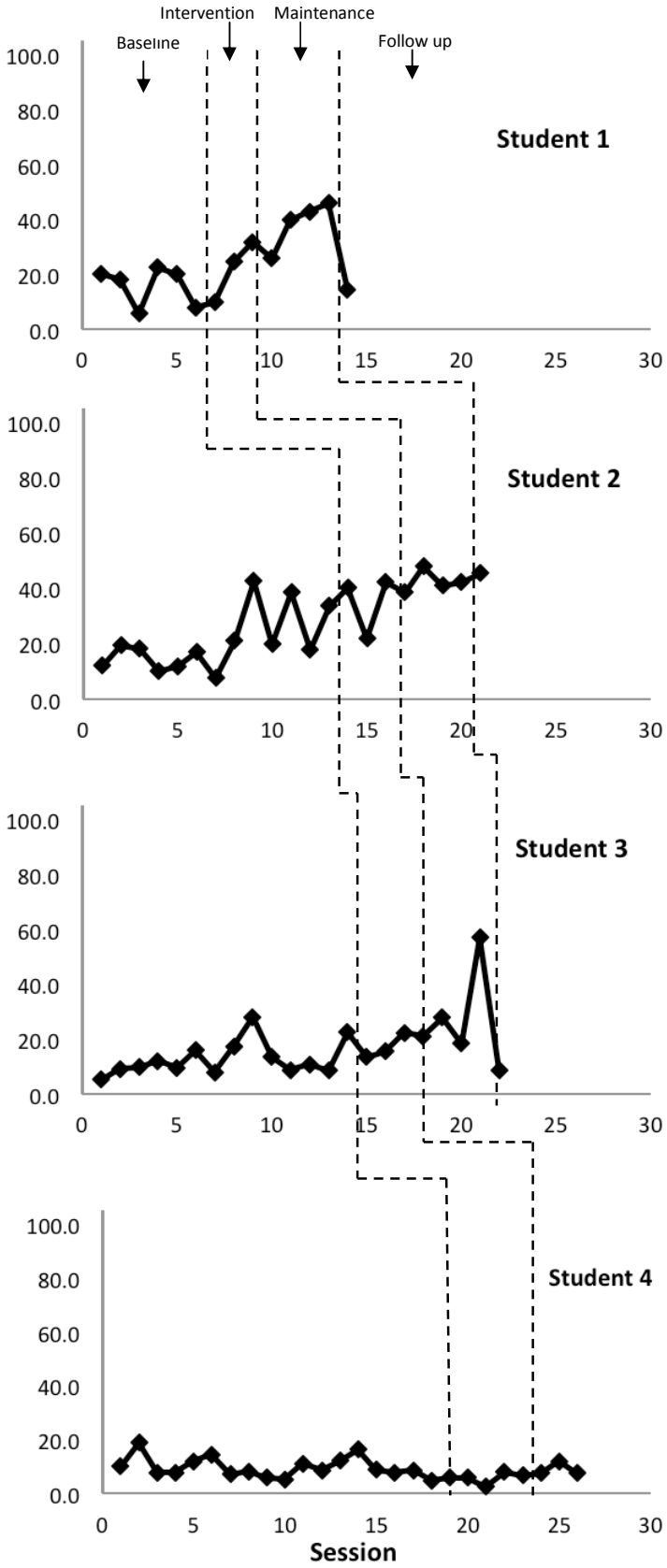
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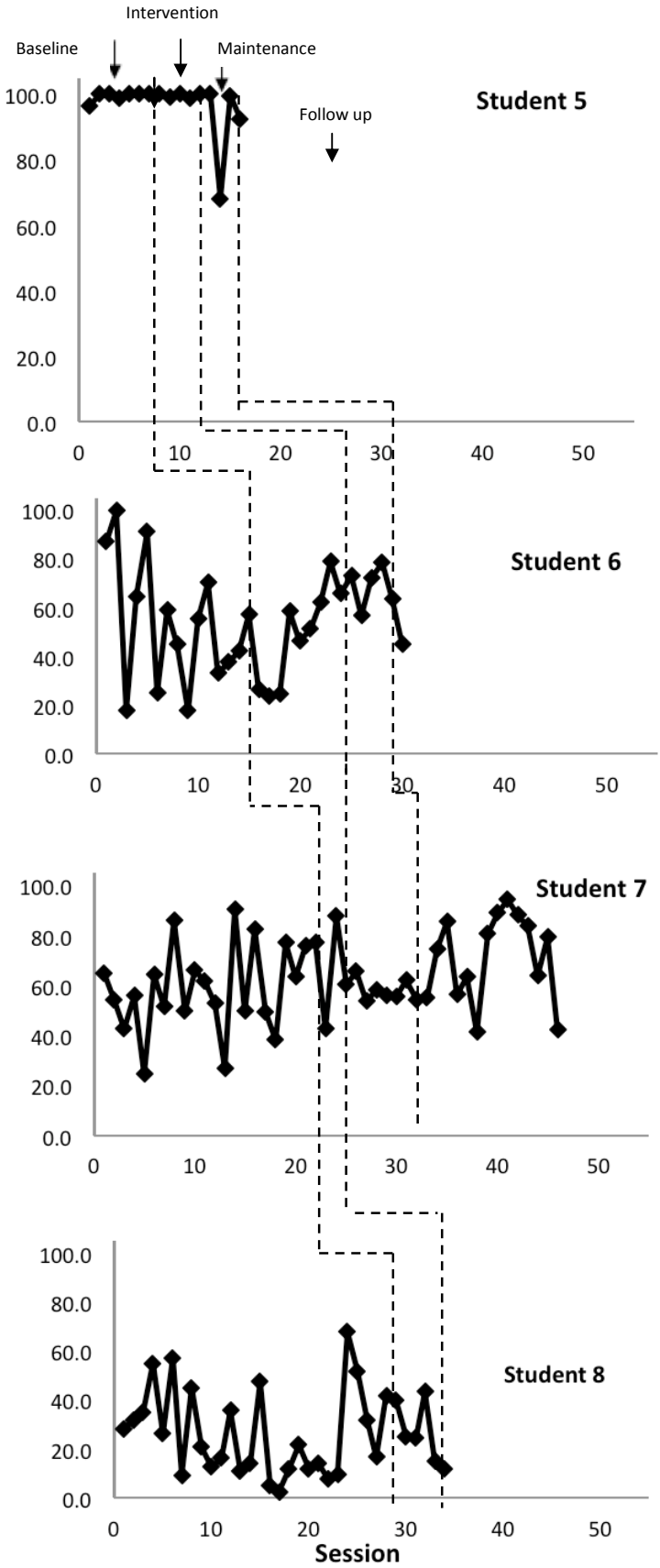
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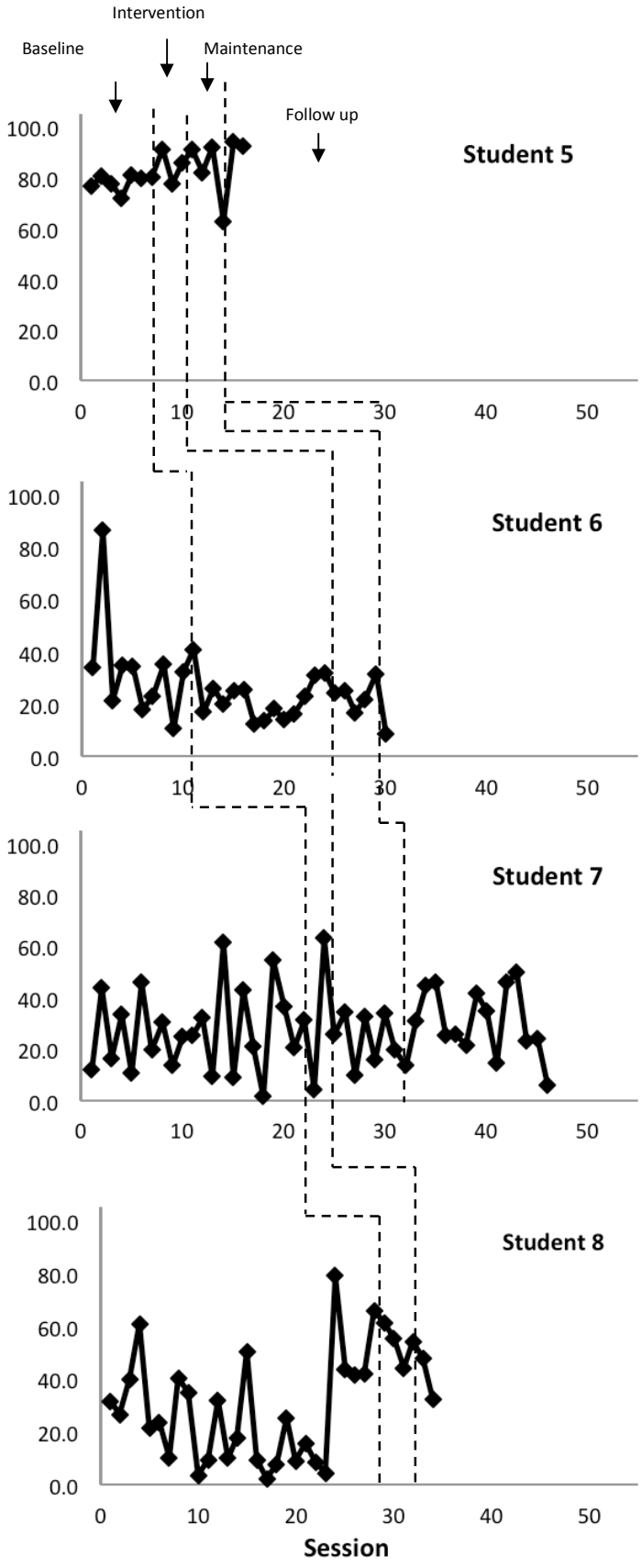
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