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Memory Functioning for Personally Experienced and Witnessed Events in Children with Autism and the Implications for Educators, Mental Health Professionals, and the Law

Kelly A. Cornett
Alliant International University, akikokellyc@gmail.com

Deborah S. Miora
Alliant International University - Alhambra, dmiora@alliant.edu

Tracy Fass
Alliant International University, tfass@alliant.edu

Dennis Dixon
Center for Autism and Related Disorders, D.Dixon@centerforautism.com

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Introduction

Autism

According to the recently updated Diagnostic and Statistical Manual of Mental Disorders (DSM-5), autism spectrum disorder has been characterized by the following: impairments in socialization, impairments in functional and pragmatic communication, and restricted repetitive and stereotyped patterns of behavior, interest, and/or activities.[1] This diagnostic term differs from what was included in the last iteration of this manual (DSM-IV-TR), in that diagnoses previously listed under the umbrella of pervasive developmental disorder (ie, autistic disorder, Asperger's disorder, childhood disintegrative disorder, and pervasive developmental disorder not otherwise specified), are now classified under the term autism spectrum disorder.[2] Alongside adoption of this updated term, severity levels were added in order to differentiate amongst the varying levels of adaptive functioning and associated support the individual requires. A recent study examined whether this set of new criteria would identify those with PDD, and results indicated that 91% of children with PDD had also met criteria for autism spectrum disorder. [3]

According to the Centers for Disease Control and Prevention, the prevalence of autism is estimated at one in every 88 births.[4] Autism was also considered to be the fastest-growing developmental disability as reported by the California Department of Health and Human Services Agency in 2007.[5] Additionally, the likelihood of a child being diagnosed with autism increased by more than 20% from 2006 to 2008.[4] This increase in prevalence rate has been attributed to a variety of factors, some of which have included the growing awareness about the symptoms of autism and the emphasis on the benefits of early detection and treatment.[6]

In the autism literature, it is believed that there is significant variation in functionality in those with this diagnosis.[7,8] High-functioning autism (HFA) is a commonly used term that, while not formally identified in any iteration of the DSM, has been used to refer to an individual who exhibits significant delay in motor skills, impairment in social interaction, and restrictive patterns of interest, but who does not typically show significant impairment in communication.[9] Similar to those diagnosed with HFA, Asperger's syndrome has also been categorized by impairment in social interaction as well as restricted and stereotyped behavior and/or interests, without the delay in the more obvious aspects of language expression.[10] Research literature, prior to the change to the DSM-5, frequently used both terms somewhat interchangeably. [11]

Research documents that individuals with autism experience a high prevalence of co-morbid disorders including specific phobias (44.3%), obsessive-compulsive disorder (37.2%), and attention deficit hyperactivity disorder (30.6%).[12*] Additionally, it is estimated that 40-69% of individuals with autism spectrum disorders are also diagnosed with a learning disorder .[13]

The better capacity to detect and diagnose autism and comorbid psychiatric disorder(s) carries the additional burden of considering how the characteristics of children with these conditions place them at risk of being bullied, victimized, and susceptible to the influence of peers and others.[14] Learning about their specific liabilities will permit the development of interventions geared towards both strengthening their areas of weakness and helping them adapt to the fast-paced world around them.

Executive Function and Memory In Autism

It is well documented that executive functions are a fluid and developing set of abilities throughout childhood and into young adulthood. Research has consistently shown that executive functions are impaired in individuals with autistic disorder.[15,16,17] Psychologists and neurologists use the term executive functioning to describe a loosely defined collection of brain processes that are responsible for planning, cognitive flexibility, abstract thinking, rule acquisition, initiating appropriate actions and inhibiting inappropriate actions, as well as selecting relevant sensory information.[18] These abilities are central to carrying out socially useful, personally enhancing, constructive, and creative activities.[19] Research in executive functioning in individuals with autism has found, when compared to typically developing, age-matched controls, impairment in their ability to perceive and appreciate social situations.[15] They also experience difficulty with freely recalling and recognizing written and spoken words[16] and providing a coherent narrative that contains the gist of the story (ie, inclusion of the critical elements of the story).[17]

Research also reveals that children with autism recalled events that happened to them with less accuracy when compared to a control group matched for age and verbal ability.[20] Investigators have proposed various explanations for the finding in this population of poor recall for personally experienced events. Barresi and Moore[21] postulated that individuals with autism were impaired in the development of intentional relations, or their awareness of who is performing the action, and information related to that

* While the DSM-IV-TR clearly did not permit for diagnosis of autistic disorder co-morbid with ADHD, clinicians and researchers alike regularly reported a comorbidity as shown in these figures. Furthermore, the DSM-V does not make this distinction.

event. This has also been supported by research that has found that children with autism experience deficits in monitoring the nuances of intention and their personal perceptions of intention.[22,23]

Research in the area of recall performance in this population has also explored how accuracy of performance may be impacted by the way in which the question is presented. McCrory, Henry, and Happe[24] used a live classroom event to compare recall and suggestibility in children with Asperger's syndrome (AS) to an age-matched, typically developing control group. While the results revealed no significant difference for suggestibility between the two groups, the AS group's responses contained less information and revealed poorer gist in comparison to the control group. The AS group also tended to omit socially salient details in their free recall responses. However, when asked general and specific questions about the event, rather than simply being asked to recall as much as possible about the event, both groups elicited a similar amount of information. Based on their findings, the authors concluded that children with Asperger's syndrome may be more reliant on questioning/cueing in order to enhance recall.

Millward, Powell, Messer, and Jordan[25] explored recall memory in children with autism disorder by comparing their recall ability for personally experienced events and observed events. It was revealed in this investigation that children with autism were less accurate in recalling details from a personally experienced event as opposed to a witnessed event. This study used a neutral event and measured recall through the use of open-ended questions.

Taken together, these findings highlight the particular impairment of children with autism to recall events they perform or to which they are subjected; however, these investigations did not explore how memory functioning would be impacted when an event with an emotional tenor was used. Additionally, these studies did not employ use of a forced-choice yes/no recognition task in order to provide additional insight into what may be recalled when this type of cueing is provided. The addition of emotional valence is particularly relevant given the identified problems with interpreting and responding to social cues found in those with autism spectrum disorders. The addition of attempting to delineate or distinguish between recall and recognition gets to the findings that structured and cued recall may elicit more information, yet in legal situations this type of interrogation or questioning can be considered suggestive or leading the witness.

Nevertheless, memory retrieval and recognition are critical to functioning in various aspects of one's daily life, from remembering where

one lives to learning new skills. Memory retrieval and recognition require several processes, first of which is the ability to attend to the incoming information so that it can be registered, then the individual must be able to store and organize this information as well as recognize relevant details in order for such information to be expressed in a meaningful way. Individuals who experience difficulties with attending to and recalling such events, and who have difficulty properly registering the meaning and nuances in social interactions may show faulty reporting due to brain-based deficits rather than due to intention such as evasion or other reasons. Such individuals are at risk when victimized and when witness to events that may require recall and testimony, especially if such events are emotionally laden given the problems in social function and communication that often beset those with autism.

The main purpose of the current study was to provide an ecologically valid investigation of recognition memory in children with autism in relation to personally experienced and witnessed events. The main prediction was: Children with autism were predicted to display less accuracy on measures of recall and recognition memory for personally experienced events than for witnessed events.

Methods

Participants

The study had received approval from the Institutional Review Board at Alliant International University, Los Angeles and written approval from the research team at the agency where participants would be recruited. After receiving approval from both, a total of 42 participants with a DSM-IV diagnosis of autistic disorder were recruited from a company that provides social skills services to children with this diagnosis. Parent report, as well as authorized inspection of the company records, indicated that all of the participants had been given a formal diagnosis of autistic disorder by an appropriately qualified clinician. Additional criteria for inclusion were fluency in English, ability to sustain attention to non-preferred tasks for at least five minutes, compliance with a minimum of two-step instruction, and the ability to communicate verbally. This was verified during the parent interview and later when the research assistant met with the participant to administer the question protocol. Written parental consent, as well as written child assent, was obtained for all participants.

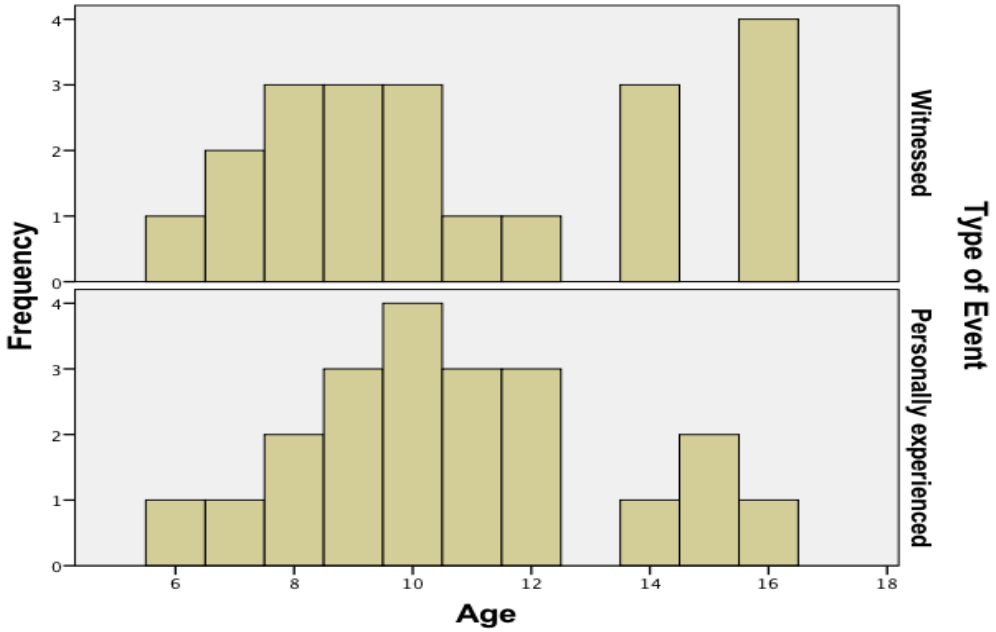
Participants fulfilling the study criteria were randomly assigned using a computerized random-number generator to either the witnessed or personally experienced event. All participants were administered verbally presented questionnaires in both the personally experienced and

witnessed event conditions in order to assess memory retrieval and recognition of the events.

Participants ranged in age from six to 16 years old. The mean age for the witnessed event was 10.9 (S.D. = 3.4), while the mean age for the personally experienced event was 10.71 (S.D. = 2.7). The frequency of age in the two sample groups is presented in Figure 1. There were 40 males and two females. Gender was not controlled for in the present study due to the demographic fact that autism is more common in males than females.[26] Furthermore, Bruck, and Melnyk[27] found no gender differences among typically developing children on measures of autobiographical memory. Additionally, the data were scrutinized to determine whether the two females had extreme scores on the recognition measure. Their data were retained in the study because no extreme scores were found. Regarding parent-reported ethnicity, the sample consisted of 26 (61.9%) Hispanic Americans, 11 (26.2%) European Americans, three (7.2%) Asian Americans, and two (4.8%) African Americans.

Two participants in the sample had parent-reported comorbid diagnoses, which were both reported as attention deficit hyperactivity disorder. In analyzing their performances on the recognition measure and considering observational report, it did not appear as though this comorbid diagnosis significantly impeded their ability to participate in the event or answer the follow-up questions.

Figure 1. Frequency of age in the two sample groups.



Design and Materials

This study used an independent samples design. The two-level independent variable consisted of the type of scenario to which the participant was exposed (witnessed or personally experienced event). The outcome/dependent variable consisted of the scores on a measure of recognition memory for the personally experienced and for the witnessed event. The study also assessed recall performance; however, analysis was not yet completed for this variable.

Participants who met the inclusion criteria were randomly assigned to undergo either the personally experienced event or the witnessed event.

Events

A videotaped scenario depicting a mild stranger-danger situation was created and used to capture recognition of a witnessed event. The scene was set outside of an office and portrayed a situation in which a child was walking with her parent. The parent then briefly walked away from the child to take a phone call, at which point the actor walked up to the child and proceeded to engage the child in a discussion for approximately three minutes. The conversation included questions the actor asked of the child relating to personal details about the child (eg, the child's name, city she lives in, hobbies she engages in) as well as a question pertaining to whether the child wanted to be driven home by the actor. The child responded by stating "No."

A similar scenario was used to capture recall and recognition of a personally experienced event. The same individual who performed in the videotape also performed in the live, personally experienced event. Parents of participants were instructed to bring the child to the office setting and to then step away from the child to take a phone call that would last for approximately three to five minutes. During this period in which the parent was on the phone, the actor approached the child and engaged him in conversation. The conversation included questions the actor asked of the child that related to personal information (eg, the child's name, in which city he/she lived, preferred hobbies), as well as whether the child wanted to be driven home by the actor.

Interview Protocol

Immediately following the event, the child was asked to sign an assent form and then, if the child gave assent, the child was asked to complete a verbally delivered set of questions that assessed recognition content from the event. The interviewer followed a structured protocol closely based on

the Child Memory Scale.[28] The interviewer stated that he or she was not present during the event and that it was okay if the child wanted to stop the interview at any point in time.

Questioning

Eleven recognition-oriented questions, which used a forced-choice yes/no paradigm, were asked following exposure to each event. The participants in the witnessed scenario were verbally presented with these questions that addressed what the actors in the video stated (eg, Did the man say what his favorite thing to do was?), what the actors were wearing (eg, Was the girl wearing a hat?), and the action in the scene (eg, Did the girl leave with the man?). The participants in the personally experienced scenario were similarly asked about what the actor stated (eg, Did the man say what his favorite thing to do was?), about what the actor was wearing (eg, Was the man wearing a hat?), and about the action in the scene (eg, Did you and the man leave the room together?).

Results

IBM SPSS Version 20.0[29] was used to analyze all collected data. An independent samples *t*-test revealed that there was not a significant difference $t(40) = 1.66$, $p = .05$ between performances on a measure of recognition for the personally experienced event, $M = 7.81$, $SD = 1.80$, and the witnessed event, $M = 8.62$, $SD = 1.32$. However, this difference did represent a medium sized effect $r = .26$ and a trend toward better recognition for an event that happened to someone else. Table 1 shows the mean total number of correctly recognized items across the two types of events.

Table 1. Number of correctly recognized items

	Mean	SD	SE
Personally Experienced ($n = 21$)	7.81	1.80	0.39
Witnessed ($n = 21$)	8.62	1.32	0.28

Spearman rank-order correlations between participant's age and total recognition score were computed in order to assess whether

recognition score was independent of chronological age. The correlations between age and recognition scores were not significant (r_s = -.04, p = .49). Therefore, the examiner was able to rule out possible effects of age on recognition scores.

Discussion and Implications

This portion of the broader study evaluated recognition memory in children with autism for personally experienced and witnessed events. Children with autism recognized fewer details in the personally experienced event than in the witnessed event, thus showing a trend toward performing worse when the object of an emotionally evocative event; however, this difference was not found to be statistically significant.

While a significant difference was not detected, these findings suggest that further research is needed in order to clarify the potential impact of such a difference. Prior research in the area of memory functioning and autism has shown that memory retrieval and recognition are significantly impaired in individuals with autism. However, it is not certain whether such impairment exists equally for witnessed and personally experienced events. Additionally, the implications for testimony as witnesses, victims, and persons charged with offenses are too significant to be ignored. As the rate of identified autism continues to increase, the likelihood that those with the diagnosis will encounter the legal system substantially increases.

Future research could benefit from exploring some of the areas that the current study was not able to address. First, it may be helpful for such investigations to inquire as to medication status given that some medications affect memory function. Second, findings could be culled from a larger sample size, as a more robust sample would permit for greater confidence in findings in any direction. Third, age groups of a larger sample would permit for a clearer picture of the impact that developmental stage and autism have on memory. Fourth, future investigations should explore the impact that receipt of behavioral therapy may have on recognition performance, as well as length of time spent in treatment. The current study was limited in exploring this variable as all participants were enrolled in behavioral therapy. Fifth, the current study utilized a videotaped scenario to represent the observed event condition, which may limit how these findings would generalize to when an in-person event is witnessed. Therefore, future investigations could expand upon this research by including an in-vivo scenario to ascertain recall of witnessed events. Additionally, this study was limited by the fact that the comparison event, while of a similar nature, did not take place in the same setting.

Thus, future investigations could benefit by having the two comparison events take place in the same setting in order to strengthen the comparison value.

In summary, while there was not a statistically significant difference between the groups, the results reflected a trend toward performing worse when the object of an emotionally evocative event. Prior research findings on autobiographical and witnessed memory as well as the at-risk status of youth with autism underscores the need for future research to further explore this potential difference. These findings highlight the significance of problems in social learning and the importance of developing curricula emphasizing children's developing sense of self-experiencing events. Such a cognitive curriculum could aid in the development of personal episodic memory, a persistently found deficit in children diagnosed with autism.

In addition, it is important that such research continue because when accused of a crime, individuals with developmental disabilities are at a significant disadvantage at all phases in the juvenile and criminal justice process. Research has demonstrated that these individuals experience unjust treatment in the following areas: interrogation,[30,31] courtroom procedures and outcomes,[32] victimization,[33] and extended sentencing.[34] Due to the various emotional, cognitive, and behavioral challenges faced by youth with autism, it would be prudent to ensure that professionals are available and present when a youth with autism faces interviews or discourse around circumstances they may have witnessed or in which they may be suspected of having been actively involved. Whether guilty or innocent, when an individual with developmental disabilities has contact with the criminal justice system, measures, such as involvement of trained professionals experienced with this population, will increase the probability of avoiding or minimizing the misinterpretation of behaviors as confirmation of not having been victimized or indifference, guilt, or lack of remorse if suspected of an offense.

Taken together, these concerns emphasize the importance of clarifying memory impairment in this population in order to more effectively support individuals with this diagnosis in functioning as witnesses, victims, persons charged with offenses, and in adaptive functioning in daily living.

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