



Increasing Compliance in Children with Autism Spectrum Disorder During an Extracurricular Activity

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Abstract

Individuals with autism spectrum disorder (ASD) commonly experience difficulties in both expressive and receptive language skills which are often associated with non-compliance in adult and peer interactions. Given the unusually high rates of non-compliance in children with ASD, effective techniques that promote compliance are highly sought after by both parents and teachers alike. This study investigated compliance rates of four (4) students with ASD based on the use of three different types of commands: (a) verbal commands only, (b) verbal commands with a gesture (i.e., pointing), and (c) verbal commands coupled with picture prompts to achieve a desired request. Results indicate that response to verbal commands plus gestures achieved the greatest degree of compliance.

Keywords: Autism spectrum disorder, ASD, Disabilities, Special education, Baseball, Compliance, Commands, Extracurricular activity

Introduction

The number of individuals being diagnosed with autism spectrum disorder (ASD) has reached epidemic proportions, with the Center for Disease Control and Prevention (2022) reporting 1 in 44 children in the U.S. have been identified with ASD. In 2004, approximately 190,000 students (ages 5-21) received special education services under the Individuals with Disabilities Education Act (IDEA) category of ASD [30]; today, approximately 800,000 school-aged children in the U.S. receive special education services for ASD [31]. As a result, ASD has become the fastest growing disability category, with an average annual increase ranging from 10-17% [4]. As the number of individuals being diagnosed with ASD increases (and any cure remains elusive) researchers strive to identify effective interventions that will help increase these students' academic and social performance.

Defining Characteristics

ASD, typically characterized by repetitive, restricted, and stereotyped patterns of behavior, is a neurobehavioral syndrome marked by qualitative impairments in social interaction and communication [18]. It is common for individuals with ASD to struggle with expressive and receptive communication

from early childhood. Another trademark of ASD is a deficit in pragmatic language skills, the ability to use language appropriately in social settings. Additionally, individuals with ASD who do possess structural language skills often struggle to use it properly in social situations [39]. Consequently, individuals with ASD often lack the ability to interact appropriately with their peers. This lack of social skill development (verbal and non-verbal) often persists and carries over to adulthood [40]. Another significant characteristic of individuals with ASD is the atypical processing of eye contact [37] this often results in difficulties with making, sustaining, and understanding the importance of eye contact (commonly referred to as eye-gaze). The phenomenon of atypical eye contact (which typically begins in childhood) may be due to an inability to understand the important role that eye-gaze plays in nonverbal communication [2].

Evolution of Research

In 1929, researcher T.V. Moore defined autistic thinking as a, "Tendency to draw conclusions based on a pathological major in the sense of a false premise that has no basis in logical common sense" [29]. Such thought seemed to symbolize early notions of autism. In the 1960s, researchers began to take a

new-found interest in the disorder. What followed would lay the foundation for the education of students with ASD for years to come, including many of today's more popular interventions, ranging from alternative educational settings, applied behavior analysis, occupational therapy, play therapy, and group teaching strategies [7,15,21,35]. Also during this time, an interest in speech development and language comprehension of children with autism began to take place [27,34]. As the term "autistic" became more widely recognized, so did research involving the disability. The early researchers in the field of autism helped bring attention and clarity to this often-misunderstood disability. With the research in the field of autism evolving, an emphasis soon began to focus on how to best achieve the acquiescence of commands by individuals with ASD.

Compliance

Students with ASD often demonstrate difficulty in compliance (e.g., following commands), especially in less-structured settings, such as extracurricular activities. Compliance continues to be a major concern for those steeped in the area of ASD [12,26]. Compliance to a command is often the first step to learning a new skill and is often a key aspect in achieving social acceptance. The effectiveness of various prompts (e.g. verbal, gestural, pictorial) have been widely tested when attempting to acquire or sustain the attention of individuals with ASD. Several studies have tested the results of compliance from verbal cues (e.g. commands, directions) that resulted in mixed findings [5,11]. Visual prompts, however, have proven effective in establishing compliance in individuals with ASD, and have benefited educators and parents of individuals with ASD both in and outside of the classroom for years [17].

In the early 1980s, the use of the Picture Exchange Communication System (PECS) began to be utilized with children with ASD. Since that time, numerous research studies have demonstrated the effectiveness of picture prompts in achieving compliance for individuals with ASD [8,11,16]. Studies that employed tactile prompts (e.g. touching, vibrating pagers, vibrating watches) have also demonstrated effectiveness when attempting to achieve compliance in students with ASD [3,24]. Research investigating prompts will continue to act as a springboard for new instructional techniques to increase compliance in the ASD population in educational, home, and extracurricular settings. The opportunity to socialize with one's peers can often be the cornerstone to a healthy and enjoyable existence. For individuals with ASD, the opportunity to interact with peers magnifies one of the main deficits in their overall development- a lack of adequate social skills.

Extracurricular activities can help provide an opportunity for those with ASD to address and receive physical and social skills training. [32] demonstrated the need for increasing extracurricular activity for the ASD population. Individuals that participate in extracurricular activities are afforded increased opportunities to interact with their peers outside of tradi-

tional educational settings. The purpose of this study was to examine response times in students with ASD when following commands in a non-academic setting. Specifically, this study was intended to identify the specific type of command that students with ASD respond best to (a) verbal command, (b) verbal command plus physical prompt (i.e., pointing), or (c) verbal command plus picture prompt.

Methods

Participants & Settings

This study focused on four children with ASD who took part in a university-sponsored Challenger Baseball program in a rural area of the Southeastern United States. Challenger Division Baseball is an athletic program specifically designed for participants (5-21 years of age) with physical and/or mental disabilities of all types [23]. All subjects were parent identified as having ASD during the athlete registration process. Parental consent and child assent was obtained from all parents and subjects when possible, in accordance with university IRB procedures. Participants included three males and one female ranging from four to six years of age and were identified as mildly-moderate autistic to severely autistic based on the Childhood Autism Rating Scale (CARS) [36]. A detailed description of each participant is provided in **Table 1**.

Table 1. Participant Demographics.

Subject	Age (yrs.)	Gender	Ethnicity	CARS Score
Keenan	4	Male	African-American	42.5 (Severe)
Natasha	5	Female	African-American	35 (Mild)
Jordan	6	Male	Caucasian	36 (Mild)
David	5	Male	Caucasian	33 (Mild)

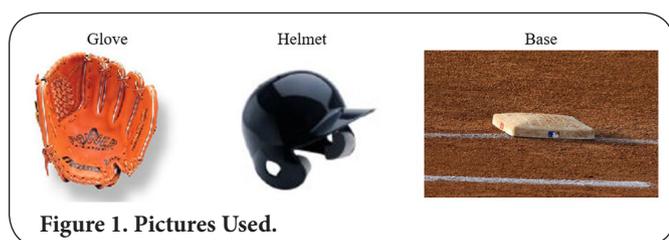
Instrumentation

Each subject's parent or guardian completed the CARS for their child. Originally developed in 1980, the CARS has become one of the most widely used (and tested) means for identifying individuals with ASD [1,13,19,35]. The CARS is a standardized fifteen question diagnostic assessment based on direct behavior observations, which yields a composite score of (a) non-autistic, (b) mildly-moderately autistic, or (c) severely autistic. Findings presented in the CARS manual indicate a high degree of test-retest reliability (.88 total score) on 91 cases ($r = .94$). In addition, numerous independent studies have demonstrated the reliability of the CARS for identifying children with autism [14,22,38].

Data collection

The goal of this study was to record latency measurements of students with ASD to differing commands during a community baseball game. Each modified game of baseball consisted of three innings in which each of the three types of commands could be counterbalanced.

Commands were given: (1) prior to the athlete taking the field ("Johnny, please put your glove on"), (2) before the player batted ("Johnny, please put a helmet on"), and (3) after the player reached first base ("Johnny, please run to second base"). The modified rules for Challenger baseball mandates each player gets a single, so every player is afforded the opportunity to run the bases). Each player was assigned a buddy who helps the athlete play baseball to the best of their abilities (command giver), and a data collector that measured the time it took for the player to initiate response to the command. Undergraduate teacher candidates were recruited and trained as command givers and data collectors. The command giver utilized a picture card in addition to the verbal command when appropriate (see **Figure 1**) and then the data collector recorded the latency measurements on a separate card. A counterbalancing implementation of the commands (i.e., ABC, ACB, BCA, BAC, CBA, & CAB) was utilized throughout the entire six-week baseball program.



Interobserver Agreement

To demonstrate Interobserver agreement (IOA), the principal investigator and two trained doctoral students collected data for each player-participant across 30% of the total observations. As outlined by [6], overall IOA was determined by dividing the sum of agreements, plus disagreements, multiplied by 100. Interobserver agreement on latency measures was over 95% ($M=100\%$) for this study.

Procedure

The Challenger baseball program took place over a six-week period (six total games). Four players participated in the study (See **Table 1** for a complete description, including CARS scores, of each player). Eight undergraduate university students were recruited and then trained by the Principal Investigator on two separate occasions on procedures for providing commands to the athletes and data collecting techniques employed. The study utilized an alternating treatment design [6] which began during the first game of the season (session one), and concluded at the end of the baseball program in week six (session six). Each player-participant was matched with two buddies (university undergraduate students). The buddies were responsible for either (a) giving commands or (b) data collection. The three verbal commands given (a) "Johnny, please put your glove on", (b) "Johnny, please put a helmet on," and (c) "Johnny, please run to second base," were

relatively simple in nature. Each command was given at either the top-half of an inning, the bottom-half of each inning, or when the player-participant was on first base. Games lasted three innings, for a total opportunity of nine commands to be given each game (e.g. three in the first inning, three in the second inning, and three in the third inning). The three commands were given in one of three ways (a) verbal command only, (b) verbal command with a gesture (i.e., pointing at the item), or (c) verbal command while showing a picture of the item (See **Figure 1**). Counterbalancing was achieved by offering an equal number and type of commands to each player-participant throughout the six sessions.

The target behavior of this research was compliance. For this study, compliance was defined as, "An individual taking a step toward the specific item (glove, helmet, or base) after the command was issued." Data collectors used stopwatches to record latency measures (i.e., the time it took the individuals to initiate compliance once the command was given). Timing began once the final word in the command was spoken (i.e., "on" or "base"). This procedure provided a clear beginning of the target behavior. Data collectors stopped timing when (a) the individual took one step in the direction of the object, or (b) a lapsed time of 15 seconds had expired (establishing an artificial ceiling). Any time over 15 seconds was considered "non-compliance." Due to time constraints (only six total baseball games) and the inherent behavioral variability of individuals with ASD (across all command types, participant behavior varied from week to week), no baseline measure of compliance was attempted.

Results

Mean response rates calculated for all participants are illustrated in **Figure 2** below. While individual response rates did vary among individual participants, overall response to verbal commands plus gestures (i.e., pointing) achieved the greatest amount of compliance (defined as the smallest amount of time it took the participants to respond to a command). The mean response rate in seconds were as follows: (a) verbal command only ($x = 6.5$ seconds), (b) verbal command plus gesture ($x = 4.5$ seconds), and (c) verbal command plus picture ($x = 6.7$ seconds). It is also important to note that average participant response times to all commands decreased slightly as the intervention progressed. This reduction in response time could be due to the participant's gradual increased understanding of the game of baseball and what was being asked of them, given the commands followed the natural course of events of a typical baseball game. Nonetheless, data indicates players responded more rapidly to verbal commands that were coupled with a gesture.

Limitations

A main limitation to this study was the reduction of response times to all three command types (regardless of command type) as the intervention progressed. Although minor, three

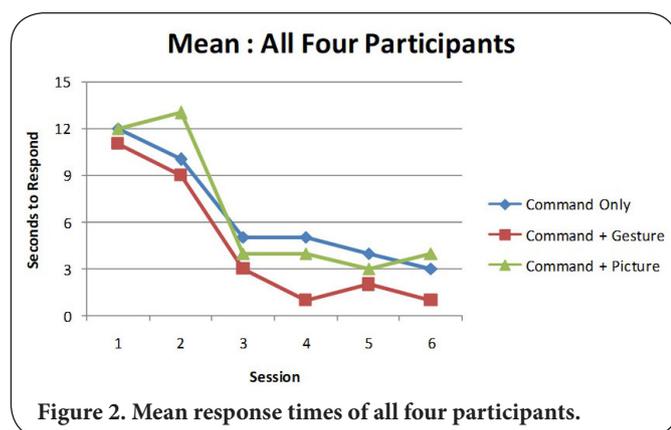


Figure 2. Mean response times of all four participants.

of the four participants responded slightly differently to command types. However, this finding can be viewed as a positive, rather than a limitation to the study. Different individuals (with differing degrees of ASD) responded differently to different command types. Another limitation is the duration of the intervention. Due to the short duration of the season (six weeks), an average of 40 data points were collected for each participant (three data points per command type, per game).

Discussion

Extracurricular activities are important to the quality of an individual's life; however people with disabilities seldom access extracurricular opportunities, particularly school-aged children [20]. For many children with ASD, communication and social skill deficits may impede their ability to respond to directions [28]. For children to participate in extracurricular activities and social interactions with their peers and other adults, compliance is a vital skill [5]. Our findings provide support for the scaffolding of extracurricular settings to promote the participation of children with ASD. Parents, teachers, and coaches can use simplified commands with gestures during activities to enhance participation.

Given the varying cognitive and social ability levels of children with this ASD, future researchers working with students with ASD must realize that results may be inconsistent. This is the inherent nature of their disability. In addition, future research should investigate the specific influence of receptive language as an isolated variable. To generalize these findings to other settings, future research should be conducted with randomized samples (representative of varying degrees of ASD) in other settings including academic, neighborhood, and informal environments. Finally, research should be conducted with children of various ages to generalize the findings further.

Competing interests

The author declares that he has no competing interests.

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