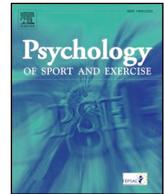




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Exploring gaze behaviors toward images of physically active individuals with a physical disability

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ABSTRACT

Objectives: The study had two main objectives: (1) to characterize able-bodied adults' gaze behaviors when viewing images of people with and without physical disabilities and in turn, (2) to examine whether portraying a person with a disability as physically active (shown participating in physical activity [i.e., sport/exercise]) versus inactive (not engaging in physical activity) affects gaze behavior. The study also had an exploratory objective: to examine the specific physical traits able-bodied adults gaze at when viewing active versus inactive people with physical disabilities.

Design: Within-subjects cross-sectional design consisting of 63 men and women without self-reported disabilities ($M_{\text{age}} = 21.22 \pm 2.52$ years).

Method: Participants viewed a series of 48 images for 5 s each. Images featured an able-bodied or disabled, active or inactive model. Eye movements were recorded while viewing each image. Differences in gaze behavior were assessed using a series of repeated measures multivariate factorial ANOVAs with Bonferroni-corrected pairwise comparisons to decompose interactions.

Results: Participants gazed significantly more at images of individuals with physical disabilities than images of able-bodied individuals. Furthermore, participants gazed significantly less at images portraying active versus inactive individuals with physical disabilities. A greater proportion of gaze behavior was directed toward the assistive device when the person with a disability was portrayed as active versus inactive.

Conclusions: This study demonstrated that able-bodied adults may gaze less at images of individuals with physical disabilities who are depicted as active versus inactive. Further research is needed to examine how these gaze patterns translate to live social situations.

1. Introduction

Having a disability often elicits negative behavioral reactions from able-bodied individuals, even when these reactions are unintended. For example, able-bodied individuals are often compelled to stare at people with disabilities – a behavior that frequently causes those with disabilities to feel ostracized and dehumanized (Goffman, 1963; Langer, Fiske, Taylor, & Chanowitz, 1976). Apart from causing social discomfort, staring at a person with a disability may detract attention from the individual's personal qualities. For example, in their study using eye tracking to quantify staring behavior by monitoring gaze patterns, Madera and Hebl (2012) examined participants' gaze toward job applicants with a stigmatized facial feature and the implications of this behavior on applicant ratings. As participants spent more time dwelling on the facially stigmatized area, they had poorer recall of interview responses and lower ratings of the applicant's qualifications, experience, and overall impression. Such gaze behavior may therefore have negative implications on the ways in which stigmatized individuals are perceived in social settings, such as job interviews. Exploring strategies to reduce able-bodied individuals' tendencies to stare at people with

physical disabilities may be a means of improving the way in which stigmatized individuals are treated in society.

The stereotype content model (SCM; Fiske, Cuddy, Glick, & Xu, 2002) provides insight into the formation and consequences of stereotypes such as staring. The SCM's multiple tenets and their application to disability are as follows (see Fig. 1 for pictorial representation):

- 1) The model suggests that stereotypes are captured along two dimensions: warmth (low – high) and competence (low – high). Typically, people with a disability are rated high on measures of warmth and low on measures of competence (Fiske et al., 2002; Stone et al., submitted).
- 2) Judgments of warmth and competence are derived from perceptions of social structure including competition and status. Perceptions of low social competition (i.e., the stereotyped individual is not perceived as vying for the same resources as the individuals making the judgment) predicts the high warmth stereotype characteristic of disability; perceptions of low social status (i.e., perceived lack of achievement and prestige) predicts low competence.
- 3) Stereotypes elicit a predictable set of affective and behavioral

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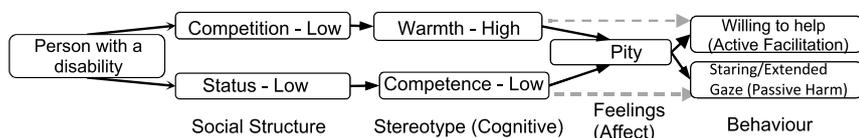


Fig. 1. SCM-based description of disability stereotypes and consequent affective and behavioral reactions.

reactions. A high warmth, low competence stereotype, for example, elicits feelings of pity from others (Cuddy, Fiske, & Glick, 2007; Fiske et al., 2002). Conversely, a high warmth, high competence stereotype elicits feelings of admiration.

- 4) Together, warmth/competence judgments and their associated affective reactions affect how people behave toward a stereotyped individual. For example, warmth-oriented stereotypes and affective reactions determine active behaviors. These are behaviors conducted with an overt effort to influence the stereotyped group. High warmth elicits active facilitation, such as helping or defending others, while low warmth elicits active harm, such as harassment, bullying, and hate crimes. Competence-oriented stereotypes and their consequent affective reactions determine passive behaviors. Passive behaviors are less deliberate than active behaviors. High competence elicits passive facilitation, such as cooperating with an outgroup, while low competence elicits passive harm, such as demeaning other groups by denying typical human interactions, which can manifest as staring. It is theorized that the typical high warmth/low competence stereotype of disability elicits active facilitation (e.g., holding a door open) and passive harm behaviors (e.g., staring) from others (Cuddy et al., 2007; Fiske et al., 2002).

In accordance with SCM, which posits that the low competence characteristic of disability stereotypes is likely to elicit negative behavioral tendencies, strategies are needed to portray people with disabilities as competent. Several studies have found that portraying people with physical disabilities as physically active is an effective strategy for improving explicit perceptions of competence (e.g., Clément-Guillotin et al., 2018; Gainforth, O'Malley, Mountenay & Latimer-Cheung, 2013; Kittson, Gainforth, Edwards, Bolkow, & Latimer-Cheung, 2013; Tyrrell, Hetz, Barg, & Latimer, 2010). In each of the studies, individuals with physical disabilities who were portrayed as physically active were consistently rated more positively on explicit measures of competence (Gainforth et al., 2013; Kittson et al., 2013; Tyrrell et al., 2010) than physically inactive individuals with physical disabilities. The studies, however, have been limited to evaluating judgments of warmth and competence and have not extended beyond the first tenet of SCM.

To broaden the scope of this research, the current study aims to explore how physical activity status (active vs. inactive) may affect passive behavioral reactions to people with disabilities, thus addressing the fourth tenet of SCM. Consistent with Fiske et al. (2002) and Cuddy

et al. (2007) suggestion, we operationalized passive harm behavioral tendencies as staring. This operationalization is appropriate in a disability context because staring is often unintentional and has negative social implications for people with disabilities (i.e., overlooking details about the person, making the target feel ostracized; Madera & Hebl, 2012; Langer et al., 1976). Of benefit, staring can be objectively assessed by measuring gaze behaviors through eye tracking. Previous work suggests that this measurement approach is sensitive to differences in cognitions and analogous to staring (Warschburger, Calvano, Richter, & Engbert, 2015).

Gaze behavior can be characterized by eye tracking parameters such as number of fixations, dwell time, average fixation duration, time to first fixation, and number of runs (Henderson, 2003; see Table 1 for definitions of these parameters). These parameters are used to assess visual attention and cognitive processing when viewing a scene (Rayner, 1998). Studies have found that visual attention may differ when viewing images/image features that are perceived as 'normal' and those that are perceived as 'unusual' (Rayner, Castelhan, & Yang, 2009). Although, to our knowledge, gaze behaviors have not been assessed previously in the context of the SCM, they have been used to explore staring tendencies toward stigmatized individuals. Madera and Hebl (2012) used eye tracking to examine gaze behavior toward job applicants with and without facial stigmas. They found that participants who viewed facially stigmatized applicants gazed more at the area containing the stigma, which led to poorer recall of their interview answers and lower applicant ratings. Madera and Hebl point out that apart from making the person feel ostracized, staring at people with disabilities may deny them of typical social interactions and opportunities. While these findings highlight the potential for examining gaze toward people with disabilities as a measure of passive harm behavior, it is unknown whether gaze patterns are modified by manipulations of stereotype content (e.g., high warmth/low competence vs. high warmth/high competence).

In applying novel technology to explore SCM tenets not previously explored in the context of physical activity and disability stereotypes, the primary objectives of the current study were to: (1) characterize able-bodied adults' gaze behaviors when viewing images of people with and without physical disabilities, and (2) evaluate whether portraying a person with a physical disability as physically active affects gaze behaviors. Using the fourth tenet of SCM as a guide, we hypothesized that able-bodied adults would gaze most when viewing images of individuals with physical disabilities compared to images of able-bodied

Table 1
Definitions of relevant eye tracking metrics.

Eye Tracking Metric	Definition	What it measures	Reference
Number of fixations	Total number of times in which the eye is relatively still within the area of interest.	More fixations indicate greater attention, suggesting that the feature may be more important to the viewer in comparison to other features.	Poole, Ball, & Phillips, 2005; Wedel & Pieters, 2000.
Dwell time	Total time (ms) in which a participant spent fixating on an area of interest.	Longer dwell times indicate greater attention and is a direct measure of cognitive processing.	Christianson, Loftus, Hoffman, & Loftus, 1991; Fox, Krugman, Fletcher, & Fischer, 1998; Pieters & Wedel, 2007.
Average fixation duration	Average duration (ms) of a single fixation.	Longer fixations indicate greater levels of scene processing.	Henderson (2003).
Time until first fixation	Time (ms) until the area of interest is first fixated on.	Faster time to first fixation indicates that the respective area of interest has properties that are better at drawing attention.	Byrne, Anderson, Douglass, and Matessa (1999).
Number of runs	Number of times that the eye enters and leaves the area of interest. A run may also be referred to as a 'visit count'.	Subsequent return to the area of interest may indicate that it is an interesting region within the image.	Rayner (2009).

individuals. We further hypothesized that able-bodied adults would gaze less when individuals with physical disabilities were depicted as physically active versus physically inactive.

Given the novelty of using eye tracking to explore able-bodied adults' gaze behaviors toward images of active and inactive people with a disability, we had a secondary, exploratory study objective. We aimed to examine the specific physical traits that able-bodied adults gaze at when viewing active versus inactive people with physical disabilities. Typically, when viewing images, people gaze more at faces than anywhere else in the image (End & Gamer, 2017; Fletcher-Watson, Findlay, Leekam, & Benson, 2008). This behavior supports findings that humans have an attentional preference for social features, such as the head and eyes (Birmingham, Bischof, & Kingstone, 2007; End & Gamer, 2017). In our exploratory analyses, we examined whether this typical viewing pattern was upheld or if participants were drawn to gaze at disability features including assistive devices or stigmatized body parts. This data provides insight into which aspects of physical disability may be heavily stigmatized and could therefore be useful in determining strategies for managing or mitigating socially ostracizing gaze behavior.

2. Methodology

2.1. Participants

Participants were a convenience sample of 63 men and women without a self-reported physical disability. An a priori power analysis, calculated based on large effects obtained by Madera and Hebl (2012) for visual attention toward stigmatized versus non-stigmatized individuals, revealed that 16 participants were required to detect differences in eye movements toward four sample means at an α of 0.05 (Cohen, 1992). However, given that other studies examining gaze toward 'unusual' versus 'normal' images revealed small discrepancies in gaze behavior (Rayner et al., 2009; effect sizes not reported), a sample size of 60 was chosen. Post-hoc power analyses revealed a power ($1-\beta$) of 0.99 and 0.97 for the main and exploratory analyses respectively. Therefore, the sample size was deemed sufficient.

Participants from a mid-sized university were recruited in person and through online postings in university groups and direct e-mails to students. Individuals who wore glasses were permitted to participate as the eye tracker could be calibrated to disregard the glasses frames and/or reflections and solely detect the pupil (SR Research, 2009). The majority of participants were female (79%), wore glasses or contact lenses (53%), and were Caucasian (70%). The mean age was 21.22 ± 2.52 years. The sample included participants with a range of experience working with individuals with physical disabilities, with 30% having no experience, 44% having experience with people with physical disabilities in a physical activity setting, and 25% of having experience with people with physical disability, but not in a physical activity setting.

2.2. Apparatus

The EyeLink 1000 (SR Research Ltd., Mississauga, Ontario, Canada) desk-mounted eye-tracking device was used to track the participants' eye movements when viewing each image. This eye tracking system uses a camera to detect pupil position when viewing a computer screen with 0.25° – 0.5° accuracy (SR Research, 2017). The images were presented on a 16-inch Samsung SyncMaster753 DF and pupil position was measured 1000 times per second (1000 Hz sampling rate). EyeLink Data Viewer (SR Research Ltd., Mississauga, Ontario, Canada) was used to define areas of interest and to extract eye tracking data.

2.3. Procedure

The study employed a cross-sectional design and was approved by the Institutional Ethics Review Board. To ensure participants did not

intentionally alter their gaze behavior, the study was advertised as a study examining scene preferences for health advertising. Participants were told that their eye movements would be tracked in order for them to provide confidential ratings of how much they liked each image. The protocol for the eye-tracking task was adapted from Rayner et al. (2009). Upon arriving at the lab, participants provided informed consent. They were then seated 55 cm from the eye-tracking camera and rested their chins on a chin rest to restrict head movements. A calibration task was completed prior to beginning eye-tracking and recalibration was necessary if the average tracking error was $> 0.5^{\circ}$ and/or the maximum tracking error was $> 1.0^{\circ}$. These measures were in place to ensure the eye tracking device recorded the accurate spatial location of the pupil. Participants viewed a series of 48 images, each of which were displayed for 5 s and presented in random order (Rayner et al., 2009). After viewing each image, participants completed a calibration check to ensure that their eye movements continued to be tracked accurately. Once this calibration was completed, the next image would appear. Upon completing the eye-tracking task, participants completed a manipulation check (image categorization task) and a demographic form. Finally, the participants were debriefed and granted us permission to use their data after having learned the true purpose of the study.

2.4. Measures

2.4.1. Eye tracking

For each image, data were extracted for average number of fixations, dwell time, average fixation duration, time until first fixation, and number of runs made within defined areas of interest. See Table 1 for definitions of these variables and an explanation of what they measure. Areas of interest included: full body, face, assistive device, and stigmatized body part. Additionally, we calculated the proportion of fixations/dwell time on the face, assistive device, or stigmatized body part by dividing average number of fixations/dwell time in the respective area by average number of fixations/dwell time on the whole body.

2.4.2. Manipulation check

Study participants were given a booklet of the images viewed. They were then asked to sort the images into categories based on how they perceived the ability and activity status of the person/people in the image. The four categories were as follows: Active/Able-bodied, Active/Disability, Inactive/Able-bodied, and Inactive/Disability. These categorizations were used to ensure that participants perceived the images as intended.

2.5. Visual stimuli

The visual stimuli included four categories of images: Active/Disability: featured at least one model with a disability engaging in a physical activity (e.g., playing a sport, lifting weights, wheeling), Active/Able-Bodied: featured only able-bodied models with at least one engaging in a physical activity, Inactive/Disability: featured at least one model with a disability; all models in the image were portrayed as inactive (e.g., sitting stationary conversing with friends or watching television), and Inactive/Able-Bodied: featured only able-bodied models portrayed as inactive. As much as possible, images were matched across the Disability/Able-Bodied categories (e.g., Fig. 2). Specifically, these images were matched for context and number of individuals in the image. Effort also was made to match images in terms of demographic features such as approximate age, gender, and racial background. This method allowed for similarity between images in the 'Disability' and 'Able-bodied' image categories for analysis purposes. It was not practically possible to match across the Inactive/Active categories as image content for physical activity versus sedentary behavior differs. For example, several active images included sport/exercise equipment which

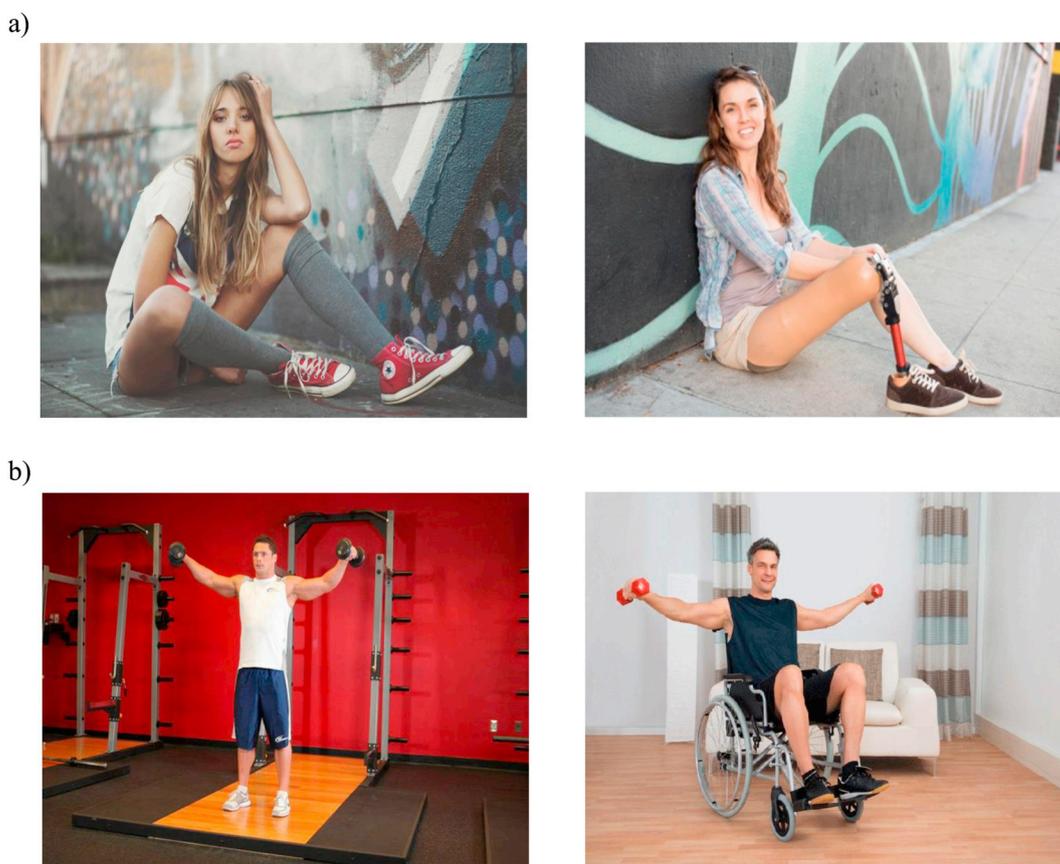


Fig. 2. (a) Able-bodied/Inactive image and matched Disability/Inactive image. (b) Able-bodied/Active image and matched Disability/Active image. Note: Images have been resized for the purpose of this publication and are not to scale.

was not appropriate for inclusion in images portraying inactivity.

The images displayed were obtained from a Google Images search and included individuals of different ages, genders, and racial backgrounds. Each image was resized to 5 inches × 6.5 inches at 100 dots per inch using Adobe Photoshop Elements 15 (O'Malley & Latimer-Cheung, 2012). These parameters ensured that the images were presented in a manner that was consistent in terms of dimensions and quality.

Prior to conducting the experiment, we conducted a pilot test to evaluate perceptions of the selected images. The protocol was approved by the Institutional Ethics Review Board. Five students from a mid-sized university participated in this pilot test. The majority of participants were female (60%), Asian (40%), and none wore glasses or used contact lenses. The mean age was 20.40 ± 3.36 years. The pilot test procedure was the same as the procedure outlined above for the main experiment. Participants viewed 40 images (10 images/category) and completed the manipulation check. In the manipulation check, participants classified 10 images differently than expected. Specifically, these images were misclassified by 60–80% of participants. After reviewing these images, we deemed eight images problematic in that they were somewhat ambiguous. The other two images (each misclassified by 75% of pilot participants) were not ambiguous and likely were misclassified due to a lack of clarity in task instructions. As a result of these findings, eight new images were included in the final image set and the manipulation task instructions were clarified.

In the main experiment, participants viewed 48 images – the original 40 images and the eight additional images. The images deemed problematic in the pilot test remained in the final image set but were not included in the analyses. Furthermore, the experimental manipulation check revealed that one image in the Inactive/Disability category and one in the Inactive/Able-bodied category were categorized

incorrectly by the majority of participants (55.74% and 57.38%, respectively). These images, as well as their counterpart images, also were excluded from the eye tracking analysis because participants, for the most part, did not perceive them as intended. The eye tracking analysis therefore included data from 36 images: 10 Active/Able-bodied images, 10 Active/Disability images, 8 Inactive/Able-bodied images, and 8 Inactive/Disability images. These images were categorized correctly, on average, by $93.01 \pm 7.83\%$ of participants. Further details regarding the misclassification rates for images included in the study can be found in Table 2.

2.6. Areas of interest

Areas of interest were manually defined around each person with a disability, as well as their able-bodied counterpart in the matching image, using EyeLink Data Viewer. For image pairs that featured multiple people, the able-bodied counterpart was determined to be the

Table 2
Image misclassification rates.

	Able-Bodied		Disability	
	Active	Inactive	Active	Inactive
Percent Misclassified <i>M (SD)</i>	2.29 (5.74)	7.19 (5.09)	10.02 (10.97)	8.63 (4.65)
Misclassification Rate (Percent Misclassified Per Image)	4.92–19.67	0–18.03	1.64–14.75	1.67–37.70

person who ‘best matched’ the individual with the disability in terms of spatial location and centrality in the image. Separate areas of interest were also drawn around the face, assistive device, and stigmatized body part of people with physical disabilities. In the case of amputation, the stigmatized body part area of interest extended slightly above and below the amputation. Areas of interest were reviewed and discussed amongst two of the authors to ensure that they were consistent between the images.

2.7. Analyses

2.7.1. Data treatment

Outliers for each eye tracking measure were identified by examining boxplots (Pallant, 2011) in SPSS Version 24. Extreme outliers (i.e., values more than three times the interquartile range above the third quartile or below the first quartile) were recoded to one number higher or lower (depending on the direction of the outlier) than the next highest or lowest value that was not an extreme outlier. When analyzing the full body areas of interest, one extreme outlier was found for time until first fixation in the Inactive/Able-bodied condition and another was found for time until first fixation in the Inactive/Disability condition. When analyzing proportion of dwell time on the stigmatized body part, one extreme outlier was found in the Active/Disability condition.

2.7.2. Statistical techniques

Our analyses were conducted in two stages. First, we conducted an analysis of gaze behaviors toward full body areas of interest. Data from all 36 images were submitted to a 2 (ability: able-bodied, disability) x 2 (activity: physically inactive, physically active) repeated measures multivariate factorial analysis of variance (ANOVA). Dependent variables included: number of fixations, dwell time, time until first fixation, average fixation duration, and number of runs.

Next, we conducted an analysis exploring gaze toward disability features. Only data from the disability image categories (Active/Disability and Inactive/Disability) that featured all three types of areas of interest (face, assistive device, stigmatized body part) were included in this analysis. As such, seven images were included from the Active/Disability category and five images were included from the Inactive/Disability category. A 2 (activity: physically inactive, physically active) x 3 (feature: stigmatized body part, assistive device, face) repeated measures multivariate factorial ANOVA was conducted for proportion of fixations and proportion of dwell time.

In terms of effect sizes, main effects and interactions (η_p^2) of 0.01, 0.06, and 0.14 were interpreted as small, medium, and large, respectively (Cohen, 1988). To decompose interactions, Bonferroni-corrected pairwise comparisons were conducted. Small, medium, and large effects (Cohen's d) were interpreted as 0.2, 0.5, and 0.8, respectively (Cohen, 1988).

Table 3

Main effect for full body areas of interest.

	Ability		d	Activity		d
	Able-bodied M (SD)	Disability M (SD)		Active M (SD)	Inactive M (SD)	
Number of Fixations	9.55 (1.32)	11.34 (1.70) ^a	1.17	10.51 (1.48)	10.39 (1.51)	0.08
Dwell Time (ms)	2862.55 (239.70)	3317.46 (238.64) ^a	1.90	3096.65 (240.07)	3083.36 (234.10)	0.06
Average Fixation Duration (ms)	305.82 (51.83)	300.50 (57.12)	0.10	301.59 (54.10)	304.72 (54.47)	0.06
Time Until First Fixation (ms)	347.10 (87.13)	191.82 (58.00) ^a	2.10	250.17 (69.10)	288.75 (70.26) ^b	0.55
Number of Runs	2.42 (0.33)	2.34 (0.29) ^a	0.26	2.52 (0.33)	2.23 (0.29) ^b	0.93

^a Significantly different from the able-bodied condition, $p < 0.05$

^b Significantly different from the physically active condition, $p < 0.05$

2.7.3. Covariates

Overall, gender and previous experience working with people with physical disabilities were examined as potential confounders but did not emerge as significant covariates in the analysis ($ps > 0.05$).

For the full body areas of interest analysis, gender had no main effect on fixation count, $F(1,60) = 0.204$, $p > 0.05$, $\eta_p^2 = 0.003$, dwell time, $F(1,60) = 0.38$, $p > 0.05$, $\eta_p^2 = 0.001$, average fixation duration, $F(1,60) = 0.186$, $p > 0.05$, $\eta_p^2 = 0.003$, time to first fixation, $F(1,60) = 0.154$, $p > 0.05$, $\eta_p^2 = 0.003$, and number of runs, $F(1,60) = 0.057$, $p > 0.05$, $\eta_p^2 = 0.001$. Previous experience working with people with physical disabilities also had no main effect on fixation count, $F(1,60) = 0.02$, $p > 0.05$, $\eta_p^2 = 0.00$, dwell time, $F(1,60) = 0.126$, $p > 0.05$, $\eta_p^2 = 0.002$, average fixation duration, $F(1,60) = 0.008$, $p > 0.05$, $\eta_p^2 = 0.00$, time to first fixation, $F(1,60) = 0.014$, $p > 0.05$, $\eta_p^2 = 0.00$, and number of runs, $F(1,60) = 0.115$, $p > 0.05$, $\eta_p^2 = 0.002$.

For the disability features areas of interest analysis, gender had no main effect on proportion of fixations, $F(1,60) = 0.15$, $p > 0.05$, $\eta_p^2 = 0.002$, or proportion of dwell time, $F(1,60) = 0.05$, $p > 0.05$, $\eta_p^2 = 0.001$. Previous experience working with people with physical disabilities also had no main effect on proportion of fixations, $F(1,60) = 0.20$, $p > 0.05$, $\eta_p^2 = 0.003$, or proportion of dwell time, $F(1,60) = 0.22$, $p > 0.05$, $\eta_p^2 = 0.004$.

Given that the pattern of findings was the same with and without covariates included, results are reported without the inclusion of the covariates.

3. Results

3.1. Full body areas of interest

3.1.1. Number of fixations

The factorial ANOVA for number of fixations revealed a significant main effect for ability, $F(1,62) = 181.04$, $p < 0.001$, $\eta_p^2 = 0.74$, but not activity. Participants made significantly more fixations on individuals with physical disabilities than on able-bodied individuals, $d = 1.17$ (Table 3). The ability x activity interaction was significant, $F(1,62) = 28.76$, $p < 0.001$, $\eta_p^2 = 0.32$. Participants made significantly more fixations on individuals with physical disabilities when they were pictured as inactive than those who were pictured engaging in physical activity, $p = 0.04$, $d = 0.23$. In contrast, participants made significantly more fixations on able-bodied individuals when they were portrayed as active versus inactive, $p < 0.001$, $d = 0.46$ (Fig. 3 panel a).

3.1.2. Dwell time

The factorial ANOVA for dwell time revealed a significant main effect for ability, $F(1,62) = 346.06$, $p < 0.001$, $\eta_p^2 = 0.85$, but not activity. Dwell time on people with physical disabilities was significantly longer than on able-bodied individuals, $d = 1.90$ (Table 3). The ability x activity interaction was significant, $F(1,62) = 44.37$, $p < 0.001$, $\eta_p^2 = 0.42$. In the disability conditions, participants

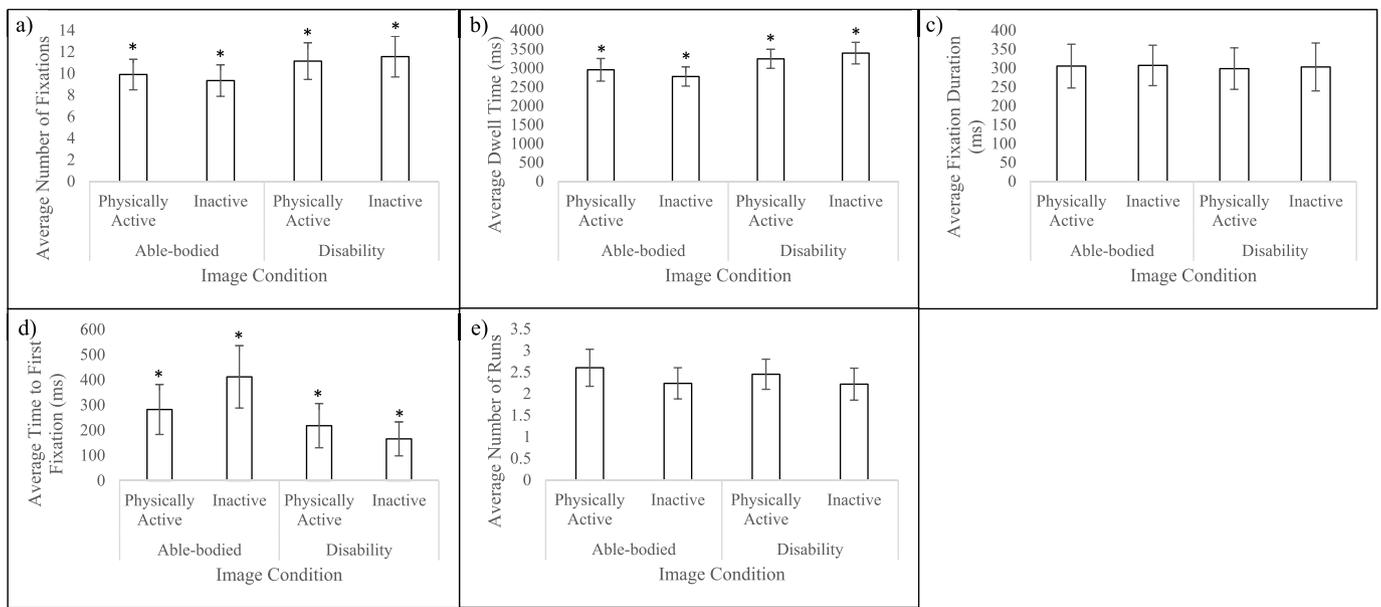


Fig. 3. Eye tracking measures for full body areas of interest by image category. (a) Number of fixations. (b) Dwell time. (c) Fixation duration. (d) Time to first fixation. (e) Number of runs.

Note: Bars with different letters are significantly different, $p < 0.05$.

dwelled significantly longer on people with physical disabilities who were pictured in an inactive position than those who were pictured engaging in physical activity, $p < 0.001$, $d = 0.55$. In contrast, participants dwelled for significantly longer on able-bodied individuals when they were pictured engaging in physical activity as opposed to inactive, $p < 0.001$, $d = 0.63$ (Fig. 3 panel b).

3.1.3. Average fixation duration

The factorial ANOVA for average fixation duration did not reveal statistically significant main effects for ability, activity, or the ability \times activity interaction ($p > 0.05$). Therefore, participants had similar average fixation times when viewing images of people with and without physical disabilities who were pictured as active and inactive (Fig. 3 panel c).

3.1.4. Time until first fixation

The factorial ANOVA for time until first fixation revealed significant main effects for ability, $F(1,62) = 140.91$, $p < 0.001$, $\eta_p^2 = 0.69$, and activity, $F(1,62) = 11.30$, $p = 0.001$, $\eta_p^2 = 0.15$. Participants were significantly quicker to fixate on individuals with physical disabilities than on able-bodied individuals, $d = 2.10$. They also were quicker to fixate on people portrayed as active versus inactive, $d = 0.55$ (Table 3). These main effects were superseded by a significant interaction, $F(1,62) = 71.82$, $p < 0.001$, $\eta_p^2 = 0.54$. Participants fixated significantly faster on people with physical disabilities who were pictured

as inactive versus active, $p = 0.001$, $d = 0.67$. In contrast, participants were significantly quicker to fixate on able-bodied individuals when they were portrayed as active versus inactive, $p < 0.001$, $d = 1.15$ (Fig. 3 panel d).

3.1.5. Number of runs

The factorial ANOVA for number of runs revealed significant main effects for ability, $F(1,62) = 4.53$, $p < 0.05$, $\eta_p^2 = 0.07$, and activity, $F(1,62) = 62.45$, $p < 0.001$, $\eta_p^2 = 0.50$. Participants' gaze had fewer runs when viewing images of individuals with a disability compared to the able-bodied condition, regardless of activity status, $d = 0.26$. Significantly more runs were made on the images of active versus inactive individuals, regardless of disability status, $d = 0.93$. The ability \times activity interaction was not significant (Fig. 3 panel e).

3.2. Disability features areas of interest

3.2.1. Proportion of fixations

Where the assumption of sphericity was violated, a Greenhouse-Geisser correction was used to interpret the main effects. The factorial ANOVA for number of fixations revealed significant main effects for activity, $F(1,62) = 14.35$, $p < 0.001$, $\eta_p^2 = 0.19$, feature, $F(1.444,89.523) = 242.94$, $p < 0.001$, $\eta_p^2 = 0.80$, and the activity \times feature interaction, $F(1.692,104.877) = 23.84$, $p < 0.001$, $\eta_p^2 = 0.28$. Because interactions supersede main effects, for clarity, only the interaction is described here. The

Table 4
Main effect for disability feature areas of interest.

	Feature			Activity			Active M (SD)	Inactive M (SD)	d
	Face M (SD)	Stigmatized Body Part M (SD)	Assistive Device M (SD)	d1	d2	d3			
Proportion of Fixations (%)	43.52 (8.90) ^a	18.71 (4.34) ^a	14.69 (6.25) ^a	3.54	3.75	0.75	24.90 (2.40)	26.38 (2.48) ^b	0.61
Proportion of Dwell Time (%)	52.21 (10.14) ^a	15.48 (4.26) ^a	13.09 (6.29) ^a	4.72	4.64	0.44	26.09 (3.06)	27.76 (2.87) ^b	0.56

d1: effect size face vs. stigmatized body part; d2: effect size face vs. assistive device; d3 = effect size stigmatized body part vs. assistive device.

Note: Proportion calculated by dividing average number of fixations or dwell time in the respective area (i.e., face, stigmatized body part, assistive device) by average number of fixations made on the whole body

^a Significantly different from both other features, $p < 0.05$

^b Significantly different from the physically active condition, $p < 0.05$

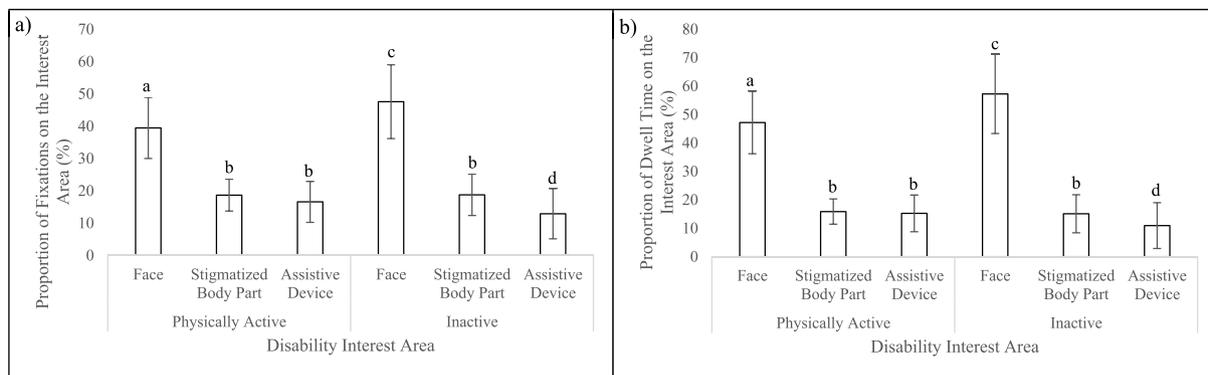


Fig. 4. Eye tracking measures for disability features areas of interest by image category. (a) Proportion of fixations. (b) Proportion of dwell time. Note: Bars with different letters are significantly different, $p < 0.05$.

main effects are described in Table 4. Given the exploratory nature of these analyses, the interaction is described first in terms of activity status and secondly in terms of image feature.

Considering the interaction in terms of activity status, when individuals with physical disabilities were portrayed as physically active, a significantly greater proportion of fixations were directed toward the face than toward the stigmatized body part or assistive device, $p < 0.001$, $d = 2.75$ and $p < 0.001$, $d = 2.84$, respectively. There was no significant difference in proportion of fixations directed toward the stigmatized body part and assistive device, $p > 0.05$. Similarly, when individuals with physical disabilities were pictured as inactive, a significantly greater proportion of fixations were directed toward the face than on the stigmatized body part and assistive device, $p < 0.001$, $d = 3.11$ and $p < 0.001$, $d = 3.56$, respectively, and a significantly greater proportion of fixations were directed toward the stigmatized body part than on the assistive device, $p < 0.001$, $d = 0.84$ (Fig. 4).

Considering the interaction in terms of image feature, the proportion of fixations directed toward the assistive device was significantly higher when viewing people with physical disabilities who were depicted as physically active versus inactive, $p < 0.001$, $d = 0.53$. In contrast, the proportion of fixations directed toward the face was significantly lower when viewing people with physical disabilities who were depicted as physically active versus inactive, $p < 0.001$, $d = 0.77$. Proportion of fixations directed toward the stigmatized body part, however, did not significantly differ when viewing individuals with physical disabilities pictured engaging in physical activity or inactive, $p > 0.05$ (Fig. 4).

3.2.2. Proportion of dwell time

Where the assumption of sphericity was violated, a Greenhouse-Geisser correction was used to interpret the main effects. The factorial ANOVA for dwell time revealed significant main effects for activity, $F(1,62) = 10.96$, $p = 0.002$, $\eta_p^2 = 0.15$, feature, $F(1.332,82.601) = 415.31$, $p < 0.001$, $\eta_p^2 = 0.87$, and the activity \times feature interaction, $F(1.476,91.540) = 25.14$, $p < 0.001$, $\eta_p^2 = 0.29$. The proportion of time spent dwelling on the assistive device was significantly higher when viewing people with physical disabilities who were portrayed as physically active versus inactive, $p < 0.001$, $d = 0.59$. In contrast, the proportion of time spent dwelling on the face was significantly lower when viewing people with physical disabilities who were portrayed as active versus inactive, $p < 0.001$, $d = 0.80$. Time spent dwelling on the stigmatized body part, however, did not differ when viewing individuals with physical disabilities who were portrayed as physically active versus inactive, $p > 0.05$. When individuals with physical disabilities were pictured engaging in physical activity, a significantly greater proportion of dwell time was directed toward the face than on the stigmatized body part or assistive device, $p < 0.001$, $d = 3.74$, and $p < 0.001$, $d = 3.55$, respectively, but there was no significant difference in proportion of dwell time directed toward the stigmatized body part and assistive device, $p > 0.05$. When individuals with physical disabilities were

pictured as inactive, however, a significantly greater proportion of fixations were made on the face than on the stigmatized body part and assistive device, $p < 0.001$, $d = 3.86$, and $p < 0.001$, $d = 4.07$, respectively, and a significantly greater proportion of fixations were made on the stigmatized body part than on the assistive device, $p < 0.05$, $d = 0.56$ (Fig. 4).

4. Discussion

The purpose of this study was threefold: (a) to characterize able-bodied adults' gaze behaviors toward images of people with and without physical disabilities, (b) to assess whether presenting somebody with a physical disability engaging in physical activity reduces gaze behaviors, and (c) to explore the specific features able-bodied adults gaze at when viewing people with physical disabilities who are depicted as physically active versus inactive. A quantitative eye movement analysis gave rise to five main findings. First, although there were no significant differences in average fixation duration toward the four image types (Active/Able-bodied, Active/Disability, Inactive/Able-bodied, Inactive/Disability), able-bodied adults engaged in greater overall gaze behaviors (i.e., greater number of fixations, dwell time, and shorter time to first fixation coupled with fewer runs) when viewing images of people with physical disabilities than images of able-bodied individuals. Furthermore, participants gazed less at people with physical disabilities who were portrayed as physically active, as opposed to inactive. An analysis examining gaze behavior toward specific features of people with physical disabilities revealed that in both active and inactive conditions, the greatest proportion of gaze behaviors was directed toward the face in comparison to the stigmatized areas (assistive device and stigmatized body part). In comparison to the inactive images, however, when viewing the active images, a greater proportion of gaze behavior was directed toward the assistive device, and a smaller proportion was directed toward the face. Interestingly, proportion of gaze behavior toward the stigmatized body part did not significantly differ between images in the active and inactive conditions.

As indicated by greater number of fixations, dwell time, and shorter time to first fixation, participants engaged in greater gaze behaviors toward images of individuals with physical disabilities than images of able-bodied individuals. These findings were true regardless of whether the individuals were portrayed as physically active or inactive and are further qualified by the number of runs data. Participants' gaze patterns included significantly more runs on able-bodied individuals than on people with physical disabilities. A run represents a return to the region of interest which, in this case, is the person with or without a physical disability, within a 5 s time span. Since participants made more fixations and stared longer at individuals with physical disabilities than able-bodied individuals, they spent more time examining the region of interest and therefore left it less frequently in the 5 s time span. Thus, the results support the first hypothesis and are in line with previous work suggesting that able-bodied individuals are compelled to stare at

individuals with physical disabilities (Langer et al., 1976), regardless of activity status. These findings also align with the SCM predictions of the emergence of passive harm behaviors toward individuals from groups generally stereotyped as high warmth/low competence (i.e., persons with a disability).

When viewing images of people with physical disabilities, able-bodied participants gazed less at individuals who were pictured engaging in physical activity, as opposed to inactive. These results support the second hypothesis and align with the SCM (Cuddy et al., 2007; Fiske et al., 2002). Participants made fewer fixations, dwelled for less time, and took longer to fixate on people with physical disabilities who were portrayed as physically active, as opposed to inactive. The findings from the current study compliment previous work, which found that able-bodied adults perceived individuals with physical disabilities as more competent when they were portrayed as being physically active (Gainforth et al., 2013; Kittson et al., 2013; Tyrrell et al., 2010). In accordance with SCM, the decreased gaze observed in the activity condition synonymous with decreased passive harm behavioral tendencies may be a manifestation of greater perceptions of competence fostered by activity status.

Interestingly, the opposite gaze patterns were demonstrated when viewing images of able-bodied individuals; the active images garnered greater gaze than the inactive images. Because eye movements are considered to be indicative of cognitive state (Henderson, Shinkareva, Wang, Luke, & Olejarczyk, 2013), perhaps these findings are attributable to differences in image relevance and viewing motivation. Kawakami et al. (2014) have demonstrated that gaze patterns can be influenced by an individual's specific motivation. Since the participants were able-bodied, their gaze patterns while viewing images of able-bodied individuals (members of their in-group) may reflect efforts to gain useful information applicable to themselves. Given that being active is highly desirable (Penedo & Dahn, 2005), their gaze might reflect efforts to seek physical activity related information. Furthermore, several studies have found that when viewing in-group faces, individuals focus on features that may differentiate the person from other members of the in-group (Hugenberg, Young, Bernstein, & Sacco, 2010; Pauker et al., 2009; Rhodes, Locke, Ewing, & Evangelista, 2009). As such, it is possible that when viewing the images of able-bodied individuals, participants focused more on physical activity information to help distinguish the person in the image from other members of their in-group. Nevertheless, further research is needed to explore the cognitive mechanisms that may have contributed to these findings.

When viewing images of people with physical disabilities, participants engaged in a greater proportion of gaze behaviors toward the face than the stigmatized body part or assistive device. These findings held true across active and inactive images and are in line with previous work suggesting significantly more fixations on the facial region than anywhere else in the image (End & Gamer, 2017; Fletcher-Watson et al., 2008). Interestingly, participants directed a larger proportion of gaze behaviors toward the face when examining the inactive images than the active images. In contrast, participants directed a larger proportion of gaze behavior toward the assistive device when examining the active images than the inactive images. When viewing the inactive images, it may be that participants directed their gaze away from the assistive device and toward the face in an attempt to conform with societal norms that discourage staring (Langer et al., 1976). The adapted sport context presented in the active images, however, may be particularly novel and draw attention to the assistive devices used (Berlyne, 1960; Fox, Russo, Bowles, & Dutton, 2001; Langer et al., 1976; Rinck & Becker, 2006; Thompson & Kent, 2001). Thus, the sporting context may offer a license to gaze at the assistive device and, in turn, reduce corrective gaze to conform with societal norms. Considering these findings in the context of the SCM, that same sporting component, however, may also contribute to increased perceptions of competence and help to mitigate overall staring behavior (Cuddy et al., 2007; Fiske et al., 2002). Interestingly, proportion of gaze behavior toward the

stigmatized body part (e.g., the legs of somebody who uses a wheelchair) did not significantly differ between images in the active and inactive conditions. As such, able-bodied individuals' cognitions regarding anatomical stigma may not differ when people with physical disabilities are depicted as physically active versus inactive (Henderson et al., 2013).

Despite the study's robust findings, there are some limitations that should be taken into consideration. Although each image of somebody with a physical disability was matched to an image of an able-bodied individual, it was not feasible to also match active and inactive images. While the differences in these images may have had implications on gaze behavior, it should be noted that the average number of people per image did not substantially differ between active and inactive image categories. There was an average of 1.80 people per image in the active categories and an average of 1.87 people per image in the inactive categories. Nevertheless, future research should try to match across all image categories to ensure they are as similar as possible. For example, rather than using existent images, researchers can create their own pictorial stimuli in which all aspects of the images (e.g., background, number of people, clothing) are controlled. Given that each participant viewed the images in a different sequence, it is also unknown whether the order of stimuli may have influenced gaze behavior and if gaze behavior toward images of people with disabilities decreased over time. Such findings would raise the possibility of an attention effect in which the novelty of a stimulus (i.e., person with a disability) elicits gaze (Langer et al., 1976). Furthermore, this study did not measure perceived warmth and competence of the individuals in the images. This measurement would have added significant participant burden to the experiment. Rather, the study was predicated on the well-established evidence that a physical disability elicits an explicit high warmth/low competence stereotype (Cuddy et al., Fiske & Glick, 2007; Fiske et al., 2002) and that engaging in physical activity can improve perceptions of competence (Clément-Guillotin et al., 2018; Gainforth et al., 2013; Kittson et al., 2013; Tyrrell et al., 2010). Additional research is needed to definitively investigate the relationship between perceptions of competence and gaze behavior. Finally, the participant sample was composed of primarily young, Caucasian, and female university students. Since the sample was not diverse, the results may not be generalizable to the broader population.

This study was the first in the realm of physical activity stereotypes of disability to explore SCM tenets beyond warmth and competence judgments. The study serves as a proof-of-concept demonstrating the potential for gaze patterns to be used as a measure sensitive to behavioral manifestations of stereotyped judgements of physically active individuals with a disability. Thus, the major contribution of this study is the establishment of a foundation for future research in this area. Future research should examine gaze patterns toward other media-types (e.g., videos), contexts (e.g., face-to-face interaction), and disability types (e.g., intellectual disability). Furthermore, varying means of conveying physical activity information should be explored (e.g., wearing athletic clothing or clothing with team logos or slogan such as "Property of Para Hockey Athletics").

Although spurring further research and innovation is the primary research contribution of this study, the study findings may have preliminary practical applications. Specifically, individuals with a disability might appreciate learning about where able-bodied others tend to stare when viewing images of disability. They might be able to draw parallels to the staring behaviors they have experienced in real-life interactions. This information could help individuals with a disability anticipate these gaze patterns and feel less ostracized by them – they might even seize the opportunity to educate an onlooker about their sport by starting a discussion. Marketing staff who develop campaigns promoting the Paralympics might also find the gaze pattern information useful in informing how they design their print media to draw the greatest attention to key features of the ad.

In conclusion, this study aligns with previous research and the

assumptions of the SCM and suggests that able-bodied adults may gaze less at individuals with physical disabilities who are portrayed as physically active versus inactive. A greater proportion of this behavior, however, may be spent gazing at the assistive device when the person with a physical disability is portrayed as active versus inactive. Given that this is the first study using eye tracking to evaluate gaze toward individuals with physical disabilities, it provides unique insight into the SCM and the cognitive processes surrounding negative behavioral reactions to physical disability. This study also provides a foundation for evaluating gaze toward individuals with disabilities and for understanding the role that physical activity may play in mitigating this behavior moving forward.

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References

- Berlyne, D. E. (1960). *Conflict, arousal, and curiosity*. New York: McGraw-Hill.
- Birmingham, E., Bischof, W. F., & Kingstone, A. (2007). Why do we look at people's eyes? *Journal of Eye Movement Research*, 1(1).
- Byrne, M. D., Anderson, J. R., Douglass, S., & Matessa, M. (1999). Eye tracking the visual search of click-down menus. *Proceedings of the SIGCHI conference on human factors in computing systems* (pp. 402–409). ACM.
- Christianson, S.Å., Loftus, E. F., Hoffman, H., & Loftus, G. R. (1991). Eye fixations and memory for emotional events. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 17(4), 693.
- Clément-Guillotin, C., Rohmer, O., Forestier, C., Guillotin, P., Deshayes, M., & d'Arripe-Longueville, F. (2018). Implicit and explicit stereotype content associated with people with physical disability: Does sport change anything? *Psychology of Sport and Exercise*, 38, 192–201.
- Cohen, J. W. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Hillsdale, NJ: Lawrence Erlbaum Associates.
- Cohen, J. W. (1992). A power primer. *Psychological Bulletin*, 112(1), 155–159. <https://doi.org/10.1037/0033-2909.112.1.155>.
- Cuddy, A. J., Fiske, S. T., & Glick, P. (2007). The BIAS map: Behaviors from intergroup affect and stereotypes. *Journal of Personality and Social Psychology*, 92(4), 631.
- End, A., & Gamer, M. (2017). Preferential processing of social features and their interplay with physical saliency in complex naturalistic scenes. *Frontiers in Psychology*, 8.
- Fiske, S. T., Cuddy, A. J., Glick, P., & Xu, J. (2002). A model of (often mixed) stereotype content: Competence and warmth respectively follow from perceived status and competition. *Journal of Personality and Social Psychology*, 82(6), 878.
- Fletcher-Watson, S., Findlay, J. M., Leekam, S. R., & Benson, V. (2008). Rapid detection of person information in a naturalistic scene. *Perception*, 37(4), 571–583.
- Fox, R. J., Krugman, D. M., Fletcher, J. E., & Fischer, P. M. (1998). Adolescents' attention to beer and cigarette print ads and associated product warnings. *Journal of Advertising*, 27(3), 57–68.
- Fox, E., Russo, R., Bowles, R. J., & Dutton, K. (2001). Do negative stimuli draw or hold visual attention in subclinical anxiety? *Journal of Experimental Psychology: General*, 130, 681–700.
- Gainforth, H. L., O'Malley, D., Mountenay, T., & Latimer-Cheung, A. (2013). Independence and physical activity status moderate stereotypes toward people with a physical disability. *International Journal of Sport and Exercise Psychology*, 11(3), 244–257.
- Goffman, E. (1963). *Behavior in public place*. New York: Glencoe: the free press.
- Henderson, J. M. (2003). Human gaze control during real-world scene perception. *Trends in Cognitive Sciences*, 7(11), 498–504.
- Henderson, J. M., Shinkareva, S. V., Wang, J., Luke, S. G., & Olejarczyk, J. (2013). Predicting cognitive state from eye movements. *PLoS One*, 8(5), e64937.
- Hugenberg, K., Young, S. G., Bernstein, M. J., & Sacco, D. F. (2010). The categorization-identification model: An integrative account of the other-race recognition deficit. *Psychological Review*, 117, 1168–1187. <https://doi.org/10.1037/a0020463>.
- Kawakami, K., Williams, A., Sidhu, D., Choma, B. L., Rodriguez-Bailón, R., Cañadas, E., ... Hugenberg, K. (2014). An eye for the I: Preferential attention to the eyes of ingroup members. *Journal of Personality and Social Psychology*, 107(1), 1.
- Kittson, K., Gainforth, H. L., Edwards, J., Bolkow, R., & Latimer-Cheung, A. E. (2013). The effect of video observation on warmth and competence ratings of individuals with a disability. *Psychology of Sport and Exercise*, 14(6), 847–851.
- Langer, E. J., Fiske, S., Taylor, S. E., & Chanowitz, B. (1976). Stigma, staring, and discomfort: A novel-stimulus hypothesis. *Journal of Experimental Social Psychology*, 12(5), 451–463.
- Madera, J. M., & Hebl, M. R. (2012). Discrimination against facially stigmatized applicants in interviews: An eye-tracking and face-to-face investigation. *Journal of Applied Psychology*, 97(2), 317.
- O'Malley, D. A., & Latimer-Cheung, A. E. (2012). Gaining perspective: The effects of message frame on viewer attention to and recall of osteoporosis prevention print advertisements. *Journal of Health Psychology*, 18(11), 1400–1410.
- Pallant, J. (2011). *SPSS survival manual: A step by step guide to data analysis using SPSS* (4th ed.). St Leonards, Australia: Allen & Unwin.
- Pauker, K., Weisbuch, M., Ambady, N., Sommers, S. R., Adams, R. B., & Ivcevic, Z. (2009). Not so black and white: Memory for ambiguous group members. *Journal of Personality and Social Psychology*, 96, 795–810. <https://doi.org/10.1037/a0013265>.
- Penedo, F. J., & Dahn, J. R. (2005). Exercise and well-being: A review of mental and physical health benefits associated with physical activity. *Current Opinion in Psychiatry*, 18(2), 189–193.
- Pieters, R., & Wedel, M. (2007). Goal control of attention to advertising: The Yarbus implication. *Journal of Consumer Research*, 34(2), 224–233.
- Poole, A., Ball, L. J., & Phillips, P. (2005). In search of saliency: A response-time and eye-movement analysis of bookmark recognition. *People and computers XVIII—design for life* (pp. 363–378). London: Springer.
- Rayner, K. (1998). Eye movements in reading and information processing: 20 years of research. *Psychological Bulletin*, 124(3), 372.
- Rayner, K. (2009). The 35th Sir Frederick Bartlett Lecture: Eye movements and attention in reading, scene perception, and visual search. *Quarterly Journal of Experimental Psychology*, 62(8), 1457–1506.
- Rayner, K., Castelano, M. S., & Yang, J. (2009). Eye movements when looking at unusual/weird scenes: Are there cultural differences? *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 35(1), 254.
- Rhodes, G., Locke, V., Ewing, L., & Evangelista, E. (2009). Race coding and the other-race effect in face recognition. *Perception*, 38, 232–241. <https://doi.org/10.1068/p6110>.
- Rinck, M., & Becker, E. S. (2006). Spider fearful individuals attend to threat, then quickly avoid it: Evidence from eye movements. *Journal of Abnormal Psychology*, 115, 231–238.
- SR Research (2009). EyeLink 1000 user manual. Retrieved from <http://sr-research.jp/support/EyeLink%201000%20User%20Manual%201.5.0.pdf>.
- SR Research (2017). EyeLink 1000: Multiple eye tracking solutions in one. Retrieved from <http://www.sr-research.com/EL1000.html>.
- Stone, R., Sweet, S. N., Perrier, M. J., Martin Ginis, K. A., McDonald, T., & Latimer-Cheung, A. E. Exploring stereotypes of athletes with a disability: A behaviours from intergroup Affect and stereotypes (BIAS) map comparison. Manuscript submitted for publication.
- Thompson, A., & Kent, G. (2001). Adjusting to disfigurement: Processes involved in dealing with being visibly different. *Clinical Psychology Review*, 21, 665–682.
- Tyrell, A. C., Hetz, S. P., Barg, C. J., & Latimer, A. E. (2010). Exercise as stigma management for individuals with onset-controllable and onset-uncontrollable spinal cord injury. *Rehabilitation Psychology*, 55(4), 383.
- Warschburger, P., Calvano, C., Richter, E. M., & Engbert, R. (2015). Analysis of attentional bias toward attractive and unattractive body regions among overweight males and females: An eye-movement study. *PLoS One*, 10(10), e0140813.
- Wedel, M., & Pieters, R. (2000). Eye fixations on advertisements and memory for brands: A model and findings. *Marketing Science*, 19(4), 297–312.