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Impact of Affordances on Inhibition of Return is moderated by ADHD

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Abstract

Visual attention is essential to performing functional tasks such as reaching out and picking up a cup of coffee from the table. To what extent is attention in individuals diagnosed with ADHD affected during such tasks? What factors influence attention in functional tasks that relate to goal-directed behaviour (i.e. affordances) is largely unknown. Researchers have used the cognitive mechanism of inhibition of return to investigate how attention works. Pragmatic inhibition of return occurs when the affordances, or pragmatic features, of the object are presented repeatedly as both cue and target stimuli, and suppress processing of similar information in the future to facilitate identification of novel stimuli. In the present study, pragmatic inhibition of return was examined by using “preferred” and “non-preferred” stimuli in the Posner cueing task in order to determine whether the stimulus with a more salient or obvious affordance would show a greater inhibition of return effect. The preferred stimuli were a soccer ball being kicked and a tennis ball being hit with a racket. The non-preferred stimuli were a soccer ball being hit by a racket and a tennis ball being kicked with the foot. Both the ADHD group and the control group exhibited inhibition of return, but the ADHD group was affected at later time delays following a cue stimulus. This suggests that the difference between ADHD and normal controls is a consequence of straightforward temporal delay, and not necessarily related to differences in the nature of attentional processing.

Keywords: affordance, Attention Deficit Hyperactivity Disorder, inhibition of return, visual attention

Introduction

Attention to actions performed by self and others is an essential part of guiding behaviour. Objects encountered in everyday life are perceived in terms of the actions they provide: a football is perceived as kickable, a chair as something that affords sitting. In the present study, the goal was to test the temporal aspects of attentional processes in situations where several different objects and actions are being observed

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in rapid succession, such as when watching a dynamic sports game, a lively theatre performance, or people interacting on a busy street. Specifically, we investigated whether perception of a particular object affects subsequent detection of actions that are related to that object at a later time. Such tasks involve intricate control of visual attention both in space and time by different types of cues. Current research (Klein, 2004; Lupiáñez et al., 2006) treats external stimuli as exogenous cues (e.g. flashes of light) that are not under the control of the perceiver and are not necessarily related to the target, whereas endogenous cues are meaningful stimuli (e.g. a word representing the target category) that facilitate expectancies about the identity and potential interaction with the target. Our interest in the current study was the relationship between perception of an object and potential actions that this perception entails. Thus, our initial idea was to employ pictures of objects as endogenous cues to trigger responses about potential actions (e.g. soccer ball as a cue for kicking with the foot). Importantly, Lupiáñez et al. (2006) claimed that the effects of endogenous cues are long-lasting, whereas the effects of exogenous cues are short-lived.

In order to test the time course of perceiving actionable uses of various objects we chose an inhibition of return (IOR) task as our experimental paradigm, typically characterized by a delayed response to a stimulus in a spatial location which has already been attended (Posner & Cohen, 1984). IOR tasks demonstrate a behaviourally adaptive bias towards perceiving novel stimuli at the expense of old stimuli, and a tendency towards orienting to novel spatial locations to optimize search for new targets (Klein & MacInnes, 1999). One study found that inhibition of return was greater when the graspable part of an object was in view as compared to when the ungraspable part of a tool was visible (Riggio et al., 2006). This demonstrates that inhibition of return not only applies to spatial attention, but also to object-based attention. Specifically, object-based attention may be exhibited as attention to task-relevant functional properties of an object or tool. For example, after seeing a soccer ball, attention to the sight of a person kicking the ball might be suppressed as compared to another action. In order to shed light on the time course of attention in a task that involves control of visual orienting the current study will also consider the ways in which affordance perception is affected differently in Attention Deficit Hyperactivity Disorder (ADHD) as revealed through the mechanism of inhibition of return.

Affordances

Affordances may be described as the functions that an object or aspect of the environment can fulfil, given a particular agent who may wish to interact with the object (Gibson, 1979). For example, a keypad affords typing, and a ball affords catching, throwing, and kicking. The term affordance was coined by James J. Gibson to provide a new framework for understanding perception. Manmade affordances are created for ease of use, allowing individuals to quickly determine how to interact with the object in question. It follows that an object with an obvious affordance may be easier to categorize and quickly react to than an object without one.

Riggio et al. (2006) found that presenting the part of an object commonly associated with a particular affordance (e.g. grasping) results in higher inhibition of return than showing another part of the same object. In this study, objects that are normally grasped were shown to complete a task (e.g. holding a knife or comb), and the difference in inhibition of return between the preferred side for gripping (i.e. the handle) and the non-preferred side (i.e. the blade) was measured. This study confirmed that a relationship exists between affordance and inhibition of return, and prompts further questions about the nature of this relationship. Riggio et al. (2006) suggested that affordance is location-specific, as inhibition of return relies on attending the cued location. This is supported by a review of anatomical and physiological data relating to spatial perception, which concluded that selective spatial attention depends on the neurons which are involved in pragmatic coding (Rizzolatti et al., 1994). Pragmatic coding sorts objects via their pragmatic features, or affordances. Comparably, Bub et al. (2013) discovered that priming individuals with certain action plans ("prepare to grasp") leads to better and faster object identification on subsequent trials. However, this only occurs when the primed hand gesture is spatially matched with the object (graspable part oriented in the same direction, see also Tucker & Ellis, 1998).

Inhibition of Return

Inhibition of return is an attentional mechanism that slows reaction times for targets in a location that has been attended before (Posner & Cohen, 1984). This occurs because attention disengages from a location and prevents attention from returning to that specific location. Inhibition of return can be measured in several different ways. Saccadic inhibition of return occurs when the eye is slower to orient itself towards a target in a location that has already been attended (Briand et al., 2000). For example, a driver is less likely to notice a person beginning to cross the street if the driver already checked the crosswalk. Manual inhibition of return occurs when the body is slower to perform an action in response to a target in a location that has already been attended (Briand et al., 2000). In the driving example, the driver would be slower to press the brakes in response to the pedestrian since the location has already been attended.

The various subtypes of inhibition often have important differences. For example, saccadic and manual inhibition of return unfold at different rates (Riggio et al., 2006). Additionally, saccadic and manual inhibition of return appear to rely on different mechanisms in the brain. Manual inhibition of return is affected by the detection of target luminance, which is believed to be related to manual function, but is not influenced by the fixation onset effect (thought to be related to oculomotor function; see Hunt & Kingstone, 2003; Rajkai et al., 2008; Zhang & Zhang, 2011).

Target luminance is defined by the way that light is cast on an object, and is thought to interact with some aspects of affordance. A recent study found that perceived reachability is altered based on the luminance of a target surface (Doyon et al., 2021). One explanation for this may be that luminance, IOR, and affordance rely on similar perceptual areas, but distinct neural pathways in the brain. A recent study has postulated that affordances are processed differently in the brain based on their nature – for example, a midsized door may trigger motor representations as the viewer tries to determine whether they can fit through, while a wide door may not (Djebbara et al., 2019).

When reaction time is slowed based on repeated stimulation of a location, it is known as location-based inhibition of return. This is perhaps the most well-studied type of inhibition of return, and serves the purpose of helping an individual pay adequate attention to novel locations. Spatial orientation involves perception of the location and position of objects within a given space (Vallar & Maravita, 2009). The process of spatial orientation relies heavily on perceptual processing in order to identify aspects of the environment – the onlooker must remember the location of objects, as well as their identity and how the object is to be used. Spatial orientation is important for inhibition of return because the cue must be accurately processed and recalled in order to prevent re-attending the location (Mitolo et al., 2015).

Pragmatic inhibition of return occurs due to the affordances, or pragmatic features, of the object being repeated as both cue and target. The mechanism of pragmatic inhibition of return is still not well understood. One area of question is whether the type of grip employed while interacting with objects plays a role in inhibition of return. Specifically, it is not clear whether the factor that influences pragmatic inhibition of return is the object's identity, orientation, or both. One test of this could be to prime different actions (grasp, pour) for the same or different objects (coffee mug, bucket). The complicating factor here is that some objects "invite" multiple affordances, given a specific task and constraints (Ye et al., 2009). Disentangling which affordances are primary for a given object is fraught with difficulty. Inhibition of return may be a suitable method to discover which affordance is most salient for a given object.

ADHD and Affordance Perception

Attention Deficit Hyperactivity Disorder is a neurodevelopmental disorder which may cause affected individuals to have difficulties with attention, exhibit heightened impulsivity, and, for some, induce hyperactivity. ADHD has historically been considered a childhood disorder, and was originally conceptualized in terms of conduct as well as academic performance. In recent years, research has elucidated that ADHD could potentially have far more wide-ranging effects than initially thought. ADHD is relevant to affordance perception due to the unique sensorimotor behaviour associated with the disorder. Those with ADHD are known to engage in sensation-seeking behaviours, which include thrill-seeking and the pursuit of novel experiences related to an attempt to autoregulate the sensory systems of the body (Geissler et al., 2014). ADHD has also been linked to increased cortical thickness in the right somatosensory cortex (Duerden et al., 2012). In chronic pain patients, a similar increase has been found, and is thought to be related to impaired inhibitory mechanisms. This impairment in somatosensory inhibition may alter inhibition of return in those with ADHD.

Notably, suspected working memory and sensorimotor abnormalities associated with ADHD may extend to inhibition of return. ADHD has been associated with difficulties in working memory as well as spatial orientation, two integral processes to inhibition of return. It follows that those with ADHD may therefore not perform in the same manner as controls on a task of inhibition of return. One study found slightly smaller inhibition of return in children with ADHD than in neurotypical children (Li et al., 2003). This study involved saccadic rather than manual measures, and involved a non-functional psychophysical task. It has been suggested that those with ADHD have impaired working memory, the largest effect found in children with the disorder (Westerberg et al., 2004). A meta-analysis found ADHD to be associated with difficulty in actively retaining and using information (Martinussen et al., 2005).

Traditional theories treat ADHD as a disinhibitory disorder (Barkley, 1997; Nigg, 2001): the harder the task, the less inhibition control the individual possesses. This leads to a plausible prediction that a short delay between cue and target stimulus would be insufficient for the activation of inhibitory processes in ADHD individuals and result in insensitivity to inhibition of return.

The Current Study

Testing affordance perception in people with ADHD in an experimental paradigm that manipulates attention was the focus of the present study. Affordances are perceived directly by selectively attending to functional relationships that are in the service of guiding future actions. Selective attention requires the ability to detect action-relevant properties of objects and the environment while disregarding all other potential properties associated with other possible actions. The current study explored inhibition of return through a cued reaction time test known as the Posner cueing task, which is designed to measure attention (Posner, 1980). This task was chosen in order to investigate potential differences between reaction times for the preferred and non-preferred use of an object in both cued and uncued locations. In order to expand upon Riggio et al.'s (2006) research, this study utilized preferred and non-preferred methods of object interaction (kicking and hitting a soccer ball or tennis ball).

The first hypothesis associated with the current study was that location-based inhibition of return would be stronger in the ADHD group than in the control group.

This was predicted due to differences in spatial orientation as well as working memory in those with ADHD. Since inhibition of return draws heavily on these abilities, it was predicted that those with higher levels of ADHD symptoms would experience location-based inhibition of return differently than controls. It was additionally hypothesized that pragmatic (or function-based) inhibition of return would affect the ADHD group at different delays than the control group. Specifically, it was hypothesized that functional congruence (i.e. matching affordance properties between cue and target stimulus) would cause the ADHD group to experience inhibition of return after a greater time delay than the control group.

Method

Participants

Participants were recruited by using the Psychology Department's SONA system at a large public university in the United States. SONA is an online portal that allows psychology students to receive course credit for participating in research. The sample size for this experiment was 54 participants; 47 of these participants were female, and seven were male. The average age of participants was 23.66 years, with a median age of 20. The age of respondents ranged from 18 to 52 years old. Participants in this study were awarded 1 credit per hour through the SONA participant pool. Participants were all adults (aged 18+) with normal or corrected-to-normal vision. Participants were screened based on their results on the Adult ADHD Self-Report Scale (ASRS, Kessler et al., 2007). Participants were grouped into a high ADHD symptoms category and a low ADHD symptoms category based on their ASRS scores. The high symptoms group consisted of those who marked 4 or more of the first 6 questions within a shaded box according to the scoring instructions of the ASRS, and the low symptoms group consisted of all participants below this cutoff. The shaded boxes in the ASRS represent a symptom intensity level that is indicative of possible ADHD. All procedures were approved by the local Institutional Review Board (IRB) to ensure that ethical guidelines of human subjects research have been followed. Each person confirmed their willingness to participate by agreeing to a consent document before the start of data collection.

Materials

The ASRS questionnaire was used to categorize individuals with respect to ADHD. A custom-made online experiment platform was developed and programmed to present stimuli and collect responses in the inhibition of return task. The ASRS scale is not diagnostic, but rather provides insight into ADHD symptomatology. Practitioners normally use this tool to determine whether further testing for ADHD should be conducted, or in order to learn more about the way an individual's ADHD manifests. The first 6 questions of this scale are meant to be predictive of the severity of ADHD symptoms, while the remaining 12 questions provide insight into the ways these symptoms impact the survey taker's life. The ASRS is one of the few research-backed self-report measures currently in use for adult ADHD (Kessler et al., 2007). The ASRS has been found to have moderate sensitivity and high specificity, with an AUC of .87 and a κ of .52. This translates to a few missed cases of ADHD, but some inclusion of individuals without the disorder. It has additionally been found that this survey is more reliable when it comes to high-positive symptoms than low-positive symptoms – a difference of 20% (Kessler et al., 2007). The ASRS questionnaire was administered using the Qualtrics online software platform.

To run the test associated with this study, an online experiment platform was created to collect data using custom programming code in PHP. The experiment was set up to record response latencies in a reaction time task (Posner cueing task). Participants were required to complete the study using a computer capable of accessing the program with an active internet connection.

Design

This experiment was conducted using a within-subjects design. The independent variables were location, function congruence, and presentation delay between cue and stimulus. The dependent variable was reaction time on the IOR task. ASRS scores were analyzed in order to create a dichotomous independent variable for ADHD (high versus low). There were a total of 160 trials, consisting of combinations of 2 location types (cued vs. uncued), 2 function congruence conditions (congruent vs. incongruent), 2 types of cue objects (soccer ball and tennis ball), 2 delays (500ms vs. 1000ms), and two locations for the cue/target appearance (left or right side of the screen). All combinations of trial types were repeated 5 times. Cues and stimuli were presented at lateral regions equidistant from the fixation point. The location of both cue and target stimulus was randomized to occur in either the left or right periphery of the computer screen. Invalid cues were cues which appeared on the opposite side to the target stimulus (uncued location), and consisted of half of the trials, whereas valid cues appeared on the same side as the target stimulus (cued location).

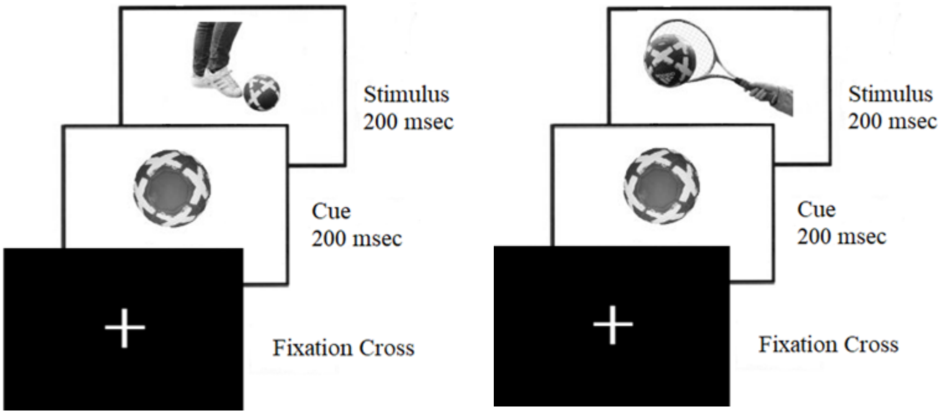
Procedure

At the beginning of the experimental session, participants were asked whether they were right- or left-handed, and if their vision was normal or corrected-to-normal. Participants were provided with a web link to the ASRS through Qualtrics, a survey administration software. Participants were kept naive in regards to their results on the ASRS as well as to the purpose of the study, and were debriefed on the study after its conclusion.

After completing the ASRS, the participants were administered the IOR task. In order to ensure data validity, participants were asked to complete this task on a computer rather than a smartphone or tablet. Participants were instructed to look at the fixation cross for the duration of the experiment to minimize distraction and excessive eye movements. Each trial began with the fixation point in the middle of the screen, and then a cue (soccer ball or tennis ball) was presented for 200 ms. After a delay of either 500 ms or 1 second, the target stimulus was presented. The target stimulus depicted an action (kicking with a foot or hitting with a racquet) involving the cued object. The sequence of events on any given trial is illustrated in Figure 1.

Figure 1

Event Sequence in Congruent and Incongruent Experimental Trials

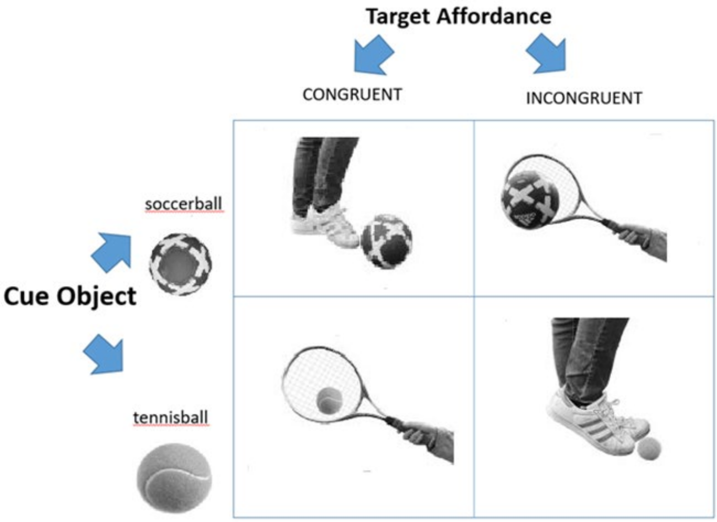


Note. Example of event sequence in a congruent experimental trial in which a soccer ball was kicked with the foot (left panel). Time measurements refer to the duration for which the cue or stimulus remained on the screen. Note that stimuli and cues were paired randomly for each experimental trial and that the cue and target stimulus appeared either on the same side or opposite side (left or right) of the screen. The right panel shows the event sequence in an incongruent experimental trial in which a soccer ball was hit with a tennis racquet.

Each trial started with a cue stimulus appearing either on the left or right side of the screen for 200ms, followed by a variable delay of 500ms or 1s. The target stimulus appeared after the delay either on the same or opposite side as the cue for 200ms. Participants were instructed to press the space bar as quickly as they can as soon as the target stimulus appeared, irrespective of whether it appeared on the left or right side of the screen. Two cue images were used in this study: an image of a soccer ball and an image of a tennis ball. The stimuli used for trials including the soccer ball were images of the soccer ball being either kicked with the foot or hit with a tennis racquet. The stimuli for the tennis ball were the tennis ball being hit with a tennis racquet or kicked with the foot. This allowed for comparison of IOR for preferred versus non-preferred affordances. The background was removed from each photograph to minimize distraction. The stimuli are depicted in Figure 2.

Figure 2

Experimental Design Showing in Trials as a Function of Target Affordance and Cue Object



Note. The matrix depicts functional congruence of Cues and Target Stimuli in Experimental Trials. For example, kicking the soccer ball with the foot represents an affordance function that is congruent with the soccer ball as a cue, whereas hitting a soccer ball with a tennis racquet is considered functionally incongruent.

Data Processing and Analysis

Due to technical errors on 436 trials, the responses were not recorded correctly. These trials were removed from further analysis. Trials that were 2.5 standard deviations above the mean response time (longer than 4407 ms) were excluded from further analysis as well. This resulted in a loss of 5% of all trials across all participants. The trials were collapsed across different cues (soccer and tennis ball) because object type was not a variable of interest. The experimental design that formed the basis of statistical analyses was a mixed factorial design consisting of the following within-subjects independent variables: location (cued, uncued), delay (500ms, 1000ms), and function (congruent, incongruent). ADHD was dichotomized as low or high and was considered a between-subjects variable. Seventeen individuals were categorized as having high ADHD symptoms, whereas 37 participants had low ADHD symptoms.

A linear mixed effects regression model was generated according to the following equation:

Response Time = [Target Location] × [Delay] × [Function] × [ADHD] + [1|ID],

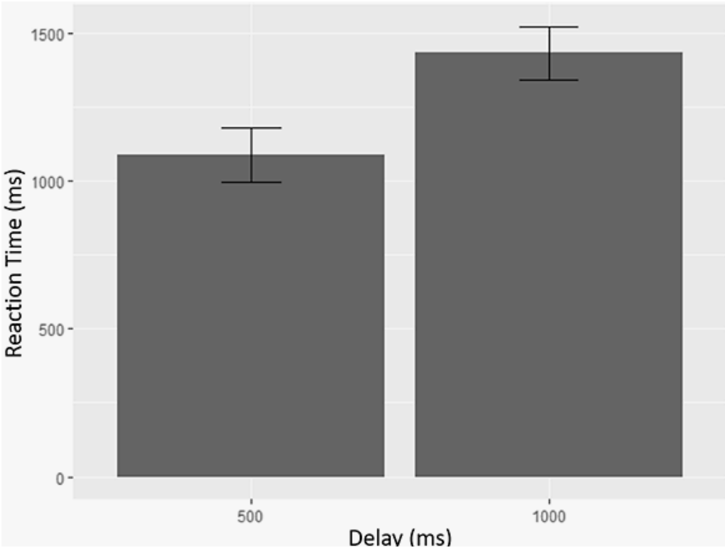
where target Location, Delay, Function, and ADHD were fixed effects, and participant ID was a random effect. A Type III Analysis of Variance was assumed using the Kenward-Roger's method of approximation (Halekoh & Hojsgaard, 2014) to obtain F statistics and calculate significance values. A linear mixed model was chosen as the statistical method because it is based on the analysis of raw data from individual trials and has fewer assumptions about variables' distributions than ANOVA. This method has the advantage of not requiring researchers to average across trials and repetitions, and accounts for variance due to random variability more effectively than ANOVA, thus resulting in higher statistical power.

Results

The main effect of Delay was significant ($F_{(1, 364)} = 227.38$, $p < .001$, $\eta_p^2 = .38$). Reaction times were significantly shorter after a 500 ms delay as compared to a 1000 ms delay between the cue and the target stimulus. The pattern of results found in the current experiment is opposite to the direction of the effect measured by Swanson et al. (1991). It is worth noting that the stimuli used in their experiment were nonfunctional symbols, whereas the present study used photographs of real objects that may have required longer processing. Participants in their study were underage children, in contrast to the present experiment's participant pool of individuals aged 18 or older. Another difference between Swanson et al.'s study and the present study lies in the method of assessing ADHD symptomology. Swanson's study involved diagnosis of ADHD by teachers using the DSM-III-R (Diagnostic and Statistical Manual of Mental Disorders, Third Edition, Revised) and the 10-item Iowa Conners teacher rating scale (Milich et al., 1982). In addition, their study was conducted in person, whereas the present study was conducted online. The effect of delay on IOR in this experiment is depicted in Figure 3.

Figure 3

Effect of Delay on Reaction Times in the IOR Task



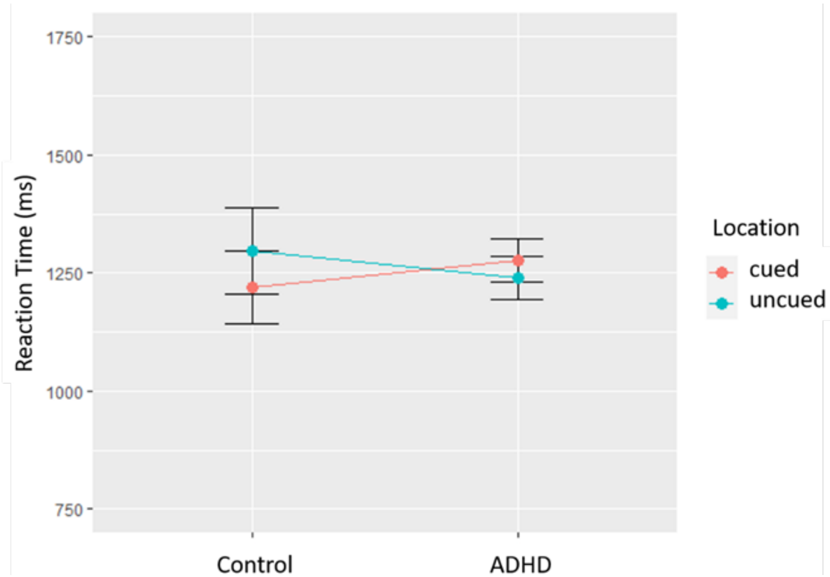
Note. Shorter delay resulted in faster responses. Error bars in this and subsequent figures indicate 95% confidence intervals.

The interaction between Location and ADHD was significant ($F_{(1, 364)}$ = 6.49, $p < .01$, $\eta_p^2 = .02$). In the high ADHD symptoms group, the pattern of reaction times between the cued and uncued location trials was significantly different than that of the control group (low ADHD symptoms). Specifically, the cued trials were faster than the uncued trials in the control group, whereas in the high symptoms group the pattern was the opposite. This effect suggests that those with ADHD may have a deficit in processing speed for location-based IOR within the specific context of cued images, consistent with the hypothesis that location-based IOR effects are present in the high symptoms group. This is paired with the fact that target stimuli in novel (uncued) locations were processed faster by the ADHD group compared to the control group. The interaction between location and ADHD is depicted in Figure 4.

We found a significant interaction between Function, Delay, and ADHD ($F_{(1, 364)}$ = 5.21, $p < .02$, $\eta_p^2 = .01$). In the 500 ms delay condition reaction times for the control group were larger in congruent trials as compared to incongruent trials. This result is consistent with the findings of the original cueing paradigm (Posner, 1980) and the pragmatic IOR effects observed in Riggio et al. (2006). In the 1000 ms delay condition, the ADHD group produced numerically larger reaction times in congruent trials as compared to incongruent trials, which is qualitatively similar to the pattern of results for the control group in the 500 ms delay condition. This suggests that the temporal range for the pragmatic IOR effect may be shifted towards longer delays between cue and target stimulus in ADHD individuals as compared to controls. The interaction between Function, Delay, and ADHD is depicted in Figure 5.

Figure 4

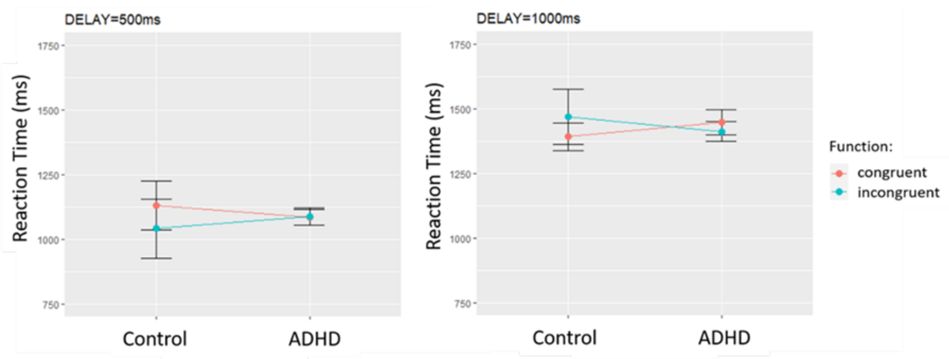
Location × ADHD Interaction on Reaction Time



Note. In the control group, the differences between locations are larger and pointing in the opposite direction than in the ADHD group.

Figure 5

Function × Delay × ADHD Interaction on Reaction Time



Note. The pattern for the control group in the 500 ms delay condition matches the pattern for the ADHD group in the 1000 ms delay condition. See details in the text.

Discussion

Inhibition of return is an important attentional process that has the potential to shed light on how behaviour is controlled in activities of daily life. IOR has been typically studied using psychophysical methods and with underspecified stimuli such as flashes of light and symbols serving as cues and stimuli. The current study attempted to make a contribution to understanding behaviour via IOR by framing the task in functional terms and using real objects as cues and target stimuli. We demonstrated that IOR affects not only spatial attention, but also object-based attention through the perception of affordance properties of objects. We demonstrated that perception of pragmatic properties of objects induces IOR effects whereas nonpragmatic, incongruent tool use does not. Additionally, the study examined inhibition of return in ADHD, in order to determine whether the perception of affordances is disrupted due to a lack of attentional focus.

Our results illustrate a complex and interdependent relationship between inhibition of return and affordance perception. Previous research has shown that an object's pragmatic features, or affordances, can affect inhibition of return (Riggio et al., 2006). Our current study extended and corroborated these findings by comparing an ADHD group with a control group. The high ADHD symptoms group exhibited some of the same effects of IOR as the control group, but the ADHD group's responses were affected at larger delays between the cue and the target stimulus. This result suggests that optimal attentional processing in individuals with ADHD occurs within a larger time frame than in controls. At a short time scale (within a 500 ms delay) individuals with ADHD are not affected by IOR, thus indicating that attention is not inhibited. A plausible reason for this might be that impulsivity in ADHD individuals results in fast responses due to increased alertness, but that this accelerated mode of apprehension (a sort of hypersensitivity) stabilizes at longer time delays. Theories that treat ADHD as a disinhibitory disorder (Barkley, 1997) predict that increased task difficulty leads to less inhibition control. Participants in the ADHD group exhibited less inhibition under short time delay, an arguably harder task constraint. Thus, our results are consistent with Barkley's theory. However, Roberts et al. (2016) showed that lack of inhibition is not only a function of task difficulty, rather it may be due to insensitivity to environmental cues (motivation, social functioning, behavioural control). In fact, some studies revealed that ADHD is oftentimes comorbid with autism (Roy et al., 2013), a condition in which individuals lack sensitivity to environmental cues. If we assume that the cues and targets in the present study are pragmatic stimuli (Riggio et al., 2006), directly relevant to functional tasks (i.e. affordance perception), then the lack of sensitivity to environmental cues in ADHD patients is consistent with disinhibition at short delays. Affordance perception is served by the dorsal system (Goodale & Milner, 1992; Proffitt et al., 1995) which is related to action-oriented perception, an arguably fast neural process, as opposed to the ventral system that is a slower process involved in object recognition (Norman, 2002). Following the terminology of Lupiáñez et al.

(2016), stimuli in our study can be described as endogenous, and not exogenous (Ortega et al., 2013) in nature. If we also assume that endogenous cues are processed slower than exogenous cues, then the question remains whether pragmatic cues related to affordances, which are processed by the fast dorsal system, can be accurately labelled as endogenous in the literature. More empirical and theoretical work is needed to reconcile apparent contradictions in the terminology about the nature of stimuli in the literature on ADHD, inhibition of return, and affordances.

Our results suggest that at longer delays the ADHD group behaves very similarly to how the control group behaves at shorter delays. What might be at the heart of the process of inhibition of return? Attention under normal circumstances (e.g. during visual search) is highly selective and focused on novelty. Perhaps ADHD individuals have difficulty to attend selectively at short time delays due to impulsivity (or other uncontrollable neurological issues such as disinhibition) and are able to regain the ability to selectively attend at longer time delays. Future research is planned to probe inhibition of return in functional affordance tasks at many time delays to obtain a better picture of the exact timeline of when and how attention switches from global to selective mode of apprehension in ADHD individuals.

The most valuable result of the current study is that we successfully demonstrated that the differences in attentional ability between ADHD and control groups may be simply a matter of temporal delay, rather than due to chronic neurological or behavioural deficiency. The difference is one of temporal degree, not of kind or type.

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Utjecaj priuštivosti na inhibiciju povratka moderiran je ADHD-om

Sažetak

Vizualna je pažnja ključna za izvođenje funkcionalnih zadataka poput posezanja za šalicom kave i njezina podizanja sa stola. U kojoj je mjeri pažnja osoba kojima je dijagnosticiran ADHD promijenjena kod takvih zadataka? Uglavnom je nepoznato koji čimbenici utječu na pažnju u funkcionalnim zadacima koji se odnose na cilju usmjereno ponašanje (priuštivost; engl. *affordance*). Znanstvenici su koristili kognitivni mehanizam inhibicije povratka da bi istražili kako pažnja funkcionira. Pragmatična inhibicija povratka događa se kada se priuštivosti ili pragmatične karakteristike objekta prezentiraju ponavljano i kao orijentirajući podražaj i kao ciljni podražaj te potiskuju procesiranje sličnih informacija u budućnosti da bi olakšali identifikaciju novih podražaja. U ovome je istraživanju pragmatična inhibicija povratka ispitana korištenjem „preferiranih" i „nepreferiranih" podražaja u Posnerovu zadatku da bi se utvrdilo hoće li podražaj sa salijentnijom ili uočljivijom priuštivošću pokazati veći efekt inhibicije povratka. Preferirani su podražaji bili nogometna lopta koju udara noga i loptica za tenis koju udara reket. Nepreferirani su podražaji bili nogometna lopta koju udara reket i loptica za tenis koju udara noga. I skupina s ADHD-om i kontrolna skupina pokazale su inhibiciju povratka, ali u skupini s ADHD-om dobiveni su efekti na duljim vremenima odgode nakon pojave orijentirajućega podražaja. Dobiveno sugerira da je razlika između sudionika s ADHD-om i zdravih sudionika posljedica jednostavne vremenske odgode, a nije nužno povezana s razlikama u prirodi procesiranja pažnje.

Ključne riječi: priuštivost, poremećaj pažnje s hiperaktivnošću, inhibicija povratka, vizualna pažnja

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