

Effectiveness of Computer-Aided Personalized System of Instruction in Teaching the Self-
Regulation Program of Awareness and Resilience in Kids

by

Kara-Lynn Kehler

A Thesis submitted to the Faculty of Graduate Studies of the University of Manitoba in partial
fulfillment of the requirements of the degree of

MASTER OF ARTS

Department of Psychology

University of Manitoba

Winnipeg

Copyright © 2015 by Kara-Lynn Kehler

Acknowledgements

I would first like to express my deepest thanks to my advisor Dr. Joseph J. Pear for his incredible guidance, encouragement and patience for me throughout my Masters work. This thesis would not have been possible without his tremendous support.

I would also like to thank my thesis committee members Drs. Janine Montgomery and Shahin Shoostari for their time, friendly advice and appreciated direction.

My thanks must also go to Jade Wightman for her help on inter-observer reliability checks and procedural integrity assessments.

Thank you to all of the participants. Your involvement was so greatly appreciated.

My gratitude must also go to my parents Gary and Carolyn Giesbrecht, parents-in-law Randy and Nicole Kehler and Daniel Brunet and Rochelle Squires, my sister, brothers-in law and sisters-in-law who have supported me through my every decision and have been there to listen whenever I needed to talk through an idea or two.

Lastly, I would like to thank my husband Tyler Kehler and son Jaxon Kehler for all of their love, support and remarkable patience. They have been, and continue to be, my greatest inspiration.

Correspondence should be sent to Kara-Lynn Kehler, Department of Psychology,
University of Manitoba, Winnipeg, Manitoba, R3T 2N2, Canada
(e-mail: umgies86@cc.umanitoba.ca).

Abstract

The *self-regulation program of awareness and resilience in kids* (spark*) is a newly developed approach for teaching children with Autism Spectrum Disorders (ASD) daily living skills. Due to the increasing prevalence of ASD in children, a cost-efficient and practical system for teaching the procedures to individuals working with children with ASD is becoming more necessary. An effective teaching method is that of the online computer-aided personalized system of instruction (CAPSI) based on the Personalized System of Instruction (PSI) developed by Fred Keller. Because CAPSI has previously been shown to be an effective method of instruction for individuals working with children with ASD, the current study sought to evaluate CAPSI's effectiveness in teaching spark*. The study consisted of two phases, participants undergoing the intervention independently and participants under direct supervision with a monetary incentive. The participants were given the spark* text and access to CAPSI. Participants were administered a knowledge test via CAPSI prior-to and following studying the text. Results showed that there was an insignificant ($p = .07$) improvement following independently learning spark* through CAPSI and a significant improvement ($p=.01$) when learning through CAPSI under direct supervision. In addition, participants showed improvement in their ability to answer higher-order thinking questions after instruction. Together, these findings suggest that CAPSI is indeed an effective method of instruction for teaching individuals spark*, at least while participants study under supervision and if they receive a monetary incentive.

Effectiveness of a Computer-Aided-Personalized-System of Instruction to Teach spark*

Introduction

The *self-regulation program of awareness and resilience in kids* (spark*) is a recently developed instructional method for individuals to employ when teaching children with Autism Spectrum Disorders (ASD) daily living skills (Mackenzie, 2010). Due to the increasing prevalence of ASD in children (Fombonne, 2003) a cost-efficient and practical system for delivering specialized teaching procedures to individuals working with children with ASD is becoming more necessary.

Since the creation of spark* in 2010, the techniques have been taught through workshops with the aid of the spark* text and training manual (H. Mackenzie, personal communication, 2012) – a lengthy and costly undertaking. Because of this, a more time and cost-effective method of training is needed if spark* techniques are to achieve widespread recognition and practice.

Autism

ASD is characterized by deficits in several areas including socialization skills, communication, as well as the presence of restrictive and repetitive behaviours and interests (American Psychiatric Association [APA] 2000). Diagnosis can be given by medical professionals by the age of two years, with the accuracy of diagnosis increasing as the child ages (Stone et al., 1999). However, a loss of previously acquired skills referred to as regression, is often seen as a strong indicator of ASD to parents or caregivers (Lainhart et al., 2002). The prevalence of ASD has increased noticeably over the past several decades (Duchan and Patel, 2012). Recent research has shown that there is an average annual prevalence increase among children aged 2-14 between 9.7% to 14.6% across Canada (Ouellette-Kuntz et al., 2014), with

the Center for Disease control stating that the overall prevalence of ASD is approximately 1 in every 68 children aged 8 years (CDC, 2010). Due to this increasing trend, accessible treatment and individuals trained in delivering effective treatment is becoming more of a necessity.

spark*

spark* is an assortment of techniques assembled by Dr. Heather Mackenzie in 2010 for tutors, teachers and parents to employ when attempting to teach children with ASD early-life skills such as emotional, behavioural, and cognitive regulation. It focuses on the core belief that increasing both self-regulation and self-management in children will lead to the generalized improvement of all facets of a child's life (Lee et al., 2007; Carr et al., 2014).

A study by Stoesz et al. (2013) found that compared to a control group, children learning administered the spark* program experienced significant improvements in social perception as shown by the NEPSY Affect Recognition (Korkman, 1998) as well as a decrease in their behavioural rigidity and unusual behaviours. In addition, from parental report, self-regulatory skill generalization was noted (Stoesz et al., 2013). However, spark* is currently being taught through in-person workshops, a costly and restricted method of teaching. Practically, as only those individuals in a small proximity to a workshop are able to attend the training, a more accessible method of training is needed if spark*'s range of use is to increase.

Computer-Aided Personalized System of Instruction

The computer-aided personalized system of instruction (CAPSI), developed by Witold Kinsner and Joseph Pear is an effective, web-based version of the Personalized System of Instruction (PSI) developed by Fred Keller in the 1960's (Crone-Todd & Pear, 2001; Martin, Pear & Martin, 2002; Keller, 1968). CAPSI is based on behavioural principles allowing for self-

paced learning, clearly specified end-goals, gradual advancement toward end goals, and mastery learning.

Like the traditional PSI, CAPSI requires students to study material which has been organized into units followed by unit tests. When a student finishes studying a unit of material, CAPSI assigns a unit test consisting of three randomly chosen questions based on the material in the unit. Following completion of the unit test, it is then sent to either the instructor or to one or more peers depending on availability for review. If the student shows mastery of the material, he is then able to proceed to the next unit. However, if the student does not display mastery, he receives a “re-study” and is required to re-study the unit material and attempt another unit test after a brief re-study period.

In addition to being employed as the method of instruction for several psychology courses at the University of Manitoba, CAPSI’s effectiveness in knowledge synthesis has been shown in several studies, working with various materials and subjects (Pear & Svenningsen, 2011). As well, previous studies have demonstrated CAPSI’s effectiveness in teaching discrete trials teaching (DTT) and the assessment of basic learning abilities (ABLA) – both methods for teaching children with ASD life skills. Both studies showed that CAPSI was an effective method of instruction, showing higher rates of accuracy on written knowledge tests as compared to self-instruction (Zaragoza-Scherman, 2010; Hu, 2012).

Since the questions presented to students through CAPSI are vital in the understanding of the presented material, CAPSI researchers have applied Benjamin Bloom’s taxonomy to create objectives to aid in leading the individual to higher-order thinking (Bloom, 1956). The decision to base questions on Bloom’s taxonomy was first proposed by Crone-Todd, Pear, and Read

(2000). The taxonomy categorizes and operationalizes thinking into six distinct levels ranging from lower-level knowledge to higher-order reasoning. Level one “knowledge” questions require the participant to write verbatim text material. Level two “comprehension” questions require participants to paraphrase text material while attempting to incorporate text terminology. Level three “application” questions require participants to apply previously learned material to novel circumstances. Level four “analysis” questions require participants to be able to break down a concept into several components. Level five “synthesis” questions are the opposite of level four in that they require participants to combine several different items to create a new concept. Lastly, level six “evaluation” questions require participants to apply all previously learned levels to evaluate an example or scenario.

Purpose

Due to spark*’s recent creation, research is lacking on which methods of instruction are viable options. Therefore, the objective of this study was to evaluate CAPSI’s ability to teach individuals to implement spark* procedures. Because of CAPSI’s proven effectiveness as a teaching method for several other techniques employed when working with children with ASD, it was hypothesized that individuals learning spark* through CAPSI in combination with the spark* text would show an increased final performance on the written knowledge test as compared to their baseline performance. In addition, it was hypothesized that the participants would show an increased ability to answer higher-order questions on the final written knowledge test as compared to their baseline performance.

Method

This study was run in two phases with additional participants recruited for the second phase as there was an initial high attrition rate.

Participants

Phase 1. A total of six participants were recruited from the University of Manitoba for use in a large study on inter-professional education (IPE). The participants used CAPSI as the method of instruction for their teaching material (spark*) and, as such, only their performance on the CAPSI component was considered. These participants were all recruited through the University of Manitoba as graduate students interested in professional development opportunities. All of the participants were enrolled in the U of M school psychology program ranging in age from approximately 18 years to 50 years of age. Four out of the six participants fully completed their demographics form (see appendix C) emailed to them prior to baseline. Of the four participants, two participants had previously received some form of training in working with children with ASD; however, none of the participants had any previous CAPSI training. All participants stated that their starting GPA was 3.5 or above on the 4.5 GPA University of Manitoba scale at commencement of the study.

Due to this project's extensive reading requirement, it was explained at baseline that the method of delivery of the material was in English and that a significant amount of reading and writing in English would be required for completion. In addition, the demographics form included a question regarding the participants' first language to attempt to correlate any discrepancies on results with that of a potential language barrier.

The only exclusion criteria employed was that the participants' knowledge of spark* should not exceed 70% at baseline as determined by the completion of a written knowledge test. 70% was chosen as the exclusion criterion because at the University of Manitoba, 70% on average is the lowest requirement for inclusion in higher educational programs (i.e., the Honours stream) in the majority of fields. No participant was excluded from the study due to this criterion. The total sample size for phase 1 was $n=2$, as 2 out of the 6 participants recruited completed all portions of the study.

Phase 2. Due to an attrition rate of 66.67, 13 additional participants were recruited through the use of recruitment posters placed at the University of Manitoba. They were recruited to participate in only the CAPSI portion as the larger IPE study had concluded. The participants ranged from 18 years of age to 61 years of age, 4 were psychology graduate students at the University of Manitoba with the remaining of varying educational backgrounds. Out of the 13 participants, 9 completed the demographics questionnaire noting 6 participants had previously received some form of training in working with children with autism and 5 participants had previous CAPSI training. Reported GPAs ranged from 2.1- 4.5.

Identical to phase 1, the participants were informed of the extensive reading requirement prior to commencement of the study. The total sample size for phase 2 was $n=11$, as 11 out of the 13 participants recruited completed all portions of the study.

Materials

The materials required for this study were a hard copy of the spark* text, a pdf version of a CAPSI guide explaining how to use the CAPSI program and an emailed package of review questions developed by the primary researcher regarding the spark* material (see Appendix A).

The participants were expected to read only chapters one through six of the nine chaptered spark* text to prevent possible attrition resulting from the extensive reading the full text would require. Because of this, a form was sent indicating the order in which the parts of the text should be read (see Appendix B). For data collection, a demographics questionnaire was delivered at baseline (see Appendix C). In addition, a written knowledge test administered via CAPSI at Baseline (see Appendix D), and following Post-Intervention (see Appendix E) were used to measure knowledge gained through combination of CAPSI and the spark* text. The knowledge tests consisted of ten short-answer questions, drawn randomly from the different levels of Bloom's taxonomy while incorporating material from each of the 6 spark* chapters. Each of the two tests consisted of the same ratio of levelled questions; however, they differed on what the questions asked. This was done to prevent a carry-over effect from baseline to post-intervention. For procedural reliability concerning the question levels of the tests, an independent research assistant graded 30% of the questions as to what they believed the levels of questions would be ranked. For inter-observer-reliability, forms describing how to grade each short-answer question for baseline (see Appendix F), and post-intervention (see Appendix G) tests were created and utilized. In addition, because CAPSI is an online version of the PSI, all of the participants required the use of a computer with internet to access the CAPSI study units.

Procedure

Design. A within-subjects design was used to evaluate the effectiveness of the intervention. This particular design involved the participants serving as their own controls and all participants receiving the same treatment relative to the phase they were recruited for. Particular advantages to this design are that it does not require a large number of participants and that it reduces error variance associated with individual differences as compared to between subject

designs. This design was deemed to be the most appropriate for phase 1 as all of the participants needed equivalent instruction on the teaching material due to the requirements of the IPE study they were participants in. Phase 2 was run under the same design to maintain as similar testing parameters as possible.

Question Development. A defining feature of CAPSI is that it randomly selects questions from a pool of questions of varying difficulty to create a unit test based on a portion of material. Because spark* had been primarily taught through in-person workshops prior to this study, there was only a modest number of questions available for review. To increase both the amount of questions available for CAPSI to randomly select from and also the number of questions available for review while studying the spark* text, the primary researcher created approximately 15-30 additional questions for each chapter, ranging from basic “knowledge” level questions to more advanced “evaluation” questions as outlined by Bloom’s taxonomy. Approximately 15% of the CAPSI questions were drawn from questions originally present in the spark* materials.

A general procedure to create questions was formed for each level of question. For level one, questions were created by having participants repeat necessary definitions and results of scholarly findings which were deemed subjectively important for future follow-through of spark* procedures. Similarly, level two questions were developed by having participants paraphrase findings or information in the text which would be directly applicable to applying spark* skills in vivo. Level 3 questions however were created by questioning how material in the text could be applied in a real-life situation or to one’s self. Level 4 questions were created by noting the various differences between concepts and building questions requiring the participants to compare and contrast these differences. Level 5 questions were developed by adding

information from previous chapters to ask participants to combine previously learned information to create a new concept. Lastly, level 6 questions were developed when any scenario or finding in the text could potentially have multiple explanations. If the primary researcher was able to provide additional explanations for a scenario as discussed in the text, a question was created asking for the participant's opinion and justification for that opinion.

Phase 1

Baseline (BL). The baseline phase consisted of each participant receiving an outline of the entire study as well as a consent form outlining their expressed consent to participate, whether they would like to receive the results of the study upon completion, noting that they will receive a certificate of completion at completion, as well as stating that their participation in the study can be discontinued at any point without punishment. Upon receiving written consent, the participants were emailed the demographics questionnaire as well as a CAPSI username and password for the "capsiresearch.org" website. They were then asked through email to complete the written knowledge test consisting of ten short-answer questions online via CAPSI. The participants had one hour to complete the test. Upon completion, they were then given a hard-copy of the spark* text. As an additional study aid, each participant was given a package of study questions developed specifically for the spark* text. These questions were not mandatory to read through however they were made available if the participant wanted additional reading. To help the participants work through the CAPSI system, each participant was also given a pdf CAPSI guide explaining how to use CAPSI. The group of participants were then asked to read the six chapters of material within the confines of one month. There were seven CAPSI units based on the six chapters solely because chapter six of spark* was significantly more material-intensive

as compared to the others so it was divided in two and required the participants to complete a test following reading half of the chapter.

Intervention. Following baseline, the participants were given a maximum of one month to read the required portion of the text and to finish the CAPSI units. The participants were expected to read all of the material in each chapter prior to requesting a test from the CAPSI program. CAPSI then randomly selected three questions and administered them as a unit test. Following completion of each test, the test was immediately sent to the primary researcher for review. Each test was graded as soon as the primary researcher received notification that a test was submitted to allow for the participant to proceed as quickly as possible. To proceed to the next unit, each student was required to receive a “pass” on his or her current unit test. A “pass” was given for meeting the mastery criterion of 100% accuracy on all three test questions. If the student received a “re-study”, the student was then asked to re-study the material and to request an additional unit test following a brief re-study period of five minutes. Once each participant completed all seven units, the primary researcher initiated the post-intervention phase.

Post-Intervention (P.I.). Following the intervention, the participants were then administered a second knowledge test via CAPSI to be completed within one hour to determine the effect of the intervention. The tests were then graded by the primary researcher. Of the six participants, only two completed all seven of the CAPSI units and therefore only those two participants were administered the second knowledge test. The participants were asked to not use the text as aid while completing the test, however the text was still in their possession as it was required for further progress in the IPE study. For participating in the study, the participants who completed all portions were mailed a certificate acknowledging their completion of spark*

training of the behavioural unit via CAPSI which was signed by the principal investigators of the IPE study: Dr. Grace Ukasoanya and Dr. Janine Montgomery.

Phase 2

Due to the high attrition rate of phase 1, two procedural modifications were made prior to the recruitment of additional participants in hopes of reducing attrition: the baseline, intervention, and post-intervention phases were to be run while the participants were under supervision of the primary researcher and the incentive upon completion of the study would be a \$20 token of appreciation as compared to a certificate of completion. These particular modifications were put in place due to previous experience on reducing attrition in a CAPSI study. The combination of supervised study sessions with a monetary incentive largely decreased attrition for participants studying DTT through CAPSI (Lee et al., 2013). Baseline, intervention, and post-intervention phases were identical to those in phase 1 except for these two modifications.

Supervised study. All written knowledge tests, studying and CAPSI unit tests were completed under supervision of the primary researcher. The primary researcher was in the room of the participants' choosing however, she did not interact with the participant following commencement of the session. During the intervention phase, the primary researcher would immediately grade each submitted unit test so that the participant may continue through the study as efficiently as possible. The sessions lasted for whatever length of time the participant desired. Following each session, a follow-up session was scheduled to continue the study.

Test-Grading

The primary researcher graded the baseline, post-intervention and follow-up written knowledge tests. A research assistant graded 30% of the written knowledge tests and CAPSI unit tests to determine inter-observer reliability. In addition, a research assistant determined the Bloom's taxonomy level on 30% of the questions used for the written knowledge tests to ensure procedural reliability.

Inter-Observer Reliability

Percent agreement was calculated by dividing the total number of agreements by the total number of agreements plus disagreements and multiplying by 100%. Inter-observer reliability was shown to be 86% on the baseline tests, 87% on the post-intervention tests, and 83% on the CAPSI unit tests.

Procedural Reliability

Procedural reliability (PR) was calculated identically to that of inter-observer reliability; that is, dividing the total number of agreements by the total number of agreements plus disagreements and multiplying by 100%. PR was shown to be 92% for Bloom's Taxonomy level accuracy.

Data Analysis

A paired sample *t*-test was run for the overall score improvement as well as on the mean score improvement on each level of question individually for participants in both phases. This test was chosen for two main reasons: 1) it does not require a large sample size, and 2) it provides good control for individual differences thereby producing limited random error. To

prevent carry-over effects, a common disadvantage of employing the paired sample *t*-test, the written tests administered consisted of different sample questions.

Results

Over the course of phase 1, participant completion of the study units gradually decreased. Five of the six participants completed the baseline written knowledge test, four participants completed the first four units, three continued to complete the 5th and 6th unit, and two participants completed all portions of the study including the post-intervention test.

Following the modifications for phase 2, participant attrition dramatically dropped from 66.67% to 13.33% which provides support for the use of the combination of supervised study sessions and monetary reinforcement for reducing attrition.

As seen in Figure 1, the two participants from phase 1 who completed both baseline and post-intervention written knowledge tests showed an increase in spark* knowledge with a $M = 14.00\%$ improved score. After running a paired samples *t*-test, the results were insignificant ($p=0.067$), however they are still promising as there was a very small sample size ($n = 2$) and a trend was demonstrated. In addition, the same can be said of the participants' ability to answer the varying levels of questions; there was improvement however it was statistically insignificant ($p=.08$) as shown in Figure 2.

Regarding phase 2, the participants who completed both written knowledge tests showed an increase in spark* knowledge with a $M: 32.55\%$ improved score with significant results ($p<.01$) as seen in Figure 3. Additionally, the participants showed a significant ($p=.01$) increase in their ability to answer varying levels of questions following CAPSI as shown in Figure 4. A point to note is that of the level 2 questions on the post-intervention test: every participant

answered the question incorrectly, therefore showing a 0% average across participants for answering level 2 questions. Unfortunately, the questions when developed were created from a different edition of the manual that was distributed to the participants. Because of this, the answer to the question on the post-intervention test was not in the edition of manual the participants had access to and so will be avoided in further studies. Therefore, this experiment does not provide appropriate data to conclude its effect on answering level 2 comprehension questions.

All participants received a “pass” on every unit test that they completed; no “re-study” grade was given. Speculating, this finding provides support to the belief that participants rely heavily on the text while completing the unit tests. It may be beneficial in the future to reduce the time allotted to the participants to complete the unit tests to promote more independent answering of the questions without use of the text book.

Discussion

The results of this study indicate that CAPSI is an effective method of instruction for spark*, at least under supervision with a monetary incentive. In addition, the participants’ ability to answer higher order questions also increased following intervention, again while under supervision and with a monetary incentive. These results show consistency with the previous research on CAPSI’s effectiveness as a teaching method. Although the results for phase 1 were not found to be statistically significant, they were still promising as there were several limitations to the study which hindered potential significance.

Limitations

Because this is the first study looking at CAPSI's ability to teach spark* procedures, no background research was available to help indicate potential complications and limitations of spark*/CAPSI research. Therefore, several limitations did appear during the study's undertaking. First, regardless of the decreased reading requirement placed on the participants, there was still a high attrition rate in phase one due to either the reinforcer not being effective enough to match the degree of effort required to complete the study, or due to participants' conflicting obligations resulting from the timing of when the study was run. The first phase was run during the summer months with only graduate students; a time often filled with additional activities and events not occurring throughout the school year. Conversely, the second phase was run during the school year with a mixture of graduate, undergraduate and previously graduated students, providing a wider spectrum of individuals with varying obligatory conflicts.

In addition, because it was necessary to instruct all of the participants in the same way with the same material due to their participation in the larger IPE study, no true control group was used. A further limitation is that of the reliance on the honour system upon administering the post-intervention test. The participants had access to the spark* text while writing the post-intervention test as the text could not be collected due to being required for their participation in the IPE study. Although they were asked to not peruse the text during the test, it cannot be confirmed that this was indeed the case. However, there was a safeguard put in place in that of the time allowance to complete the test. Adding a time limit restricts individuals from having a large amount of time to peruse the text while writing to create a verbatim answer.

A further limitation is the edition of the manual provided to the participants. The questions were originally created from the 2010 spark* text while unknowingly, the participants received the updated, 2013 edition. This posed several small discrepancies: page numbers referred to in unit test questions were either slightly behind or ahead of the answers as presented in the text, several questions did not have answers in the text edition, and the level two question on the post-intervention exam did not have an answer in the text. For future studies, the questions would be modified to ensure consistency with the most updated version of the text.

Regarding phase 2 of this study, although the attrition rate was dramatically reduced due to the changes implemented, this reduction cannot be conclusively attributed to supervised study because an additional monetary reinforcer was also administered. The combination of changes applied to phase 2 participants were done with the ultimate purpose of reducing attrition; a goal which was accomplished. It was not a priority of this study to determine the effectiveness of each change independently. In addition, although the primary researcher did not interact with the participants during the supervised study sessions, an observer effect can not be discounted as a possible influence on performance. The phase 2 changes may also have affected the degree to which the participants were invested in learning the material and completing the unit tests. In addition, phase 2 participants did not continue on into the IPE portion of the study as the IPE study had concluded. This change may have affected the dedication to which the participants felt towards their intake and recall of the information.

Implications

Because of the prevalence of ASD in children, a practical system for delivering effective teaching procedures tailored to individuals working with children with ASD is becoming more

necessary. Encouragingly, due to CAPSI's flexibility and proven effectiveness in teaching, and due to CAPSI being shown as a viable method of instruction for spark*, it may be possible to increase the range of individuals able to learn and implement spark* procedures.

As spark* is tailored towards being accessible to both health care practitioners as well as parents, these findings are promising as individuals who may have been previously hindered in attending workshop training sessions may now have the opportunity to learn techniques previously unattainable.

Follow-up studies should be run with more participants as well as with a more concrete control group; that is, with individuals learning spark* through CAPSI, individuals learning spark* through the text alone, as well as with individuals learning spark* through workshop training. Further research should also look at developing a protocol for determining CAPSI's effectiveness in knowledge translation of spark*; that is, through testing how CAPSI promotes both the acquisition of spark* knowledge as well as the acquisition of the skills needed to perform spark* techniques in vivo.

In conclusion, because CAPSI has been seen to effectively teach spark*, further research should be focused on its viability in knowledge translation so that another method of working with children with ASD is available for use in the public domain. As spark* has been shown to be an effective instructive technique for children with ASD, CAPSI may be an answer to how spark* can be introduced to the general public.

References

- American Psychiatric Association. (2000). *Diagnostic and statistical manual of mental disorders, 4th ed., text revision*. Washington, DC: American Psychiatric Publishing.
- Bloom, B. S. (1956). *Taxonomy of Educational Objectives: Cognitive and Affective Domains*. New York: David McKay.
- Carr, M.E., Moore, D.W., & Anderson, A. (2014) Self-management interventions on students with autism: a meta-analysis of single-subject research. *Exceptional Children, 81*(1), 28-44.
- CDC. Prevalence of autism spectrum disorder among children aged 8 years. *Autism and Developmental Disabilities Monitoring Network, 11 sites, United States, 2010. 63*(SS02), 1-21.
- Crone-Todd, D., & Pear, J. (2001). Application of Bloom's taxonomy to PSI. *Behavior Analyst Today, 2*(3), 204-210.
- Crone-Todd, D., Pear, J., & Read, C. (2000). Operational definitions for higher-order thinking objectives at the post-secondary level. *Academic Exchange Quarterly, 4*(3), 99-106.
- Duchan, E., & Patel, D.R. (2012). Epidemiology of autism spectrum disorders. *Pediatric Clinics of North America, 59*(1), 27-43.
- Fombonne, E. (2003). The Prevalence of Autism. *JAMA, 289*(1), 87-89.
- Hu, Lei (2012). *Effects of a self-instructional manual (SIM) and web-based computer-aided personalized system of instruction (WebCAPSI) on teaching knowledge and implementation of the assessment of basic learning abilities (ABLA)* (Master's thesis). Available from MSpace at the University of Manitoba Faculty of Graduate Studies – Electronic Theses and Dissertations. Retrieved from <http://hdl.handle.net/1993/12547>
- Keller, F. S. (1968). "Good-bye, Teacher...". *Journal of Applied Behavior Analysis, 1*(1),79-89.
- Korkman, M., Kirk, U., & Kemp, S. (1998). *NEPSY: A developmental neuropsychological assessment*. San Antonio, Texas: The Psychological Corporation.
- Lainhart, J. E., Ozonoff, S., Coon, H., Krasny, L., Dinh, E., Nice, J., et al. (2002). Autism, regression and the broader autism phenotype. *American Journal of Medical Genetics, 113*, 231-237.
- Lee, M.S., Kehler, K., Martin, T., Wightman, J., Pear, J., Yu, C.T., & Oliveira, M. (2013). The effect of study supervision on attrition and learning in experiments on Discrete Trials Teaching instruction. Poster presented at a provincial meeting for Manitoba Association for Behaviour Analysis (MABA), 2013 Canada.

- Lee, S.H., Simpson, R.L. & Shogren, K.A. (2007). Effects and implications of self-management for students with Autism: a meta analysis. *Focus on Autism and Other Developmental Disabilities*, 22(1), 2-13.
- Mackenzie, H. (2010). *The Autistic Child's Guide to How to Behave – Introducing spark*: Self-Regulation Program of Awareness and Resilience in Kids*. Winnipeg, Manitoba: Wired Fox Publications.
- Martin, G. & Pear, J. (2011). *Behavior Modification – What It Is and How To Do It* (9th ed.). Upper Saddle River, New Jersey: Pearson Education.
- Martin, T. L., Pear, J. J., & Martin, G. L. (2002). Analysis of proctor marking accuracy in a computer-aided personalized system of instruction course. *Journal of Applied Behavior Analysis*, 35(3), 309-312.
- Ouellette-Kuntz, H., Coo, H., Lam, M., Breitenbach, M., Hennessey, P., Jackman, P. D., Lewis, M. E. S., Dewey, D., Bernier, F. P. & Chung, A. M. (2014). The changing prevalence of autism in three regions of Canada. *Journal of Autism and Developmental Disorders* 44, 120-136.
- Pear, J. & Svenningsen, L. (2011). Effects of computer-aided personalized system of instruction in developing knowledge and critical thinking in blended learning courses. *The Behavior Analyst Today* 12(1), 33.
- Stoesz, B. M., Montgomery, J. M., & MacKenzie, H. (2013). Evaluation of executive function and autism characteristics in children with ASD participating in spark*. Poster presented at International Meeting for Autism Research (IMFAR), May 2-4, 2013 Spain.
- Stone WL, Lee EB, Ashford L, Brissie J, Hepburn SL, Coonrod EE, et al. (1999) Can autism be diagnosed accurately in children under 3 years? *Journal of Child Psychology and Psychiatry*, 40(2), 219-226.
- Zaragoza-Sherman, Alejandra (2010). *Using Computer-Aided Personalized System of Instruction (CAPSI) to Teach Discrete- Trials Teaching (DTT) for Educating Children with Autism Spectrum Disorders (ASDs)* (Master's thesis). Available from MSpace at the University of Manitoba Faculty of Graduate Studies – Electronic Theses and Dissertations. Retrieved from <http://hdl.handle.net/1993/4151>

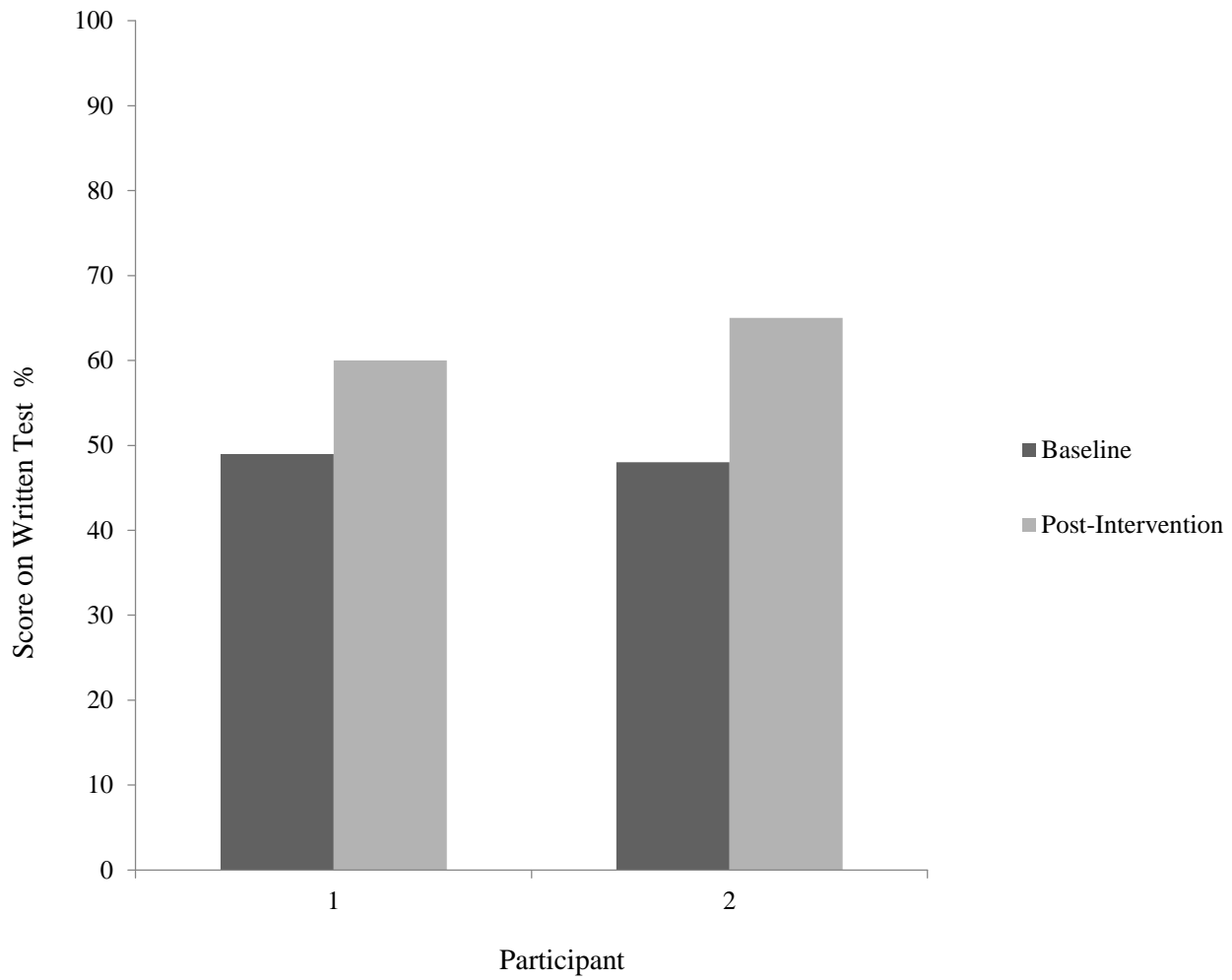


Figure 1. Written test performance increase from baseline to post-intervention for phase 1 participants.

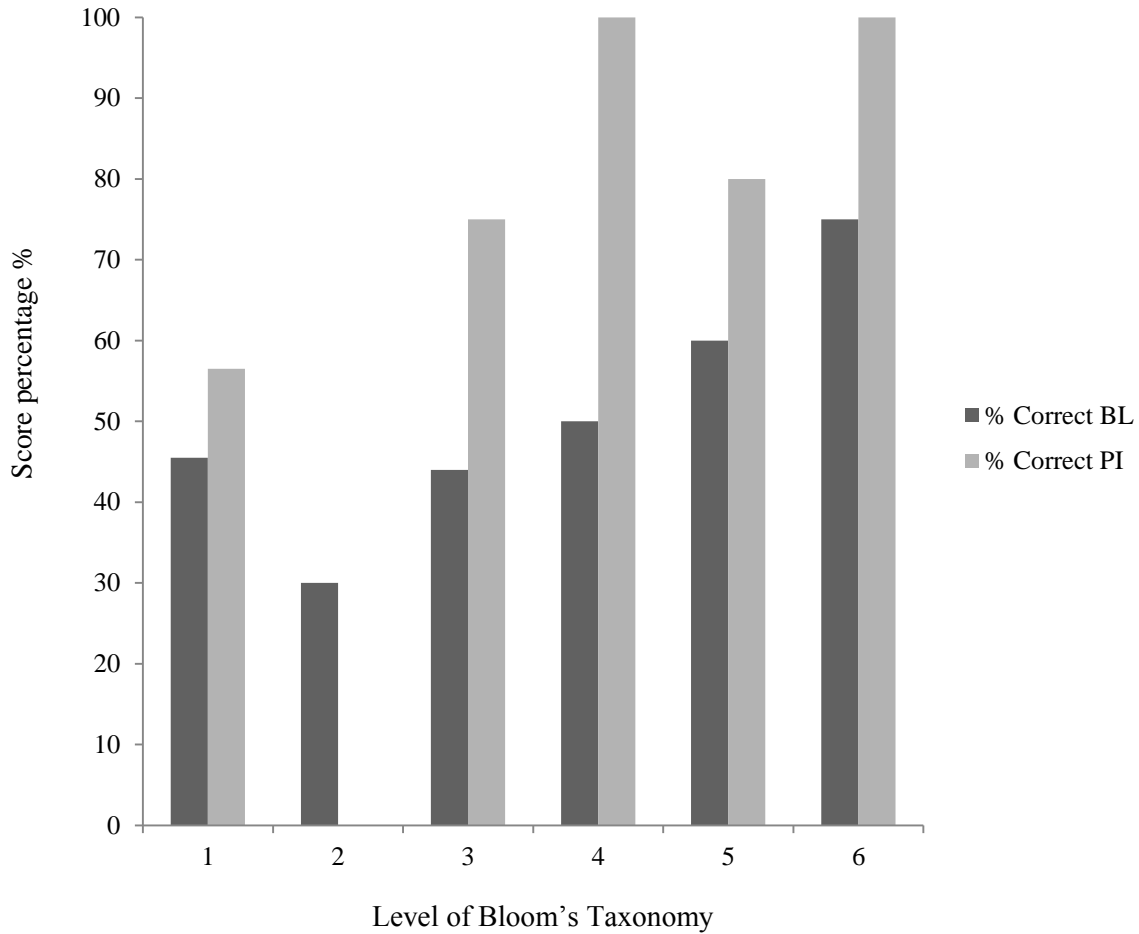


Figure 2. Bloom's Taxonomy level of performance increase from baseline to post-intervention for phase 1 participants. Data indicates average score of answers averaged across participants for each level.

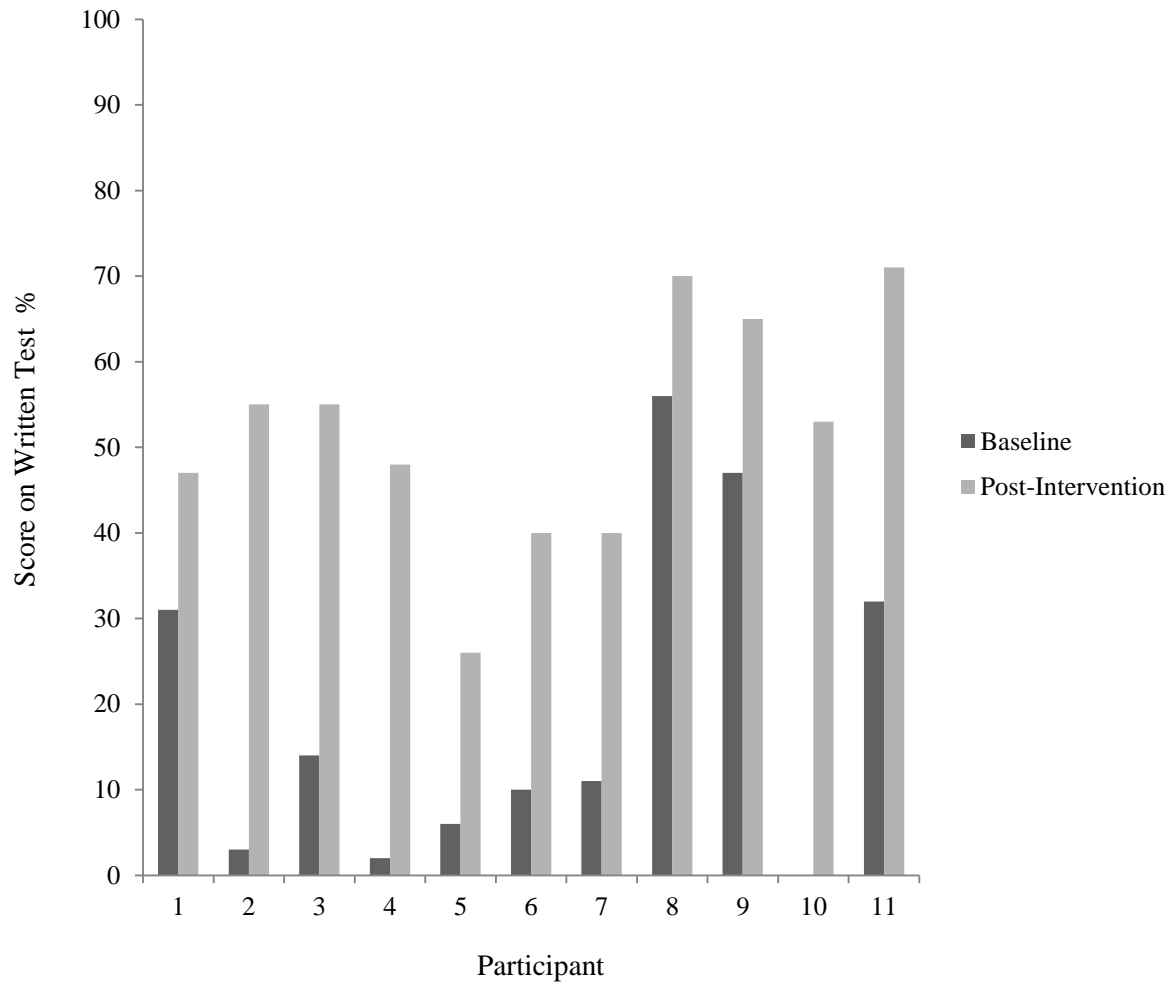


Figure 3. Written test performance score increase from baseline to post-intervention for phase 2 participants.

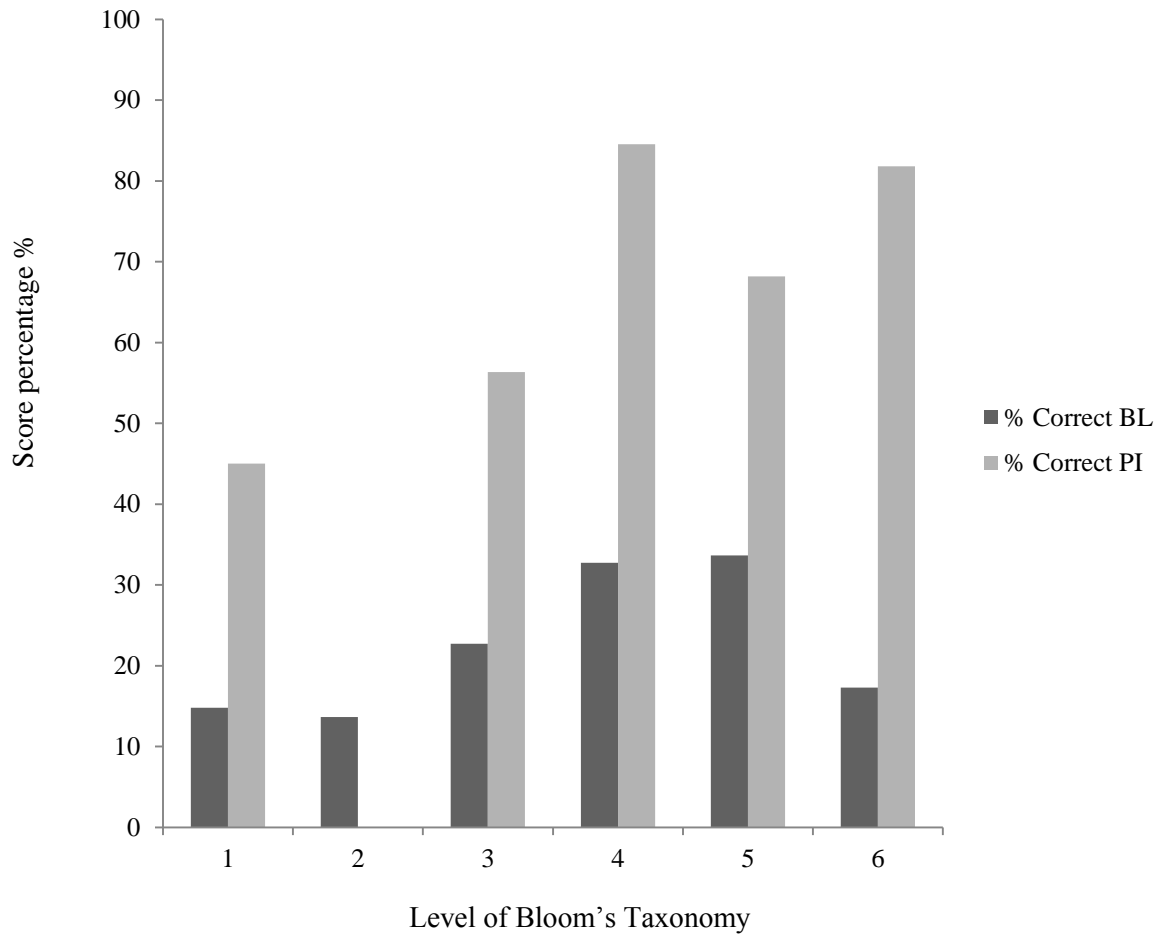


Figure 4. Bloom's Taxonomy level of performance increase from baseline to post-intervention for phase 2 participants. Data indicates average score of answers averaged across participants for each level.

Appendix A

Study Questions Developed by Primary ResearcherUnit 1:

1. Define “self-regulation”.
2. List the six benefits of self-regulation as determined by Zimmerman.
3. List the six steps of a child’s self-regulation process.
4. In an example from your own life, illustrate the process of self-regulation.
5. List and briefly describe the stages which occur when helping a child to increase their independence.
6. Using an original example, describe the connection between self-regulation and one’s cultural values.
7. Using an original example, describe the connection between self-regulation and one’s preferences.
8. Using an original example, describe the connection between self-regulation and one’s familial values.
9. Why does self-regulation need to be adaptable to varying contexts, such as cultural, religious, individual family?
10. List and briefly describe what self-regulation is not.
11. Using an example from your own life, describe when you either experienced or came across someone who experienced dysregulation.
12. List the three areas of difficulty often shown in individuals with Autism spectrum conditions.
13. In your own words, what does it mean that an individual on the Autism Spectrum shows social impairments?
14. In your own words, what does it mean that an individual on the Autism Spectrum shows communication impairments?
15. In your own words, what does it mean that an individual on the Autism Spectrum shows behavioural impairments?
16. Briefly summarize the findings presented concerning outcomes for adults with ASC.
17. List the three main reasons why it is hypothesized people with ASC do not achieve higher levels of education, employment and independence.
18. What percentage of adults with ASC showed significant difficulties with ritualistic and stereotyped behaviour, resistance to change and unusual preoccupations according to Howlin, Goode, Hutton and Rutter’s (2004) study?
19. As defined by Levine (2007), what are the four pieces of “gear” needed in the *Essential Cognitive Backpack* for children to carry into successful adulthood?
20. Why would an adult lacking self-advocacy skills indicate a poor ability to self-regulate?
21. Why would an adult lacking the ability to execute goal-directed activities indicate a poor ability to self-regulate?
22. Why would an adult lacking the ability to modify their behaviours to comply with societal and communal standards indicate a poor ability to self-regulate?
23. Compare the ways in which a child with weak self-regulatory skills would behave with the way in which a child with strong self-regulatory skills would behave during a fight with his friends.
24. Using two separate research findings provide an original example showing how those particular benefits can aid a child in their everyday life.

25. Imagine that a child wants a toy which his friend is currently playing with. Right before he hits his friend in hopes of gaining access to the toy, he stops and decides to just push his friend instead. Is this an example of self-regulation? Why or why not?

Unit 2

1. What is the “main organizing and coordinating centre in our brains” referred to as?
2. Describe how spark* defines “executive functions”.
3. Describe Figure 1.’s intention in defining the relationship between executive functions, self-regulation and context.
4. What is meant by self-regulation in the context of spark* as indicated by the mentioned major premises?
5. List the five executive functions included in spark*
6. In your own words, describe what is meant by “planning and organization” in respect to one’s executive thinking.
7. Using an original example, describe a way a child shows that they are using their ability to plan and organize.
8. In your own words, describe what is meant by “inhibitory control”.
9. Using an original example, describe a way a child shows inhibitory control.
10. In your own words, describe what is meant by “working memory”.
11. Which of the five executive functions has a “supervisory” role? And what effect does this role have on the person?
12. In your own words, describe what is meant by “cognitive flexibility”.
13. In your own words, describe what is meant by “self-monitoring”.
14. Using an original example, describe a way a child shows cognitive flexibility.
15. Using an original example, describe a way a child shows self-monitoring.
16. Using an original example, describe how the inter-dependence between the executive functions can impact each other while dealing with a stressful task.
17. List the three types of attention and provide an example of each.
18. In your opinion, is one of the three mentioned types of attention more necessary to the development of proper self-regulatory skills than the others? Explain your reasoning.
19. What is mentioned as the most notable trend in the development of self-regulation?
20. Which of the five executive functions would be assumed to be engaged most prominently when a child is determining what activity they want to sign up for in class?
21. Which of the five executive functions would be assumed to be engaged most prominently when a child is about to engage in a chore?
22. Imagine a teenager is trying to learn how to wash his laundry. He determines that for the task he needs the dirty laundry, a washing machine and some form of soap. He concludes that he needs to put the dirty laundry in the washing machine, add the soap and then press the start button on the machine. Feeling lazy, he hurriedly shoves all of his clothes into the machine. Since the machine started, he deemed that everything was ok. Upon removing all of his clothes, he sadly notices that his white shirt is no longer white – now a baby pink colour. He throws his shirt away upset. The next week when returning to wash his laundry again, he repeats the exact same process. Which of the five executive functions is not functioning in this example?

23. Why is it necessary for all five executive functions do be functioning properly to display healthy self-regulatory skills?
24. Create an original example showing how two or three different executive functions allows a person to achieve a goal. In your example, indicate the functions you chose, the particular goal to be achieved and the process in doing so.

Unit 3

1. List and describe in your own words the two commons myths concerning neurology and the reasons why the myths are incorrect.
2. If a friend told you that there must be an fMRI brain scan indicating a causal relationship between a particular behaviour and an appearance on the scan, what would your response be? Keeping in mind the current research brought forward in spark*.
3. What is the one cognitive deficit in individuals with ASC that has been found repeatedly across researchers?
4. In your own words, briefly describe how the different common behaviours of children with ASC may be linked to under-developed self-regulatory skills and executive functioning. (p.24)
5. Explain why learning self-regulation is particularly important to children with ASC and other special conditions.
6. What is the general conclusion regarding all of the studies researching the effects of children with ASC's planning and organizing skills? In what circumstance is the effect compounded?
7. What is the general conclusion regarding all of the studies researching the effects of children with ASC's inhibitory control skills?
8. Compare and contrast how a child without ASC and how a child with ASC may approach a direction from their parent to clean their room.
9. Compare and contrast how a child without ASC and how a child with ASC may respond to the instruction "Behave yourself!" while in a dentist's office.
10. Considering the five executive functions, provide an example of how a child may act in an arousing situation if they have deficits in several of the functions. In your example, describe the situation, the particular deficits, and how those deficits cause the particular behavior.
11. Compare and contrast how a child without ASC and how a child with ASC may approach a conflict with friends.
12. What is the general conclusion regarding all of the studies researching the effects of children with ASC/s working memory?
13. What is the general conclusion regarding all of the studies researching the effects of children with ASC's self-monitoring skills?
14. What is the general conclusion regarding all of the studies researching the effects of children with ASC's cognitive flexibility?
15. How might the cognitive inflexibility of an individual with ASC affect his/her daily living activities?
16. How might emotional dysregulation of an individual with ASC affect that individual's social life?

Unit 4 -

1. Create an original example combining at least two of the long-term goals of spark* on how a child's life can improve with proper self-regulatory skills.
2. List the 6 unique features of spark* listed in the training manual.

3. What does spark* stand for?
4. What does the concept of neuroplasticity mean in the context of spark* helping children with ASC?
5. List the two points Feuerstein stressed as vitally important in the Instrumental Enrichment model.
6. In your own words, describe Reuven Feuerstein's (1988) model of Instrumental Enrichment (IE) and the conclusions drawn from it.
7. What was the general conclusion of the Brace, Morton and Munakata (2006) study? Why would this be significant to the spark* program?
8. What was the general conclusion of the Kouijzer, de Moor, Gerrits, Buitelaar and van Schie (2009) study? Why would this be significant to the spark* program?
9. In your own words, describe what cognitive behavioural therapy (CBT) is and what it is often used for.
10. Define "mindfulness". What does mindfulness teach?
11. What is Mindfulness Education (ME)? What does it focus on
12. List the four particular attributes spark* is designed to enhance in children.
13. List and briefly paraphrase the three main components of spark*.
14. Why would it be more difficult for a child to engage in cognitive self-regulation as compared to behavioural self-regulation?
15. Using two different, original examples compare how a child may appear with weak behavioural self-regulatory skills with one who has strong behavioural self-regulatory skills.
16. What are the five areas of focus within behavioural self-regulation?
17. What is the order of progression of task variations concerning behavioural self-regulation?
18. What five contexts should each action in the behavioural self-regulation unit be performed in?
19. Using two different, original examples compare how a child may appear with weak cognitive self-regulatory skills with one who has strong cognitive self-regulatory skills.
20. In your own words, briefly explain the reasoning for the five, progressively difficult contexts each task in the behavioural self-regulation should be run through.
21. List the three main areas of focus for cognitive self-regulation including their sub-skills.
22. Using two different, original examples compare how a child may appear with weak emotional self-regulatory skills with one who has strong emotional self-regulatory skills.
23. List the three main areas of focus for emotional self-regulation.
24. As indicated by Figure 7, why would the self-advocacy step not be a component of the development of emotional self-regulation?
25. What are the four steps each child goes through in the process of achieving self-regulation in the spark* model?
26. Describe what is meant by "awareness of ability" in the context of spark*.
27. What does the acronym "SPELL" stand for in relation to the National Autism Society in the United Kingdom? Define the word each letter stands for.
28. Describe what is meant by "awareness of need" in the context of spark*.
29. Describe what is meant by "resilience" in the context of spark*.
30. Describe what is meant by "self-advocacy" in the context of spark*.

Unit 5 -

1. In your own words, describe what is meant by "emotional climate". Why would this be important when working with children with ASC in particular?

2. List and briefly describe the five different environmental factors one must consider before starting a spark* session.
3. Using an original example, describe a situation in which you would choose to use a “face-to-face in group” seating arrangement.
4. Imagine you are working with a child with ASC who you have previously found becomes increasingly distracted with surrounded by peers. What seating arrangement/s would you choose to work in and which ones would you not? Why?
5. Using an original example, describe a situation in which you would use a “side-by-side” seating arrangement.
6. List the five “rules of thumb” when performing a spark* session with a child.
7. What is meant by ensuring a child “CAN” learn? Define the word each letter stands for and state its importance.
8. List and briefly describe the two different child variables one must consider before starting a spark* session.
9. Define intrinsic motivation and explain briefly why it is stressed in the spark* model.
10. List and briefly describe the five different adult behaviours one must consider before starting a spark* session.
11. List the key features of an effective and facilitative adult communicative style.
12. Define “autonomy” as it is seen in the spark* model.
13. What is meant by the “180 degree rule”? Provide an example from your own life on how you could apply the rule to become a more positive communicator.
14. What is meant by “scaffolding”? Describe several ways you could employ ‘scaffolding’ in a spark* session with a child with ASC.
15. On the basis of the info presented in the text and training manual, what would you say is the ultimate goal of spark*? Defend your answer

Unit 6

1. What does “POET” stand for? What is its function in spark*?
2. What does “TIM” stand for? What is its function in spark*?
3. What are the over-riding goals in mediated learning?
4. Briefly describe the five features of Vygotsky’s mediational approach
5. List the five key features of a “mediated learning”. Which of the five are directly related to therapeutic alliance?
6. List and briefly describe the six important processes that help make up mediational learning.
7. With the help of an example from your own life, compare and contrast mediational and directive approaches to leadership.
8. Imagine an individual decided to “take charge” of their group project at school and started telling classmates which roles they should play in order to share the work. The student then makes himself the self-proclaimed leader and asks the other group members to bring forward their ideas and work for him to correct and modify as he sees fit. Would this be an example of a mediational approach? Defend your answer.
9. Imagine a circumstance in which a CEO of a corporation dictated tasks to his workers, took very little to no advice from his support staff, and has implemented a strict reward and punishment incentives. Is

this an example of a meditational or directive approach? How could you change this circumstance to switch it to the other approach?

10. Create an original example in which it would be more beneficial to use a directional approach.
11. What particular word is used in high frequency in mediated learning? Why?
12. What particular words are to be avoided in meditational learning?
13. In general, what percentage of language should be non-directive when conducting a spark* session?
14. Imagine a circumstance in which you just met a child with ASC for the first time and when performing an imitative task with the group, you single out the one child and ask him “What would happen if I did this instead?” What level of cognitive complexity is this question? Is it appropriate? If it is, why? If not, how could you make it a more appropriately leveled question?
15. In your own words, summarize the steps required to prepare for a spark* session; including the mention of needed materials, set-up of chairs, and the planning board.
16. In your own words, summarize the steps to be engaged in during spark* sessions; stating the differences between one-on-one sessions and group settings.
17. What are six important behaviours to model when conducting a spark* session?
18. Using a minimum of three of the mentioned tips for fostering a therapeutic alliance, create an original example in which the therapeutic alliance built helped handle a child who was showing some difficulty during a spark* session.

Unit 7

1. How can you ensure that spark* is implemented as it was designed to be?
2. List and briefly describe the six areas listed as directions and words you should use when working with children.
3. What percentage score on the Treatment Integrity Monitoring form indicates good treatment integrity?
4. Describe in two or three sentences why it is important for the child, while learning body control, to progress from particular body parts to the whole body?
5. List and briefly describe the five areas of focus when teaching behavioural self-regulation and the rationale behind their ordering.
6. List and briefly describe the four areas of skill development when teaching behavioural self-regulation and the rationale behind their ordering.
7. Why are “self-monitoring” and “inhibitory control” stressed throughout the lessons?
8. Why does cognitive flexibility only receive secondary attention throughout the lessons?
9. List and briefly describe the four different ways a task can be varied within each lesson in the behavioural self-regulation unit?
10. Briefly list and paraphrase the ways that adult involvement is reduced progressively throughout the lessons.
11. What effect does using “inclusive language” throughout the lessons in the text, have on the child?
12. What is the level of accuracy you should strive for before progressing to the next lesson in the sequence? What is the level of accuracy reduced to when engaging in activities that require extension into daily life? What is the rationale behind the reduction?
13. Why is it important that you do not, if at all possible, tell the child to use his self-regulation?
14. Briefly summarize the steps required to perform a pre-assessment.

15. Imagine a circumstance in which you are running a session with an individual and you are performing a pre-assessment. You are on the “slow-clapping” step. After the five trials, you make note that the child performed three correct. Which box would you place the checkmark?
16. List and briefly describe the three letters used as progress indicators when evaluating a child’s abilities.
17. According to the Pre-assessment-behavioural self-regulation form found on p.355, what four areas of focus will be assessed prior to the lessons being engaged in?

Appendix B

Order to Read spark* Text

Autistic Child's Guide to How to Behave = ACGHB

- 1) ACGHB - Chapter 1
- 2) ACGHB – Chapter 2
- 3) ACGHB – Chapter 3
- 4) ACGHB – Chapter 4
- 5) ACGHB – Chapter 5
- 6) ACGHB – Chapter 5
- 7) ACGHB – Chapter 6

Appendix C

Demographics Questionnaire

Research Project: Effectiveness of a Computer-Aided-Personalized-System of Instruction to Teach spark*
Procedures

Please answer the questions below to provide us with some more information regarding your background. Please do not put your name on this form. The researcher will assign an arbitrary code for you to mask your identity.

You do not have to give any information that you do not want to. Let the researcher know if you have any questions.

1. Please indicate your gender.

M / F

2. Is English your first language?

Y / N

3. Please identify the range that includes your GPA:

- 1.5-2.0
- 2.1-2.9
- 3.0-3.4
- 3.5-3.9
- 4.0-4.5

4. Please identify the range that includes your age.

- 18-24
- 25-29
- 30-34
- 35+

5. Have you used Computer-aided Personalized System of Instruction (CAPSI) before?

Y / N

6. If you've completed or are working on a university degree, please indicate your major and minor areas of study.

Major: _____

Minor: _____

7. Have you received or attended any training on how to teach individuals with autism or developmental disabilities?

Y / N

8. If you answered yes to the previous question, please describe the training. _____

9. Have you received any previous training on spark* or do you know any information regarding spark* and how spark* sessions are run?

Y / N

Appendix D

spark* Knowledge Test – Baseline**QUESTIONS TO BE ENTERED INTO CAPSI**

1. In an example from your own life, illustrate the process of self-regulation.
2. In your own words, describe what is meant by “cognitive flexibility”.
3. Which disorders other than autism spectrum disorder involve impaired executive functions and weak self-regulatory skills?
4. Why would it be more difficult for a child to engage in cognitive self-regulation as compared to behavioral self-regulation?
5. List the key features of an effective and facilitative adult communicative style.
6. Compare the way in which a child with weak self-regulatory skills would behave with the way in which a child with strong self-regulatory skills would behave during a fight with his friends.
7. Create an original example showing how two or three different executive functions allows a person to achieve a goal. In your example, indicate the functions you chose, the particular goal to be achieved and the process in doing so.
8. In your own words, list and briefly describe the five executive functions and their effect on children with ASC.
9. Define “mindfulness”. What does mindfulness teach?
10. What is meant by the “180 degree rule”? Provide an example from your own life on how you could apply the rule to become a more positive communicator.

Appendix E

spark* Knowledge Test – Post-Intervention
QUESTIONS TO BE ENTERED INTO CAPSI

1. Define “self-regulation”.
2. List the five executive functions included in spark*.
3. In your own words, briefly describe how the different common behaviours of children with ASC may be linked to under-developed self-regulatory skills and executive functioning.
4. Using two different, original examples compare how a child may appear with weak behavioural self-regulatory skills with one who has strong behavioural self-regulatory skills.
5. List the five “rules of thumb” when performing a spark* session with a child.
6. List the six steps of a child’s self-regulation process.
7. Using an original example, describe a way a child shows inhibitory control.
8. Considering the five executive functions, provide an example of how a child may act in an arousing situation if they have deficits in several of the functions. In your example, describe the situation, the particular deficits, and how those deficits cause the particular behavior.
9. What is the order of progression of task variations concerning behavioral self-regulation?
10. Using an original example, describe a situation in which you would use a “side-by-side” seating arrangement.

Appendix F

spark* Knowledge Test – Baseline Answer Key*Each question worth 10 points*

1. In an example from your own life, illustrate the process of self-regulation.
 - “Self-Regulation” – Ability to control one’s body (1), perceptions (1) and thinking (1) in situationally-appropriate ways. (2)
 - Examples will vary...control one’s body (1), perceptions (1), thinking (1) in situationally appropriate ways (2).
2. In your own words, describe what is meant by “cognitive flexibility”.
 - Cognitive flexibility:
 - Ability to move easily from one situation or activity to another and adjust to the change. (4)
 - Permits you to shift to a different thought, action or perspective according to changes in the context (3)
 - Allows one to think of alternative solutions to a problem or unconventional uses of an object. (3)
3. Which disorders other than autism spectrum disorder involve impaired executive functions and weak self-regulatory skills?
 - ADD (2)
 - Tourette’s syndrome (2)
 - Schizophrenia (2)
 - OCD (2)
 - Phenylketonuria (2)
4. Why would it be more difficult for a child to engage in cognitive self-regulation as compared to behavioral self-regulation?
 - Varied answers acceptable.....(10)
 - Ex: Must learn that he/she actually has control over and can modify physical movements (external behaviors) in appropriate ways before he/she can learn to take control over internal behaviors

5. List 4 of the key features of an effective and facilitative adult communicative style.

- Varied answers acceptable – each of the four = (2.5)
 - Giving child opportunity to talk
 - Saying/admitting when you do not know something
 - Listening to how the child would like to do things
 - Responding positively to child questions and comments even when different from own ideas
 - Providing necessary guidelines to guide child's behavior
 - Using hints/cues/open questions to prompt child action
 - Acknowledging the child's perspective and experiences
 - Allowing control over discussion to flow more to the child
 - Providing motivational support and praise that explains clearly what he/she did well
 - Avoiding directives, orders and commands
 - Offering feedback that helps the child understand his learning strengths

6. Compare the way in which a child with weak self-regulatory skills would behave with the way in which a child with strong self-regulatory skills would behave during a fight with his friends.

- Varied answers acceptable
- Self-regulation: ability to control one's body, perceptions and thinking in situationally-appropriate ways.
- Weak self-regulation – Can't control either body, emotions, voice etc. or combination of all
- Description of self-regulation – (4)
- Comparison (2 points per comparison item mentioned – maximum of 6 points)

7. Create an original example showing how two or three different executive functions allows a person to achieve a goal. In your example, indicate the functions you chose, the particular goal to be achieved and the process in doing so.

- Answers may vary...
- Five executive functions: Planning and organizing, inhibitory control, working memory,

self-monitoring, and cognitive flexibility (pick at least 2) (2)

- Identify goal (2)
- Process to achieve goal (6)

8. In your own words, list and briefly describe the five executive functions and their effect on children with ASC.

- Planning + Organizing: Perceptions, thoughts, intentions and actions organized and integrated into a plan (2)
- Inhibitory Control: Direct attention and actions even in the presence of distractions (2)
- Working memory: Hold information in mind long enough to generate goals, plans and steps needed to achieve goals (2)
- Self-monitoring: Ability to supervise actions and thoughts to ensure they are directed towards a goal. (2)
- Cognitive flexibility: Move easily from one situation to another and adjust to the change. (2)

9. What does mindfulness teach?

- Mindfulness: Systematic approaches to regulating attention (3) so it is maintained on your immediate experience (4) – increased recognition of thoughts and feelings in the present moment in a non-judgemental and accepting way (3)

10. What is meant by the “180 degree rule”? Provide an example from your own life on how you could apply the rule to become a more positive communicator.

- 180 degree rule: Turning your mindset 180 degrees and convert prohibitive language into positive statements. (5)
- Example: (5)

Appendix G

spark* Knowledge Test – Post-Intervention Answer Key

1. Define “self-regulation”.

- Self-regulation – Ability to control one’s body, perceptions and thinking in situationally-appropriate ways. (10)

2. List the five main components of executive functions included in spark*.

- Planning and organization (2)
- Inhibitory control (2)
- Working memory (2)
- Self-monitoring (2)
- Cognitive flexibility (2)

3. In your own words, briefly describe how the different common behaviours of children with ASC may be linked to under-developed self-regulatory skills and executive functioning.

- Varied answers acceptable (10)
- Ex: Repetitive behaviors + preoccupations → self-regulation problem
 - Perseveration + over-focus show unable to inhibit behaviors/thoughts to shift focus
- Ex: Poor imitation skills
 - Weak self-regulation of attention, planning and organization, inhibitory control, working memory, self-monitoring and cognitive flexibility
- Ex: Joint attention impairments
 - Problem in self-regulation
- Ex: Inability to self-monitor
 - Poor working memory, inhibitory control, and cognitive flexibility involved

4. Using two different, original examples compare how a child may appear with weak behavioural self-regulatory skills with one who has strong behavioural self-regulatory skills.

- Example 1 – (5)
- Example 2 – (5)
- Strong behavioural self-regulation: Aware of body in space; aware of appropriate bodily movements for situations
- Weak behavioral self-regulation: Not aware of body, space required, appropriate physical actions for situations

5. List the five “rules of thumb” when performing a spark* session with a child.

- Demonstrate a skill up to 3 times – (2)

- Guide the child in practicing the new skill up to 4 times – (2)
- Once he/she learns a skill, move on to more challenging skills –(2)
- If does not learn, change structure of the task/process in which it is taught + try again (2)
- Always assume that it is what/how YOU presented something and NOT a problem with the child (2)

6. List the six steps of a child’s self-regulation process.

- Set realistic and successful goals for learning (1.7)
- Develop and use effective strategies (1.7)
- Monitor their performance (1.7)
- Manage their time well (1.7)
- Adjust goals and strategies to optimize performance (1.7)
- Believe in their own abilities (1.7)

7. Using an original example, describe a way a child shows inhibitory control.

- Answers may vary...
- Definition of inhibitory control – Allows you to direct attention and actions even with distractions – override external stimuli; suppress inappropriate thoughts and actions (3)
- Example describing definition appropriately (7)

8. Considering the five executive functions, provide an example of how a child may act in an arousing situation if they have deficits in several of the functions. In your example, describe the situation, the particular deficits, and how those deficits cause the particular behavior.

- Answers may vary...
- Five executive functions: Planning and organizing, inhibitory control, working memory, self-monitoring, and cognitive flexibility (should pick at least two of these) (2)
- Define particular deficits (4)
- Example of how child would behave (4)

9. What is the order of progression of task variations concerning behavioral self-regulation?

- Location or position (2.5)
- Speed or rate (2.5)
- Intensity or force (2.5)
- Manner of movement (2.5)

10. Using an original example, describe a situation in which you would use a “side-by-side” seating arrangement.

- Answers may vary
- Side by side seating – less focus on social interaction – allowing for more attention on task – increased focus on task and materials
- Explanation of when: (4)
- Example: (6)