

Perceptions When Drawing

A Interdisciplinary Qualifying Project Report

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By

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Abstract

Past research shows that individuals sometimes accentuate parts of drawings and other times leave out details (Brooke, 1995). Thus, this research project examined what factors, such as the angle of the light shining on the object, the position of the object, and the type of object, influenced the accuracy of drawings created. Both college students (ages 18-22) and fourth graders (ages 9-10) viewed an object, drew it, and answered a questionnaire. We found that college students drew more accurate pictures than fourth graders. More detailed objects were also drawn more accurately than less detailed objects. However, the lighting and the position did not influence the accuracy of the drawings. While our data shows that age and the type of object are important factors in the drawing accuracy, other factors should be studied in future research.

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1. Introduction

“Perception comes to us moment by moment, one perception vanishing as the next appears.”

(Myers, 2007, p. 237)

As the above quote suggests, our perceptions can be quick and fleeting. Research also suggests that our perceptions are based upon sensory input and situational factors, and sometimes people can perceive the same object differently (Myers, 2007). In particular, past research shows that individuals sometimes accentuate parts of drawings and other times leave out details (Brooke, 1995). Given that perceptions and accurate representations of perceptions vary, this study set out to examine what factors influence the accuracy of details of objects during drawing. More specifically, this project explores whether the angle of the light shining on the object, the position of the object to be drawn, and whether the object itself influence the accuracy in the drawing of the object.

2. Background

2.1 Perception

Perception is the organization and interpretation of sensory information. It allows us to identify objects and events and is decided through a variety of biological, psychological, and social-cultural influences (Myers, 2007, pgs.197 & 261). Research in perception shows that people may perceive objects differently; for instance, some process the whole object first and then the parts, while others reverse the process (Harris, 2009).

To better understand how people perceive objects, Marr’s model presents perception as a three-step process (Guérin, Ska, & Belleville, 1999). First, an image is transformed to a 2D

representation. The background and foreground are not distinguishable in this representation. Then a two and a half D representation is established, and features such as distance, orientation, and surface are added to the image. Finally, a 3D structure of the object is constructed (Guérin, Ska, & Belleville, 1999). This model suggests that perception is a step-wise process, and that features of the perceived object are important during the perception process.

2.2 Perception and Drawing

Perception is also an important component in drawing—as one has to perceive the object to be drawn. One question then is—do differences in perceptions of the object lead to differences in drawings, of the perceived object? Past research shows that different perceptions can lead to differences in drawings. For instance, one study found that individuals sometimes leave details out of their drawings, and sometimes accentuating certain parts (Brooke, 1995). An example of this phenomenon is children who experienced abuse. These children often produce drawings that accentuate parts of their pictures that relate to their abuse (Brooke, 1995). Research on attention suggests that the accentuation and lack of details in drawings may be due to selective attention. Selective attention is the focusing of conscious awareness on a particular stimulus that sub (Myers, 2007, p. 237). When perceiving an object to draw, one may selectively focus on part of an object and subsequently overlook the other parts of the object.

2.3 Factors Influencing Perception

Based on Marr's model of perception, features of the object are important during the perception process. Yet, research shows that not all features are processed to the same extent; for instance, some features may be highlighted over others (Brooke, 1995; Myers, 2007). Given that features are an important component to perception and an important component to

accurately drawing perceived objects, we investigated whether certain features could influence the accuracy of perceptions of objects when drawing.

One such feature is the angle of the lighting directed on the object. Past research investigating the effects of lighting on 3D video game objects showed that it was harder to detect finer details when a light shined directly on the object because it decrease the amount of shadows on the object (Shacked, 2001). Based on this research, we predicted that when the light shined directly on the object (or a 0 degrees on the object) that less accurate drawings would be produced than when the light did not shine as directly on the object (or 45 degrees).

While the angle of the light may play a role in the perception of an object (Shacked, 2001), the position of the actual object may also influence the amount of details perceived. Based on this, we explored whether the position of the object (front or side view) influenced the accuracy of the drawings.

According to Marr's three-stage model (as cited in Guérin, Ska, & Belleville, 1999), objects are percieved in a step-wise fashion from more general impression to a more detailed impression, and the last step in perception is the detection of different details (e.g., distance, orientation, etc.). Given this, we explored whether the amount of details portrayed in the object influenced accuracy.

In addition to features of the object, aspects of the perceiver may also play a role in perception (Myers, 2007). Past research shows that age is an important factor in perception, as adults are better able at perceiving more complex scenes than children (Pillow, 1986). Based on this, we predicted that older participants would draw more accurate pictures than younger participants. Previous research also suggests that mood is an important factor in how accurately people perceive situations (Gasper, 2003). More specifically, this research shows that those in

happier moods are less accurate than those in sad moods (Gasper, 2003). Based on this, we predicted that people in happier moods would draw less accurate pictures than those in sadder moods. Another factor that may influence perception is gender. However, past research shows that if both genders have the same amount of time to process an object, then both genders will create equally accurate representations (Robert, 2003). Thus, we predicted that gender would not influence accuracy when drawing.

2.3 Conclusion

Since past research suggests that people perceive the same object differently and that individuals sometimes accentuate parts of drawings and other times leave out details (Brooke, 1995; Myer, 2007), this research project set out to examine what factors might influence the amount of details that are reflected in drawings. More specifically, this project examined whether the angle of the light shining on the object, the position of the object to be drawn, and whether the object itself influenced the accuracy in the drawing of the object. In addition, we set out to examine whether features of the perceiver influenced accuracy as well (e.g., age, mood, and gender).

3. Methods

3.1 Participants

A total of 56 people (31 males, 23 females) participated in this study. Of these participants 16 were elementary school students (ranging from 9 and 10 years) and 40 were college students (ranging from 19 and 22 years). For the elementary school aged population, the participants were recruited from their weekly art class, and parents and guardian provided informed consent for their children. These participants were offered no incentives for participating. For the college

aged students, all participants provided informed consent and the participants earned course credit for their participation.

3.2 Design and Materials

In order to examine the effects of positioning and lighting on the individual's accuracy, the experiment implemented a 2 (object: car or flower) x 2 (positioning: front or side) x 2 (lighting: zero degrees or 45 degrees) between-subjects design. A factor in the accuracy of the drawings was the object. The car and flowers were compared in trial (see figure 1, 2, and 3). To understanding the effects that the position of the object had on the participant accuracy, the car was positioned either to show the front view or the side view (45 degrees from the front of the object). Only the position of the car was monitored. The flower was not shown at a particular angle. In order to examine the effect that lighting had on the individual's accuracy, the lighting was manipulated such that the light was directed from the participant's angle, or the light was directed forty five degrees of the car (see Figure 4).



Figure 1.

Drawing accuracy is assessed for the front view of the car.



Figure 2.

The side view of the car is used to judge accuracy.



Figure 3.

The accuracy of the drawings is based off of the amount of detail shown for the flowers.

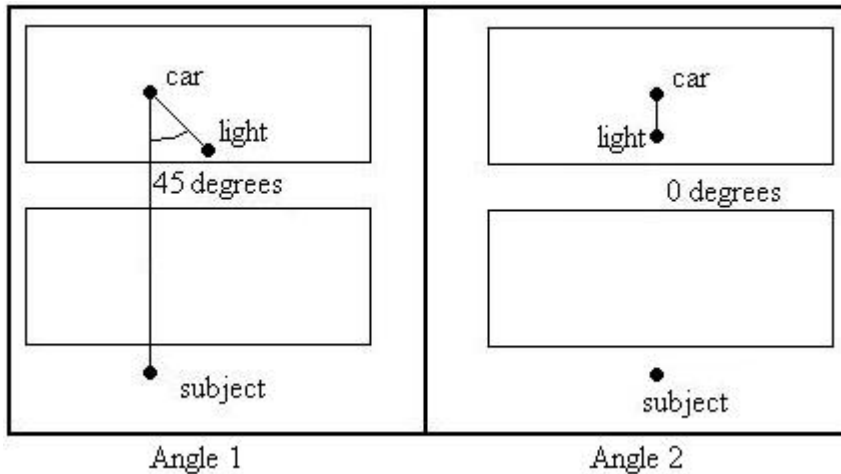


Figure 4.

This is the arrangement of tables, object, object, subject and lamp.

To determine the level of accuracy in the drawings, each drawing was evaluated based on the amount of detail exhibited in the drawing. All participants viewed either a toy car or a flower, and the object shown was counterbalanced with the conditions.

3.2.1 Accuracy. In order to examine the accuracy of the drawings created by the participants, the amount of detail provided in the drawings was assessed. Each object and view had a list of guidelines. The front view of the car had 14 major details, and the car's side angle has twenty. The flower has nine specific items (see Appendix A for lists). The coder that evaluated the list was highly reliable ($\alpha=0.05$). For this dependent variable, accuracy, the number of details drawn was divided by the number of details in reality. The lists from Appendix A are used for grading. For a lack of any of those characteristics zero was awarded. In addition, individual's accuracy was also measured through a follow-up questionnaire. Questions in reference to

lighting and positioning were asked about whether or not the object was seen as a whole or a series of curves and lines.

3.2.2 *Mood*. In addition to understanding how positioning and lighting influenced perceptions while drawing, we explored whether the participant's mood also played a role. For exploratory purposes, we examined whether positioning and lighting influenced mood, and we also examined whether one's self-reported mood influenced the accuracy of the drawing. To do so, participants completed the Positive Affect Negative Affect Scale (PANAS; PANAS Scale). More specifically, this scale lists a number of traits relating to positive and negative affect, and participants indicate on a 5-point Likert-type scale the extent to which they are feeling those emotions at the present moment (1 = very slightly or not at all; 5 = extremely). These feelings describing the affects are listed below. For the positive affect, the total score was added up and then divided by nine. For the negative affect, the score was divided by ten. The mood was calculated by adding the affects together.

Positive Affects

Active
Alert
Attentive
Determined
Enthusiastic
Inspired
Interested
Proud
Strong

Negative Affects

Afraid
Scared
Nervous
Jittery
Irritable
Hostile
Guilty
Ashamed

Upset Distressed

3.2.3 Final Questionnaire. On the questionnaire, participants indicated their impression of the object they perceived. Specifically, they indicated: the extent to which they saw the object as a whole or as its parts (e.g., series of curves and lines). Also the participants' demographic information (e.g., age and gender) was collected (see Appendix B).

4. Procedure

4.1 Adult Procedure

Before the experiment began, a coin was flipped to randomly select the object to be shown, the position to be used and the lighting to be used. The randomly selected object (toy car or flower) was then placed on a table that was arranged in the center of the room based on the randomly selected position (front or side view) and the lighting (zero degrees and forty-five degrees). After setting up the stimuli, the experiment began and participants were first asked to provide informed consent. After giving informed consent, participants were led to believe that experiment was investigating perceptions of images. Using a script to maintain consistency across conditions and experimenters, the experimenter informed the participants that during the experiment they would view an object, draw their impression of the object, and fill out a questionnaire that assessed their mood, their perceptions of the object as a whole or a series of lines, and demographic information (see Appendix B for the questionnaire). The toy car was oriented either with its front or side facing the second table. For both objects, the lighting was adjusted to one of the two conditions. After hearing the instructions, the participants viewed the object, and created their drawing of the object. The participants were given as much time as

needed to complete the drawings and the drawing process was not timed. They answered the questionnaire after the drawing was completed. After finishing the questionnaire, the participants were debriefed and thanked for their time.

4.2 Elementary School Procedure

For the elementary school version of the experiment, the procedure remained the same as above except for a few changes. In this version, sixteen 4th grade students, participated during their weekly art class. Prior to participating, the parents/ guardians were notified and provided informed consent for their children to participate (all parents gave consent). In addition, only the flower object was used in this version due to the small sample size. To randomize the conditions, the class of sixteen students was then divided into four. Each group viewed a flower that was arranged based on one of the four possible conditions. After the students completed their drawings, the students completed the same questionnaire as before. And, the students were debriefed, thanked for their time.

5. Results

All analysis were assessed for statistical significance at $\alpha = .05$.

5.1 Main Analysis: Accuracy Based on Lighting, Position, and Object

Past research investigating the effects of angle of a light showed that it was harder to detect finer details when a light shined directly on the object (Shacked, 2001). Based on this research, we predicted that when a light shined directly on an object it would be drawn less accurately than when the light did not shine directly on the object. In addition, we predicted that both the position of the object (front or side view) and the type of object (more detailed or less detailed) would also influence accuracy of drawing. To examine this, we used a 2 X 2 X 2 ANOVA with

light angle (zero degrees, forty five degrees), and car position (front, side), and object (car, flower) as independent variables. Our expected main effect for the light angle was not statistically significant, $F(1, 50) = 0, p = 0.985$. Those who saw the object when the light was shining directly on it, or 0 degrees ($M = 0.54; SD = 0.253$) drew pictures that were as accurate as those who saw the object when the light was placed 45 degrees on the object ($M = 0.54; SD = 0.290$). (See Table 1 for means and standard deviations for all analyses). In addition, the main effect for the car positioning was not statistically significant, $F(1, 22) = 4.176, p = 0.053$. Viewing the car from front ($M = 0.82; SD = 0.144$) or the side ($M = 0.67; SD = 0.194$) did not influence the accuracy of the drawings. However, the results did show a main effect for the type of object. More specifically, the more detailed object (the toy car; $M = 0.74; SD = 0.185$) was represented more accurately than the less detailed object (the flower; $M = 0.41; SD = 0.227$), $F(1, 54) = 34.550, p = 0.00$. See Table 1 for descriptive statistics.

Table 1.

Means and Standard Deviations for Light Angle, Car Positioning, Object, Gender, Age, and Mood on Accuracy of Drawings.

Group	n	Mean	Standard Deviation
Object			
Toy Car	24	0.74	0.185
Flowers	32	0.41	0.227
Light Angle			
Zero Degrees	22	0.54	0.253
Forty-Five Degrees	30	0.54	0.290
Car Positioning			
Front	11	4.01	0.76
Side	13	3.49	1.23
Light Angle vs. Car Positioning			

Front	18	0.82	0.144
Side	18	0.67	0.194
Gender			
Female	23	0.51	0.261
Male	31	0.57	0.277
Age			
9-10 years old	16	4.01	0.182
18-22 years old	40	3.49	0.235
Mood			
Positive	20	0.31	0.254
Negative	15	0.64	0.203

5.2 Exploratory Analyses

5.2.1 *Gender.* Robert (2003) suggests that if both genders have the same amount of time to process an object, then both genders will create equally accurate representations. Difference in gender did not yield statistically significant results, $F(1, 52) = 0.523, p = 0.473$. Male ($M = 0.57$; $SD = 0.277$) or female ($M = 0.51$; $SD = 0.261$) did not affect the accuracy of the individuals' drawings.

5.2.2 *Age.* Past research shows that adults are better able at perceiving more complex scenes than children (Pillow, 1986). From this information it was predicted that the fourth graders would have less accurate drawings; these results were statistically significant, $F(1, 54) = 25.540, p = 0$. The fourth graders' ($M = 4.01$; $SD = 0.182$) drawings were less accurate than the college students' ($M = 3.49$; $SD = 0.235$) drawings.

5.2.3 *Mood.* Previous studies suggest that mood has an impact on the accuracy with which people perceive situations (Gasper, 2003). Drawing accuracy is greater for those in sad moods; individuals who are in happy moods perceive the world with less accuracy (Gasper, 2003). Mood was judged as either positive ($M = 0.31$; $SD = 0.254$) or negative ($M = 0.64$; $SD = 0.203$). It was

expected that mood would have an effect on accuracy. However, the results showed that accuracy was not dependent on mood. This is shown to not be statistically significant, $F(1, 33) = 0.650, p = 0.426$.

6. Discussion

Since past research shows that individuals sometimes accentuate parts of drawings and other times leave out details (Brooke, 1995), this research project set out to examine what factors might influence the amount of details that are reflected in drawings. More specifically, this project examined whether the angle of the light shining on the object, the position of the object to be drawn, and whether the object itself influenced the accuracy in the drawing of the object.

6.1 Lighting

Past research investigating the effects of lighting on 3D video game objects showed that it was harder to detect finer details when a light shined directly on the object because it decrease the amount of shadows on the object (Shacked, 2001). Based on this research, we investigated whether the angle of the lighting influenced the accuracy of the drawings produced. We predicted that when the light shined directly on the object (or a 0 degrees on the object) that less accurate drawings would be produced than when the light did not shine as directly on the object (or 45 degrees). Contrary to our predictions and past research, the angle of the lighting did not influence the accuracy of the drawings. One limitation to this finding is that the angle of the light may not have always been congruent with the viewer's line of sight as the table the object was on remained constant; whereas, the height of the participant varied. Thus, future research should take this into account (e.g., taking pictures of the objects with the different light angles and presenting the pictures to participants).

6.2 Position

While the angle of the light may play a role in the perception of an object (Shacked, 2001), the position of the actual object may also influence the amount of details perceived. Based on this, we explored whether the position of the object (front or side view) influenced the accuracy of the drawings. Results showed that the position of the object did not influence accuracy. One possible confound with this manipulation is the familiarity of the object and object's position. For instance, we know from past research that the familiarity of an object influences how the object is perceived. More specifically, individuals are more likely to fill in the rest of a pattern (or provide more detail) if they were already familiar with it (Zhao & Meyer, 2007). Applying this finding, it is possible that the accuracy might change depending on whether one position is more familiar than a less familiar position. To examine this, future research could manipulate the familiarity of the position of the object. It would be expected that the most familiar side will be drawn more accurately than the less familiar side.

6.3 Object

According to Marr's three-stage model (as cited in Guérin, Ska, & Belleville, 1999), objects are perceived in a step-wise fashion from more general impression to a more detailed impression, and the last step in perception is the detection of different details (e.g., distance, orientation, etc.). Given this, we explored whether the amount of details portrayed in the object influenced accuracy. To do so, participants viewed a less detailed object (a flower) or a more detailed object (a toy car; see Appendix A for rubric on how the details of the objects were selected). Results show that the less detailed object (the flower) was drawn with less accuracy than the more detailed object (toy car). One limitation of this finding is that the two objects were different in nature. Future research should consider using the same type of object (e.g., two cars)

that vary in the amount of details available to the viewer (e.g., more distinct features like spoilers, etc.).

6.4 Other Factors

For exploratory purposes, we also investigated if other factors influenced accuracy, such as age of the participant, gender, and one's mood. Past research shows that adults are better able at perceiving more complex scenes than children (Pillow, 1986). To examine whether age influenced accuracy, participants were divided into two groups: fourth graders (ages 9-10) and college students (ages 18-22). Consistent with past research, the results showed that the older participants (the college students) were more accurate in their drawings of the objects than the younger participants (the fourth graders). Future research might investigate whether motivation to draw more detailed images influences the accuracy of the drawings created.

In addition to age, we also examined whether the gender of the participant influenced the accuracy. Past research suggests that if both genders have the same amount of time to process an object, then both genders will create equally accurate representations (Robert, 2003). In line with this finding, we found no differences based on gender.

Previous studies suggest that mood has an impact on the accuracy with which people perceive situations (Gasper, 2003). Those in happier moods are less accurate than those in sad moods (Gasper, 2003). In other words, those in happy moods should be less accurate than those in sadder moods. However, in this experiment, mood had no statistically significant effect on their drawing accuracy of adults or children. For future study, the mood prior to viewing the object could be manipulated. Also, the extent to which the participant is asked to draw something based on their personal feelings could also be manipulated.

6.5 Methods of Perception

Past research suggests that some people perceive objects as a whole; whereas others see the parts first to create the whole image (Myers, 2007, p. 242). While this was not examined in this experiment, future research should study the way in which an object is perceived (as a whole or as its parts) influence the accuracy of the drawings. It has been shown through research that the age of the perceiver influences how the object is perceived; adults have the capacity to draw with more accuracy (Pillow, 1986). In addition, while looking through the drawings, it was noticed that while some adult participants drew cartoon-like figures; others drew detailed depictions (see Figures 5 and 6). However, no children drew cartoon-like depictions (see Figure 7). Thus, future research could also examine age and the extent to which realistic representations are created. Finally, some of the selected participants (the children) came from a liberal arts oriented school with a rigorous art program; whereas, other participants (the college students) came from a science and engineering oriented school. Future research could examine whether the educational focus could be an important factor in perception and accuracy.



Figure 5.

Cartoon of a car drawn by a college student.



Figure 6.

The most realistic drawing was of car and was drawn by a college student.



Figure 7.

This image was drawn by a fourth grade student; it shows that this picture was drawn as a series of lines and curves.

7. Conclusion

In conclusion, the goal of this project was to determine factors that influence accurate perception. Based on the results of this experiment, the two most influential factors in creating accurate drawings were age and the type of object. More specifically, older participants drew more accurate pictures than younger participants, and more detailed objects were more accurately drawn than less detailed objects. The findings also showed that neither the lighting, position, gender of the participant, or mood of the participant influenced accuracy when drawing.

Along with lighting, positioning, and object, some additional variables for future consideration are: the distance of the object and whether the object is stationary or moving. In addition our study measured mood, but future research could manipulate mood in order to observe the effects on drawing accuracy. Thus, this research provides insights to factors that influence perceptions and accuracy of perceptions. Extending this research to the real world, exploring the way in which individuals perceive objects can aid our understanding of ways to teach art to different age groups.

Appendix A

Rubrics for accuracy measurement:

Car (side)

Accuracy = X/20, X = Number of Details

Tires

Rims

Police symbol

"Police"

"to protect and serve"

"Emergency 911"

Mirror (side)

Mirror (front)

Three Lights on the Roof

“388”

Chevrolet symbol

Gril Lines

Lead Lights

Bumpers

Door Handles

Interior of Car

Winshield Wipers

Shading

Windows

Door

Car (front)

Accuracy = X/14, X = Number of Details

Tires

Mirror (side)

Mirror (front)

Three Lights on the Roof

Chevrolet Symbol

Gril lines

Head lights

Bumper

Interior of Car

Winshield Wipers

Shading

Windows

Door

"Police"

Flower

Accuracy = $X/9$, X = Number of Details

Stamen

Number of Stamen and Stigma (6)

Number of Petals

Dots

Shading

Folding

Blossom

Number of leaves

Number of flowers (3)

Appendix B

Informed Consent Agreement

Project Title: Perceptions When Drawing

Please read this consent agreement carefully before you decide to participate in the study.

Purpose of the research study: This study investigates how people perceive different objects and how they draw them.

What you will do: In this study, you will be asked to view an object. You may also be asked to draw your own version of the object you viewed. You will also be asked several questions on your impressions of the object, your drawing experience, your feelings, and your demographic information.

Time required: This study will take less than 30 minutes.

Risks: There are no anticipated risks.

Benefits: There are no additional benefits associated with your participation in this study.

Confidentiality: All information provided in this study will remain anonymous and confidential.

Voluntary participation: Your participation in this study is completely voluntary.

Right to withdraw from this study: You have the right to withdraw from this study at any time without penalty.

Payment: You will receive no payment for participating in this study. Participants needing to fulfill a research study requirement will earn 1 experiment credit by participating in this study. If the participant's instructor is offering extra credit for participation in experimental research, the instructor will be notified of the participation in this study.

How to withdraw from the study: If you want to withdraw from the study, please quietly tell the researcher and leave the room. There is no penalty for withdrawing. You will still receive full credit for the experiment. If you would like to withdraw after your materials have been submitted, please contact Dr. Skorinko: skorinko@wpi.edu

Whom to contact if you have questions about this study:

Professor Jeanine Skorinko, Social Science & Policy Studies, Atwater Kent, Telephone: (508) 831-5451, e-mail: skorinko@wpi.edu.

Agreement: I agree to participate in the research study described above.

Who to contact about your rights in the study:

Chair of the WPI Institutional Review Board (Prof. Kent Rissmiller, Tel. 508-831-5019, Email: kjr@wpi.edu) or WPI's University Compliance Officer (Michael J. Curley, Tel. 508-831-6919).

Agreement: I agree to participate in the studies described above. [If you do not agree, simply do not return this form]

Your Name [printed] _____

Your Signature _____ Date: _____

Parental Informed Consent Agreement

Project Title: Perceptions When Drawing

Please read this consent agreement carefully before you decide to participate in the study.

Purpose of the research study: This study investigates how people perceive different objects and their own individual interpretations of the object.

What you will do: In this study, your child will be asked to view an object. Your child may also be asked to draw their own version of the object you viewed. They will also be asked several questions on their impressions of the object and drawing experience.

Time required: This study will take less than 30 minutes.

Risks: There are no anticipated risks.

Benefits: There are no additional benefits associated with your participation in this study.

Confidentiality: All information provided in this study will remain anonymous and confidential.

Voluntary participation: Your child's participation in this study is completely voluntary.

Right to withdraw from this study: You have the right to withdraw your child from this study at any time without penalty.

Payment: Your child will receive no payment for participating in this study.

How to withdraw from the study: If your child wants to withdraw your child from the study they should, notify the instructor. There is no penalty for withdrawing. If you would like to withdraw your child from the study after their materials have been submitted, please contact Dr. Skorinko:

skorinko@wpi.edu

Whom to contact if you have questions about this study:

Professor Jeanine Skorinko, Social Science & Policy Studies, Atwater Kent, Telephone: (508) 831-5451, e-mail: skorinko@wpi.edu.

Agreement: I agree to have my child participate in the research study described above.

Who to contact about your rights in the study:

Chair of the WPI Institutional Review Board (Prof. Kent Rissmiller, Tel. 508-831-5019, Email: kjr@wpi.edu) or WPI's University Compliance Officer (Michael J. Curley, Tel. 508-831-6919).

Agreement: I agree to have my child participate in the studies described above. [If you do not agree, simply do not return this form]

Your Name [printed] _____

Your Signature _____ Date: _____

Perception When Drawing Proposal

The goal of this study is to investigate one's perception of images. Positioning and lighting influences on how a person represents an image they view in a drawing shall be investigated. In other words, we are interested in better understanding what factors may influence the amount of details (e.g. few details and just generalization of the object, or many details so the drawing very accurately reflects the object) a person uses when recreating that image in drawing format. Often when drawing, one creates a representation of the object that they are analyzing. Others attempted to draw detailed recreations of what they visually perceive. What decides whether one draws a generalization or an accurate depiction? The independent variables are age of participant, positioning of object, and angle of lighting. By giving one of two the angles of light and one of two positions of the object, the independent variables are manipulated and the information collected is focused. The dependant variable is the amount of detail in each of the drawings. A drawing rubric will be set in place to assess the accuracy of the drawings.

The object used is a toy car. The level of detail in the drawing is measured through a predetermined rubric; it will be assessed on a scale from zero to five. For this dependent variable, zero is awarded for lack of detail and a five is awarded for the most detailed. Head lights, windows, bumpers, door handles, the shape of the particular make of the car are the indicators for judging. For a lack of any of those characteristics zero is awarded. If you draw one of the items from the list, then you score a one; if you draw two of them, then you score a two. The same is true for ratings three, four, and five. The independent variables of this study are the positioning of the car and the angle of the lighting. Both of these variables are explored on the questionnaire Information on perception, mood, age, gender, school, and class is then collected through a questionnaire. Questions on the effects of light and car positioning are addressed in questions focusing on perception. It is asked whether or not the car is seen as a whole or as a series of curves and lines due to these factors. The correlation between what is said to have impact and what actually has impact on perception is analyzed. A questionnaire provides background information on the participant. Mood is also a point of interest. The effect of mood on perception is inspected. The target populations are students at Worcester Polytechnic Institute and the Key School's 4th grade art class. The experiment is run as many times as possible. As a sample of technical thinkers, Worcester Polytechnic Institute students are being used for participants. The elementary school students give information from a younger age group.

For the children classroom environment and the single person adult study, the experiment is kept as consistent as possible, so that the results are not skewed. For the adults, the room that the experiment is conducted in has two tables: the first table supports a lamp and a toy car, the second supports a pencil, a piece of paper, and a questionnaire. Half of the time, toy car is oriented in a manner that the side of the car faces the second table, for the other half, the front of the car faces the second table, in hopes of determining if this has an impact on detail. It is expected that if the car is in a more identifiable in one of the positions. This will be determined by how generic the drawing produced will be. There are two experimental conditions; for both conditions, a light is focused on the toy car. The first condition has the light directed from the participant's angle (zero degrees), where as the second condition has the light directed from forty

five degrees to the right of the participant, where the toy car is equivalent to the center of the circle. A picture of the car is taken from the view of the participants; this is used for a comparison with the participant's drawings. After the drawing and questionnaire are collected, the results are evaluated and recorded.

For the children's portion of the experiment, elementary level students are presented with the procedure as a "class" in a school art room setting. Each class of students is then divided, so that the children form groups of five. Half of the students are positioned with a car facing towards them, while the other half draws a car from a side view. All of the toy cars are identical in color and shape. For the lighting, the positioning of the lamp is randomly chosen from the two angles discussed above. As the students complete their drawings, the questionnaire is presented to each student, and responses are collected by the examiner.

The major focuses of this experiment are: accuracy of the drawing, positioning of the toy car, angle of lighting, mood evaluation, age of participant, and gender. The accuracy of the drawing provides as guide to whether the participant is drawing a representation of a car, or an accurate depiction of their visual perception. View, lighting, mood, age, and gender are recorded, and the influences of these conditions are then quantified.

The most identifiable view of a car is to be determined by the amount of detail produced in the drawings, whether facing the front or side of a car is less familiar. This assumption leads to the likelihood that one would be more likely to draw the familiar side view in a more representative fashion. For the side that often comes to mind when thinking of a car, the drawing should be less based on the scheme of a car, and more on the visual input.

There are two lighting possibilities provided for the experiment, zero degree and forty five degree lighting. When the light is placed at zero degrees, it can be considered direct lighting. Direct lighting is predicted to decrease the amount of visible shadow, therefore decreasing the participants detail and accuracy. This could decrease the amount of detail drawn (Shacked, 2001). The forty five degree angle of lighting provides more shadow and contrast. Because of the shadow and contrast, the details of the car are more detectable. The change in light should communicate more visual information about the object to the viewer. This could alter the participants' perspective, so that they view the car as a series of lines and shadow vs. a toy car (Shacked, 2001). Lighting and age are predicted to play a role in the perception of the toy car.

As one ages from childhood to adulthood, they view spatial differences on a more complex scale (Pillow, 1986). Adult spatial awareness increases the likelihood that they would draw a more detailed drawing (Pillow, 1986). A child is more likely to draw a representation of a car instead of drawing the image viewed; age influences drawing accuracy.

A question on gender is provided on the questionnaire. Gender is predicted to cause no change. Men have a faster visual processing speed than, women (Robert, 2003). If given the same amount of time to complete a visual exercise, the accuracy has been reported as equal (Robert, 2003). It is possible that the tendency for adult males to find interest in cars could draw their attention to accuracy. Although it is expected that gender does not change the amount of detail in a drawing, it is possible that because of the subject, men might be more interest in

drawing more detail. This is why a true or false question on cars as a hobby is on the questionnaire.

The interest of this study is to determine the effects of age of participant, lighting angle, and object positioning on perception. Age of participant, Angle of lighting, and positioning of object are the independent variables and the accuracy of the drawing is the dependant variable. In hopes of exploring if these factors affect if an object is viewed as a scheme or a series of lines and curves when drawn, these variables are studied.

Adult Questionnaire

This scale consists of a number of words that describe different feelings and emotions. Read each item and then mark the appropriate answer in the space next to that word. Indicate to what extent you feel this way right now, that is, at the present moment. Use the following scale to record your answers:

1	2	3	4	5
very slightly or not at all	a little	moderately	quite a bit	extremely
___ interested			___ irritable	
___ distressed			___ alert	
___ excited			___ ashamed	
___ upset			___ inspired	
___ strong			___ nervous	
___ guilty			___ determined	
___ scared			___ attentive	
___ hostile			___ jittery	
___ enthusiastic			___ active	
___ proud			___ afraid	

Please fill in or circle the appropriate response for the questions below. This questionnaire is completely anonymous and confidential, so please answer each question as openly as possible.

1. I am having a (an) _____ day.

1	2	3
Bad	Average	Good

2. When I drew the car, I saw the car as a whole object. I did not focus on the smaller parts of the car (e.g., the specific lines and curves).

1	2	3	4	5
Strongly Disagree				Strongly Agree

3. When I drew the car, I saw the car as a series of curves and lines and drew these lines and curves. I did not focus on the larger picture of the car (e.g., the entire car overall).

1	2	3	4	5
Strongly Disagree				Strongly Agree

4. The way the car was positioned led me to see the car as a whole object. I drew the entire car and did not focus on the smaller parts of the car (e.g., the specific lines and curves).

1	2	3	4	5
Strongly Disagree				Strongly Agree

5. The way the car was positioned led me to see the car as a series of lines and curves. I drew these curves and lines and did not focus on the larger picture of the car (e.g., the entire car overall).

1	2	3	4	5
Strongly Disagree				Strongly Agree

6. The way the lighting was falling on the car led me to see the car as a whole object. I drew the entire car and did not focus on the smaller parts of the car (e.g., the specific lines and curves).

1	2	3	4	5
Strongly Disagree				Strongly Agree

7. The way the lighting was falling on the car led me to see the car as a series of lines and curves. I drew these curves and lines and did not focus on the larger picture of the car (e.g., the entire car overall).

1	2	3	4	5
Strongly Disagree				Strongly Agree

8. Cars are one of my hobbies.

1	2	3	4	5
Strongly Disagree				Strongly Agree

Your age: _____

Your school: _____

Your year in school: _____

Your Major: _____

Your sex: Female / Male

End of Questionnaire
Thank you for your participation!

Child Questionnaire

Please fill in or circle the appropriate response for the questions below. This questionnaire is completely anonymous and confidential, so please answer each question as openly as possible.

1. I am having a (an) _____ day.

1	2	3
Bad	Average	Good

2. When I drew the car, I saw the car as a whole object. I did not focus on the smaller parts of the car (e.g., the specific lines and curves).

1	2	3	4	5
Strongly Disagree				Strongly Agree

3. When I drew the car, I saw the car as a series of curves and lines and drew these lines and curves. I did not focus on the larger picture of the car (e.g., the entire car overall).

1	2	3	4	5
Strongly Disagree				Strongly Agree

4. The way the car was sitting on the table led me to see the car as a whole object. I drew the entire car and did not focus on the smaller parts of the car (e.g., the specific lines and curves).

1	2	3	4	5
Strongly Disagree				Strongly Agree

5. The way the car was sitting led me to see the car as a series of lines and curves. I drew these curves and lines and did not focus on the larger picture of the car (e.g., the entire car overall).

1	2	3	4	5
Strongly Disagree				Strongly Agree

6. The way the lighting was falling on the car led me to see the car as a whole object. I drew the entire car and did not focus on the smaller parts of the car (e.g., the specific lines and curves).

1	2	3	4	5
Strongly Disagree				Strongly Agree

7. The way the lighting was falling on the car led me to see the car as a series of lines and curves. I drew these curves and lines and did not focus on the larger picture of the car (e.g., the entire car overall).

1	2	3	4	5
Strongly Disagree				Strongly Agree

8. Cars are one of my hobbies.

1	2	3	4	5
Strongly Disagree				Strongly Agree

Your age: _____

Your school: _____

Your grade in school: _____

Your sex: Female / Male

End of Questionnaire
Thank you for your participation!

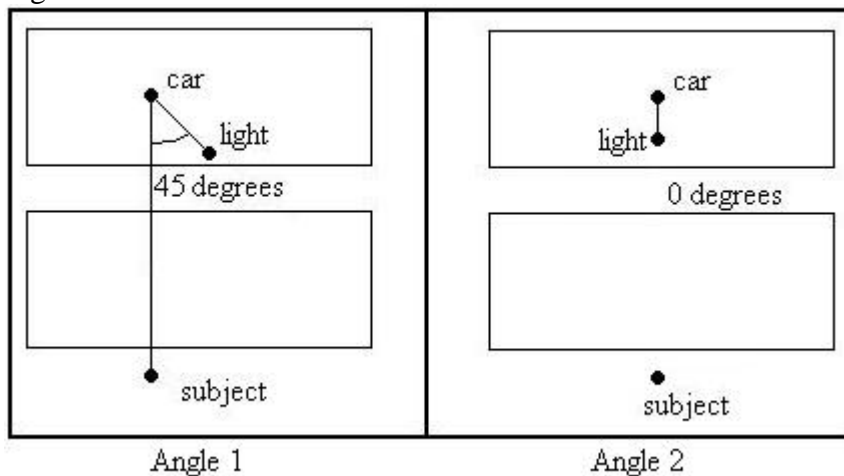
Adult Script

The room that the experiment is conducted in has two tables: the first table supports a lamp and a toy car, the second supports a pencil, a piece of paper, and the questionnaire. The toy car is oriented in a manner that the side of the car faces the second table. A chair is placed at the second table.

Script

1. Greet participants and say: “This is an experiment about perceptions of images. During this experiment, you will be asked to view an object, and then draw it and fill out a questionnaire. Your answers will be kept anonymous, so please answer the questions freely and honestly.”
2. Have the participants read the informed consent agreement.
3. Randomly assign participants to one of the two conditions. For both conditions, a light is focused on the object. The first condition has the light directed from the participant’s angle, where as the second condition has the light directed from forty five degrees to the right of the participant, where the object is equivalent to the center of the circle (see Figure 1.). For the first condition the light is arranged in a way that it does not block the view of the car. A bendable lamp is used.

Figure 1.



4. When the participant reaches the tables, say: “Please draw the object and then complete the questionnaire on the next page. When you are done, turn all materials over to indicate to the experimenter that you are finished. Are there any questions? You may begin.”
5. Once all the participants have finished, collect the drawing and the questionnaire.
6. Debrief the participants by saying, “In this experiment, we are investigating the effects of age, light positioning, and car orientation on the accuracy of drawings. These factors are manipulated in the experiment. Finding whether the car is drawn globally or a series of lines and curves is of

interest. Your interpretation of the object is important. This will be determined based on the questionnaire and the amount of detail drawn. We predict that accuracy will be highest for college students. We expect the mood of the participants selected on the questionnaire will produce a correlation. The positioning of the light and the positioning of the object is expected to impact the amount detail drawn. Does anyone have any questions?" Then offer them a copy of the debriefing form to take with them if they wish.

7. "Thank you for participating in this study."

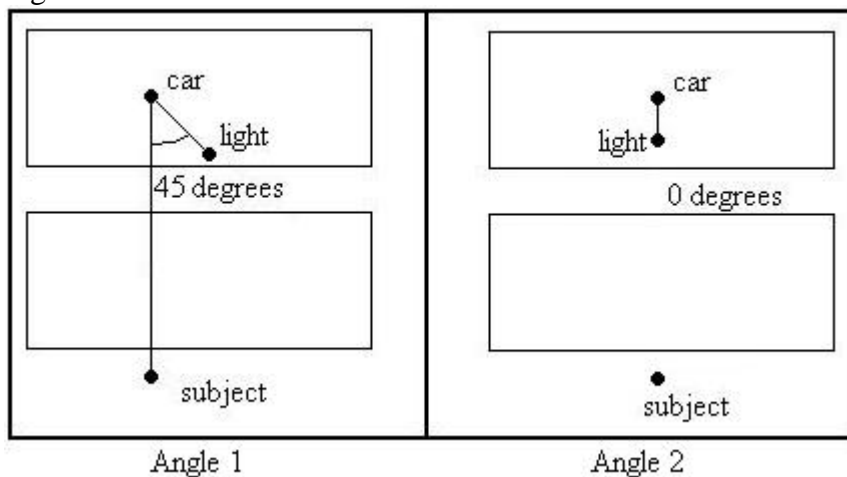
Child Script

The room that the experiment is conducted in has two tables: the first table supports a lamp and an object, the second supports a pencil, a piece of paper, and the questionnaire. The object is oriented in a manner that the side of the car faces the second table. The tables are one meter apart and a chair is placed at the second table.

Script

1. Make sure consent forms are there for each child. If there is no consent form for the child, then they will work on another unrelated task assigned by the art teacher.
2. Greet participants and say: "Hello! We are going to do a task where you look at an object and then you get to draw it. We will also ask you a few questions afterwards about what you saw and what you decided to draw. We are not recording your names on your drawings so please do not write your name on your drawing. Does anyone have any questions?"
3. Read the informed consent agreement to the participants.
4. Randomly assign participants to one of the two conditions. For both conditions, a light is focused on the object. The first condition has the light directed from the participant's angle, where as the second condition has the light directed from forty five degrees to the right of the participant, where the object is equivalent to the center of the circle (see Figure 1.). For the first condition the light is arranged in a way that it does not block the view of the car. A bendable lamp is used.

Figure 1.



5. Instruct Children to View and Draw the Object: "Ok. I want each of you to look at the object that I have here. Raise your hand if you can't see the object. What is this object? Ok. Good. Now, I want you to draw a picture of this object. When you are done with your drawing turn over your paper. Are there any questions? You may begin."

6. Once all of the participants have finished, collect the drawings and hand out the questionnaires. “Ok. Now I have a few questions for you to answer about your drawing and what you saw. If you have any questions about the questions, please raise your hand and I will come help you.”

6. Debrief the participants by saying, “Thank you for helping me out with this project. This was a study. In this study, we were looking at how you drew the object I showed you. However, we were a little tricky. Some of you saw the car turned like this <SHOW ANGLE 1> and others of you saw the car like this <SHOW ANGLE TWO>. We also were tricky with the light. Some of you saw the light like this <SHOW LIGHT 1> and others of you saw the light like this <SHOW LIGHT TWO>. We did this to see if these things made you draw different pictures. Does anyone have any questions?”

7. “Thank you for participating in this study.”

Works Cited

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