Image Preference Biases on Manual and Oculomotor Tasks in Preliterate Children

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Psyc 400AB: Honours Thesis

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April 28, 2020

Abstract

Pseudoneglect is a leftward spatial bias that is observed in neurotypical people, or people with no known brain damage (Bowers & Heilman, 1980). Line bisection tasks are commonly used to investigate this phenomenon that involve participants marking where they perceive the midpoint to be on a horizontal line. Consistently, neurotypical participants will err to the left of centre on these tasks. Several factors contribute to the extent to which pseudoneglect is experienced including handedness, gender, age, and native reading direction (for a review, see Jewell & McCourt, 2000). Native reading direction been observed to be extremely influential in the direction and severity of spatial biases, with left-to-right reader erring to the left and right-to-left readers erring to right (Faghihi et al., 2019). The majority of studies examining pseudoneglect have included only adult participants or a mix of both child and adult participants. The present study examined this lateral spatial bias in children who have not yet learned to read. Twenty-nine four and five-year-old children completed a task in which they placed felt cut-out images onto felt boards, as well as a forced-choice mirrored image task. Each task was coded and scored for lateral preferences. Children displayed a strong leftward bias for figure placement ($p = .007$) on the felt board task and a non-significant rightward weighted image preference on the forced choice paradigm. The predicted leftward bias on the felt board task and the unpredicted pattern of directionality between the two tasks is discussed in terms of oculomotor and manual/motor mechanisms and right hemisphere activation.

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Hemispatial neglect, or unilateral neglect, is a condition that results from damage to the right cerebral hemisphere, or more specifically, the right parietal lobe. This damage is typically the result of a stroke and causes an individual to attend to one side of space while unintentionally ignoring the other side (Corbetta & Shulman, 2011). It is most common for space on the right side to be attended to and the left side to be neglected for individuals with this condition. For instance, these individuals may accidentally bump into the left side of door frames more often than the right side or forget to eat the food on the left side of their plate (Bartolomeo & Chokron, 2002).

For neurotypical individuals, or people with no known brain damage, a contrary phenomenon occurs in which spatial attention is unintentionally concentrated on the left while the right is inadvertently unattended. This is known as pseudoneglect, a term first coined by Bowers and Heilman (1980). Both hemispatial neglect and pseudoneglect have been widely studied using several modalities including the Landmark task, in which participants judge the accuracy of pre-bisected lines (Fink et al., 2002); tactile rod bisection tasks, in which subjects are blindfolded and asked to use their hand to indicate the centre of a rod (Laeng et al., 1996); and cancellation tasks, which can either be performed using a paper-and-pencil method or on a touch screen device and require the subject to visually search the display for target items and manually cross or cancel them out (Keller et al., 2015). The most common method used to test both phenomena has been a line bisection task (Jewell & McCourt, 2000). This task generally involves presenting a subject with a horizontal line drawn on a sheet of paper and instructing the subject to mark with a pen where the centre of that line is (Jewell & McCourt, 2000). Patients with hemispatial neglect will consistently mark the line to the right of centre, whereas neurotypical subjects will frequently mark the line to the left of centre (Jewell & McCourt, 2000). Regardless of modality, neglect patients demonstrate a rightward bias that is much greater in magnitude than the leftward bias demonstrated by neurotypical individuals (Jewell & McCourt, 2000).

Additional tasks that have been used to assess spatial biases include several drawing paradigms. For instance, Faghihi et al. (2019) had right and left-handed adult participants, who were either left-to-right readers and writers or right-to-left readers and writers, draw a symmetrical tree on an unlined sheet of paper with their dominant hand. The researchers then measured the figures to determine if the overall tree was biased toward the left of centre, the right of centre, or not biased at all. The researchers found that an overall leftward bias was present and was most pronounced with right-handed participants who read from left-to-right (Faghihi et al., 2019). Faghihi et al. (2019) based their study on a previous study by Picard & Zarhbouch, (2014) whose participants were left and right-handed children who either read and wrote from left-to-right or from right-to-left. The participants each drew a tree on a sheet of paper and the images were then measured, coded, and analyzed to determine if they were directionally biased. Results from this study were analogous to the results from the Faghihi et al. (2019) study, with an overall leftward bias, particularly with right-handed participants (Picard & Zarhbouch, 2014). Additionally, Picard (2011) and Kebbe and Vinter (2013) had participants draw side-view images of common place items such as a walking dog, a human face, and a car or truck. Both studies found that right-handed participants from a culture in which reading and writing is done from left-to-right displayed a leftward bias, with drawn images facing to the left (Picard, 2011; Kebbe & Vinter, 2013).

There are several factors at play in neurotypical individuals that effect the direction and severity of pseudoneglect that they experience including handedness, gender, age, and native reading direction (Jewell & McCourt, 2000). Karev (1999) reported that in his study of 754 subjects, who were classified as either right-handed, left-handed, or mixed, all subjects demonstrated a leftward bias but to varying degrees. In terms of sex and gender, Roig and Cicero (1994) found that males tend to bisect further to the left than females do. As well, younger adults (i.e., in their early and mid 20's) tend to bisect further to the left than older adults (Barret & Craver-Lemley, 2008).

Scanning direction is a considerable factor to take into account in terms of spatial bias tasks. Erring to the either the left or right of centre is largely dependent on which direction the subject begins a motor or oculomotor scan (see Jewell & McCourt, 2000 for review). For example, if a subject visually scans the line in a line bisection task from the left to the right, it is more likely that the subject will then bisect the line to the left of objective centre. Scanning direction tendencies may be the result of native reading direction, which has significant effects on pseudoneglect and spatial biases in general. Individuals who live in or were raised in a culture in which reading is performed from the left to the right consistently display a leftward bias, whereas individuals who live in or were raised in a culture in which reading is performed from the right to the left consistently display a rightward bias (Kebbe & Vinter, 2013; Vaid, Singh, Sakhuja, & Gupta, 2002).

The corpus callosum is a thick commissure of nerve fibers connecting the left and right hemispheres of the brain and allows for communication between the two hemispheres. The corpus callosum is developed in utero with the number of fibers already fixed around birth (Luders et al., 2010). Growth of the corpus callosum continues through childhood and adolescence, though not all areas of the corpus callosum grow at the same rate. Growth of the callosal isthmus, for instance, which connects the parietal lobes responsible for spatial association, grows exponentially (up to 80%) between the ages of 6 and 11 (Thompson et al., 2000). Considering that the callosal isthmus is not fully developed until early adolescence, this may explain why younger subjects tend to err to the left more frequently than older subjects (Jewell & & McCourt, 2000).

The vast majority of studies examining neglect and pseudoneglect have been conducted using adult participants. Studies that have included child participants have found that children between the ages of 5 and 11 display a leftward bias when drawing pictures (Kebbe & Vinter, 2013; Picard, 2011; Picard & Zarhbouch, 2014). Of the small number of studies that included child participants, few had participants under the age of 5 (Bradshaw et al., 1987; Chokron & De Agostini, 1995; Tada & Stiles, 1996). Bradshaw et al. (1987) reported that right-handed subjects between the ages of 3 and 5 erred to the left regardless of which hand they used to perform a bisection task (Bradshaw et al., 1987). Contrary to the typical leftward bias reported, however, Chokron and De Agostini (1995) reported that right-handed children aged 3 and 4 displayed a rightward bias during line bisection tasks. Similarly, Dellatolas, et al. (1996) reported that 4 and 5-year-old children bisected to the right with their right hand, but with a group of 10 to 12-year-old children, their right-handed bisections erred to the left (Dellatolas, et al., 1996).

As there is very limited information about the phenomenon of pseudoneglect and spatial biases in children, the present study aims to examine spatial biases in preliterate children (i.e., children who have not yet learned to read) through two tasks which have not previously been used to study spatial biases in children. Task 1 involves 4 trials of manually placing cut-out felt figures onto premade felt boards that resemble generic outdoor scenes. The figures include three unique items for each board and a sun that is used on all boards. Task 2 is a forced-choice paradigm in which participants indicate their preference between two mirrored images. The goal of the present study is to examine the directional trends of figure placement in task 1 and the image choices in task 2. Given the influence that native reading direction appears to have on an individual's spatial biases (Faghihi et al., 2019), we have decided to control for this factor by including only children who have not learned to read yet. As such, the children should not yet be accustomed to beginning visual searches from the left side of space. With so many factors playing a role in the phenomenon of pseudoneglect and spatial biases in general, we anticipate that sun and figure placements in task 1 will be biased to the left and image preferences in task 2 will reflect preferences for leftward weighted images.

Methods

Participants

29 children (17 male), aged 3 years (N=1), 4 years (N=12), and 5 years (N=16) participated in the study. Prior to each child's participation, parents signed an informed consent form (Appendix A) and completed the Edinburgh Handedness Inventory – Short Form questionnaire (Veale, 2014; Appendix B) on behalf of their child. Results from the inventory revealed 23 of the participants were strongly right-handed, 4 were strongly left-handed, and 2 were rated as using each hand equally. Each child verbally assented before beginning the tasks when asked "Do you want to play a game with me?" by the researcher. All participants completed the tasks with the exception of one participant whose partial data set was included. Tasks were counterbalanced in order to control for order effects and participants completed one after another with a brief rest in between. Parents were debriefed at the end of their child's participation and provided with a debriefing form (Appendix C).

Task 1

Stimuli and Procedure

Participants were seated at a table and felt boards measuring 24” x 24” felt board (cardboard backing with felt covering it entirely) were placed in front of them on the table one at a time. Boards were made to look like a generic outdoor scene and four small figures also made of felt. Participants completed four trials in this task, with each trial’s felt board and figures containing different themes and images. Board themes were a park scene, an urban scene, a swimming scene, and a jungle scene (Figure 1).

Participants were presented with the figures in a stack at their midline and given instructions to place the figures on the board in a way that looked correct to them. The same instructions were given for each trial. No time limit was imposed and children were able to adjust or move the figures until they were satisfied. The researcher took a photo of each board once complete.

Figure 1

Completed felt board examples

a) b) c) d)

Note. Felt board scene: a) park scene, b) urban scene, c) swimming scene, & d) jungle scene

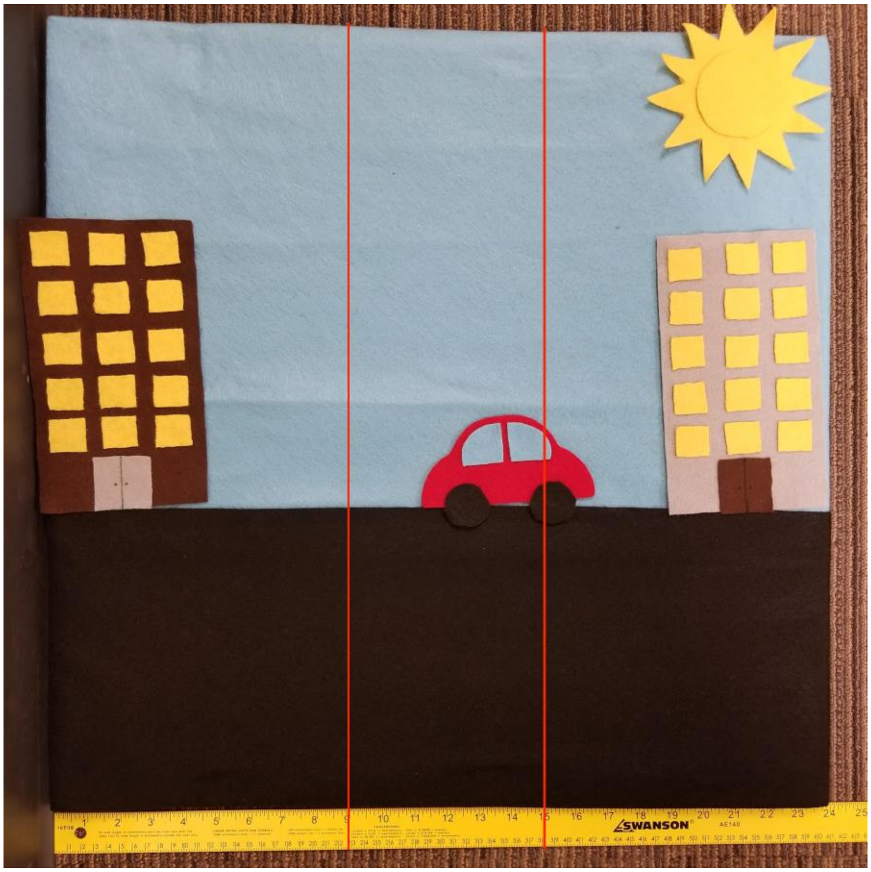
All felt figures were forward facing or bidirectional, so as not to have any directional influence on the participants placement choice. Importantly, the car figure in the urban scene gives no indication of which is the front or the back of the vehicle. As well, to ensure that the shape of the board itself does not influence the placement of the figures, it was decided upon to make it a perfect square.

Scoring and Analysis

Upon completion of each felt board, the researcher placed a yardstick along the bottom edge of the board before photographing it. Three vertical sections were designated on the boards for scoring purposes: 9” inward from the left edge of the board, 9” inward from the right edge of the board, and the remaining 6” in the centre (Figure 2). Photos of completed boards with the yardstick allowed for accurate measurement and scoring of the boards at a later time.

Figure 2

Completed felt board with overlaid scoring lines



Note. Scoring lines at 9” and at 15” on the yardstick, resulting in a 6” space in the centre and 9” spaces on either side.

Each trial received two scores: one for sun placement and one for overall placement of the other three figures, on a scale from -1 to +1. Sun placement received a score of -1 if it was placed in the left 9” area, a score of 0 if it was placed in the 6” centre, or a score of +1 if it was placed in the right 9” area. Figure placement scores were -1 if the figures were more heavily weighted in the left 9” area, a 0 if they were balanced across all three areas, or a +1 if they were more heavily weighted in the right 9” area. The mean scores for each dimension (sun, figures) were analyzed for lateral placements, where negative scores indicate a leftward bias, positive scores indicate a rightward bias, and a score of zero indicates no bias.

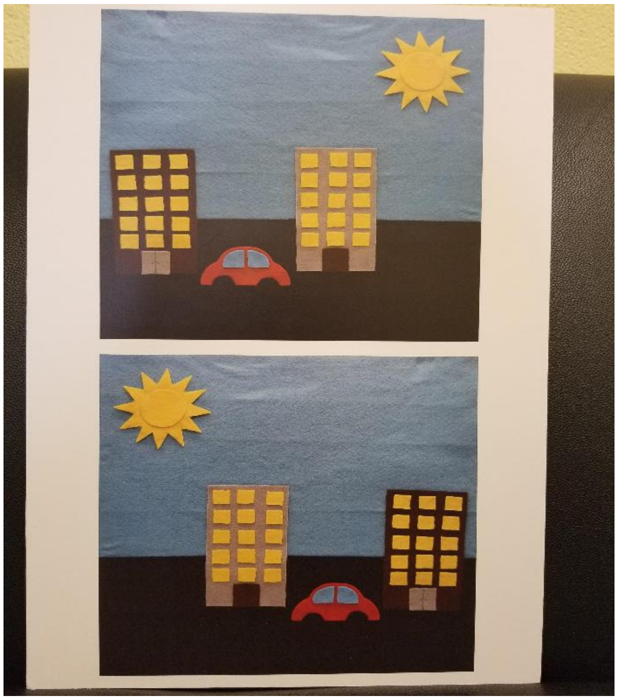
Task 2

Stimuli and procedure

Participants completed 8 forced-choice trials in which they were presented with two horizontally mirrored image photos, stacked one on top of the other (figure 3). The decision to display the photos vertically was intended to avoid directionally influencing the participant’s decision. The images were photos of premade felt boards and were printed onto Coroplast boards. Each of the scenes from task 1 (i.e., park, swimming, jungle, and urban scenes) were presented two times, with the placement of the sun either on the right, left, or centred. Similarly, the figures were situated either to the left, right, or balanced across the image. The presentations of sun and figures were arranged to be balanced across the 8 trials. See Table 1 for a description of figure placement and scenes for each trial. Each forced choice board containing two mirrored images were labelled from A through H, which was written on the backside of each board. The letters A through H were entered into an online randomizer to create unique orders of trial presentations. The boards were held upright, roughly two feet away from the child. The researcher then asked the child “Which picture do you like the best? Do you like the top one better? Or the bottom one better?”. The order of the last two questions was counter balanced with each trial to avoid influencing the child’s decision. The child would then verbally respond by saying either “the top” or “the bottom”. The response was immediately recorded on a sheet of paper before presenting the next set of images to the child. There was no time constraint for each board, however, the child could not progress to the next image board until they had made a decision on the current board.

Figure 3

Forced-choice board example



Note. An example of an urban scene mirrored-image forced-choice trial.

Table 1

Scene, sun, and figure combinations for each forced-choice trial

Trial #	Scene	Top		Bottom	
1	Jungle	Centre Sun	Left Figures	Centre Sun	Right Figures
2	Urban	Centre Sun	Right Figures	Centre Sun	Left Figures
3	Park	Left Sun	Bal. Figures	Right Sun	Bal. Figures
4	Swimming	Right Sun	Bal. Figures	Left Sun	Bal. Figures
5	Swimming	Left Sun	Left Figures	Right Sun	Right Figures
6	Park	Right Sun	Right Figures	Left Sun	Left Figures
7	Jungle	Left Sun	Right Figures	Right Sun	Left Figures
8	Urban	Right Sun	Left Figures	Left Sun	Right Figures

Scoring and Analysis

Task 2 was coded much the same as task 1. Each trial received two scores, depending on which image (top or bottom) the participant chose. Each board was coded for both sun and figure placement with scores ranging from -1 to +1. Sun placement received a score of -1 if it was placed in the left 9” area, a score of 0 if it was placed in the 6” centre, or a score of +1 if it was placed in the right 9” area. Figure placement scores were -1 if the figures were more heavily weighted in the left 9” area, a 0 if they were balanced across all three areas, or a +1 if they were more heavily weighted in the right 9” area. Scores for each individual image were determined and recorded prior to running any participants.

The mean scores for each dimension (sun, figures) were analyzed for lateral placements, where negative scores indicate a leftward bias, positive scores indicate a rightward bias, and a score of zero indicates no bias.

Results

In task 1, sun and figure placement was leftward for males (Sun: M= -.059, $t(16)= -.109$, $p= .914$, Figures: M= -.588, $t(16)= -2.279$, $p= .037$) and for females (Sun: M= -.917, $t(11)= -1.476$, $p= .168$, Figures: M= -. 833, $t(11)= -1.820$, $p= .096$). An independent *t* test was used to compare the mean ‘sun’ and ‘figure’ scores of the male participants and female participants. While the means suggest that females placed the items to the left slightly more frequently than males, the differences in ‘sun’ and ‘figure’ placement between the two sexes were not significant, sun: $t(27)=1.037$, $p=.309$; figures: $t(27)=.499$, $p=.622$. An independent samples *t* test was also used to compare ‘sun’ and ‘figure’ means between 4 and 5-year-old participants, although these results were also nonsignificant, sun: $t(26)= -.312$, $p=.758$; figures: $t(26)= .503$, *p*= .619. Both 4 and 5-year-old participants demonstrated an overall leftward directionality in task 1; 4 years SunM= -.583, FigureM= -.500; 5 years SunM= -.313, FigureM= -.750.

For task 2, male and female image preferences were compared with an independent samples *t* according to the scoring of images for sun and figure locations, sun: $t(27)= -.248$, $p= .806$; figures: $t(27)= -.822$, $p= .418$. Females displayed an overall rightward placement of items (SunM= .667, FigureM=.500) and males displayed rightward ‘sun’ placements and leftward ‘figure’ placements (SunM= .471, FigureM= -.235). Age effects were analyzed using an independent *t* test to compare mean ‘sun’ and ‘figure’ scores between 4 and 5 year old participants and similarly produced nonsignificant results, sun: $t(26)= .421$, $p=.677$; figures: $t(26)= 1.014$, $p=.320$.

One sample *t* tests were used to compare overall ‘sun’ and ‘figure’ means from all participants in each task, task 1 sun: $t(28)= -1.015$, $p= .319$; task 1 figures: $t(28)= -2.891$, $p= .007$; task 2 sun: $t(28)= 1.440$, $p= .161$; task 2 figures: $t(28)= .157$, $p= .876$. Leftward sun and figure placements were observed in task 1 (SunM= -.414, FigureM= -.690), and rightward in task 2 (SunM= .552, FigureM= .069), with a significant leftward bias for figures in task 1. Given the consistency in the direction of the scores within each task, we combined sun and figure scores from each trial of both tasks. This was done by summing the ‘sun’ score and ‘figure’ score for each board in task 1 and similarly summing the scores from the chosen images in task 2. One sample *t* tests against zero found the mean score of leftward placements in task 1 (M= -1.10) approaching significance ($t(28) = -1.994$, $p = 0.056$) and the rightward mean scores on task 2 (M= .48) to be non-significant significant ($t(28) = 1.192$, $p = .243$). A paired samples *t* test comparing the scores from task 1 and task 2 found the lateral preferences on each task to be significantly different from each other, $t(28) = -2.229$, $p = .034$.

Discussion

The present study aimed to investigate the presence and degree of pseudoneglect, or leftward spatial biases, in preliterate children using stimuli that, to our knowledge, has not been used for this purpose before. Across both tasks, we expected the participants to exhibit a leftward bias despite not having learned to read yet. Specifically, in task 1, we expected that the sun would be placed on the left side of the sky much more frequently than on the right and that the figures would be placed more heavily on the left the majority of the time. As well, in task 2, we expected that images with the sun on the left side of the picture would be preferred more often than images with the sun on the right, and that images with the figures more heavily weighted on the left would be preferred more frequently than images with the figures on the right.

Findings from task 1 revealed a pattern of leftward sun and figure placements, with figure placement biased significantly leftward. The bias score created from combining figure and sun indicated a leftward preference that approached significance. Our results support previous findings from studies where participants engaged in a motor activity display a leftward bias (see Picard, 2011; Picard & Zarhbouch, 2014; Kebbe & Vinter, 2013; Faghihi et al., 2019). As participants employed motor activity in task 1 of the present study, this suggests that a motor bias may be involved along side perceptual and attentional biases.

In contrast to task 1 we observed overall rightward preferences in task 2, instead of the expected leftward bias. A potential explanation for this unanticipated result may lie in the fact that while the two tasks use comparable stimuli, they require the use of different neural mechanisms. Previous studies have also found an opposite bias in manual and oculomotor tasks. Participants who manually bisect stimuli tend to err to the left of vertical centre, yet participants who visually bisect stimuli tend to err to the right of vertical centre (Elias et al., 2005; Leonards et al., 2013; Rhode & Elias, 2007). The stimuli in the present study differs from typical bisection stimuli, however it is reasonable to presume the same neural mechanisms and biases that are at play in the aforementioned studies are active in task 1 and task 2 here as well. Levy (1976) found similar results with a mirrored images forced-choice task. Results from her study indicated that right-handed adult participants preferred images which were more heavily weighted on the right side of the picture (Levy, 1976). The author posits that right-weighted pictures may be more aesthetically pleasing due to the right hemisphere being activated when viewing pictures which biases attention to the left, creating a balance between the right-weighted pictures and the leftward attention (Levy, 1976).

It is worth noting that literacy skills were not assessed prior to the children's participation as other studies have done (Portex et al., 2017). For the present study, we worked under the assumption that the children were all at the same literacy level and have had similar levels of literacy exposure. However, future researchers may wish to assess literacy levels in a more systematic fashion.

Observations from the present study with preliterate children are comparable to observations in studies using adult participants, i.e., leftward tendencies in directionality tasks that include a motor or manual component and rightward tendencies in directionality tasks with an oculomotor component. A future investigation comparing performances by both preliterate children and adults on the same or similar tasks as in the present study should be conducted in order to better determine the role of the corpus isthmus in spatial attention.

Implications

The findings of this study of a leftward directionality in a motor task and a rightward directionality in an oculomotor task in preliterate children adds to the scarce literature on pseudoneglect and lateral spatial biases in children. Additionally, the leftward bias in task 1 indicates the presences of pseudoneglect in children prior to full development of the corpus callosum or learning to read and write from left-to-right. Considering the novel stimuli used in Task 1 of the present study, further research using the same or similar stimuli will need to conducted to either support or refute the evidence gleaned from our results.

Acknowledgments

We would like to extend our thanks to Dr. Jeff Loucks for his invaluable input and for the use the Early Cognitive Development Lab at the University of Regina.

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Appendix A

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Participant Consent Form

Project Title: Spatial Bias in Preliterate Children

Researchers:
Student: Nicole Isabelle, University of Regina Undergraduate (Psychology Honours Student), isabelln@uregina.ca
Supervisor: Austen Smith, Assistant Professor, Psychology Department, University of Regina, 306-585-4297, austen.smith@uregina.ca
Co-supervisor: Jeff Loucks, Associate Professor, Psychology Department, University of Regina, 306-585-4033, jeff.loucks@uregina.ca

Purpose and Objective of the Research:
- The purpose of this study is to examine whether children who have not yet learned to read display a visual preference to either the left or right.

Procedures:
- Your child will be asked to create several scenes/pictures using a felt board and felt figures.
- Your child will also be shown pairs of identical, but mirrored, images and asked which image they prefer.
- Your child's behaviour during all of the games will be video recorded.
- You may also be asked to fill out one or more brief questionnaires while your child is completing the tasks.
- The study will take place in the Early Cognitive Development Laboratory, CL 429. These tasks will take your child approximately 15 minutes to complete.
- Please feel free to ask any questions regarding the procedures and goals of the study or you or your child's role.

Potential Risks:
- There are no known or anticipated risks to you or your child by participating in this research.

Compensation:
- Your child will receive a small toy (approximate value $5.00) on the day of their participation in the study as compensation for coming in. They do not need to complete the study in order to receive compensation.

Confidentiality:

- Any information that we collect from you about you, your child, or your family during the course of this study will remain entirely confidential.
- You and your child's information will be linked to your name on the consent form by way of a code that is known only to the researcher and the research staff. Your consent form will be stored in a secure location in the researcher's lab, separate from the rest of the data we collect from you and your child. When you or your child's data are presented in any kind of public forum, it will not be possible to identify you or your child as an individual.
- Your child's video will not be shown outside to anyone outside of the research team. However, we may wish to show a video of your child's participation in a public forum (e.g., conference presentation). In such an event, we would contact you to request your additional consent to show the video in this manner. This would be completely voluntary, and you would be under no obligation to consent.

Storage of Data:

- The information we collect from you and your child will be stored in a secure location in the researcher's lab for as long as the data are required, for a minimum of 10 years.
- After the data are no longer required, they will be securely destroyed.

Right to Withdraw:

- You and your child's participation is voluntary. You can allow your child to participate only in the activities you are comfortable with, and can answer only those questions that you are comfortable with. You may withdraw yourself and your child from the research project for any reason, at any time during the study without explanation or penalty of any sort.
- Whether you choose to participate or not will have no effect on you or your child: your child will receive compensation today irrespective of whether you choose to participate in the study after reading this consent form.
- You and your child can withdraw at any time during the study, even after signing the consent form or partway through the study. You will not lose your compensation if you choose to withdraw from the study.
- Should you or your child wish to withdraw, you will be given the option to have the information we have collected from you and your child removed from the study and destroyed.
- Your right to withdraw data from the study will apply until two weeks after your participation date. After this point it is possible that some form of research dissemination will have already occurred (e.g., published, presented at a conference) and it may not be possible to withdraw your child's data.

Follow up:

- The researcher will summarize your child's performance at the end of the study.
- If the results of the study become published, these publications will be available on the researcher's lab web site: uregina.ca/~loucks5j

Questions or Concerns:

- Contact the researcher using the information at the top of page 1.

- This project has been approved on ethical grounds by the U of R Research Ethics Board on [DATE]. Any questions regarding your rights as a participant may be addressed to the committee at (585-4775 or research.ethics@uregina.ca). Out of town participants may call collect.

Consent:

Your signature below indicates that you have read and understand the description provided; I have had an opportunity to ask questions and my/our questions have been answered. I consent for myself and my child to participate in the research project. A copy of this Consent Form has been given to me for my records.

____________________ __________________________

Name of Participant   Signature

________________________ ______________________

Researcher's Signature   Date

A copy of this consent will be left with you, and a copy will be taken by the researcher.

Appendix B

Edinburgh Handedness Inventory – Short Form

Please indicate your preferences in the use of hands in the following activities or objects:

	Always right	Usually right	Both equally	Usually left	Always left
Writing	☐	☐	☐	☐	☐
Throwing	☐	☐	☐	☐	☐
Toothbrush	☐	☐	☐	☐	☐
Spoon	☐	☐	☐	☐	☐

(Veale, 2014)

Appendix C

Debriefing Form for Parents

Thank you very much for participating in this study.

Hemispatial neglect is a condition that results from damage to one side of the brain and causes an individual to attend to one side of space while unconsciously ignoring the other side. It is most common for space on the right side to be attended to and the left side to be neglected for individuals with this condition. For instance, these individuals may accidentally bump into the left side of door frames more often than the right side.

For individuals with no known brain damage (termed neurotypical), it would be assumed that attention is equally divided between left and right space. However, there is a tendency for these individuals to attend more to the left and unintentionally ignore the right. This phenomenon is known as pseudoneglect. This phenomenon has been widely studied using what is called a line bisection task, in which participants are asked to mark the center point of a horizontal line on a sheet of paper. Neurotypical people almost always mark the line to the left of center.

There are several factors that can affect the degree to which neurotypical people experience pseudoneglect. These include sex, age, handedness, and native reading direction (left-to-right or right-to-left). We are looking at the influence that pseudoneglect may have on the way objects are arranged in space and image preferences of children who have not yet learned to read. Thank you for your time today. Your child's participation in this study will help us better understand pseudoneglect in children.

If you have any questions or concerns regarding your child’s participation in this study, please feel free to contact Nicole (isabelln@uregina.ca), Dr. Austen Smith (austen.smith@uregina.ca, 306-585-4297), or Dr. Jeff Loucks (jeff.loucks@uregina.ca, 306-585-4033). You may also contact the University of Regina Research Ethics Board at 585-4775 or research.ethics@uregina.ca.