

The Effects of Signs on Unwanted Touching of Museum Displays

By

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Abstract

Museums struggle with the issue of visitors touching the artworks without consent, sometimes causing extensive damage. Although this is an important issue, no known empirical data on the frequency of touching art pieces or how to decrease such damaging behavior exist in the peer reviewed literature. An alternating treatments design was employed to test three sign conditions: a directive sign indicating a direct message, a rationale sign telling visitors why they should not touch the display, and a rationale plus graphic sign (i.e., addition of a supporting visual). These sign conditions were tested against a baseline condition of no sign. An observing response component of a double-sided sign directed visitors to move around the sign to see the message on the back, increasing the chances that visitors read and complied with the sign. Results indicated that the signs were effective in decreasing touching but there were no significant differences between the three intervention conditions. Those visitors who engaged in the observing response showed zero rates of touching. Results are discussed in terms of antecedent control of behavior, and the further application of behavioral science to understudied areas.

Keywords: museum, touching, visitor, sign, observing response

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Literature Review

Museums are beloved cultural institutions that people visit to marvel at priceless art and artifacts. In 2020 in the United States, 76% of leisure travellers participated in cultural activities that included visiting a museum (American Alliance of Museums, 2020). A Canadian heritage survey in 2015 documented 75 million physical visits to institutions across the country that year (Hannay, 2018). Museums create a space of learning where visitors gain access to portions of history not accessible in everyday life, and they are “responsible for the tangible and intangible natural and cultural heritage” (International Council of Museums, 2017, p. 3).

Museums and related cultural institutions strive to preserve the items in their collection and display them in a way that will both entertain and educate visitors. This effort includes ensuring that the collection is kept in good condition, is displayed appropriately and is visually accessible to all who wish to visit the institution (Ontario Ministry of Heritage, Sport, Tourism and Culture Industries, 2017). Above all, the museum must prioritize the protection of their collection, as collections are intended to capture parts of history in hope of preserving and educating the public for decades to come (International Council of Museums, 2017).

When exploring a museum, visitors can become so curious about the works they are viewing that they are compelled to reach out and touch them, brush against objects unintentionally, or touch objects because they are unaware of the rules (intentional or unintentional contact). Candlin (2017) observed large numbers of visitors touching displays at the British Museum. She interviewed both museum volunteers and visitors and found that touching was very prevalent, with some visitors seemingly confused about what was expected of them in terms of handling the artworks. While only a small minority of visitors vandalize pieces (Gamboni, 1997), many touch displays because of sheer curiosity or confusion about the rules of the museum (McGregor, 2008). An example of this latter point can be seen in contemporary art.

Many contemporary artists stray from using well-known materials and instead create art from objects and materials found around the home, causing the works to resemble everyday objects that can be quite confusing to museum visitors (Abdullah & Hansen, 2011). Visitors may touch these strange pieces of work because they are unaware that they are part of the exhibition.

Yayoi Kusama's infinity mirrors exhibit is an example of contemporary art where visitors walk inside small rooms filled with mirrors and colourful sculptures (Art Gallery of Ontario, 2016). When the exhibit was on display at the Hirschorn Museum in Washington, DC, a visitor stepped off the platform inside of one of the infinity rooms in the exhibit and stepped onto a fiberglass pumpkin. The damage was estimated at \$800,000, and a new pumpkin had to be sent by the artist from Japan (Hauser, 2017). A less likely but documented reason for art damage is intentional vandalism (Gamboni, 1997). For example, the National Gallery of Canada experienced 97 incidents of damage between 2001 and 2008, including public urination on a statue, words carved into a sculpture, and chewing gum stuck to a sculpture (McGregor, 2008).

Classen (2005) detailed how, in the late 17th and 18th centuries, touching art and artifacts was commonplace in museums, which were often displayed in private collections that enabled the owner to restrict how many people were viewing and touching the art. This implied that the pieces were not touched frequently enough to incur damage. Even when museums opened to the public, visits were restricted to small numbers of people, and it was common for the curator to accompany visitors on a tour of the museum and allow touching for further inspection of pieces (Classen, 2007). Over the years, museums began to accommodate large numbers of visitors and curators changed their attitudes, considering that allowing all visitors to touch the pieces would cause too much damage. Therefore, museum administrators discourage or prohibit visitor touching, and touching has become taboo (Candlin, 2006). Conservators work collaboratively

with other staff to find ways to display the works in an open and engaging manner without risking damage to the pieces themselves (Narkiss, 2009).

Conservation is a major department in all museums no matter the size. Whether the institution has a team of in-house conservators or hires contract workers, museum budgets prioritize conservation services (Royal Ontario Museum, 2020), and allocate substantial amounts of money for restoring and repairing the art and artifacts in their collection as part of their commitment to the public. For example, in 2019, the Smithsonian institution (comprised of 17 different museums in Washington, DC) spent \$239.1 million on repairs and restorations (Smithsonian, 2019), while the Museum of Modern Art in New York City alone spent \$201,000 on exhibition utilities and repairs in the same year (Museum of Modern Art, 2019). Another art museum experienced approximately 60 incidents of damage between 2017 and 2019, one causing considerable damage that required five weeks of treatment and repairs totalling close to \$9000 in staff hours (M.S, personal communication, March 17, 2021). While repairs are indicated in the annual budget and value is not placed on each individual item that is repaired within a large institution, private conservators set rates for each piece on which they work and often require extended periods of time to finish repairing a piece (Art Business News, 2019). For example, cleaning a painting can cost \$100-150 per hour, paper cleaning can cost \$85-150 per hour and textile cleaning can cost \$60-175 per hour (Artwork Archive, 2020).

Even the smallest amount of handling can potentially result in extensive or irreversible damage. The human touch transfers oils from the skin onto the pieces which can be very damaging to the art. These oils build up over time and result in staining, abrasion, and breakage (Haines, 2016; Stolow, 1981). The Metropolitan Museum of Art outlined safe handling practices for various media, stating that a) metal should be handled only with gloves, since salts and oils

from the hands can etch into the surface; b) ceramics and glass should be handled with nitrile gloves to avoid staining; c) sculptures should be handled with gloves to avoid staining porous surfaces; and d) the surface of paintings should never be touched to avoid damage. Additionally, the surface of wooden objects can be easily scratched with jewellery; gloves should be worn when touching ivory and bone to avoid transfer of oils and moisture; and clean and dry hands must be used to touch paper objects to avoid staining (Mason, 2018; Shelley, 1987). Clearly, visitors handling art and artifacts is something museums deal with daily and attempt to balance preserving the collection with providing a stimulating experience for the public (Haines, 2016).

A common problem museums face is how to mitigate unwanted visitor touching while maintaining a pleasant and stimulating experience for visitors. Museums do employ interventions such as stanchions, plexiglass, signs, and platforms to discourage touching (Bailey, 2016), but no empirical data have been found regarding the effectiveness of these interventions. Anecdotally, interventions that physically limit interaction with the pieces, like stanchions and plexiglass, are most effective in reducing touching (J.R, personal communication, December 2020). However, the artist often requests fewer of these protective elements in order to enhance the experience of public viewing (M.S, personal communication, April 2021). In sum, there are little empirical data on the effectiveness of current museum strategies to curtail the amount of damage by human touching.

Antecedent Interventions

While no empirical approaches to decrease the touching of museum displays have been tested, prior applications of behavioral science to influence behavior are relevant and informative. For example, behavior-focused antecedent interventions have the potential to improve behavior (Kern et al., 2002). Antecedent interventions are prompts or instructions

posted before a behavior occurs in order to increase or decrease its occurrence (Kern et al., 2002). Examples of successful antecedent interventions include functional communication training (Carr & Durand, 1985), functional analysis (Iwata et al., 1982/1994), non-contingent reinforcement (Nolan & Filter, 2012), and the high-probability request sequence (Riviere et al., 2011). Antecedent-based interventions can be implemented quickly, conveniently, and with minimal financial and response cost.

Signs in Behavioral Literature

Signs can be classified as an antecedent intervention, as they are stimuli added to the environment to influence behavior. Signs can influence a wide variety of operant behaviors, and often require participants to engage in a desired behavior. For example, Van Houten et al. (1985) used signs as part of a treatment package to decrease motorist-pedestrian conflicts in crosswalks. Researchers provided information via four reflective signs with visuals of pedestrians signalling to cross the street indicating the percentage of motorists who yielded to pedestrians in the past week. Two types of signs were also placed at the crosswalk, one prompting drivers to yield to pedestrians and the second providing instructions to pedestrians on the proper way to signal an intention to cross the street. The antecedent manipulations were part of a larger consequence intervention to change behavior. Motorists who failed to yield to pedestrians were pulled over by the police, issued an informative flier and a warning ticket. Motorists who safely yielded were pulled over by the police and issued a reward package to thank them for yielding. The sign feedback, prompting of drivers and pedestrians, and enforcement condition increased both motorist yielding and pedestrian signalling behavior.

An additional study by Van Houten (1988) examined the effects of signs and advanced stop lines on motorist yielding to pedestrians. Two experiments were included in this study; the

first used a reversal design and the second, a multiple baseline across settings design. The first experiment implemented two signs reading “STOP HERE FOR PEDESTRIANS” and an advanced stop line painted on the pavement. Results showed a decrease in motorist-pedestrian conflicts and an increase in motorists yielding to pedestrians. The second experiment attempted to extend generality in that the same intervention was applied across two crosswalks. Results once again found a decrease in motorist-pedestrian conflicts and an increase in motorist yielding across both settings.

Similarly, Huybers et al. (2004) tested the effects of signs alone and signs paired with pavement markings on driver yielding behavior and conflicts between motorists and pedestrians. The researchers employed a multiple baseline across settings design at four crosswalks. Both white and yellow signs alone failed to increase driver yielding distance at one location, but moderately increased yielding distance at the three other locations. When the white sign was combined with pavement markings, a rapid and stable decrease in conflicts between motorists and pedestrians was observed.

In a related study dedicated to safe vehicle behavior, Geller and colleagues (1985) used a passenger in a vehicle to flash a sign prompt at drivers of adjacent cars to encourage safety-belt usage. Passengers flashed a card reading “Please buckle up-I care” to drivers who were not using a safety-belt and revealed the other side of the card reading “Thank you” if the driver buckled up. Out of the 893 drivers who turned their head to look at the flash card, 192, or 21% buckled up because of the message.

Austin et al. (2006) replicated the flashcard method to test the effects of prompting and feedback on cars making complete stops in a university parking lot. A volunteer stood in the parking lot holding a sign that read “Please stop, I care”. If the driver came to a complete stop

the volunteer revealed the reverse side of the sign that read “Thank you for stopping.” Data were collected for a specific location, where the sign and volunteer were both visible, and at another location, where only the volunteer was visible, thus evaluating the effect of the presence of a confederate without a sign. Both stops showed an increase in drivers making a complete stop, however, a more substantial increase was made at the first location where the sign and the observer were visible.

Similarly, Geller (2021) used a sign to prompt pedestrians to thank drivers for stopping at a crosswalk with a wave. The author placed a sign reading “Please Thank Drivers with a Wave” at two pedestrian crosswalks on a college campus. Results showed an increase in waving, demonstrating a successful feedforward procedure.

Fritz et al. (2017) used signs to investigate the effects of a sign on improper recycling. This study took place in a hallway inside a university where recycling material was being placed improperly in the garbage can. Researchers displayed a sign urging participants to properly dispose and recycle their waste and alerting them to the location of the trash and recycling bins. The trash bin, which was placed inside the classroom during baseline, was moved outside the classroom to stand beside the recycling bin during intervention. Results showed an initial increase in garbage left in the classroom, followed by a gradual decrease of the garbage in the classroom and an increase in proper recycling. Similarly, Kratzke et al. (2014) tested the effects of a control condition compared with a sign condition on proper waste disposal in a public washroom. A sign posted inside the washroom was effective at increasing proper disposal of waste; however, the study only ran for a brief time in one setting.

Mueller et al. (2001) tested the effects of signs on the number of students pushing in their chairs in a university lecture hall. Several students with wheelchairs found that they could not

safely navigate through the rows to find a spot because other students left their chairs in the aisles. A sign was placed on the front wall of the classroom that prompted students to push in their chairs to allow students with disabilities to have full access to the rows. These signs increased chairs pushed in by 20% across two classes.

While many studies involving signs encouraged participants to engage in a desired behavior, some studies used signs to decrease unwanted behavior. For example, Van Houten et al. (1980) tested whether public posting of motorist speeding influenced driver speeding. The daily and weekly average speeds of motorists on a specific roadway were posted on billboards and were effective at decreasing speeding among drivers. Ragnarsson and Bjorgvinsson (1991) replicated Van Houten et al. (1980) and posted signs indicating the percentage of drivers speeding daily. Researchers tested both a single posting of one sign and a double posting of two signs that were spaced out. Both conditions were effective at decreasing driver speed, emphasizing the effectiveness of signs to influence behavior without extrinsic consequences.

Nettle et al. (2012) tested the effects of signs on reducing bicycle theft occurring on a university campus. The intervention involved placing signs in three different areas where theft was most common. The signs consisted of a visual of eyes paired with the wording “Cycle thieves, we are watching you.” Thefts decreased significantly following this intervention, with numbers decreasing from 21, 13, and 5 thefts respectively in baseline to 7, 6, and 2 thefts during the intervention across locations.

Cope et al. (1991) noticed illegal behavior of drivers incorrectly parking in spots designated to handicapped individuals. The authors studied whether a message declaring the social effects of illegal parking rather than a threat of punishment influenced behavior. Researchers conducted a modified reversal design to test the effects of a visual sign alone versus

a visual sign paired with a message board. The visual sign was presented as a visual of the handicapped access sign painted into the parking spot, with the message board displaying “WARNING: THIS SPACE WATCHED BY CONCERNED CITIZENS.” This message highlighted the concern of neighborhood members and implied disapproval but did not threaten any consequences. A decrease in illegal parking occurred at both conditions, but a more dramatic decrease was observed when relevant visuals were paired with the message board.

Targeting a completely different behavior, Clayton and Blaskewicz (2012) used antecedent interventions to decrease urine spillage in public washrooms. The researchers placed signs over the urinal and a heat-activated visual inside the urinal to attempt to decrease urine spilling onto the floor in men’s washrooms. The visual in the urinal was a bullseye that was displayed when activated with the heat from the urine, which served as a consequence component. Using a multiple baseline across settings design, the authors found that both conditions decreased urine spillage significantly.

While signs are consistently shown to influence behavior, there is a lack of substantial research regarding the most effective content in signage. Warman et al. (2019) investigated the effects of the content of signs using three different messages. Three sign conditions were tested at an elementary school to measure the amount of proper sign outs of students by teacher assistants. The study found that a static sign showing the same message each day displaying “Please sign out your student” had no effect on behavior, whereas varying parts of the sign daily like the size and type of font showed a moderate increase. While the authors did not specify how the sign was changed every day, it was implied that the act of changing the sign in some way promoted behavior change. The third sign condition consisting of a humorous message was most effective at increasing the frequency of desired behavior.

To determine whether changing the sign influenced behavior, Vander Weg et al. (2019) compared static signs with signs that were changed daily and weekly. This study took place in an acute care ward of a veteran's hospital where staff were not complying consistently with hand hygiene protocols. Interestingly, the sign conditions did not have a positive effect on hand hygiene. The units that changed signs weekly experienced a decline in hand hygiene, while the units that changed signs daily and those units that did not change the hand-hygiene prompt experienced no significant change.

Parker et al. (2018) observed excessive touching and feeding of animals at a zoo setting which contributed to sickness in animals. Researchers tested four different sign conditions to find the most effective prompt to decrease touching and feeding. The conditions contained two variables: the content of the message and the type of visual. The content of the message was either non-specific or specific, with the specific message including a rationale of why touching and feeding were detrimental to both the animals and visitors. The visuals displayed on the sign were either eyes or pawprints. Results indicated that the presence of a sign saying "Do not feed" decreased feeding behavior but correlated with an increase in touching behavior. There were no significant differences between conditions, indicating that the use of visuals paired with written content was effective in influencing behavior (Perrine & Heather, 2000). This study did not include the use of signs without visuals, so authors could not determine whether the presence of both components of the sign were necessary (Parker et al., 2018).

Creating Effective Sign Prompts

The effectiveness of a sign depends on two factors- the content and the location. Geller conducted a series of field studies investigating the extent to which various constructions of signs as antecedent prompts influenced various behavioral targets. For example, Geller and colleagues

(1973) used two prompts designed to increase purchases of soft drinks in returnable bottles at a grocery store. These prompts included a handbill given to customers to promote the purchase of drinks in returnable containers and a public chart that posted daily purchases of returnable containers. The prompts were compared with a control condition, and the researchers varied the confederates used to distribute the handbill to customers. Additionally, either a single confederate or a group of confederates stood near the poster and read the information to draw attention to the poster. Results showed an increase in the purchase of soft drinks in returnable containers with the handbills present; and although there were several returning customers, the removal of the handbill in the control condition demonstrated a decrease in the purchase of soft drinks in returnable containers, emphasizing the importance of a constant prompt. Geller et al. (1977) also varied prompts on handbills to encourage proper disposal of the handbills for recycling in a grocery store. The authors noted that disposing the handbill in the correct location increased when the handbills specified the location of the trash receptacle for disposing of the handbill for recycling.

To increase safety-belt usage on a university campus, Geller and colleagues (1982) distributed fliers to drivers specifying either a contingent or non-contingent reward system. The contingent reward system was effective at increasing safety-belt usage, and the authors specified that use of polite language and a low response effort to engage in the behavior helped to increase occurrences of the target behavior. Several studies recommended that effective use of instructional cues (including written signs) include the need to continuously display the cue (Geller et al., 1973), the placement of the prompt in close proximity to where the target behavior should occur (Austin et al., 1993; Geller et al., 1985), the inclusion of specific instructions and a rationale for the desired behavior (Geller et al., 1977; Geller et al., 1985), and the message

should use polite and positive language (De Kort et al., 2008; Durdan et al., 1985; Geller et al., 1985). Additionally, the response effort for engaging in the behavior should be low in order to increase chances of compliance (Bennett et al., 2014; Bitgood, 2003; Geller et al., 1982).

These guidelines appear easy to implement and straightforward; however, there is conflicting research regarding the effects of a message on a sign. While some studies support the use of positive language on the sign (De Kort et al., 2008; Durdan et al., 1985; Geller et al., 1982; Sussman & Gifford, 2012), Newcomb and Newcomb (2020) found insignificant differences between messages written with “do” or “don’t,” signifying that either a negative or a positive-framed message can influence behavior. In contrast, researchers examining the effects of message-framing on the willingness to complete breast self-exams (BSE) found that a negatively framed-message that warned participants about the dangers of failing to participate in BSE was more effective at increasing attitudes and intentions towards BSE and increasing BSE behavior than was a positively framed or a neutral message (Meyerowitz & Chaiken, 1987).

Warman et al. (2019) found that a humorous message on a sign was more effective in changing behavior than a straightforward message, but Horsley (1988) found a humorous message to be confusing and was interpreted differently by many participants when compared to a straightforward message. While the specifics of message framing are conflicting, disseminating the intended message is the most important aspect of a sign. The content included on a sign needs to display a simple behavior-focused message (Meis & Kashima, 2017). Méard and colleagues (2008) asserted that signs are understood and internalized further when there is an understanding and personal relation to the content of the message.

Regarding visuals (i.e., pictures or graphics) included on signs, research indicates that visuals improve the influence of a sign on behavior, but too many visuals can be overwhelming.

Perrine and Heather (2000) found that including a visual on a sign placed over a donation box increased monetary donations more than a sign showing only text. Advertising literature (Decrop, 2007) has indicated that visuals increase the attractiveness of a sign and participants preferred a sign with a visual versus one with no visual. Van Meurs and Aristoff (2009) validated this sentiment, stating that visuals do increase motivation to look at the sign, but creators need to be cognizant that too many elements on a poster can be overwhelming to viewers. How many is too many was not defined, but researchers noted that all elements of the poster must be essential.

Sussman and Gifford (2012) tested the effects of signs with visuals to increase energy conservation in a public washroom setting. Signs were effective at increasing the duration of time that lights were off when no one was in the washroom. Two sets of visuals were used on signs to discourage touching of animals in a zoo, and researchers found no differential effects between the two visuals (Parker et al., 2018). A limitation of this study was that all the signs tested included a visual and therefore researchers could not determine whether the visuals were necessary to influence behavior.

There is still much to be learned regarding the content of signs, but a convincing body of empirical research suggests that signs are an effective means of managing behavior. When designing a sign for a museum setting, Bitgood (2003) suggested keeping text on the sign short, using a larger type size to increase readability and placing the sign near the target behavior. He suggested that visitors do not give much attention to signs and therefore, any signage needs to be brief, to the point, and ultimately motivate the visitor. Further suggestions include decreasing the perceived effort to read the sign, avoiding sensory overload, and engaging and interesting the viewer (Bitgood, 2003).

Observing Response

In the above-reviewed literature, signs have shown generally effective results. But for a sign to control behavior (to establish stimulus control), the individual must attend to it (Halbur et al., 2021). If the discriminative stimulus (e.g., a sign) is in place but the learner is attending to something other than that stimulus, a different stimulus has acquired control (Bickel & Etzel, 1985). While many researchers have established signs as an effective antecedent intervention, few studies have addressed the behavior of participants reading the sign. For example, Cox and Geller (2010) did not record whether participants looked at the signs but hypothesized that due to the placement of the prompt, the participants had to read the sign. To determine whether participants attended to the signs, Parker and colleagues (2018) recorded whether participants were near the sign for ten seconds or more and whether they acknowledged the sign through pointing or commenting.

Stimulus control can be increased by teaching learners to attend to relevant stimuli and using salient stimuli to capture attention (Herrnstein, 1990). An observing response is a response that “produces or clarifies a discriminative stimulus and that may be maintained by the effectiveness of the stimulus as a conditional reinforcer” (Catania, 2013, p. 452). Observing responses are often used in match-to-sample tasks and increase the learner’s attention to the discriminative stimulus, thus increasing correct discrimination between stimuli when responding (Wyckoff, 1952). Further, a differential observing response requires the learner to engage in different observing responses for each discriminative stimulus, which helps to increase attending (Grow & Leblanc, 2013).

The overall connection between the development of stimulus control by incorporating the observing response has been substantiated with key research. Dube and McIlvane (1999)

investigated stimulus over-selectivity among individuals with mental retardation. Three individuals participated in a match-to-sample task on a computer. Prior to implementing the intervention, participants were pretested on a handful of match-to-sample tasks. The researchers evaluated the effects of a differential observing response (DOR) procedure on a two-sample delayed match-to-sample (DMTS) task. Baseline consisted of six sessions with 36 trials of a two-sample DMTS task. The intervention was a compound DOR procedure involving a compound simultaneous matching trial in the sample observation period of the DMTS trial. The DOR procedure ensured that participants attended to all parts of the sample stimuli, as only one small element of the comparison stimuli changed. When participants touched the display area, three comparison stimuli were presented with the sample stimulus. In this display, one of the comparison stimuli matched both elements of the sample stimuli while the other two displays had only one matching stimulus. Selection of the correct stimuli revealed the DMTS task with individual stimuli that were presented in the comparison stimuli for the DOR procedure. Results indicated that the DOR procedure provided a quick and sharp increase in accuracy for two participants and a moderate increase in accuracy for the third participant.

Doughty and Hopkins (2011) applied an increased observing response to reduce stimulus over-selectivity for an individual with an intellectual disability. A 25-year-old man with a mild intellectual disability participated in a DMTS task on the computer during baseline that consisted of a simple observing response made by clicking on the sample stimulus before choosing a matching stimulus. Selection of the correct stimulus earned a token for the participant and flashed a star on the screen, while incorrect selection turned the screen black for 1.5 seconds as a “time-out.” Intervention increased the observing response to ten mouse clicks on the sample stimulus before selection of the matching stimulus. The introduction of the increased observing

response showed an immediate and dramatic increase in accuracy that was maintained throughout the condition, indicating that the observing response led to better performance.

In a related study, Kisamore et al. (2013) used a DOR to increase intraverbal responses among preschool children. The DOR required the children to attend to each relevant stimulus to increase stimulus control. Six typically developing children between four and five years of age who attended a preschool were involved. A nonconcurrent multiple baseline design was conducted across five participants, while a multiple baseline across behaviors was conducted on the last participant due to a lack of generalization between the procedures employed. During baseline, participants were instructed on intraverbal tasks involving synonyms and antonyms and received differential reinforcement for correct responses. Tokens were also received for unprompted, correct responses. The DOR intervention involved the experimenter saying the instruction and asking the learner to repeat the instruction and give the answer. The DOR intervention increased correct responding in four of the six participants who achieved mastery in the two intraverbal tasks with the help of the DOR procedure, demonstrating good experimental control.

The observing response is effective in increasing accuracy in match-to-sample tasks, and it is assumed that the increase in attending helps to increase accuracy (Doughty & Hopkins, 2011; Dube & McIlvane, 1999; Kisamore et al., 2013). Using signs as an intervention presents the problem of attending skills, as the sign can only influence behavior if the intended participant attends to the content of the sign. While some experimenters defined attending to the sign as focusing one's eyes on the content of the sign for a period (e.g., Parker et al., 2018) or turning the head towards the sign (Geller et al., 1985), there is no consensus as to what indicates that a participant has read the content of the sign. The observing response may increase the likelihood

that the participant read the content of the sign, and that any behavior change is due to the sign itself.

In sum, there is broad consensus in the artistic and historical communities that art needs to be preserved, and museums invest substantial amounts of financial and personnel resources into both preventing damage and refurbishing damaged art pieces. A scarcity of empirical research has studied this problem. Historically, it seems that museums tend to rely on antecedent procedures (i.e., signs, instructions warnings) to deter touching, but as of yet, no empirical study has tested the impact of such a prompting intervention in a museum. Thus, the current research examined the effects of signs on unwanted visitor touching in a museum setting. This study attempted to address several issues and answer the following questions.

- What are the effects of a sign prompt on unwanted visitor touching of museum displays?
- What are the effects of an observing response on unwanted visitor touching of museum displays?

The different signs tested in this study were designed using best practices (Bitgood, 2003), and were intended to test potential differential impact of a directive sign with a straightforward message, a rationale sign with an informative message and a rationale, and a rationale plus graphic sign with an informative message and a visual. An observing response was added to increase confidence in the sign's message being read. While most of the literature using sign conditions applied prompts to increase occurrences of desirable behavior, this study used sign prompts to decrease occurrences of undesirable behavior.

Method

Setting

The study took place in a large art gallery catering to all members of the public located in Ontario, Canada. The specific location of this study was in the atrium (27 x 63 feet; see Appendix A) with a hanging sculpture (see Appendix B). The artwork was a sculpture created by Haegue Yang and suspended from the ceiling and comprised of aluminum venetian blinds, powder-coated aluminum hanging sculpture, steel wire rope, LED tubes, and cable.

Participants

The participants involved in this study were the patrons who visited the art gallery on Wednesday evenings, Saturday afternoons and Sunday afternoons. Participants were any age and gender, and there was no inclusion or exclusion criteria for the study. Participants were labelled as adults (over 12 years old) and children (under 12 years old).

Materials

The materials for this study were two double-sided stanchions (see Appendix C) and three different signs, one for each condition (see Appendices D-G). Additionally, a cellphone with Zoom installed was used for interrater reliability of the behavioral observations.

Dependent Variables

The researcher observed 50 visitors per session from a vantage point on the second floor of the gallery (see Appendix B) and measured the frequency of visitors who touched the art piece. “Touching” was defined as the hands, feet, face, and/or other body parts of a person coming into contact with any part of the art piece. This included deliberate or accidental touching or brushing against the object. It did not include standing close with no part of the body

contacting the object. An additional variable measured was whether the visitor was a child or an adult.

The final variable analyzed was the observing response, defined as the visitor looking at the back of the sign, by either physically walking around the sign or leaning around the stanchion to read the back side of the sign. An observing response was scored if the visitor's head passed the front of the sign and then turned towards the direction of the back of the sign. The author then calculated the percentage of visitors who engaged in touching after completing the observing response.

Data collection occurred using direct observation in the institution on Wednesday evenings, Saturday afternoons, and Sunday afternoons. The author observed each session and two secondary observers (researchers) collected reliability data via Zoom during 36% of all sessions. The Zoom sessions consisted of the secondary observers taking data in real time via videoconferencing. The author took frequency counts of touching using a pen and paper. An analysis of the age of visitors who touched the art piece was calculated using a frequency of adults and children (separately) who touched the piece divided by the total frequency of visitors who touched the piece and multiplied by 100. The percentage of visitors who engaged in the observing response was determined using a frequency count of the number of visitors who engaged in the observing response divided by the total number of visitors and multiplied by 100. From the visitors who touched the art piece, a percentage of those who engaged in the observing response was calculated by dividing the number of visitors who engaged in the observing response and touched the art piece by the total number of visitors who touched the art piece and multiplying by 100.

Experimental Design

This study used an alternating treatments design (Perone & Hursh, 2013). A benefit of this design is the ability to begin treatments immediately and to test several treatments in alternation (Wolery et al., 2014). Each of the conditions served as a separate treatment and were run during separate sessions. Each of the sign conditions and a baseline condition with no sign were alternated between sessions with each condition staying up for at least an entire session and sometimes two consecutive sessions.

The alternating treatments design relies on visual inspection of the data to determine the effects of the separate interventions (Kratochwill et al., 2010; Lane & Gast, 2014). Experimental control was determined through the differentiation of the three conditions throughout the duration of the experiment, as well as the repeated measures of interventions with different subjects entering the gallery each session.

Procedures

The experimental conditions took place in the atrium in the gallery. We chose the art piece for the study based on an informal analysis of the most touched pieces of art within the gallery. The field study ran three days a week with each day serving as a session. The session timing was based on the most populated times judged by the museum staff. Sessions were run on Wednesday evenings, Saturday afternoons, and Sunday afternoons. Data for each session were collected from the time that the gallery was deemed busiest and finished when 50 participants were observed. Observation of 50 participants took about one hour. Two secondary observers performed interrater reliability via Zoom. The author used a cellphone with Zoom installed to provide a view of the gallery in real time and the observers took data with paper and pencil.

Independent Variables

Each of the sign conditions was placed inside a double-sided stanchion (see Appendix C) six feet from the chosen work of art. The placement of the stanchion was determined with the help of the museum staff to allow room for visitors to complete the observing response without touching the art piece and to be in a central location where all visitors entering the room would easily see the sign. Placement of the stanchions was documented via a photograph in case of accidental movement of the stanchion or movement for an evening event. The double-sided stanchion permitted the opportunity for an observing response by requiring the visitor to walk around to the back of the sign in order to view the directions located there.

Condition 1: Directive sign (Appendix E)

The front side of the sign read “Please look at the back of this sign!” (Appendix D) and the back side of the sign read “Please look and do not touch! Thank you!”.

Condition 2: Rationale sign (Appendix F)

The front side of the sign read “Please look at the back of this sign!” and the back side of the sign read “Please look and do not touch! The oils and contact from your hands can damage the artwork-even from just soft touches. Please work with us to protect valuable art. Thank you!”

Condition 3: Rationale + graphic sign (Appendix G)

The front side of the sign read “Please look at the back of this sign!,” and the back side of the sign read “Please look and do not touch! The oils and contact from your hands can damage the artwork-even from just soft touches. Please work with us to protect valuable art. Thank you!” Under the written message, there was a visual of a spiral fracture on a painting to show how delicate the artwork can be. Text under the visual read, “Damage like this spiral crack in a painting comes as a result of human touch.”

Social Validity

A survey assessing social validity (see Appendix H) based on the standards recommended by Wolf (1978) was administered to the museum's conservator following the study. The survey consisted of a mixture of multiple choice, rating scale, and long answer questions designed to solicit feedback on the social significance of the study, the appropriateness of the methods, and the importance of the results (Wolf, 1978).

Interobserver Agreement

Interobserver agreement (IOA) occurred during 36% of observation sessions, and during 40% of Baseline, Directive, and Rationale plus Graphic conditions, and during 25% of the Rationale conditions. Trial-by-trial IOA was collected by dividing the number of trials with agreement by the total number of trials and multiplying by 100 (Cooper et al., 2019). An agreement was defined as the two observers recording the same information about the age of the visitor, whether the visitor touched or not, and whether the visitor completed the observing response or not (only for the sign conditions). All three components had to match for the trial to be marked as an agreement. Each visitor observed was counted as one trial, with a total of 50 visitors observed per session. IOA was collected by two trained observers. Both observers attended 36% of the sessions overall and directly observed the visitors via Zoom connected with the author's cellphone. The paper-and-pencil data collection method was used to record data. The observers were trained on precise data collection using behavior skills training. Interobserver agreement had a mean of 94.5% with a range from 84-100%.

Treatment Integrity

Treatment integrity was measured by the same observers who took IOA. Treatment integrity was measured in 36% of all sessions, and 40% of Baseline, Directive, and Rationale plus Graphic conditions, and during 25% of the Rationale conditions. The observers recorded

whether the correct sign was placed in the stanchion, whether the sign was present for the entire observation period, whether the stanchions were placed in the right position beside the artwork of choice, and whether the stanchions were placed six feet from the art and facing the right direction as determined by the photo documentation of correct positioning. Integrity checks were completed at the end of the session. The author walked around the artwork with the observers on Zoom and showed the placement of the stanchion and the sign condition. Treatment integrity was 100% for the entire study.

Results

Across the entire study, nine visitors were observed touching the art piece. Figure 1 portrays the frequency of overall touches in each condition, while Figure 2 breaks down the rate of touching per hour. Figure 1 indicates the most touching in the Baseline condition, followed by the Rationale and Graphic condition, and the Directive and Rationale conditions at equal measures. Figure 2 shows a rate of 0.8 touches per hour in No Sign condition and 0.35 touches per hour in the Sign condition (all 3 conditions combined). Figure 3 shows the frequency of touching within sessions, with the highest frequency of touching in Baseline condition with four total touches. Directive and Rationale condition both showed one total touch, and Rationale plus Graphic condition showed 3 total touches. Figure 4 shows the frequency of touching by age, indicating that six of the touches (66%) were initiated by children, while the remaining three (33%) were initiated by adults.

The second component of the study was the observing response component which directed visitors to read the message on the back of the sign. A total of 210 (22%) visitors of the 950 observed engaged in the observing response. Figure 5 shows the overall percentages of observing responses made during each session, with the overall mean of observing responses at

30% (ranging from 16-48% of visitors each session). Data were variable but overall showed a slight decreasing trend over time.

Figure 6 shows the percentage of visitors who touched the art after engaging in the observing response, demonstrating that none of the visitors who made an observing response touched the art, while all the visitors who touched the art had not made an observing response.

The results of the social validity survey indicated that the conservator was very interested in decreasing unwanted visitor touching and placed high value on this mission. She considered zero touches per day from visitors to be an optimal level of touching. The design of the signs was up to museum standards, and the message portrayed in the signs was conducive to the gallery's mission. She felt that the study was easy to implement and indicated that she was uncertain about whether the observing response encouraged visitors to read the sign. Finally, she indicated that the results were helpful and will inform future sign choices in the institution. She also indicated that although they removed the signs from this particular study, they may use a double-sided sign in the future.

Discussion

The purpose of this study was to determine the extent to which different types of signs influenced the inappropriate touching of an art exhibit in a museum, and to assess the extent to which an observing response influenced the touching response. The researcher tested three different sign messages and compared them to a baseline (no sign condition) to establish levels of visitor touching. The first sign contained a directive message, the second contained a directive and a rationale, and the third sign included a directive, rationale, and an accompanying visual. These signs were placed inside a double-sided stanchion with the sign condition on the back. The double-sided stanchion encouraged an observing response from visitors, providing some

potential evidence of whether the visitor read the sign. Results indicated that most touching occurred in the baseline condition, suggesting that the presence of a sign was successful in decreasing touching. However, there was little differentiation between the sign conditions, indicating that the message displayed on the sign did not make a notable difference. Even though the percentage of visitors who engaged in the observing response was low, no visitor who made the observing response touched the art. In other words, none of the visitors who touched the art made the observing response, suggesting that they did not read the sign.

Prior to this study, there was no found systematic approach to address the problem of touching art in museums. This is an important issue that has a major financial impact on museums every year. A behavioral science intervention is relevant and cost effective for this problem. While there are no known studies that have addressed this specific issue, antecedent interventions (e.g., signs and pavement markings in traffic, signs to encourage proper clean up and recycling, signs to deter theft and more) have effectively improved target behaviors. While many of these studies attempted to increase the frequency of a desired behavior, this study used signs to decrease the occurrences of an undesirable behavior. Museum visitors were asked to abstain from a touching behavior rather than engage in an alternative behavior. The data presented here suggest that signs can be effective at reducing occurrences of this target behavior.

Similar to research conducted by Geller and colleagues, this study a) placed the sign close to where the desired behavior should occur (Austin et al., 1993; Geller et al., 1977), b) provided instructions and a rationale for the behavior (Geller et al., 1977), c) required a low response effort (Bennett et al., 2014; Bitgood, 2003; Geller et al., 1982), and d) presented the message in positive language (De Kort et al., 2008; Durdan et al., 1985; Geller et al., 1982). With

all these intervention components combined, the signs proved effective in decreasing display touching compared to the baseline condition.

The use of a visual (graphic) increases the attractiveness of a sign (Decrop, 2007), and in one instance increased monetary donations given to a charity when compared to a sign with no visual (Perrine & Heather, 2000). However, the present study demonstrated the least touching by visitors in the directive and rationale conditions, both of which had no visual on the sign. One possible explanation is that the rationale plus visual sign may have seemed overwhelming for a visitor to read as there were more components to the sign compared to the other two conditions.

The observing response is a strategy used to increase attending to a task. This study attempted a creative way of employing the observing response to increase the chances that visitors read the sign. The double-sided stanchion required visitors to walk around the sign or move their head around the sign to read the entire message. While only a small percentage of visitors performed the observing response, those who did never touched the art, suggesting that the observing response increased the chance that the message was read and followed.

Unfortunately, many visitors failed to engage in the observing response and therefore it can be assumed that many did not read the sign. The data collected were confirmatory, in that all the touching by visitors was done by those who had not engaged in the observing response.

Furthermore, unlike previous research on observing responses, there was no consequence for engaging in the observing response, and this may have affected the level of engagement. As has been established many times in the behavioral literature, signs are an effective means of communicating messages intended to increase or decrease behavior; however, if a message is not read it cannot influence behavior. The observing response increases the chances of attending to

the discriminative stimulus, which may then lead to an increase in correct responding. In this study, the observing response seemed effective in disseminating the message of the sign.

There were many informative aspects of this field study. First, while there was not much differentiation between the conditions, the signs themselves were effective. The highest frequency of touching occurred during the baseline condition, indicating that the presence of a sign may have been effective in minimizing touching. This may have occurred due to generalization from another museum visit, or from observational learning through reading and hearing about museum rules in other institutions.

There was a total of nine touches throughout the study, and while this seems like a small number, the conservator indicated that zero touches per day was the only acceptable rate within the museum. Several of the touches observed by the author were visitors running their hands up and down the blinds and potentially causing damage. In fact, during the study, the conservator confirmed that one of the blinds had been damaged due to touch and had to be replaced. So, while nine is not a large number, even one touch can be detrimental to these priceless pieces.

Discrimination of age of visitor was based on visual analysis and therefore was not precise, however, another finding was that most of the touching may have been done by children, which was not very surprising but still helpful information. While the museum welcomes children, the main audience is adults, and the signs were designed for adults. The frequency of touching by younger visitors poses a question for further research to address not only the message content but how to minimize this touching if children cannot read the sign. Perhaps a different intervention could be tested that would be both adult and child friendly. A sign using graphics only or an interactive sign may be a more useful intervention to prohibit touching by children.

This study was conducted on the three busiest days of the week according to the museum staff- Wednesday evenings, Saturday afternoons, and Sunday afternoons. While all the times chosen were quite busy, there were differences noted between the observation days. The data showed that the most touches occurred on Wednesday evenings (4), followed by Saturday afternoons (3), and Sunday afternoons (2). The weekend sessions brought more families with children to the gallery, while the Wednesday evening sessions were filled with couples and groups of young adults. The museum hosted a free night each Wednesday evening, and the museum liaison suggested that many people who attend on Wednesday evenings may not be regular visitors and could be unaware of museum etiquette. This is an interesting realization because while the data highlighted the problem of children touching art pieces, it also brought to light the issue of quickly conveying important messages to “non-regular” visitors, and how to most effectively do so.

The social validity measure indicated that this study was helpful to the institution and will influence future sign decisions. The staff stated that while the choice of intervention is always a balance between the wishes of the curator and the artist, this study provided an outlook into visitor behavior that will be valuable knowledge for them.

There were potential limitations to this study that lower the confidence of a causal relationship between the use of signs and reduced touching. First, the art piece chosen for the study was selected in collaboration with the institution staff, based on the pieces that receive the most unwanted touching from visitors (determined through informal observation and anecdotal reports). The chosen piece was in a room with no other pieces that connected the gallery space to the elevators, and as such, many visitors walked past the signs without reading them. The

addition of visitors who did not look at the art to the total count may have inflated the frequency of visitors who refrained from touching.

A second potential limitation was that the observation of visitors had to be accomplished in person and visitors could potentially have experienced some reactivity if they were aware of observation. The researcher tried to minimize reactivity by observing from an upper floor and staying as hidden as possible, keeping data sheets hidden, standing close to a corner, and pretending to be talking on the phone instead of watching visitors. However, visitors had to walk past the sign before potentially noticing the observer, so reactivity was unlikely.

Lastly, the final session of observation could not be completed due to COVID restrictions forcing the institution to close in early January. As a result, the final session of IOA and treatment integrity data could not be collected, and thus were not reflected in the data. This potential limitation does not severely affect the data as the trends in data were notable in the first 19 sessions.

Behavioral science has positively impacted several fields of study with simple interventions that solve big problems. The art world has struggled for many years with visitors causing damage to priceless pieces, and although institutions put interventions into place, there are no empirical data on the success of these interventions. Future research should focus in several areas. First, as this study is the first documentation of behavior science techniques in a museum, it is necessary to conduct replications of this work. It could be extended within the cultural world and replicated within different kinds of museums- whether museums geared towards children, contemporary galleries, science centres, or any other institution that struggles with unwanted handling. Similarly, within the art museum, this study could be replicated with

more traditional pieces like paintings and sculptures, or with other mediums that are touched frequently.

Importantly, the observing response component should be considered. Creating a successful message on a sign is contingent on visitors reading the sign, and an observing response is one way to increase the likelihood of reading. Future research should be conducted with alternative observing responses to entice visitors to read, such as a flip up tab, a button to push to light up a message, or other methods.

Furthermore, more research could be conducted into the content of the sign. This experiment showed little differential effects between the three sign conditions. Further study of the differences between the contents of the messages is needed. Additionally, design factors of the signs could be manipulated for future research. Elements such as color, graphics, and text could be changed to increase the probability of visitors reading the sign and influence interaction with the art following the reading.

The art world is one that has previously not been studied among behavioral scientists. This study applied basic behavioral principles to a significant issue within museums and showed that signs are effective in decreasing unwanted touching behavior. This approach furthered the research and expanded behavioral science into a whole new realm. The current study was one of the first to empirically assess the actual extent of touching of art in a museum. These procedures were effective in gathering objective data on the extent of this behavior and seemed simple enough that replication of these procedures in other museums could occur to develop an objective assessment of this important problem in the art world. Frequent touching of art pieces in museums can be expensive to repair, and damage can be detrimental to the pieces. A simple behavioral intervention is easy for the museum to install and could save the institutions large

amounts of money. Behavioral science has been applied to health and fitness, animal behavior, medicine, environmental planning, organizational management, and much more. The art world faces issues that could one day prove detrimental to the success of museums, and the universal impact of behavior science could just be the saving grace.

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Figure 1

Frequency of Touching

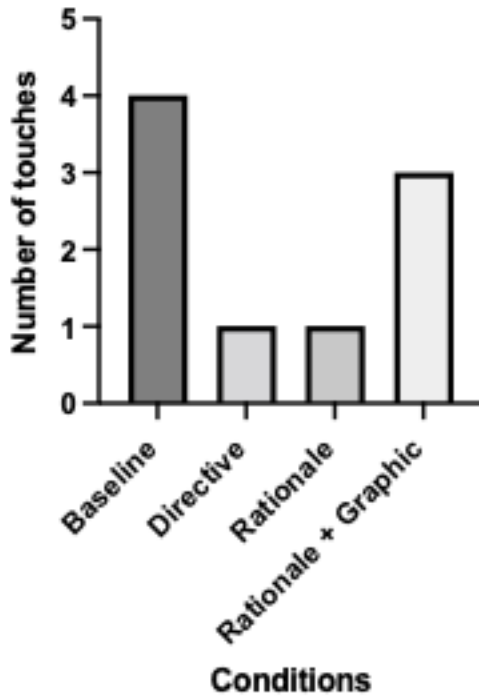


Figure 2

Rate of Touching

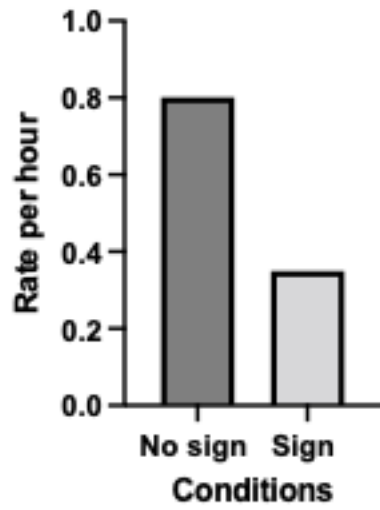


Figure 3

Frequency of Touching Within Sessions

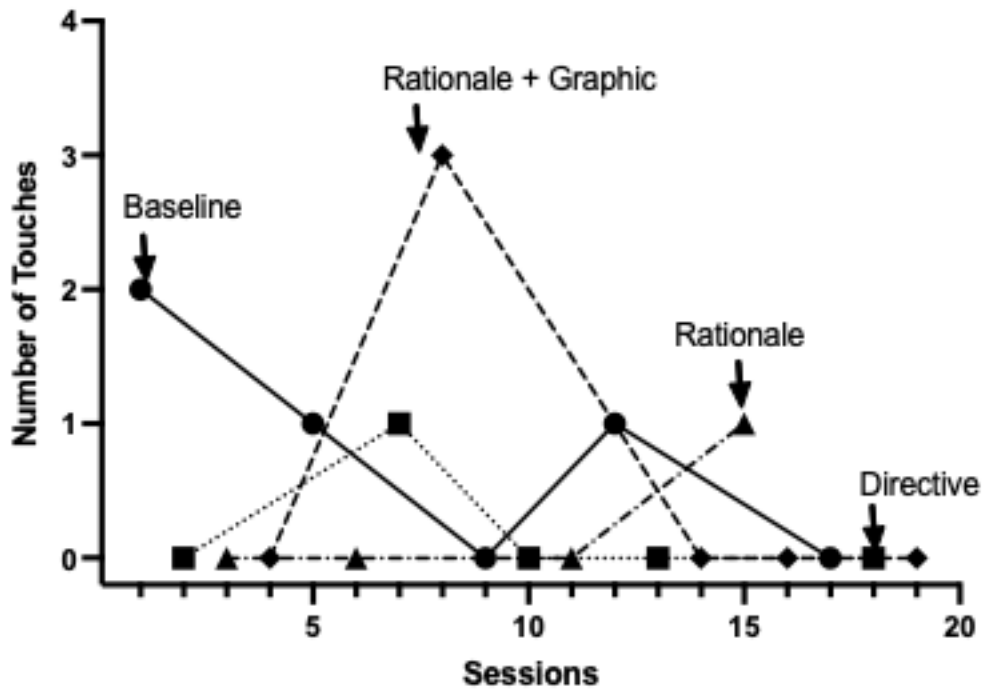


Figure 4

Frequency of Touching by Age

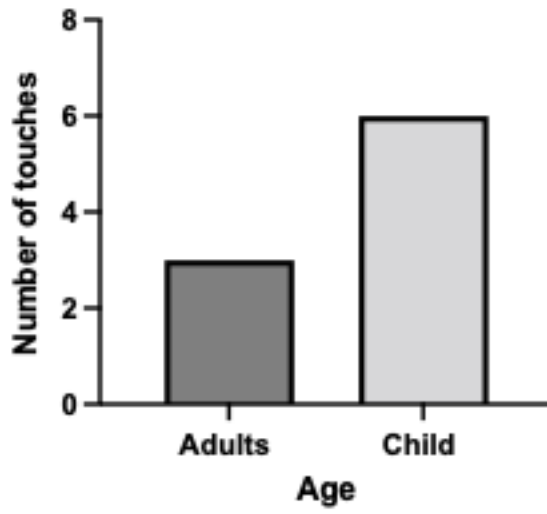


Figure 5

Percentage of Visitors Making Observing Responses

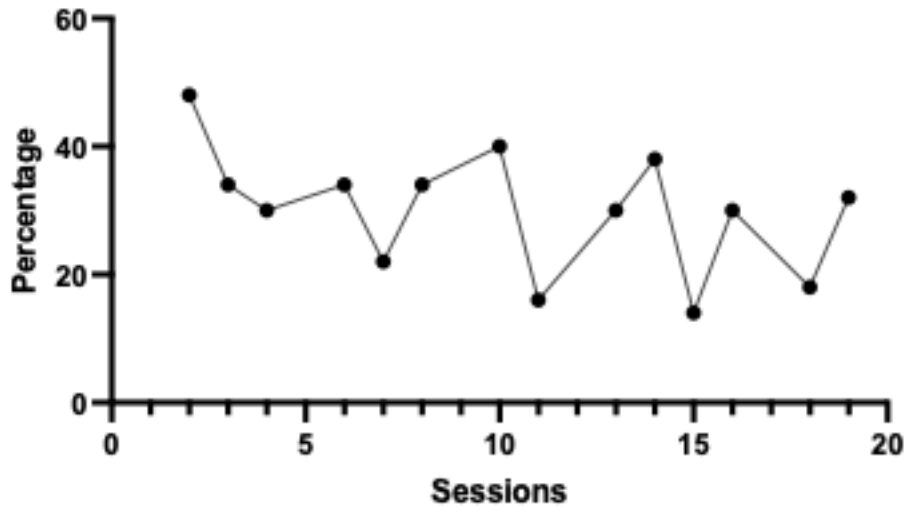
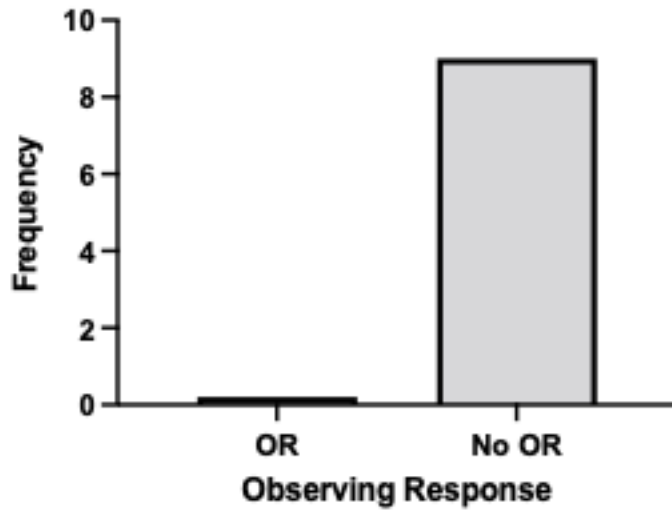


Figure 6

Frequency of Touching with and without Observing Response



Appendix B



Appendix C



Appendix D

**PLEASE
LOOK AT
THE BACK
OF THIS
SIGN!**

Appendix E

**PLEASE
LOOK BUT
DO NOT
TOUCH!**

Thank you!

Appendix F

**PLEASE LOOK BUT
DO NOT TOUCH!**

**The oils and contact from
your hands can damage the
artwork – even from just soft
touches. Please work with us
to protect valuable art.**

Thank you!

Appendix G

PLEASE LOOK BUT DO NOT TOUCH!
The oils and contact from your hands can damage the artwork – even from just soft touches. Please work with us to protect valuable art. Thank you!



Damage like this spiral cracking in a painting comes as a result of human touch.

Appendix H

Social Validity Survey

Thank you for participating in the study. Please fill out this survey to inform future research and provide feedback to the researcher. Please choose the number that most accurately depicts your feelings.

- 1= Disagree
- 2=Somewhat disagree
- 3= Neither agree or disagree
- 4=Somewhat agree
- 5=Agree

*Required

The design of the signs was up to the institution's standards. *

- 1
- 2
- 3
- 4
- 5

The message in the signs portrayed a message that was conducive to the institution's mission. *

- 1
- 2
- 3
- 4
- 5

The study was easy to implement based on the directions provided. *

- 1
- 2
- 3
- 4
- 5

The double-sided sign encouraged visitors to read the back of the sign.

- 1
- 2
- 3
- 4
- 5

The study provided a positive addition to the visitor's time at the museum.

- 1
- 2
- 3
- 4
- 5

The results proved helpful to the institution. *

- 1
- 2
- 3
- 4
- 5

The results will help inform future sign choices in the institution.

- 1
- 2
- 3
- 4
- 5

The double sided sign will be used again in the future.

- 1
- 2
- 3
- 4
- 5

How important is it to reduce unwanted visitor touching?

- Very important
- Important
- Neutral
- Not important

What would you consider to be an acceptable amount of touching to prevent damage?

- 0 touches per day
- 1-2 touches per day
- 3-5 touches per day
- 5+ touches per day

Do you have any further feedback? *

Interventions to minimize visitor interaction are difficult to enact and must take into account artist and curator preferences> It is a very delicate balance but this study gives us some very useful information to help understand visitor behaviour.