Objective: Inspection time (IT) is a component of processing speed that is amenable to accessibility modifications for children with significant motor impairments including those associated with cerebral palsy (CP). Previous findings indicate that standard and modified (via assistive technology) inspection time tasks have equivalent psychometric properties for typically developing children, but not for children with CP. The current study examined physiological, cognitive, behavioral and motor factors that potentially moderate the differences between standard and modified IT in children with CP. Method: Participants were 45 children with CP, ages 8-16, 71% male. In this high functioning sample, capable of participating in standard and modified tasks, 62% were at Gross Motor Function Classification System (GMFCS) level I and 38% were at Manual Ability Classification System (MACS) level I. Children completed standard and modified IT tasks and the PPVT-III. Results: Regression moderation analyses using the product variable approach (Baron & Kenny, 1986; Cohen & Cohen, 1983) indicate that history of seizures (R^2 = .66, p<.05), Conners’ PRS-R DSM Inattentive T-scores (R^2 = .53, p<.01), GMFCS (R^2 = .52, p<.01), and MACS (R^2 = .58, p<.01) are significant moderators of the relationship between standard and modified IT in children with cerebral palsy. Birth weight, CPRS-R Hyperactive T-scores, and PPVT scores are not significant moderators. Conclusions: Results indicate that several factors, including but not limited to functional motor impairment, are associated with differential performance on standard and modified IT in children with CP. Psychometric and clinical implications are discussed.

## Introduction

There is evidence to suggest that children with Cerebral Palsy (CP) are at risk for slowed processing speed (PS). PS is associated with development of critical cognitive functions including working memory and fluid intelligence, and is sensitive to brain dysfunction, medication effects, and aging. Traditional PS measures used in studies of children with CP have had significant motor response demands (Christ et al., 2003) and are not accessible to many children with CP. Inspection Time (IT) has been studied extensively as a measure of general speed of processing. Recent work suggests that while IT is a measure of general speed of processing, it more specifically measures speed of visualization as one component of PS (O’Connor & Burns, 2003). Because response time is not a measurement component of IT tasks, they are more accessible to individuals with speech and motor impairments than standard graphomotor PS tasks. IT tasks can be further modified to reduce verbal or fine motor responding to provide responses through use of assistive technology and forced choice responding. Use of assistive technology is known to add cognitive demands to tasks which may affect performance of children with CP on modified tasks. Previous findings indicate that standard and modified (via assistive technology) inspection time tasks have differing psychometric properties for typically developing children and children with CP. The current study examined physiological, cognitive, behavioral, and motor factors that potentially moderate the relationship between standard and modified IT in children with CP to aid understanding of these relationships.

## Participants

Participants were 45 children with CP, aged 8-16 years. Children in the CP group were all oral communicators; and most children had no, mild, or moderate gross and fine motor impairments. 90% Gross Motor Functional Classification Scale (GMFCS) levels I-II. 95% rated as Manual Dexterity Classification Scale (MACS) levels I-II. All children in the CP group demonstrated the ability to provide a reliable dichotomous choice response on a dichotomous choice screening measure.

## Task Description

Participants were shown a fixation point for 3000ms (A) with brightening (B) lasting 1500ms to assist with orientation to impending stimulus presentation. A clear screen (C) was followed by the target stimulus presentation with varying duration (D). A visual stimulus mask (E) was used to prevent visual rehearsal of the target (on-screen mask duration = 1000ms – DurationTarget + 25ms). In the standard task condition (upper example), mask stimuli are followed by a blank screen (F) which remains for duration of participant response using keyboard arrow keys to the question, “Which side of the figure has the longer leg?” In the adapted task condition participants were shown both a correct target and an inverse stimulus which served as a lure. A selection box alternated between stimulus choices at a scan rate determined by the participant to be a comfortable pace (i.e. allowed participant to initiate and complete motor response while preferred stimulus choice was selected). Response selection in the adapted condition (Gadapted) was by Big Buddy pressure switch. IT was estimated using a stepwise technique (Wetherill and Levitt) to identify the threshold presentation time required to make an accurate response. Following 3 accurate responses, presentation rate was reduced by 17ms, and increased by 17ms after a single error. Final inspection time was calculated as the mean of the last eight reversals.

## Analyses and Results

Analyses were conducted to determine if there is a significant difference in the relationship between standard and modified IT in children with minimal functional impairment is currently unclear, though score distributions are likely a factor. Higher inattention symptoms are associated with longer inspection times on the modified IT measure but not the standard measure. Attentional demands associated with choice selection scanning procedures in the modified approach may be greater than the more straightforward direct selection approach. Further examination of the impact of cognitive load of adapted strategies will be important.

## Conclusions and Future Directions

Results indicate that several factors including history of seizures, gross functional motor impairment, limited dexterity, and CPRS-R DSM Inattentive symptoms significantly affect the relationship between standard and modified IT in children with CP. The relationship between standard and modified inspection times was stronger for children that had history of seizure and greater impairments in gross and fine-motor functional abilities. Results suggest that costs and benefits of assistive technology appear to vary based on physiological and functional characteristics. Inconsistencies in the relationship between standard and modified IT in children with minimal functional impairment is currently unclear, though score distributions are likely a factor.

## References


