Does Love Get in the Way of Engagement? A Mobile Eye Tracking Study of Museum Visitors at a Climate Change Exhibit

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Oler, J.R., Blodgett, G.R., Roberts, A., Zummo, L., & Lohani, M. (2025). Does Love Get in the Way of Engagement? A Mobile Eye Tracking Study of Museum Visitors at a Climate Change Exhibit. RANGE Journal of Undergraduate Research. Volume 26(2). In press.

ABSTRACT

With climate change being declared a global crisis, awareness of its adverse effects is increasingly critical. Public awareness of the impact of climate change is a crucial step towards implementing solutions for the climate crisis, and museum exhibits provide an effective means of distributing this climate change knowledge to the public. Therefore, maximizing visitor engagement with presented information is essential for spreading updates on climate change challenges and solutions. This study focused on social connection as a factor that can influence visual engagement and information intake in a museum exhibit environment. The potential link between social connection and visual engagement was tested by examining adult visitors to a climate change exhibit at the Natural History Museum of Utah. In total, there were 50 groups of between two and five visitors who came to the museum together and already knew each other socially (such as friends, romantic partners, etc.). One visitor in each group wore a mobile eye tracker as they explored the exhibit. Visual engagement was measured by the total time spent fixated on relevant areas of the climate exhibit. After completing the exhibit, visitors answered self-report questions about the quality of their social connection with their group members. The self-reported social connection was rated as very good by most participants and showed little variability. Non-significant associations between social connection and visual attention were found, and low variability may have impacted these results. However, the social connection type showed an interesting pattern with the presence or absence of romantic partners predicting visual attention. The follow-up analyses revealed that visitors who visited the museum with a romantic partner paid less attention to climate change-relevant information overall, and specifically to the positive areas of the climate change exhibit. These findings suggest that visiting the exhibit with a romantic partner present, rather than with other social connections, may be detrimental to visually engaging with the climate change exhibit. Further work is needed to explore the underlying mechanism that may lead to differences across social connection types and to determine what efforts can be taken to overcome any negative impacts this difference may have on engagement with climate change exhibits.

INTRODUCTION

Climate change poses a significant concern for the world, and it has been declared a global threat to humanity (United Nations, 2021). While some scientists have referred to this climate crisis as a potential mass extinction event that could wipe out humankind (Bellard et al., 2012), others have projected broad declines in quality of life and natural resource supply if the crisis continues on its current course unchecked (Arnell et al., 2016). Given that climate change presents an impending threat to the human species and life on earth as a whole, it is important to take steps towards mitigating its effects. Public awareness of climate change and its impacts is a crucial first step to motivate engagement in addressing climate change on a large scale (Abbasi & Nawaz, 2020; Gifford, 2011). This is because heightened awareness and understanding of climate change have been found to be positively associated with both understanding of climate change risks and stronger intentions to implement strategies for addressing climate change (van Valkengoed et al., 2024). Museum exhibits are a valuable medium for providing informal learning opportunities and raising awareness of the consequences of climate change (Sutton, 2020). These learning experiences can be valuable in fostering a better public understanding of climate change, thereby facilitating engagement in solutions to address the climate crisis. In other words, evidence-based climate change information presented in the form of a museum exhibit is an informal yet informative way for people to accurately learn about the climate crisis and what they can do to help mitigate it (Sutton, 2020).

Museums are presumably effective as tools for climate change learning when visitors can engage well with the information presented in the exhibits, and visual attention has been shown to be a vital component in maximizing understanding of exhibit information (Evans et al., 2011; Lohani et al., 2025b; Janney et al., 2025). Within a museum setting, exhibits are designed by curators to maximize engagement with the exhibit content and minimize distractions (Allen, 2004). However, there are aspects outside of the content itself that may play a role in engagement with the exhibit. For instance, museum visits are often a social activity for visitors (Ha et al., 2021). In fact, many museums report that approximately eighty percent of museumgoers visit in groups rather than alone (Neves, 2002). Given that visitors often engage with museum exhibits in social groups, an important individual difference variable to consider is social connection.

Social connection is defined as the extent to which an individual feels attached to others in their environment and secure within their relationships (Mickley Steinmetz et al., 2024). Past work has shown that social connection can affect visual attention and perception (Laforest et al., 2021). For example, the presence of social support can alter the perceived steepness of hills (Schnall et al., 2008), increase the time spent viewing positive images when participants are in the presence of familiar others (Laforest et al., 2021), and increase the likelihood that an individual will think positively of a stimulus if others in their environment view it repeatedly (Capozzi & Kingstone, 2024). Even a minimal amount of social connection (such as the physical or implied presence of a peer) has been shown to significantly influence visual attention and perceptual processes (Laforest et al., 2021; Richardson et al., 2008). This prior work informs the aim of the current study: to examine how social connection influences visual engagement with a climate change museum exhibit. Based on past literature, there are at least two broad associations that social connection could have with attention in the climate change museum environment – it may *impede* or *facilitate* visual attention to climate change information. Gaining insight into

whether social connection facilitates or impedes visual attention to climate change information has important implications for how the public processes and responds to this critical issue.

Social Connection Could Impede Visual Engagement

One possibility is that social connections with fellow museum visitors could act as a distraction or consume valuable cognitive resources, thereby limiting attention paid to museum exhibit content. Social distractions, such as unrelated conversations between individuals in one's group, can prevent groups from paying attention to and engaging with climate change content. Previous research has shown that social distraction adversely affects both visual attention in the moment and long-term memory formation from the experience (Doherty et al., 2017). When individuals attempt to manage two tasks simultaneously, such as attending to social information and engaging with museum exhibit content, they must frequently switch between tasks, which increases cognitive demand and can reduce efficiency on both tasks (Rubinstein et al., 2001). Therefore, we would expect that museum visitors' climate change learning experience may be less productive when they are distracted by social interactions. In the long term, memory and knowledge acquired from the exhibit may also be more difficult to recall and apply to new contexts because of the increased cognitive load in the moment (Schmidt, 2020), which would defeat the goals of museum-based learning and climate engagement. Furthermore, as collaborative discussion has been shown to enhance subsequent individual memory (Vredeveldt et al., 2016), visitors who are distracted by unrelated social interactions and do not review the relevant exhibit content together are less likely to retain the information (Bitgood, 2015), thereby limiting the positive impact of the exhibit. This supports the possibility that strong social connections may negatively impact visual engagement with climate content by increasing the cognitive load due to social distraction, ultimately hindering efforts to build public awareness of climate change.

Social Connection Could Facilitate Visual Engagement

In contrast, another possibility is that social connections facilitate greater engagement with museum content. This possibility is supported by prior research showing that social connection may enhance cognitive processing and retention of information (Augustinova & Ferrand, 2012; Costley, 2019; Garrison et al., 2010; K.L. Marsh et al., 2009; Macrae et al., 2008). For example, social connection may improve cognitive functioning by reducing stress and freeing up attentional resources for the task at hand (Ihle et al., 2018; Lanfranco et al., 2023; Zautra et al., 2014). (K.L. Marsh et al., 2009). In the context of the present study, these additional cognitive resources could support more careful examination and deeper understanding of the museum exhibit. Social support may be particularly relevant given that climate change-related stimuli often elicit strong negative emotional responses (Ágoston et al., 2022; Pihkala, 2022). Furthermore, while not directly related to visual attention, enhanced social connection can improve memory storage and retrieval of events experienced together (e.g., Costley, 2019; Macrae et al., 2008), which would likely lead to improved memory of exhibit information. Overall, this provides some initial evidence that social connection may free up cognitive resources, leading to greater engagement and retention of museum exhibit content.

Additionally, individuals may spend more time looking at relevant stimuli in order to create shared experiences of joint attention and perception. *Joint attention* is a link that ties an individual's experience to their social environment, consisting of two or more people knowingly paying attention to the same object in their shared space (Povis & Crowley, 2015). These shared experiences can be a tool for increasing the amount of time spent viewing climate change

information. Individuals may have a greater desire to move in synchrony and spend more time viewing exhibit content with their group members as a means of strengthening their social relationships (K.L. Marsh et al., 2009). Furthermore, research has shown that moments of joint attention and perception can enhance cognitive functioning and improve awareness of the environment for those involved (Macrae et al., 2008; Knoblich & Sebanz, 2006). Increased awareness of one's environment may enhance understanding of exhibit content, which would help improve public awareness of climate change. Thus, the link between social connection and joint attention may facilitate coordinated focus and engagement with the climate content presented at the exhibit (Wolf et al., 2016). This provides additional support for the possibility that greater social connection may lead to increased visual engagement with museum content. However, this link has yet to be tested directly. The current study aims to address this gap in the context of a climate change exhibit. Results of the current study will contribute to our understanding of how to best facilitate learning about climate change in a museum setting.

The Current Study

To our knowledge, the links between social connection and visual attention in the context of climate change information remain unexplored. The immediate goal of this study was to address this gap in the literature by investigating how social connection may affect attention in climate change museum environments, with a long-term goal of building public awareness of climate change and its mitigation strategies effectively. To study how people engage with climate change information in a museum context, this study utilized the Natural History Museum of Utah's "Climate of Hope" exhibit, a science-based exhibit on climate change. All participants were museum visitors in groups to ensure that an element of social connection was present while exploring the exhibit. Social connection was assessed using self-report survey questions answered by each participant. To objectively measure visual engagement, one participant per group was given a mobile eye tracker to track the information they paid attention to while visiting the climate exhibit.

Hypotheses

Based on the existing literature, we tested two alternative hypotheses. On the one hand, we expected that increased reported levels of social connection would be correlated with increased attention paid to climate change-relevant information in museum exhibits. This was due to previous research that found increases in cognitive facilitation through social connection, including enhanced awareness via joint attention and perception, more cognitive resources being available for an individual to use, and improved memory storage of the experience, which could boost climate engagement in the long term (Costley, 2019; Garrison et al., 2010; Ihle et al., 2018; Knoblich & Sebanz, 2006; Lanfranco et al., 2023; Macrae et al., 2008; K.L. Marsh et al., 2009; Povis & Crowley, 2015; Wolf et al., 2016; Zautra et al., 2014). Alternatively, it was predicted that social connections would be a distraction and impede visual engagement with the climate exhibit due to increased cognitive load (Bitgood, 2015; Doherty et al., 2017; Rubinstein et al., 2001; Schmidt, 2020), thereby limiting the climate exhibit's goal of spreading awareness.

METHOD

Participants

All participants were visitors to the Natural History Museum of Utah in Salt Lake City, where the data collection for this research took place. This study included 50 groups of participants. There was no attrition and all participants who agreed to participate also completed the study. The groups included in the study ranged in size from two to five participants. For age,

the inclusion criterion was being an adult (minimum of 18 years old). All participants were expected to have a basic understanding of English. Participants who had previously viewed the "Climate of Hope" museum exhibit were excluded to avoid pre-existing biases toward the exhibit's content, which may have been influenced by prior exposure (Ferrari et al., 2011). Additionally, at least one member of the group was required not to wear corrective lenses for their vision as a requirement for the eye tracking portion of the study.

One participant per group wore an eye tracker (refer to eye tracking methodology and metric section for selection process), and these fifty survey responses were the only ones considered for this study because the visual engagement metric (from the equipment) was required in our analysis. Of the respondents considered, the age range for participants spanned from 18 to 83, with an average age of 36. A slight majority of participants identified as male (56%, $n = 28$), with the remaining participants identifying as either female (40%, $n = 20$) or genderqueer (4%, $n = 2$). The participants identified themselves as Caucasian (76%, $n = 20$), Hispanic or Latino (12%, $n = 6$), Black or African American (4%, $n = 2$), Asian (4%, $n = 2$), or as having multiple ethnicities (4 %, $n = 2$).

Measures and Materials

Eye Tracking Methodology and Metric

Mobile eye tracking was utilized for the attentional portion of the study as it is an accurate and validated method for capturing visual attention (Allen et al., 2020). This study utilized a Tobii Pro Glasses 3 mobile eye tracker (Tobii Pro, 2020). The device continuously monitored the participants' gaze patterns as they explored the exhibit. Visual attention to climate change-relevant information in the exhibit was the main outcome variable in this study. The primary metric of visual attention utilized in this study was total fixation duration, which was extracted from eye tracking data and processed using Tobii Pro Lab software. *Total fixation duration* is the duration of time (in seconds) that an individual spends looking within a predefined area of the visual content available to the participant (Ishrat & Abrol, 2022).

Each predefined region of the exhibit display, also referred to as an *Area of Interest* (AOI), was selected by research assistants prior to data collection based on what information in the exhibit was determined to be relevant to climate change. Every individual display, picture, video screen, paragraph, and exhibit piece was given its own AOI in accordance with practices of previous museum eye-tracking studies (e.g., Hsieh et al., 2022; Orquin et al., 2015). A manual review of every fixation was also conducted to ensure that the software accurately determined how much time a visitor spent looking at climate change-relevant museum exhibit content. This information, gained from the eye-tracker, is valuable as it explains exactly what the participant is looking at in a real-world setting and how much time they spend doing so. This was used in this study to infer how much attention a participant was paying to the exhibit content.

Social Connection

The social connection experienced by each respondent towards their group was measured immediately following the exhibit exploration using existing items selected from other surveys and adapted for this study. To assess the quality of social connections experienced by the respondents, participants were asked two questions. The first question was, "To what extent do you feel supported by the other persons present?" (Pauw et al., 2022). Participants reported their answers on a scale from one to five, with five representing the highest social connection. The second question was, "How good is your relationship with your relative/friend compared to most?" (Renshaw et al., 2011). Participants reported their answers to this question on a scale

from one to five, with five representing the best relationship comparatively. The answers to the two numeric response questions were then added together to create a social connectedness score ranging from one to ten, with a higher score implying a stronger social connection with the group.

Along with measures for the quality of social connection, participants were asked to categorize their type of social connection. Participants were given a forced-choice probe asking, "Who are you with?", and the available response options for this question were acquaintances, strangers, close friends, romantic partners, family, or other (Shackman et al., 2018). This was collected to compare social connections that exist across different types of relationships. Altogether, these survey responses can assess how socially connected the participant feels to their group members in the museum environment.

Procedure

In fall 2024 and spring 2025, participants were recruited directly from the Natural History Museum at the University of Utah. Eligible groups of visitors were approached and asked if they would be interested in participating in a study on the fifth-floor exhibit. Potential participants were given a brief overview of the study to gauge their interest. This overview explained that participants would be given free admission and laid out a basic structure for what the visitor's role in the study would be, including exploring an exhibit while wearing an eye tracker and answering survey questions before and after their experience. If participants asked to know more about the study, follow-up questions were answered (such as the expected time commitment of 45 minutes and what equipment would be used). If participants asked about the purpose of the study, they were informed that it aimed to learn how visitors interacted with the exhibit. If the visitors agreed to participate, they were then given free admission and taken to a conference room on the fifth floor to complete pre-screening questions. During this walk, a specific route to the conference room was taken that prevented participants from seeing the exhibit before the setup portion of the study had concluded.

After participants arrived at the conference room to begin the study, each group member was given an informed consent form to read through and sign. Once each participant had acknowledged their written consent to participate, it was then stated to the group that participation was completely voluntary and that they were free to discontinue their participation at any time. Following this, the participants were given an overview of the study's procedure. This overview included a disclosure that the eye tracker a participant would be wearing recorded continuous audio and video. Participants were informed that the goal was to make the experience as naturalistic as possible, and that their task was to navigate the exhibit as they normally would and interact with it according to their preference, which could include conversations among themselves if they so desired.

Only one eye tracker was available for use in this study, so participants chose for themselves who in the group would wear the eye tracker, with the only requirement being that the individual didn't wear corrective lenses. Once the decision was made, the designated participant was set up with the eye tracker. The eye tracker was positioned on the participant's face in the same manner as normal prescription glasses and properly tightened to ensure stability before being configured for data collection (see Appendix). All group members received an iPad to carry with them during the exhibit and then answered the pre-exhibit questionnaire to ensure that the setup portion was complete. Next, participants walked to the exhibit on the same floor. At the exhibit entrance, participants were oriented to the intended route through the exhibit and

then told they were free to explore the exhibit. Participants were also informed that the research team would be available outside the exhibit if they required any assistance. Participants then explored the exhibit at their preferred pace. During this time, researchers were seated outside the entrance to the exhibit, watching the live video feed from the eye tracker. Most groups spent approximately 20-30 minutes at the exhibit.

Once all participants had completed the exhibit, the group was approached and directed to return to the conference room to complete the remaining post-exhibit survey. Upon the group's return to the conference room, the eye tracker was removed, and participants completed the post-exhibit questionnaire. During this phase of the study, participants answered questions about how socially connected they felt with their group members and some demographic questions. Once the survey was complete, participants were offered a gift shop prize as a token of appreciation for participating in the study and were then walked back into the general museum area to spend the rest of their time at the museum as they pleased. Altogether, groups typically took around 45-60 minutes to complete the entire process.

Data Analysis

This non-experimental study investigated the relationship between social connection and attention in the museum environment, with two alternative hypotheses: that self-reported social connection would be positively or negatively associated with visual attention. *Visual attention*, operationalized in this study as total fixation duration, was a continuous variable. *Social connection*, operationalized in this study as social connection composite score, was a discrete variable.

General descriptive statistical testing was performed first to measure the center and spread of social connection and visual attention. The measure of central tendency in both instances was the mean, and the measure of spread was the standard deviation. Following this descriptive analysis, Pearson's correlation coefficient was calculated, with social connection score as the predictor and total fixation duration as the outcome. This correlational testing allowed the study to determine whether there was a statistically significant association between social connection and visual attention in the museum environment.

RESULTS

Descriptive Statistics

In response to the question regarding the level of support the 50 participants (those who wore an eye tracker) felt from their group members, the responses varied from somewhat to extremely supported, with no participants responding that they felt completely unsupported. The majority of participants (56%, $n = 28$) reported that they felt very or extremely supported by their group members. Figure 1 provides a visualization of participants' responses to the first social connection item, which measured the level of social support. The second social connection question assessed the quality of participants' social connections with the social group members they were visiting the museum with (see Figure 2). Surprisingly, an overwhelming majority of participants (96%, $n = 48$) rated their social connection quality as the highest option available. Responses to both social connection questions were given separate figures to showcase the difference in response quality between the two questions. The mean social connection composite score was 8.6 with a standard deviation of 1.2.

Participants were also asked to respond to a qualitative forced-choice measure, asking with whom they were visiting the exhibit. A significant majority of participants reported that they were visiting the museum with only a romantic partner (62%, $n = 31$), with the next closest

category being only with a friend or friends (14%, $n = 7$). The different social connection types are shown in Figure 3. Total fixation duration was used as the primary eye-tracking metric for measuring visual attention to the relevant areas of the climate change exhibit. The mean total fixation duration for participants was 487.4 seconds with a standard deviation of 256.0.

Inferential Statistics

Planned Analysis

To test the proposed hypotheses that social connection would have a significant association with visual attention, correlational analyses were performed. Pearson's correlation coefficient was calculated to determine whether an association existed between the composite social connection score and total fixation duration, which at an alpha level of .05 did not return statistically significant results, $r(48) = .22$, $p = .134$.

To examine the possibility that image valence might impact the findings, nineteen museum visitors were surveyed separately from the central study and asked to rate the positivity and negativity of each area of interest in the exhibit. The links between social connection and visual attention were examined separately for negative (25% most negatively rated) and positive (25% most positively rated) portions of the exhibit. For total fixation duration in negative areas of interest and social connection score, no significant association was found, $r(48) = .18$, $p = .202$. There was also no significant association found for total fixation duration in positive areas of interest and social connection score, $r(48) = .12$, $p = .426$. As none of the correlations showed statistically significant results, the self-reported social connection scores were not significantly associated with visual attention to climate content overall, visual attention to positive climate content, or visual attention to negative climate content.

Exploratory Analysis

We noticed that the type of social connection among group members was consolidated into two main groups – 36 participants visited the exhibit with a romantic partner, and 14 visited with other types of social connections. Exploratory follow-up analyses were performed on the presence versus absence of romantic connection to determine whether there were statistically significant differences in total fixation duration between the two social connection types. The assumption of homogeneity of variance was met, and no corrections were needed. An independent sample *t*-test was performed to examine whether the presence vs. absence of a romantic partner predicted significant differences in the visual attention to climate content (measured by total fixation duration). As presented in Figure 4, individuals who viewed the exhibit with a romantic partner present were found to have a significantly lower total fixation duration ($M = 425.1$, $SD = 195.2$) than those without a romantic partner present ($M = 647.5$, $SD = 325.6871$), $t(16.765) = 2.393$, $p = .029$.

To further explore how social connection type may predict visual attention, separate *t*-tests were performed for positive and negative areas of the exhibit. For negative areas of interest, there was no significant difference in total fixation duration between the romantic partner ($M = 131.2$, $SD = 96.8$) and other group ($M = 202.5$, $SD = 174.1$), $t(16.225) = 1.448$, $p = .167$; see Figure 5. For positive areas of interest, a significant difference in total fixation duration was found between the presence ($M = 182.1$, $SD = 91.4$) and absence of a romantic partner ($M = 287.4$, $SD = 138.4$), $t(17.6) = 2.631$, $p = .017$. As presented in Figure 6, individuals who visited the exhibit with a romantic partner had a lower total fixation duration on the positive exhibit information compared to those who did not come in with a romantic partner.

DISCUSSION

With the worsening impact of climate change, fostering public understanding of its risks and the urgent need for mitigation has become increasingly critical (McMichael & Lindgren, 2011; Lohani et al., 2025b). Building public awareness of the causes and consequences of climate change is essential for helping to slow its accelerating trajectory (Abbasi & Nawaz, 2020; van Valkengoed et al., 2024). Given that museum exhibits are an effective means of disseminating knowledge about climate change, understanding social factors that may impact the museum experience is vital for creating an optimal learning environment (Sutton, 2020; American Alliance of Museums, 2018). The goal of this study was to investigate whether social connection is linked to visual engagement with climate change information presented in a naturalistic museum setting. We found that the presence versus absence of romantic partners may play a significant role in how museumgoers visually engage with a climate exhibit. This study presents novel findings and informs how the type of social connection among museum visitors may play a role in effectively disseminating climate change content and building awareness among community members.

Findings from Self-reported Social Connection Levels

Based on existing literature, we had hypothesized that there would be an association between social connection and visual engagement. One possibility was that social connection might help visual engagement by facilitating cognitive processes (K. L. Marsh et al., 2009; Macrae et al., 2008). However other evidence suggested that it might hurt visual engagement by acting as a distraction from relevant information (Bitgood, 2015; Doherty et al., 2017). Our planned analyses revealed that self-reported social connection was not significantly associated with visual engagement. An important underlying explanation for this insignificant finding is the lack of variability in our items measuring self-reported social connection quality. Despite using existing measures to measure social connection (Pauw et al., 2022; Renshaw et al., 2011; Shackman et al., 2018), we observed a large ceiling effect. While variability was present in the social support question, 48 out of 50 participants (96%) reported the quality of their social connection to be “very good”, which was the highest possible value. Such a ceiling effect suggests that there may have been biases or inaccuracies in our self-reported measure of social connection, which presents a limitation in interpreting the results (Wang et al., 2008). Notably, past research on social connection has primarily been conducted in controlled lab environments rather than the more naturalistic museum setting (e.g., Doherty et al., 2017; K. L. Marsh et al., 2009; Laforest et al., 2021; Richardson et al., 2008; Wolf et al., 2016). Community members in the current study may have been impacted by social desirability bias, given that their relationship partners were present during the self-report process. While self-reported social connection levels did not provide variability in responses, exploratory analysis of social connection type yielded interesting findings.

Exploratory Analysis with Social Connection Type

An exploratory analysis was conducted to determine whether visual attention differed between types of social connection. An initial review of the categorical data revealed a clear pattern, with romantic partnerships being the most frequent type of social connection among participants who entered the exhibit. We explored whether the presence or absence of a romantic partner while visiting the exhibit could predict visual engagement with climate information. Interestingly, when an individual had a romantic partner present, they had a lower visual engagement (i.e., total fixation duration) with climate change-relevant information. In other words, participants who had romantic partners in their group spent less time overall looking at

the climate content presented at the exhibit compared to those who did not have a romantic partner present. The current finding is supported by previous research, which has shown that individuals typically have a greater percentage of their attention captured and become more distracted by people they find physically and romantically attractive (Nakamura et al., 2017). Additional research suggests that individuals tend to spend more time observing people they perceive as familiar, relevant, and important (N. Marsh et al., 2021; Diatze & Knowles, 2016). Furthermore, being in the presence of a romantic partner may take up more attentional resources than being around other types of social connections (Nakamura et al., 2017). Thus, participants with a romantic partner present may have spent less time viewing exhibit information than other groups due to the possible distraction created by a desire to socially connect with their romantic partners. Together, these findings suggest that the presence of a romantic partner may decrease visual engagement with climate content and could potentially be detrimental to the goal of spreading awareness with a climate exhibit; however, further research is needed to investigate this possibility.

Furthermore, it was found that the lower visual engagement was specific to positive areas of the exhibit. Specifically, the romantic group spent significantly less time in the positive climate content areas compared to the non-romantic group. In line with the current findings, past work has shown that the presence of social connection does not affect the amount of time spent viewing negative images, but it can increase the amount of time spent viewing positive images (Laforest et al., 2021; Richardson et al., 2008). A possible explanation for our study's findings is the motivation of the visitors to visit the museum. Notably, these visitors were not aware that they would be visiting a climate change exhibit. Although it was not specifically examined, it is possible that romantic partners came to the museum to spend time together. While relative total fixation durations between negative and positive areas show that the negative section of the climate exhibit was more attention-grabbing, it is possible that the positive sections (which always followed the negative) gave romantic partners more opportunity to interact and socialize. The positive content was more social as it emphasized community action and may also have been less intense in nature, which may have allowed the romantic partners to pursue their original goal of bonding while visiting the museum. However, this is speculative and context-specific data about motivations to visit the museum were not collected to confirm this explanation.

Alternatively, the romantic couples may have oriented their attention toward one another as a way of managing their emotions. Emotional coregulation, a process in which partners mutually influence and help regulate each other's emotional states, is common in romantic relationships (Butler & Randall, 2012). Additionally, recent research has shown that social support from romantic partners may be especially effective at reducing pain (Kreuder et al., 2018). Given that the negative section was always before the positive, romantic partners may have oriented their attention to their partner as a way of regulating their emotions and reducing the negative or painful emotions associated with learning about the negative impacts of the climate crisis. Given that attentional deployment is a common emotion regulation strategy in the context of climate change (Ágoston et al., 2022; Lohani et al., 2025a; 2025b; Zaremba et al., 2022), deployment of attention to one's partner may have helped the individuals in the current study feel better after being exposed to negative information on climate change.

Limitations and Future Directions

The findings of this study should be interpreted with several limitations in mind. First, the self-reported measure for social connection quality did not show variability, raising questions about self-report biases while measuring social connectedness in the presence of the other member of the relationship. The social presence of group members and experimenters may have contributed to the degree of connectedness being quite similar across participants, as research has shown that social presence can lead to inaccurate self-report data and over-reported levels of social connection (Lavidas et al., 2022; Latkin et al., 2017). This effect made it unlikely that the social connection scores accurately measured how socially connected participants felt to their group members (Wang et al., 2008). Future work should collect social connectedness separately, without the presence of others, to avoid this social desirability bias. Second, it may be beneficial to ask participants to rate the quality of their relationship with each of their group members individually, because it is possible that asking for an average value across the whole group muddles the unique relationships that an individual may have. An individualized assessment with each group member may lead to different findings. Third, it is unclear whether the romantic partners were actually focusing on their partner more relative to those who spent more time on the exhibit. Future studies on this topic could consider utilizing the romantic partner as a region of interest in the assessment of visual attention. While this is a computationally challenging metric to obtain (as the face changes for each video and moves dynamically across the exhibit), it would detail what the object of the romantic partner's attention is and whether they are fixating on their partner or on irrelevant areas instead. More broadly, it is challenging to determine what may contribute to the difference between romantic social connection and other types of relationships in this study. Further research should likely be conducted to closely examine the differences in visual attention and gaze patterns between romantic partners and family or friend relationships. Fourth, given this was an existing climate change exhibit, unlike lab-based stimuli, it was not possible to control the intensity or length of content in the positive and negative sections of the exhibit. This limits the ability of this study to make direct interpretations about negative versus positive content (as the intensity was most likely stronger for the negative than positive content). In future work, it would be beneficial to control for intensity and length across the different exhibit sections so that comparisons across the exhibit can be made. Finally, it remains unclear whether the findings would be different for museum exhibits with content other than climate change. The participants were not told that they would be specifically visiting a climate change exhibit prior to joining the study, and they may have had prior attitudes about climate change. It is also possible that some individuals may have decided not to visit if they were already aware of the exhibit's content, but this was not explicitly examined in our study. Further work is needed to understand whether the negativity associated with climate change content specifically is linked to differences across social connection types, and how pre-existing variables (such as political affiliation and belief in the climate crisis) may impact visual engagement.

Conclusion

In summary, the current study found that the type of social connection was associated with visual attention in a museum environment. Future studies are needed to investigate the cause of differences in gaze patterns between the types of social connection observed in this study. Further work is needed to determine what could be done to overcome the difference in engagement levels of romantic partners when compared to other social connection types. Perhaps awareness of this difference could help romantic partners overcome any potential reduction in

visually engaging with climate content. These study findings have implications for science communication and public outreach and highlight the importance of considering the role of social connections in climate engagement. More broadly, a better understanding of mitigation strategies and climate change as a whole in the public sphere is incredibly valuable and can help society work toward solutions that create a better future (van Valkengoed et al., 2024). Overall, the findings from the current study are a steppingstone for future research into optimal methods of communicating valuable information about climate change or other important topics to the general public.

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Figure 1

Participant Answers to Social Support Survey Question (Based on a Likert Scale with 5 Representing Higher Perceived Social Support)

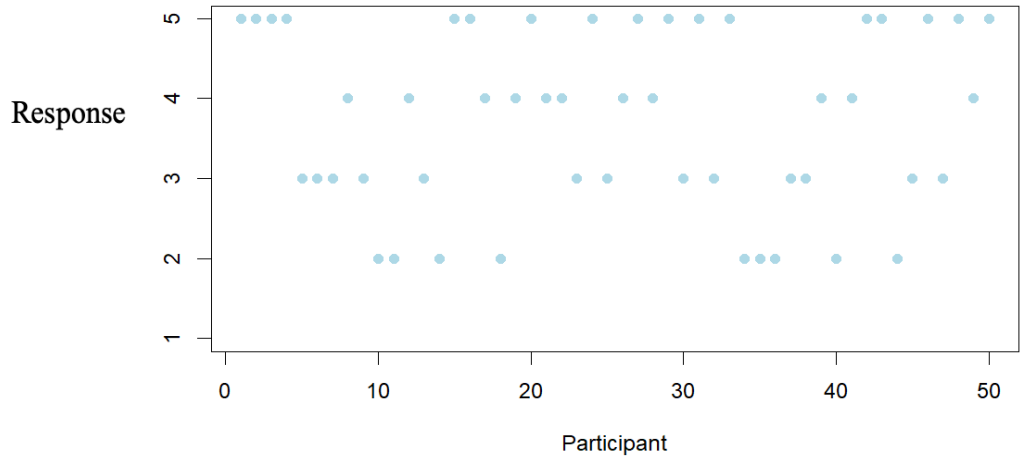


Figure 2

Participant Responses on the Quality of Social Connection (Based on a Likert Scale with Five Representing Higher Perceived Social Connection Quality)

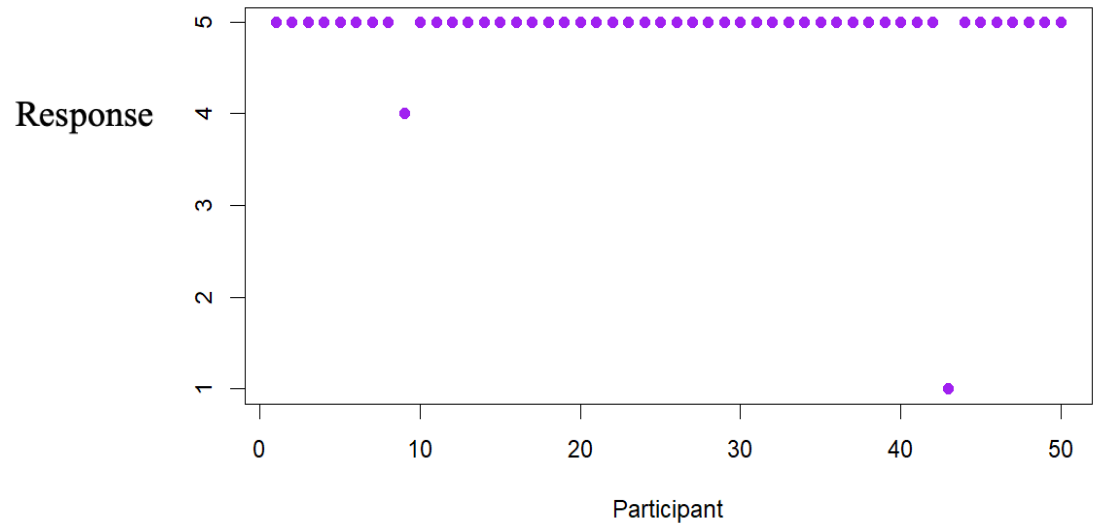


Figure 3

Categorical Information on Participants' Social Connection Type with Their Group Members

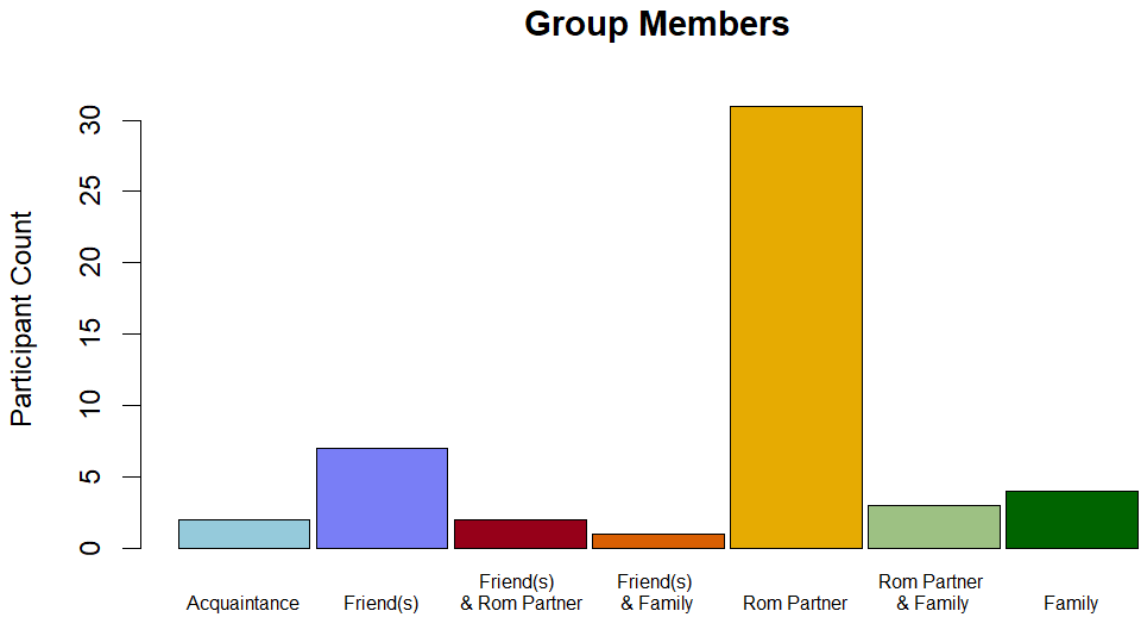


Figure 4

Total Fixation Duration (in Seconds) by Social Connection Type

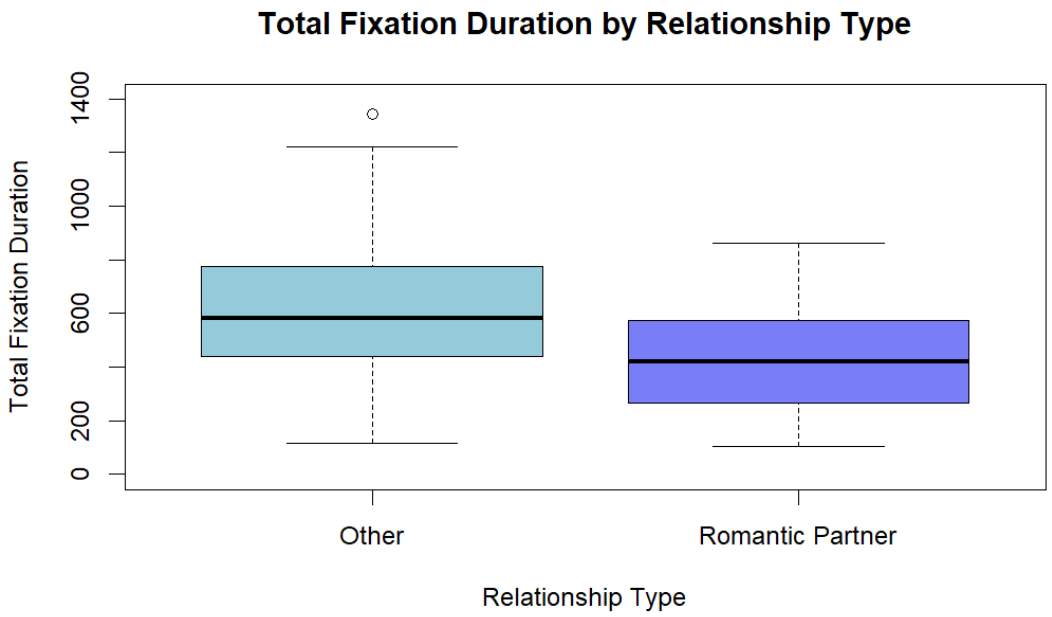


Figure 5

Total Fixation Duration (in Seconds) by Social Connection Type for Negative Areas of the Climate Change Exhibit

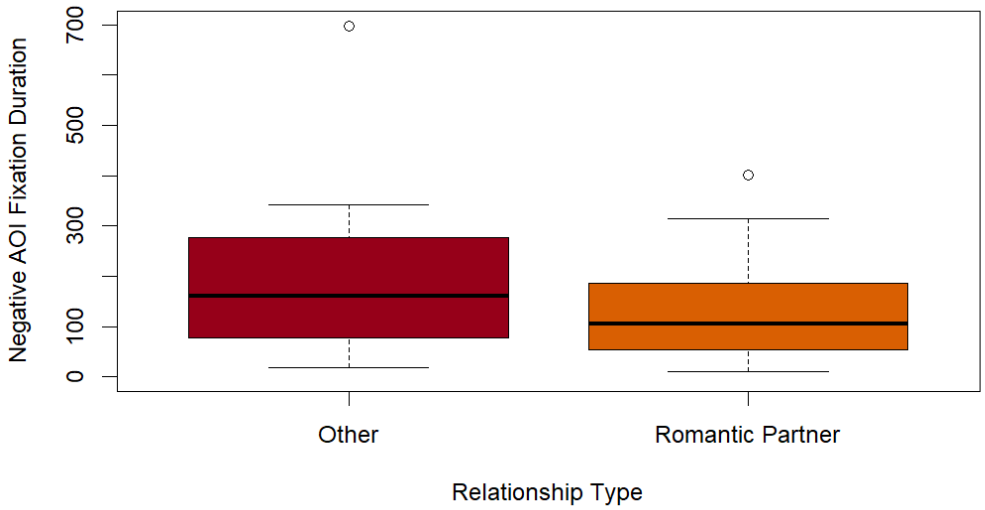
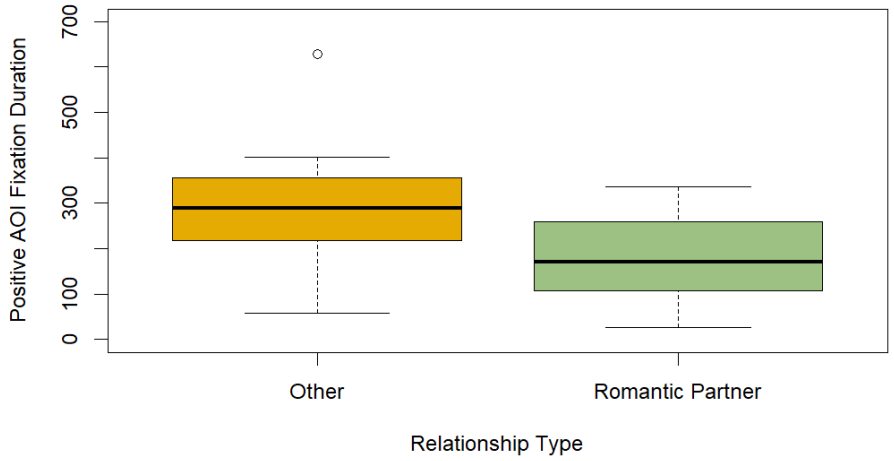


Figure 6

Total Fixation Duration (in Seconds) by Social Connection Type for Positive Areas of the Climate Change Exhibit



APPENDIX

Once the eye tracker is placed onto a participant's face, it needs to be trained on where the person is looking. This process is referred to as the calibration of the eye tracker. The eye tracker calibration process is the means by which an eye tracker acclimates to the gaze patterns of the wearer, and the process utilizes a calibration card to accurately assess the wearer's eye shape and determine the specific point at which the individual is looking from (Tobii Connect, 2023). The calibration process was brief and easy to implement. A research assistant would stand up and hold the calibration card (a white card with a black circle and a black dot in the center of the circle) in place against a wall. The participant would then stand approximately two feet from the card and look at the black dot in the center (as shown in the photo below). While the participant was looking at the black dot, the eye tracking software would learn where the participant's visual attention was focused. Once the eye tracking software had accurately calibrated, an audible ding sound effect would play, signifying to both participant and researcher that the process was complete.