Measured Speed And Accuracy of Inferred Intelligence Through Implicit Association Tests

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Abstract

This study asks the question, are first impressions of intelligence inferred automatically from the presence of glasses? The theoretical construct explored in the study is the perception of intelligence. Intelligence can be defined in many ways, such as: the ability to acquire and apply knowledge and skills; the collection of information of military or political value; the ability to learn or understand or to deal with new or trying situations; the ability to apply knowledge to manipulate one's environment or think abstractly as measured by objective criteria; and mental acuteness. The key article referenced in this study is Eggleston et al. (2020) study that questions the phylogenetic origin of first impressions from faces.

Measured Speed and Accuracy of Inferred Intelligence Through Implicit Association Tests

This study asks the question, are first impressions of intelligence inferred automatically from the presence of glasses? The theoretical construct explored in the study is the perception of intelligence. Intelligence can be defined in many ways, such as: the ability to acquire and apply knowledge and skills; the collection of information of military or political value; the ability to learn or understand or to deal with new or trying situations; the ability to apply knowledge to manipulate one's environment or think abstractly as measured by objective criteria; and mental acuteness. The key article referenced in this study is Eggleston et al. (2020) study that questions the phylogenetic origin of first impressions from faces. Alternative methods to innate origins posit face-trait experiences are acquired ontogenetically, some through direct experiences with individuals and others through cultural learning and devices. Eggleston et al. (2020) suggest previous research inferred first impressions from faces were phylogenetic in origin and the products of automatic and rapid processing. In a recent study, Eggleston et al. (2020) found evidence to confirm individuals wearing glasses are rated higher in intelligence by adults; further examination found evidence, this rating of intelligence phenomenon also occurs for children as young as 6 years old (but not 4 year olds), with children perceiving individuals in glasses to be more intelligent. This evidence contradicts earlier theories of phylogenetic origin that suggested spontaneous trait inferences were innate and instead postulates automaticity, rapid access and early emergence are consequences of learned behaviour and therefore compatible with a learning model.

Objectives

The objective of the study is to measure the accuracy and speed for participant's congruency of intelligence with glasses in first impressions compared to incongruent intelligence

with no glasses with an Implicit Association Test (IAT). The practical real world applications of

the study are to inform the academic/scientific community of recent automatic responses to first

impressions of faces with glasses or without glasses in images for student participants who attend

post-secondary on campus in Victoria, BC. This finding would replicate previous research

Eggleston et al. (2020) that concluded adults that consciously attempted to not have bias

regarding first impressions of glasses still had observable longer reaction times. To this end,

the participant pool is inclusive of students aware of implicit bias, the IAT testing and

measurement method and who may have taken additional undergraduate courses in psychology.

Hypothesis

   Our study intends to test the hypothesis: Does the presence of glasses influence the congruent

trial reaction time and accuracy reading on an IAT at the same rate as the incongruent trial? The

Independent Variable (IV) is the wearing of glasses measured in 2 levels congruent and

incongruent. The Dependent Variable (DV) is the first impression people have of others wearing

glasses measured in reaction time (ms) and accuracy (%). The data results anticipated would be

that first impressions of intelligence are inferred automatically from the presence of glasses and

therefore the reaction time for the congruent trial will be faster than the incongruent in addition

to having a higher accuracy compared to the incongruent. Eggleston et al. (2020) study supports

the hypothesis that first impressions of intelligence are inferred automatically from the presence

of glasses, and this will still be present even if participants are actively trying to ignore the

glasses. Walline, et al. study also supports our hypothesis that people wearing glasses are

perceived as smarter, both by people who wear glasses and by people who do not.

Ethics

The research designed through the TELLab website for the Implicit Association Test (IAT) provides an informed consent frame prior to participants engaging in research and does not collect personally identifiable information, nor does it require the participant to create an account with the website. In this way, the research protects the confidential nature of participants identity, and results in the form of data collected regarding accuracy and reaction times are anonymously recorded. The research designed through the TELLab website for the Implicit Association Test (IAT) provides a debrief at the end of the IAT prior to the submission of the test for research and reminds participants that they have the right to withdraw from the study and may exit the program without submitting their answers and ensures that participation is voluntary and any risks perceived by the participants or uncertainties are prioritized for their well-being. Data cannot be linked to an individual participant after the test is submitted on the final screen and will be unable to be withdrawn from the study from that point on. Names and identifying features of participants will not be published in any way related to the outcome of the study.

Methods

Design

A within-subjects one factor design. The Independent Variable (IV) is the wearing of glasses measured in 2 levels congruent and incongruent. The Dependent Variable (DV) is the first impression people have of others corrected vision (wearing glasses) measured in reaction time (ms) and accuracy (%). The data results anticipated would be that first impressions of intelligence are inferred automatically from the presence of glasses and therefore the reaction time for the congruent trial will be faster than the incongruent in addition to having a higher accuracy compared to the incongruent. The synonyms selected for intelligence were: sensible,

brains, smart, mindful, and understanding and the synonyms selected for stupidity were: foolish, inept, idiot, silly, and naïve.

As participants move through the study, they are presented with one of five tasks and a slide that both informs the participant of the task and provides directions on how to proceed. All of the tasks in the IAT experiment are timed. Participants are encouraged to answer as rapidly as possible while remaining accurate. In the first task, participants are asked to indicate whether the item in the center of the screen is a synonym for the word intelligence or stupidity. Participants are invited to press the (left/right) arrow key on your keyboard that points toward intelligence or stupidity. When the participants are clear on the instructions and ready to begin the timed task they are directed to press the 'SPACEBAR' to begin a few practice attempts to familiarize the participant with the left and right arrow key prior to commencing the test that is measured for accuracy or speed. As participants select the left or right arrow key a red cross appears if the incorrect arrow is selected, and the task waits for the participant to select the correct arrow key while the measurement of time continues. Stupidity is on the left, intelligence is on the right.
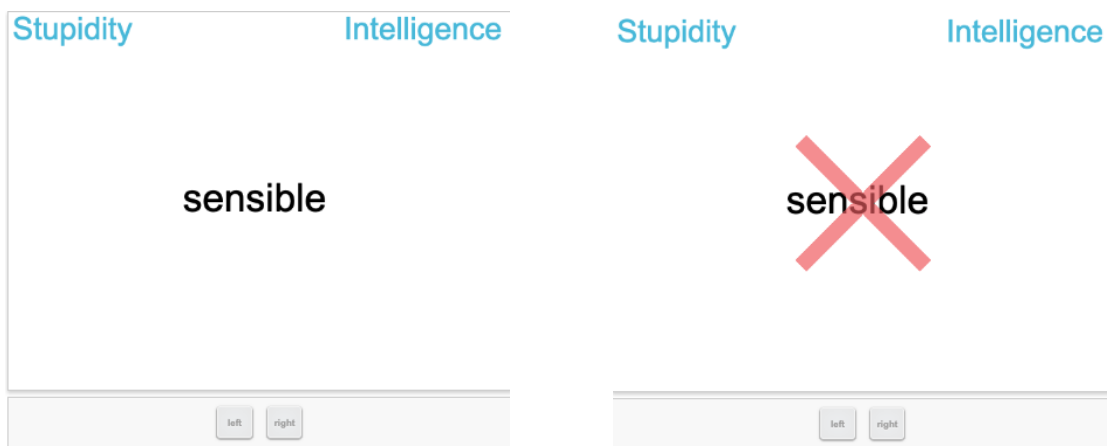

Figure 1- Task 1 synonyms for intelligence and stupidity

In the second task participants are asked to indicate whether the item in the center of the screen, an image, corresponds with Corrected Vision (wearing glasses) or 20/20 Vision. For each image placed in the center of the frame the participants press the (left/right) arrow key on their keyboard that points toward the image representing Glasses or 20/20 Vision.
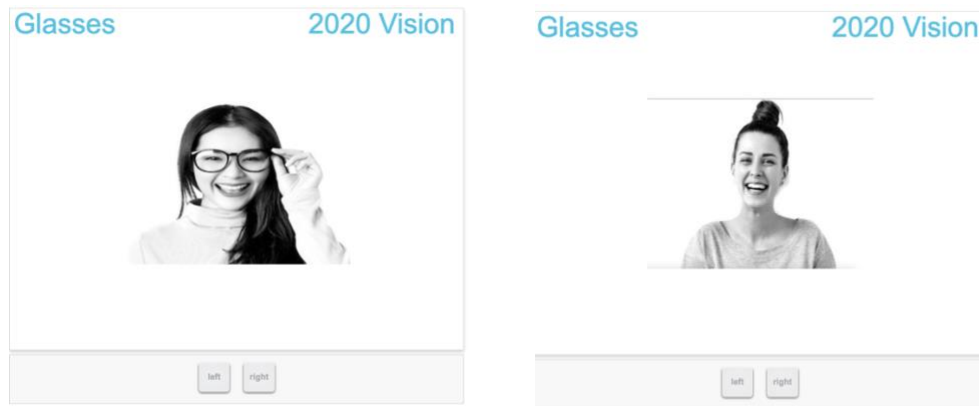

Figure 2 -Task 2 Images for Glasses or 20/20 Vision

In the third task each side of the screen displays two category labels intelligence/ stupidity or Glasses/ 20/20 Vision. The participants are asked to indicate whether the item presented in the center belongs with a category on the right or the left, using the arrow keys. Stupidity and glasses are paired together on the left side of the screen and intelligence and 2020 vision are paired together on the right side of the screen.
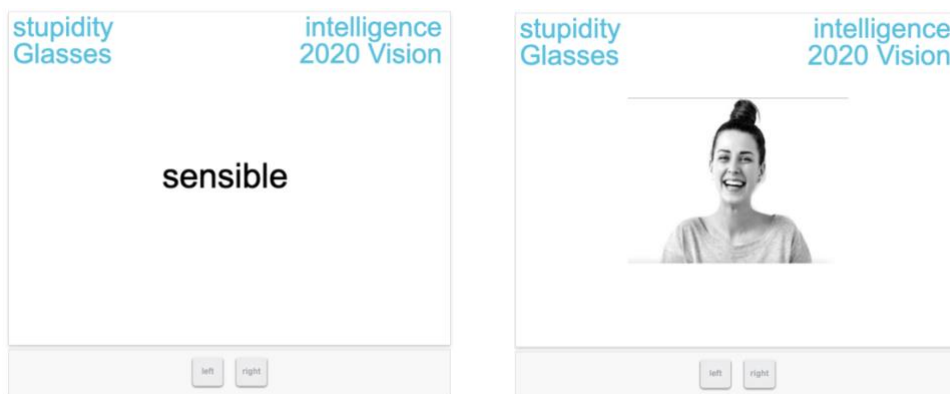

Figure 3 -Task 3 Item for Stupidity/Glasses or Intelligence/20/20 Vision

In the fourth task, participants are asked to view the item in the center of the screen and select the right or left arrow corresponding with intelligence or stupidity but the sides have now switched from the sides they were previously displayed on. In Task 1 stupidity was on the left, and intelligence was on the right. But in Task 4 intelligence is on the left side of the screen and stupidity is on the right.
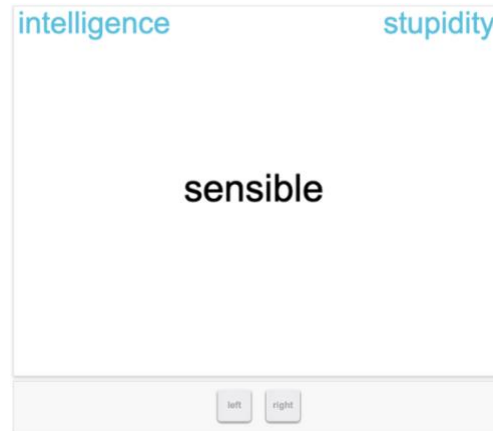

Figure 4 -Task 4 synonyms for intelligence and stupidity

In the fifth and final task each side of the screen displays two category labels intelligence/ stupidity or Glasses/ 20/20 Vision. The participants are asked to indicate whether the item presented in the center belongs with a category on the right or the left, using the arrow keys. Intelligence and glasses are paired together on the left side of the screen and stupidity and 2020 vision are paired together on the right side of the screen.
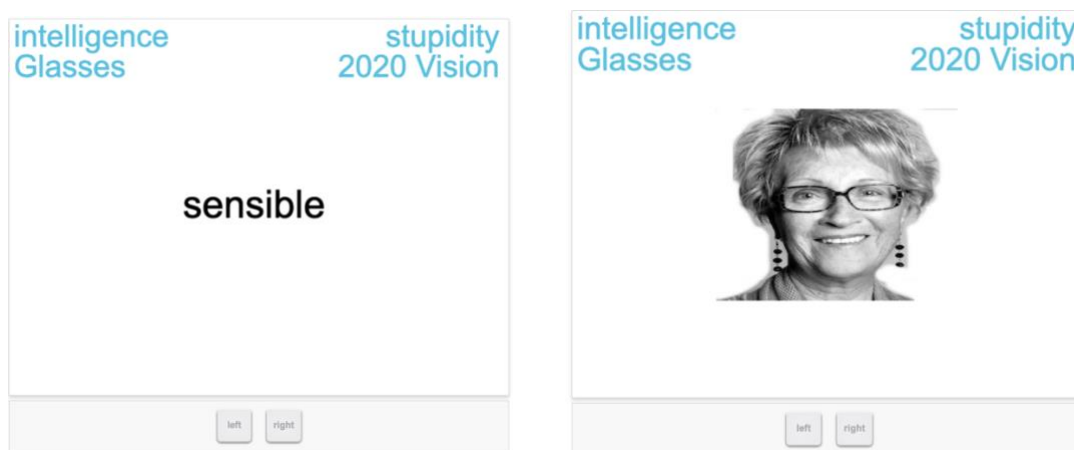
Figure 5 -Task 5 Item for intelligence/Glasses or stupidity/2020 Vision

There are 5 stimuli (synonyms or images) in each category (intelligence, stupidity, Glasses, 20/20 Vision) which leads to 20 trials (1 trial x 4 categories x 5 stimuli). The Implicit Association Test (IAT) included 5 total tasks, each task had 20 trials, therefore the total length of the experiment was 100 trials for each participant.

Participants

The participant pool included students who attend post-secondary on campus in Victoria, BC. and was inclusive of students aware of implicit bias, the testing method and undergraduate courses in psychology and who may be actively trying to resist implicit bias in favour of glasses. The aim was to invite the students in the Lab B014 section to participate, which would be approximately 20 students.

Age groups were designed to account for participants that were 17 and under, 18-24, 25-34, 35-44, 45-54 and 55+. Gender groups were designed to account for participants that were female, male, non-binary/non-conforming, other and those who preferred not to say. Participants were also asked to indicate if they wore glasses or not and if they have completed an IAT before.

There were _____ female participants (M age range = ____).

There were _____ male participants (M age range = _____).

There were _____ non-binary/non-conforming participants (M age range = _____).

There were _____ other participants (M age range = _____).

There were _____ who preferred not to say participants (M age range = _____).

There were _____ participants in the 17 and under age group.

There were _____ participants in the 18-24 age group.

There were _____ participants in the 25-34 age group.

There were _____ participants in the 35-44 age group.

There were _____ participants in the 45-54 age group.

There were _____ participants in the 55+ age group.

There were _____ participants who reported they do wear glasses.

There were _____ participants who reported they do not wear glasses.

There were _____ participants who reported they had completed an IAT before.

There were _____ participants who reported they had not completed an IAT before.

Materials

In our study, images were selected from a database of royalty free images from the website Shutterstock with two searches one for "person" and the other for "people wearing glasses". If the images were selected, photoshop was used to remove background images so that each image resembled a similar plain, un-accessorized backgrounds (white walls), position of the person (both shoulders in picture, face looking at camera), number of people in the image (by themselves), facial expression (smiling). The images chosen contained individuals smiling, alone in the picture, facing the camera to ensure the mood of the image was consistent. Images

have been included in the Appendix section of this paper. Synonyms for the words stupidity and intelligence were found using online thesaurus (https://www.thesaurus.com/).

Procedures

https://lab.tellab.org/show/paradigm/iat/63573ecc83216705dfad2d60

Appendix A Researcher Votes for synonyms for Intelligence

<u>**Domain 1:**</u>
 Category 1a: Intelligence

    1a Stimuli (5-7): sensible, brains, smart, mindful, understanding

Word	Stephanie	Sophie	Cameron	Liam	Kaze	Total
wisdom	**6= 2 pt**	**5= 3 pt**		**5= 3 pt**		**8 pt**
judgment						
sensible	**2= 6 pt**	**1= 7 pt**		**4= 4 pt**		**17 pt**
comprehensive						
brains	**5= 3 pt**	**4= 4 pt**		**3= 5 pt**		**12 pt**
reasonable				**6= 2 pt**		**2 pt**
smart	**1= 7 pt**	**2= 6 pt**		**1= 7 pt**		**20 pt**
mindful	**4= 4 pt**	**3= 5 pt**		**7= 1 pt**		**10 pt**
understanding	**7= 1 pt**	**6= 2 pt**		**2= 6 pt**		**9 pt**
observant	**3= 5 pt**	**7= 1 pt**				**6 pt**

Appendix B Researcher Votes for synonyms for Stupidity

Category 1b: Stupidity
   1b Stimuli (5-7): foolish, inept, idiot, silly, naive

Word	Stephanie	Sophie	Cameron	Liam	Kaze	Total
foolish	3= 5 pt	2= 6 pt		2= 6 pt		17 pt
dullness						
ignorance				3= 5 pt		5 pt
slowness		6= 2 pt				2 pt
crazy				7= 1 pt		1 pt
inept	2= 6 pt	1= 7 pt		1= 7 pt		20 pt
idiot	5= 3 pt	4= 4 pt		5= 3 pt		10 pt
silly	1= 7 pt	3= 5 pt				12 pt
naive	4= 4 pt	5= 3 pt		4= 4 pt		11 pt
vacant	6= 2 pt	7= 1 pt		6= 2 pt		5 pt

Appendix C Researcher Votes for Images of people wearing glasses

Domain 2:
Category 2a: Images of people wearing glasses
2a Stimuli (5-7): **shutterstock_239379919, shutterstock_1104889238, shutterstock_671507461, shutterstock_1996752281, shutterstock_1891972204**
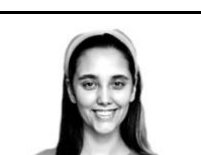
Reference	Image	Stephanie	Sophie	Cameron	Liam	Kaze
shutterstock_239379919 12 pt			1= 7 pt	7= 1 pt	4= 4 pt	
shutterstock_382594150 3 pt		5= 3 pt		9		
shutterstock_1104889238 19 pt		4= 4 pt	2= 6 pt	4= 4 pt	3= 5 pt	
shutterstock_494709772 8 pt		3= 5 pt		5= 3 pt		
shutterstock_1109322803				10		
shutterstock_671507461 20 pt		6= 2 pt	4= 4 pt	1= 7 pt	1= 7 pt	

shutterstock_708436222 **5 pt**			**6= 2 pt**	**8**	**5= 3 pt**	
shutterstock_1996752281 **19 pt**		**1= 7 pt**	**3= 5 pt**	**2= 6 pt**	**7= 1 pt**	
shutterstock_1891972204 **20 pt**		**2= 6 pt**	**5= 3 pt**	**3= 5 pt**	**2= 6 pt**	
shutterstock_606759122 **5 pt**			**7= 1 pt**	**6= 2 pt**	**6= 2 pt**	

Appendix D Researcher Votes for Images of person

Category 2b: Images of person
   2b Stimuli (5-7): **shutterstock_613759379, shutterstock_640011838, shutterstock_788313199, shutterstock_1302585136, shutterstock_1527410588**

Reference	Image	Stephanie	Sophie	Cameron	Liam	Kaze
shutterstock_613759379 23 pt		**3= 5 pt**	**1= 7 pt**	**2= 6 pt**	**3= 5 pt**	
shutterstock_640011838 22 pt		**1= 7 pt**	**2= 6 pt**	**3= 5 pt**	**4= 4 pt**	
shutterstock_788313199 25 pt		**2= 6 pt**	**3= 5 pt**	**1= 7 pt**	**1= 7 pt**	
shutterstock_1302585136 8 pt		**4= 4 pt**		**4= 4 pt**		
shutterstock_1527410588 13 pt		**5= 3 pt**	**4= 4 pt**	**9**	**2= 6 pt**	
shutterstock_1538355161 7 pt		**7= 1 pt**	**5= 3 pt**	**8**	**5= 3 pt**	
shutterstock_1864631416 3 pt				**5= 3 pt**		
shutterstock_1897763572 4 pt		**6= 2 pt**	**7= 1 pt**	**7= 1 pt**		

shutterstock_1914276025 2 pt			**6= 2 pt**	**10**		
shutterstock_1606121245 4 pt				**6= 2 pt**	**6= 2 pt**	

Appendix E Consent Frames

You are invited to participate in a research study entitled "PSYC 201 (B14) Implicit Association Test, Intelligence & Corrected Vision (Glasses)" that is being conducted under the supervision of Dr. Porter. Dr. Porter is a sessional instructor in the Department of Psychology at the University of Victoria, and you may contact him if you have further questions by emailing ronaldporter@uvic.ca.

The primary purpose of this research project is to give students in PSYC 201 (B14) a hands-on experience participating in designing a psychology experiment. The experiment will also investigate the association between Intelligence and Corrected Vision (Glasses).

Press the right arrow key to continue learning about the study

spacebar

Figure Consent 1

Although these findings will not be published beyond the course classroom, you may nonetheless find them of interest. Participating in this study is like taking a test, so it is possible that some individuals will find the experience mildly stressful, and it is possible that they might feel self-conscious about their performance.

The potential benefits of your participation in this research include adding to your knowledge of how experimental psychologists conduct research and, more specifically, learning about empirical and theoretical issues pertaining to human cognition.

Press the right arrow key to continue learning about the study

spacebar

Figure Consent 2

Your participation in this research must be entirely voluntary. If you do decide to participate, you may withdraw at any time without any consequences or any explanation. If you do withdraw from the study partway through, your data will not be used for analysis and the data will be destroyed. The study is performed entirely online and you will not have contact with the students who are running the study or with Dr. Porter

Dr. Porter is the professor for PSYC 201 (B14). Dr. Porter will not have any knowledge regarding your performance in this study.

Press the right arrow key to continue learning about the study

right

Figure – Consent 3

To protect your privacy, all of the information that you provide to us (after these consent frames) will be anonymous as no names are requested. In addition, the raw data (downloaded from TELLab) will be destroyed at the end of this semester.

Since this experiment is being hosted through TELLab, it is possible that TELLab may automatically collect your data without your knowledge. If any of this data is made available to the researchers, it will not be used or saved without your explicit consent.

Press the right arrow key to continue learning about the study

right

Figure Consent 4

In addition to being able to contact the researcher and supervisor at the above phone number, you can verify the ethical approval of this study, or raise any concerns you might have, by contacting the Associate Vice-President, Research at the University of Victoria (250-472-4545).

By pressing the spacebar, you are indicating that you understand the above conditions of participation in this study and agree to participate

spacebar   right

Figure Consent 5

Appendix F Demographic Frames

Which most closely describes your gender?

Press "F" for female
Press "M" for male
Press "N" for non-binary/non-conforming
Press "O" for other
Press "P" for prefer not to say

F   M   N   O   P

Figure Gender

Please indicate your age group:
Press "0" for 17 and under
Press "1" for 18-24
Press "2" for 25-34
Press "3" for 35-44
Press "4" for 45-54
Press "5" for 55+

0   1   2   3   4   5

Figure Age

Figure Glasses

Figure Implicit Association Test

Appendix G Debrief Frames

Thank you for participating in our research study. The study you just participated in was a version of the Implicit Association Test (IAT). The IAT is a measure of implicit bias, that is, whether there is an unconscious association between two domains.

In this case, we wanted to know whether there is an unconscious bias between Intelligence and Corrected Vision (Glasses).

Press the right arrow key to continue to the final screen and submit your responses

right

Figure Debrief

This study asks the question, are first impressions of intelligence inferred automatically from the presence of glasses? The practical real world applications of the study are to inform the academic/scientific community of recent automatic responses to first impressions of faces with glasses or without glasses in images for student participants who attend post-secondary on campus in Victoria, BC.
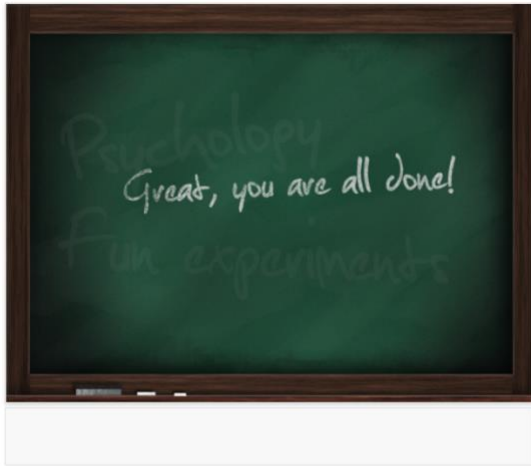
If you experience distress during this experiment please contact Dr Ron Porter at ronaldporter@uvic.ca

Click the right arrow key to see your results!

right

Figure Debrief

Appendix H Final Screen Frames

Download your result (Long format)

Download your result (Wide format)

PSYC 201 (B14) Implicit Association Test # 5

Figure Final Screen

References. All references you used in this proposal (APA 7 format).

Antonakis, J. & Dalgas, O. (2009). Predicting elections: Child's play!. *Science*, *323*, 1183.
https://econtent.hogrefe.com/doi/abs/10.1027/1864-9335/a000359?journalCode=zsp
Conaway, C. (2007). "You Can See Things that Other People Can't": Changing Images
of the Girl with Glasses, from *Gidget* to *Daria*. In: Inness, S.A. (eds) Geek Chic: Smart
Women in Popular Culture. Palgrave Macmillan, New York.
https://link.springer.com/chapter/10.1007/978-1-137-08421-7_4#citeas

Eggleston, A., Flavell, J. C., Tipper, S. P., Cook, R., & Over, H. (2021). Culturally learned first

impressions occur rapidly and automatically and emerge early in development.

Developmental Science, *24*(2), e13021. Doi: 10.1111/desc.13021

Over, H., & Cook, R. (2018). Where do spontaneous first impressions of faces come from?.

Cognition, *170*, 190-200.

Over, H., Eggleston, A., & Cook, R. (2020). Ritual and the origins of first impressions.

Philosophical Transactions of the Royal Society B, *375*(1805), 20190435.

Over, H., Eggleston, A., & Cook, R. (2020). Ritual and the origins of first impressions.

Biological Sciences.

https://doi.org/https://royalsocietypublishing.org/doi/full/10.1098/rstb.2019.0435

Walline, J.J., Sinnott, L., Johnson, E.D., Ticak, A., Jones, S.L. & Jones, L.A. (2008).

What do kids think about kids in eyeglasses? *Journal of the College of Optometrists,*

28(3), 218-224. https://doi.org/10.1111/j.1475-1313.2008.00559.x

Design

Implicit bias is a cognitive bias, and a preference (or aversion to) a person or group of people
Thoughts and feelings are implicit if we are unaware (not conscious) of the bias or prejudice.
The term implicit bias is used to describe positive or negative attitudes that we have for a group

or individual without our conscious knowledge. The IAT measures the strength of associations between concepts (i.e. intelligence and stupidity). Making a response is quicker when closely related items share the same response key. One might have an implicit preference for people wearing glasses if they were faster to complete the task when Intelligent + Glasses/ Stupidity + No Glasses (congruent stereotype trials) were paired than when Intelligent + No Glasses/ Stupidity + Glasses (incongruent stereotype trials) were paired. Congruent stereotype trials are categories that are aligned with existing stereotypes/attitudes (expect that people will respond more quickly and accurately). Incongruent stereotype trials are categories that are misaligned with existing stereotypes/attitudes (expect that people will respond more slowly and less accurately). The difference in reaction time and accuracy between the incongruent and congruent task = the IAT effect. A significant difference ($p < .05$) in reaction time speed and accuracy between congruent type trials and incongruent type trials.

The participant pool includes students who attend post-secondary on campus in Victoria, BC. and is inclusive of students aware of implicit bias, the testing method and undergraduate courses in psychology and who may be actively trying to resist implicit bias in favour of glasses. The aim is to invite the students in the Lab B014 section to participate, which would be approximately 20 students. We have selected 5 stimuli in each category (Intellect, Stupidity, Glasses, NoGlasses) (1 trial x 4 categories x 5 stimuli). The IAT will include 5 total tasks, so since each task has 20 trials, the total length of your experiment would be 100 trials. The IV is the wearing of glasses (an independent mechanism, or set of qualities, that can be manipulated, measured or selected)- 2 levels congruent and incongruent. The DV is the first impression people have of others wearing glasses (what is used to observe or measure the effect of an IV Reaction time (ms) & Accuracy (%).

As a comparison to what is normal in the field, Eggleston et al. (2020) selected twenty-four images of Caucasian faces (12 female) from a database. Images were chosen based on a selection criteria of full colour face, neutral expression, under standardized photographic conditions, including consistent lighting, clothing and position. Glasses were added to these stimuli using Adobe photoshop which resulted in 48 (24 altered, 24 unaltered) images. Participants were assigned to one of two conditions so that the faces wearing glass in condition A were not wearing glasses in condition B and vice versa.

In our study, images were selected from a database of royalty free images from the website shutterstock based on similar plain, un-accessorized backgrounds (white walls), position of the person (both shoulders in picture, face looking at camera), number of people in the image (by themselves), facial expression (smiling). The first ten images were selected from a search of the words "people wearing glasses", images chosen contained individuals smiling, alone in the picture, facing the camera to ensure the mood of the image was consistent. If an image contained coloured walls or accessories, every attempt to photoshop these distractions were removed.

1. **References.** All references you used in this proposal (APA 7 format).

Antonakis, J. & Dalgas, O. (2009). Predicting elections: Child's play!. *Science*, *323*, 1183. https://econtent.hogrefe.com/doi/abs/10.1027/1864-9335/a000359?journalCode=zsp
Conaway, C. (2007). "You Can See Things that Other People Can't": Changing Images of the Girl with Glasses, from *Gidget* to *Daria*. In: Inness, S.A. (eds) Geek Chic: Smart Women in Popular Culture. Palgrave Macmillan, New York. https://link.springer.com/chapter/10.1007/978-1-137-08421-7_4#citeas

Eggleston, A., Flavell, J. C., Tipper, S. P., Cook, R., & Over, H. (2021). Culturally learned first impressions occur rapidly and automatically and emerge early in development. *Developmental Science*, *24*(2), e13021. Doi: 10.1111/desc.13021

Over, H., & Cook, R. (2018). Where do spontaneous first impressions of faces come from?. *Cognition*, *170*, 190-200.

Over, H., Eggleston, A., & Cook, R. (2020). Ritual and the origins of first impressions. *Philosophical Transactions of the Royal Society B*, *375*(1805), 20190435.

Over, H., Eggleston, A., & Cook, R. (2020). Ritual and the origins of first impressions. *Biological Sciences*. https://doi.org/https://royalsocietypublishing.org/doi/full/10.1098/rstb.2019.0435
Walline, J.J., Sinnott, L., Johnson, E.D., Ticak, A., Jones, S.L. & Jones, L.A. (2008). What do kids think about kids in eyeglasses? *Journal of the College of Optometrists,* *28(3),* 218-224. https://doi.org/10.1111/j.1475-1313.2008.00559.x

Stimuli References:

Findings for synonyms of "Stupidity"

https://www.thesaurus.com/browse/stupidity

Shutterstock search "people wearing glasses"
https://www.shutterstock.com/search/people-wearing-glasses

Shutterstock search "person"
https://www.shutterstock.com/search/person

Findings for synonyms of "Intelligence":
https://www.thesaurus.com/browse/intelligence