

THE COGNITIVE PROCESSES PROMOTED BY EXPOSURE TO ART

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Art possesses the remarkable capacity to expand our cognitive boundaries, prompting us to perceive and engage with our surroundings in novel ways. While such virtues are intrinsically cognitive, existing research has primarily explored the emotional repercussions of art, leaving its epistemic value largely to critical theory. Indeed, the bulk of prior studies have focused on immediate responses to art, such as emotional reactions or aesthetic evaluations,¹ with little attention paid to art's downstream influence on cognitive outcomes. Our research program pioneered one of the first extensive empirical initiatives to bridge this void, adopting a comprehensive methodology that concurrently addresses individual-specific and art-specific variables.

The present research followed from a recent study in our lab revealing that exposure to art can temporarily broaden individuals' conceptual boundaries.² This study used two film genres: conventional, which employed a linear narrative and traditional film techniques, and avant-garde, which employed a non-narrative style and contained unconventional methods and visuals. The impact of these two film genres was examined with respect to their ability to promote what's known as overinclusive thinking.³ Overinclusive thinking is a state of cognitive

1. E.g., Helmut Leder et al., "What Makes an Art Expert? Emotion and Evaluation in Art Appreciation," *Cognition and Emotion* 28, no. 6 (2014): 1137–47; Matthew Pelowski, and Fuminori Akiba, "A Model of Art Perception, Evaluation, and Emotion in Transformative Aesthetic Experience," *New Ideas in Psychology* 29, no. 2 (2011): 80–97; Paul J. Silvia, "Emotional Responses to Art: From Collation and Arousal to Cognition and Emotion," *Review of General Psychology* 9, no. 4 (2005): 342–57.

2. Madeleine E. Gross, Daniel Martini, and Jonathan W. Schooler, "Can Viewing Films Promote Creative Thinking Styles? Examining the Complex Roles of Personality and Meaning-Making," *Creativity Research Journal* 35, no. 2 (2022): 154–68.

3. Hans J. Eysenck, "Creativity as a Product of Intelligence and Personality," in *International*

expansiveness assessed by one's willingness to endorse nontraditional exemplars as belonging to predefined categories, such as classifying a camel or feet as transportation. By blurring categorical boundaries, this state promotes accessibility to remote ideas and enables connections between ostensibly unrelated concepts—key processes in the generation of creative insights. For instance, few would link a falling apple to planetary motion, yet Newton did, resulting in his revolutionary insight into the nature of gravity. In line with this, conditions that promote over-inclusive thinking have been found to promote creative performance.⁴

We found that exposure to artistic films could similarly encourage conceptual expansiveness as well as feelings of creative inspiration. Yet, the extent to which individuals were impacted varied based on their levels of magical ideation—a personality trait characterized by uninhibited perceptual focus (e.g., decreased latent inhibition),⁵ openness to mystical beliefs, and artistic creativity.⁶ Specifically, those with higher levels of magical ideation showed increased conceptual expansiveness following exposure to avant-garde film, whereas the conventional film had an effect on both conceptual expansiveness and creative inspiration for those with lower levels of magical ideation.

These preliminary findings illustrate several important points. First, art's efficacy may depend on the fit between the audience's traits and the artistic style of the work they are viewing. Second, art has demonstrable impacts on human thinking, especially toward more expansive, associative modes of thought. More generally, this implies that art has the potential to redefine the cognitive landscape where understanding evolves, enabling the emergence of new ideas and the integration of new perspectives. This expanded cognitive realm may be essential for cultivating elements of our "Spiritual Reality," as envisioned by Sir John Temple-

Handbook of Personality and Intelligence, ed. Donald H. Saklofske and Moshe Zeidner (Boston: Springer, 1995), 231–47.

4. Lixia Wang et al., "High Schizotypal Individuals Are More Creative? The Mediation Roles of Overinclusive Thinking and Cognitive Inhibition," *Frontiers in Psychology* 9 (2018): article number 1766, <https://doi.org/10.3389/fpsyg.2018.01766>; F. C. Chiu, "Improving Your Creative Potential without Awareness: Overinclusive Thinking Training," *Thinking Skills and Creativity* 15 (2015): 1–12; D. D. Ottemiller, C. S. Elliott, and T. Giovannetti, "Creativity, Overinclusion, and Everyday Tasks," *Creativity Research Journal* 26, no. 3 (2014): 289–96.

5. V. Kumari and U. Ettinger, "Latent Inhibition in Schizophrenia and Schizotypy: A Review of the Empirical Literature," *Latent Inhibition: Cognition, Neuroscience, and Applications to Schizophrenia* (2010): 419–47.

6. Giles St J. Burch et al., "Schizotypy and Creativity in Visual Artists," *British Journal of Psychology* 97, no. 2 (2006): 177–90; Selcuk Acar, and Sedat Sen, "A Multilevel Meta-Analysis of the Relationship between Creativity and Schizotypy," *Psychology of Aesthetics, Creativity, and the Arts* 7, no. 3 (2013): 214.

ton, including heightened creativity, emotional intelligence, and humility. These early results also support core assertions of aesthetic cognitivism: that artworks serve cognitive purposes—the epistemic claim—and that these cognitive functions partially dictate their artistic worth—the aesthetic claim.⁷

In the present research, we explored the epistemic value of art by investigating how engagement with art expands individuals' usual way of thinking, as well as the individual-specific nature of these effects. The central mission of Art Seeking Understanding (ASU) centers on empirically testing the tenets of aesthetic cognitivism (AC). We aimed to test AC's chief assertion—the cognitive claim—by examining the diverse ways art may promote observable cognitive shifts. In particular, we examined the effect of art on five interrelated outcomes associated with cognitive openness: creative thinking, curiosity, humility, empathy, and transliminality (i.e., the boundary between conscious and subconscious processes). As our overarching goal was to understand the influence of art on cognition, we chose an empirical approach that reflects the core principles of empirical aesthetics. The ASU program strategy further poses specific queries, such as identifying any tangible links between art and understanding, determining the unique cognitive benefits arising from engaging with the arts, and examining the circumstances under which artistic activities can enable spiritual insight, understanding, or development. Our research tackled these questions head-on, exploring how art informs understanding across five socio-epistemic realms while determining the person-specific conditions needed for art to have demonstrable effects.

SUMMARIZED OBJECTIVE AND HYPOTHESES

Our first experiment examined how art influences categorical expansiveness and creativity. Based on our preliminary findings investigating the impact of viewing film clips⁸ we hypothesized that art may effectively blur the perceived boundaries around categories, enabling associations that would not otherwise be made, and thereby facilitating creativity. Our next experiment examined whether art can stimulate curiosity. We predicted that exposure to art would increase epistemic feelings and motivate information-seeking behavior. The next study explored the hypothesis that exposure to art provides an opportunity for experiencing alternative perspectives that in turn may foster greater intellectual humility. Next, we

7. Christoph Baumberger, "Art and Understanding: In Defence of Aesthetic Cognitivism," in *Bilder sehen: Perspektiven der Bildwissenschaft*, ed. Mark Greenlee et al. (Regensburg: Schnell & Steiner, 2013), 41–67.

8. Gross, Martini, and Schooler, "Can Viewing Films Promote Creative Thinking Styles?"

aimed to determine whether art's capacity to invoke an appreciation of the experience of the artist may foster a greater capacity for empathy, and in particular for recognizing the emotions of others. Finally, we aimed to explore whether art can enhance the permeability between conscious and nonconscious thoughts, potentially increasing individuals' access to information that is presented subliminally. In every study we additionally investigated the potentially differential impact of art as a function of assorted personality traits (e.g., openness). By examining the relationship between personality differences and art we may begin to understand how different forms of art may uniquely enhance the understanding of different kinds of people.

GENERAL METHODS

Design

Each of the studies consist of a two-condition between-subjects design in which participants were randomly assigned to either an art-viewing condition or a control condition; see further details about the stimuli used in these conditions in the following section.

Artistic Stimuli

The art condition we used involved exposure to short animated films, i.e., films that use traditional (hand drawn) animation, computer animation, stop motion, claymation, etc. The use of animated film as our prototype art form was based on several empirically and theoretically grounded principles. First, animated films are multifaceted art forms that incorporate visual art, storytelling, and music to create an absorbing and richly aesthetic experience. Second, unlike in live action film, the entire visual world (e.g., characters, sets, and props) is created by an artist, thereby maximizing the presence of an artistic voice. Third, short films provide an excellent fit for testing the effects of exposure to art in tightly controlled, laboratory experiments delivered via a computer. Conversely, static art (e.g., paintings, sculptures, and other visual art works) cannot be rendered in their entirety via a computer as essential elements such as scale and texture are lost; such art forms must instead be studied in museums or galleries, which presents several difficulties including the inability to control for confounding aspects of the museum-going experience, challenges involving participant travel or live recruitment, and the substantial increase in experimental resources (time and cost). Finally, we have found significant and reliable effects using short films as

the artistic medium in our previous work,⁹ reinforcing the argument for its value in aesthetics research.

To select the short films, various film curation platforms were used (e.g., *shortoftheweek.com*). The films were all created by professional filmmakers from varied cultural backgrounds, many of whom have had their films recognized by awarding agencies in the field. For example, the short entitled *I'm OK*—one of the films included in our experimental condition—was nominated for a prestigious British Academy of Film and Television Arts award in the UK and was created by Elizabeth Hobbs, a London-based artist.

Due to the amorphous nature of what defines “art,” selecting stimuli that are universally recognized as “non-art” for control conditions poses a challenge. To approach this challenge, we chose control materials that typically fall outside the traditional category of art. For this, we used compilations of humorous home videos, such as domestic pets’ mischievous behaviors and domestic bloopers/pranks, which were largely created/compiled by the YouTube channel *FailArmy*.¹⁰ Several pilot tests were conducted to confirm that both the artistic and control stimuli were generally considered equally entertaining but could be consistently identified as art or non-art, respectively, based on the consensus of our research assistants. Both the experimental (art) and control films were also matched in length, being approximately six to seven minutes long.

Personality Measures

A wealth of research in neuroaesthetics and personality psychology suggests that artistic preferences can be predicted by personality type.¹¹ The vast majority of this existing research has focused on the relationship between personality and art appreciation or preferences for different artistic styles (e.g., abstract vs. representational); on the other hand, very little research has examined if or how personality-dependent aesthetic responses play a role in facilitating downstream effects on cognition. This is a critical consideration for examining aesthetic cognitivism, particularly the epistemic and aesthetic claims, as some art forms or artistic styles may facilitate cognitive benefits only for individuals who value art in general, or the art form in particular. Indeed, based on past research,¹² certain

9. E.g., Gross, Martini, and Schooler, “Can Viewing Films Promote Creative Thinking Styles?”

10. FailArmy (n.d.), *FailArmy*, YouTube, <https://www.youtube.com/@failarmy>.

11. Tomas Chamorro-Premuzic et al., “Who Art Thou? Personality Predictors of Artistic Preferences in a Large UK Sample: The Importance of Openness,” *British Journal of Psychology* 100, no. 3 (2009): 501–16.

12. Małgorzata A. Gocłowska et al., “Why Schema-Violations Are Sometimes Preferable to

art forms may have the strongest impact on some individuals, while having a weak or even detrimental effect on others.¹³ In order to account for this variability, the studies described included a battery of personality tests that have previously been found to be associated with artistic preferences. The following personality traits were of particular interest: openness to experience, magical ideation (i.e., schizotypy), and curiosity.

ART AND CREATIVITY

Engaging with art encourages individuals to think beyond established norms and consider unconventional perspectives and ideas. This process may promote creativity, which similarly relies on the ability to think from multiple perspectives in order to generate a wide range of possible ideas or solutions to a given problem. Although rigorous, laboratory-controlled studies are lacking, existing research efforts underscore the potential for art to promote creative outcomes. For example, previous research has examined the impact of arts-based education on creativity in pedagogical contexts.¹⁴ Such work emphasizes the potentially diverse benefits art exposure may have for enhancing creative thinking and expression. However, existing findings are limited given that most studies to date have relied on longitudinal study designs and lack true experimental control. This shortcoming limits our ability to understand the unique contribution of *art* with respect to other entertaining or interesting stimuli.

Therefore, our approach for examining the downstream consequences of art used a laboratory-controlled experimental design. A central objective of our first study was to extend our previous findings, in which we observed an effect of artistic film on conceptual expansion,¹⁵ by replicating this effect using different materials and a control condition, while further exploring the potential for artistic film to promote creativity. Participants were randomly assigned to watch either one of

Schema-Consistencies: The Role of Interest and Openness to Experience,” *Journal of Research in Personality* 66 (2017): 54–69; D. V. Wiersema, J. Van Der Schalk, and G. A. van Kleef, “Who’s Afraid of Red, Yellow, and Blue? Need for Cognitive Closure Predicts Aesthetic Preferences,” *Psychology of Aesthetics, Creativity, and the Arts* 6, no. 2 (2012): 168.

13. Travis Proulx, Steven J. Heine, and Kathleen D. Vohs, “When Is the Unfamiliar the Uncanny? Meaning Affirmation after Exposure to Absurdist Literature, Humor, and Art,” *Personality and Social Psychology Bulletin* 36, no. 6 (2010): 817–29.

14. E.g., Marie Briguglio, Leonie Baldacchino, and Margaret Mangion, “Assessing Creativity in Secondary Schools: A Focus on the Impact of an Arts-Based Intervention,” *Journal of Creative Behavior* 56, no. 4 (2022): 501–20.

15. Gross et al., “Can Viewing Films Promote Creative Thinking Styles?”

five artistic shorts in the experimental condition, or one of five humorous home videos in the control condition (see “Artistic Stimuli” for more details). To assess conceptual expansion (i.e., overinclusive thinking), participants completed a categorization task after viewing the film.¹⁶ The task gauges how individuals classify different concepts. Typically, items are rated based on how strictly they fit within traditional categories; for example, *car* is generally rated highly as belonging to the category of *transportation*. But we anticipated that after watching an artistic short film, participants might broaden their categorization perspectives, leading them to rate even unconventional items, like *feet* or *camels*, more highly as potential transportation options.¹⁷ Participants also completed a creative writing task¹⁸ post-film viewing in which they were asked to generate a short story based on three given words. The creative story that participants generated was scored in two ways: (1) using an automated platform that analyzes semantic distance in natural language (SemDis),¹⁹ resulting in ratings of semantic divergence, and (2) using subjective ratings of creativity based on two trained raters, blind to condition.

Our findings revealed that artistic films promote individuals’ capacity to think outside the box,²⁰ as evidenced by greater conceptual expansiveness and verbal creativity. After watching an artistic film, participants in the experimental condition were more likely to endorse unconventional items as belonging to traditional categories and the stories they generated were significantly more original than those in the control group. This originality was evident in both the creativity scores assigned by raters and by marginally higher scores based on automated semantic analysis. Collectively, these findings suggest that artistic films can potentially broaden an individual’s mental horizons and encourage them to think beyond established boundaries. In other words, artistic films may serve as a catalyst for creativity, encouraging individuals to think and express themselves in original ways.

16. Alice M. Isen and Kimberly A. Daubman, “The Influence of Affect on Categorization,” *Journal of Personality and Social Psychology* 47, no. 6 (1984): 1206, <https://psycnet.apa.org/doi/10.1037/0022-3514.47.6.1206>; revised by Chiu, “Improving Your Creative Potential without Awareness: Overinclusive Thinking Training,” *Thinking Skills and Creativity* 15 (2015): 1–12, <https://doi.org/10.1016/j.tsc.2014.11.001>.

17. As observed in Gross et al., “Can Viewing Films Promote Creative Thinking Styles?”

18. Ranjani Prabhakaran, Adam E. Green, and Jeremy R. Gray, “Thin Slices of Creativity: Using Single-Word Utterances to Assess Creative Cognition,” *Behavior Research Methods* 46 (2014): 641–59.

19. Roger E. Beaty and Dan R. Johnson, “Automating Creativity Assessment with SemDis: An Open Platform for Computing Semantic Distance,” *Behavior Research Methods* 53, no. 2 (2021): 757–80.

20. Madeleine E. Gross and Jonathan W. Schooler, “Standing Out: An Atypical Salience Model of Creativity,” *Trends in Cognitive Sciences* 28, no. 7 (2024): 597–99.

ART AND CURIOSITY

Do aesthetic processes promote epistemic outcomes? Art has long been theorized to confer epistemic benefits which may be driven by feelings of curiosity aroused following art viewing. The incongruity theory of curiosity suggests that when individuals face information that contradicts their current understanding, curiosity is sparked.²¹ Such intellectually challenging elements have long been linked to art.²² Indeed, it's believed that art's potential to prompt personal and even broader societal shifts arises from its tendency to challenge established beliefs.²³ Yet, the epistemic impact of art remains largely unexplored.²⁴ To fill this void in existing literature, the next study sought to determine whether art exposure fosters different forms of knowledge-driven curiosity.

Knowledge-driven curiosity, also known as epistemic curiosity, can be broken down into two types—interest curiosity and deprivation curiosity—which vary based on their antecedents, emotional character, and consequences. Interest curiosity is characterized by a joyous appetite for new information, driving one to explore widely, while deprivation curiosity reflects that itch one gets when they feel they're missing a piece of the puzzle, driving one to zoom into a specific topic. Art, particularly art forms that delight the imagination while resisting straightforward interpretation, may provoke either, or both, of these types of curiosity due to its intellectually and perceptually stimulating nature.²⁵ To test these possibilities, two novel state-based measures were developed which capture self-reported feelings of interest- and deprivation-based epistemic curiosity.²⁶

Curiosity also acts as a drive-state that propels learning and problem-solving. Despite this active nature, there's a lack of tools available to capture behavioral manifestations of curiosity in real time.²⁷ While prior research has linked stable

21. Gregory Berns, *Satisfaction: The Science of Finding True Fulfillment* (New York: Macmillan, 2005).

22. Judy Ann Rollins, "Arousing Curiosity: When Hospital Art Transcends," *HERD: Health Environments Research & Design Journal* 4, no. 3 (2011): 72–94.

23. Aleksandra Sherman and Clair Morrissey, "What Is Art Good For? The Socio-Epistemic Value of Art," *Frontiers in Human Neuroscience* 11 (2017): 411.

24. Yoed N. Kenett, Stacey Humphries, and A. Chatterjee, "A Thirst for Knowledge: Grounding Curiosity, Creativity, and Aesthetics in Memory and Reward Neural Systems," *Creativity Research Journal* (2023): 1–15; Sherman and Morrissey, "What Is Art Good For?"

25. Kenett et al., "Thirst for Knowledge."

26. Madeleine Gross, "Perceptual, Phenomenological, and Behavioral Processes Underpinning State and Dispositional Curiosity" (PhD dissertation, University of California Santa Barbara, 2022).

27. Madeleine E. Gross, Claire M. Zedelius, and Jonathan W. Schooler, "Cultivating an Un-

curiosity traits with patterns of information-seeking behavior,²⁸ there's a notable gap in instruments that are capable of capturing momentary fluctuations, or *state* shifts, in curiosity. Addressing this, we developed a novel measure that tracks real-time changes in curiosity-induced information-seeking behavior.²⁹ The measure we developed captures participants' choices to read a variety of articles (indicating a boost in curiosity) or complete word search puzzles (the less curious alternative). Our previous findings support the efficacy of this method for capturing states of curiosity.³⁰

We hypothesized that art might have the potential to promote information-seeking behavior, as well as interest and deprivation curiosity. Our findings supported this hypothesis, revealing that exposure to artistic shorts promotes all three manifestations of curiosity, which may represent an optimal condition for intrinsically motivated, exploration-based learning. The ability for art to increase information-seeking behavior suggests that art doesn't just arouse passive feelings of interest, but rather promotes an active, drive state in which individuals are motivated to seek out new knowledge and learn about topics that are interesting to them. This result has exciting implications for applied settings, such as learning and intrinsically motivated exploration in pedagogical and workplace contexts. Beyond this, our results suggest that art has the unique capacity to promote both interest and deprivation facets of epistemic curiosity. Most experiences that pique our curiosity usually only hit one of these buttons at a time, or if they hit both, they might wind down one as they crank up the other. But art seems to reflect a sweet spot in which both interest and deprivation facets of curiosity are promoted simultaneously. This could be envisioned as the perfect balance of wanting to roam freely and explore, mixed with the tenacity to dive deep and get the details when something grabs your attention—a “Goldilocks zone” of curiosity.

We also explored the relationship between curiosity and mood. Consistent with previous research, interest curiosity correlated with positive emotions, while deprivation curiosity, driven by a sense of uncertainty, was tied to negative emotions. This highlights the unique ability of art to simultaneously evoke effectively opposed states. The unusual relationship between art reception and emotion is evident in the popularity of tragic narratives in theater and literature, as well as individuals'

derstanding of Curiosity as a Seed for Creativity,” *Current Opinion in Behavioral Sciences* 35 (2020): 77–82.

28. David M. Lydon-Staley et al., “Hunters, Busybodies, and the Knowledge Network Building Associated with Deprivation Curiosity,” *Nature Human Behaviour* 5, no. 3 (2021): 327–36.

29. C. M. Zedelius and J. W. Schooler, unpublished data, University of California, Santa Barbara; Gross, “Perceptual, Phenomenological, and Behavioral Processes.”

30. Gross, “Perceptual, Phenomenological, and Behavioral Processes.”

affinity for melancholic or somber music. Such observations have led theorists to propose that art possesses a distinctive capability to render negative emotions enjoyable.³¹ This unique quality of art may be the key to its ability to simultaneously foster both forms of epistemic curiosity we examined in this study.

Our findings challenge and inform current psychological theories of curiosity by showing that art can induce a powerful desire for knowledge. Most existing experimental techniques for inducing curiosity involve withholding specific, well-defined information, such as not providing an answer to a trivia question. Such methods have informed theoretical work which suggests that curiosity is only evoked by such concrete information gaps;³² however, we discovered a unique method to stimulate states of curiosity: exposure to art. With its thought-provoking qualities, art seems to have the potential to promote a knowledge-hungry state, driving curiosity-driven behaviors.

ART AND HUMILITY

Intellectual humility refers to the fundamental capacity of individuals to admit to their own limitations and display an openness to differing viewpoints, beliefs, and perspectives.³³ Dual process accounts of humility suggest that either intelligence or cognitive flexibility—the ability to adapt to changing environments and circumstances—alone are sufficient for predicting scores on this trait.³⁴ Though there is limited research examining methods for inducing intellectual humility directly,³⁵ cognitive flexibility can be promoted through environmental enrichment and diversifying experiences.³⁶ This suggests that exposure to stimuli that offers opportunities for deep engagement, exploration, and alternative perspectives may

31. Jerrold Levinson, ed., *Suffering Art Gladly: The Paradox of Negative Emotion in Art* (Hampshire: Palgrave Macmillan, 2013); Winfried Menninghaus et al., “The Distancing-Embracing Model of the Enjoyment of Negative Emotions in Art Reception,” *Behavioral and Brain Sciences* 40 (2017): article number, e347, <https://doi.org/10.1017/S0140525X17000309>.

32. A. Markey and G. Loewenstein, “Curiosity,” in *International Handbook of Emotions in Education*, ed. Reinhard Pekrun and Lisa Linnenbrink-Garcie (New York: Routledge, 2014), 228–45.

33. Mark R. Leary et al., “Cognitive and Interpersonal Features of Intellectual Humility,” *Personality and Social Psychology Bulletin* 43, no. 6 (2017): 793–813.

34. Leor Zmigrod et al., “The Psychological Roots of Intellectual Humility: The Role of Intelligence and Cognitive Flexibility,” *Personality and Individual Differences* 141 (2019): 200–208.

35. E.g. Julia Ernesta Romanowska, Gerry Larsson, and Töres Theorell, “An Art-Based Leadership Intervention for Enhancement of Self-Awareness, Humility, and Leader Performance,” *Journal of Personnel Psychology* 13, vol. 2 (2014): 97.

36. S. M. Ritter et al., “Diversifying Experiences Enhance Cognitive Flexibility,” *Journal of Experimental Social Psychology* 48, no. 8 (2012): 961–64; Francesca Gelfo, “Does Experience Enhance

promote cognitive flexibility, a key antecedent to humility. We therefore predicted that exposure to art may enhance intellectual humility.

To examine this, participants were given a behavioral intellectual humility task in which they were given the opportunity to learn more about opposing views, and a self-reported General Intellectual humility Scale.³⁷ Unfortunately, a valid behavioral measure of intellectual humility does not exist, particularly one that has been rigorously tested and found to predict theoretically associated outcomes.³⁸ However, in our commitment to not rely solely on self-report questionnaires, we included a measure which has previously been found to be associated with intellectual humility and has been shown to be sensitive to change via a manipulation.³⁹ In this task, participants are asked their position on a controversial topic (e.g., gun control). They are then given the choice to read through views on the topic—ostensibly given by other participants—that are for or against their own position on the topic. They may also choose to skip ahead to the next part of the study at any time. The proportion of times that participants chose to read an opposing view versus one congruent to their own was used as an operationalization of state intellectual humility. We found that art promotes self-reported feelings of intellectual humility, however we did not find behavioral changes in humility using this choice-based behavioral task. It is important to note we also did not find a correlation between the self-report and behavioral task which may indicate the behavioral measure was not a valid way to capture this construct. Future research should continue to explore the potential of art to promote behavioral manifestations of intellectual humility based on our promising initial findings supporting its effect on self-report measures.

The abstract, multifaceted, or unfamiliar perspectives present in art may challenge viewers to question their existing beliefs and biases leading to an openness to consider alternative viewpoints. Furthermore, intellectual humility is based on the understanding that there's always more to learn. Thus, similarly to our above findings regarding curiosity and art, exposure to films may make individuals more receptive to new information and strive to seek new knowledge. The finding that artistic short films foster self-reported intellectual humility not only elevates the value of such art but also emphasizes the profound impact of art on personal and

Cognitive Flexibility? An Overview of the Evidence Provided by the Environmental Enrichment Studies," *Frontiers in Behavioral Neuroscience* 13 (2019): 150.

37. Leary et al., "Cognitive and Interpersonal Features."

38. Tenelle Porter et al., "Predictors and Consequences of Intellectual Humility," *Nature Reviews Psychology* 1, no. 9 (2022): 524–36.

39. Tenelle Porter and Karina Schumann, "Intellectual Humility and Openness to the Opposing View," *Self and Identity* 17, no. 2 (2018): 139–62.

societal growth. The ripple effects of intellectual humility can lead to more open, inclusive, and growth-oriented individuals and communities.

ART AND TRANSLIMINALITY

Next, we aimed to examine whether art can broaden the landscape of individuals' minds via perceptual expansion. Visual perceptions are inherently filtered and restricted—a significant portion of our surrounding visual environment escapes our notice. However, new research suggests that there's variation in how quickly individuals process specific visual data. In other words, some people might detect sensory details faster than others.⁴⁰ This idea relates closely to the concept of transliminality, which describes how psychological content crosses into our conscious awareness.⁴¹ A prime example of this phenomenon is hypnagogia—a phase where individuals experience vivid visions as they drift from wakefulness to sleep. Previous research suggests that those predisposed to such transliminal states often exhibit enhanced creativity and a tendency to recall profound dreams.⁴²

Despite these intriguing findings, current methods for measuring transliminality face limitations. Existing measures often capture related concepts, like creative thinking, instead of transliminality directly (e.g., the Revised Transliminality Scale).⁴³ They also largely depend on self-reports, which can be unreliable or influenced by confounding factors. Moreover, existing tools capture stable individual differences, or traits, rather than transient fluctuations, or states.

To address these issues, we began this line of research by developing novel methods for measuring transliminality within laboratory-controlled settings. Our first objective was to assess the relationship between transliminality and unconscious information leakage through intuitive thinking tasks.⁴⁴ Our results indicated that while transliminality showed a strong association with magical

40. Assail Y. Sklar et al., "Did You See It? Robust Individual Differences in the Speed with Which Meaningful Visual Stimuli Break Suppression," *Cognition* 211 (2021): article number 104638, <https://doi.org/10.1016/j.cognition.2021.104638>.

41. M. A. Thalbourne and P. S. Delin, "Transliminality: Its Relation to Dream Life, Religiosity, and Mystical Experience," *International Journal for the Psychology of Religion* 9, no. 1 (1999): 45–61.

42. M. A. Thalbourne, "Transliminality and Creativity," *Journal of Creative Behavior* 34, no. 3 (2000): 193–202; Thalbourne and Delin, "Transliminality."

43. Rense Lange et al., "The Revised Transliminality Scale: Reliability and Validity Data from a Rasch Top-Down Purification Procedure," *Consciousness and Cognition* 9, no. 4 (2000): 591–617.

44. J. R. Ortega, M. E. Gross, and J. W. Schooler, "Intuitive, Creative, or Transliminal? Crossing the Threshold from Intuition to Convergent Thinking," poster presentation, Annual Meeting of the Society for the Neuroscience of Creativity (SfNC), San Francisco, March 24, 2023.

ideation, it wasn't closely tied to intuition. This suggests that the current primary measure, the Revised Transliminality Scale, may be confounding a result of transliminality, like magical ideation, with the actual process of transliminality. Interestingly, we observed a link between intuition and overinclusive thinking, which our previous studies have associated with enhancement from art exposure. These findings indicate that to truly understand art's potential to induce genuine transliminal states, we need to employ novel, direct methods of measuring transliminality.

In another line of this research, we examined the phenomenology of waking thoughts as potential indicators of transliminality.⁴⁵ Given that transliminality is theorized to involve unconscious content seeping into consciousness, we reasoned that trait differences in transliminality might influence an individual's day-to-day thoughts, making them resemble dreamlike states. By having participants report on their thoughts' qualities during daily life, we discovered that those with higher levels of transliminality reported thoughts that were more bizarre, novel, and interesting—qualities that tend to be characteristic of dreaming and dream thoughts. These results open up the intriguing possibility that engaging with art could influence certain thought patterns due to its capacity to induce transliminal states. Equipped with these new methodological insights, we're poised to explore art's impact on these new measures of transliminality in upcoming research.

ART AND EMPATHY

Art has the potential to facilitate a strong emotional connection with the artist's experience, thereby potentially heightening individuals' empathy. Expounding on this notion, Baumberger suggests that when one becomes deeply familiar with both sensory and emotional elements, it can enhance their understanding by providing an intimate viewpoint into another's lived experience.⁴⁶ In our pursuit to examine this hypothesis, we will apply methodologies similar to those in our previous investigations. Our approach will integrate scientifically recognized tools tailored to gauge empathy—often described as emotional intelligence—based on observed behavior. In particular, we are interested in tools that focus on the ability to interpret individuals' emotional states. We are currently in the process of fine-tuning our empathy measure and anticipate that exposure to art will bolster

45. J. R. Ortega, M. E. Gross, and J. W. Schooler, "When Life Is but a Dream: Transliminality Predicts Continuity in Bizarreness across the Sleep-Wake Cycle," *Philosophy and the Mind Sciences*, special issue, submitted.

46. Baumberger, "Art and Understanding."

performance on this behaviorally measured task—though the influence of art might again be contingent on individual personality traits.

DISCUSSION

In observing the intricate facets of human development, Sir John Templeton coined the term “Spiritual Reality,” a term used to capture the foundational elements that drive human advancement and well-being. Our research aimed to understand how individuals can use the transformative power of art to connect with this “Spiritual Reality.” We found that art acts as a conduit for fostering creativity, conceptual expansiveness, humility, curiosity, and a drive for acquiring knowledge.⁴⁷ All of these outcomes echo a common theme: a general state of cognitive openness. In this state, individuals are not only receptive of, but actively engage with, diverging perspectives, ideas, and concepts.

These exciting findings open up significant areas for further inquiry. First, an open question from our research is whether there is domain generality in art’s influence on creativity. Our research focused on artistic films given that this mode of art comprises narrative, visual, and musical features in one. However, the use of this multifaceted art form raises the question whether similar effects would be observed following exposure to art forms that include just one of these facets, such as purely visual works (e.g., painting or sculpture). Each art form may engage the human mind in unique ways. Similarly, creativity itself is multifaceted. Beyond verbal creativity, creative outcomes can include problem-solving, artistic expression in various mediums, and mathematical or scientific innovation—these variants of creative expression should also be explored as potential outcomes to art exposure. It is further possible that a congruency between the art form and the type of creative expression may amplify the effects we observed; for instance, verbal art (e.g., poetry) may have a bigger impact on verbal creativity than auditory art (e.g., music). Further research is necessary to determine whether exposure to art enhances creativity more broadly or if the effects are confined to the specific interrelations between the art and the type of creativity being measured.

Given that artistic films, a non-written art form, led to enhancements in creative writing, we suggest that art’s influence might be domain general, impacting creative outputs across various forms. Based on our creativity-related findings, as well as the observed impact of art on other forms of open-mindedness, we further put forward a novel theory of aesthetic processing that suggests that art leads to

47. Gross et al., “Can Viewing Films Promote Creative Thinking Styles?”; Gross and Schooler, “Standing Out.”

a general state of cognitive openness in which individuals take on qualities that are characteristic of the personality trait openness to experience. This trait has been linked with a broad range of virtues reflecting an explorative and receptive mindset, including aesthetic sensitivity and novelty seeking. Importantly, many of the very same virtues that are linked to trait openness to experience were also found to be influenced by art, including creativity, humility, and curiosity. We therefore suggest that art may have the capacity to temporarily promote this facet of human personality. Furthermore, given that one of the qualities of openness to experience is an appreciation of art, our research suggests a reciprocal relationship; not only does openness to experience lead to an appreciation of art, but appreciating art leads to a state akin to openness to experience. We fleshed out the neurobiological basis and behavioral implications for this working hypothesis in a recent theoretical publication.⁴⁸

Our research further revealed that the impact of art is often amplified by specific personality traits. For example, we found that those predisposed to magical ideation experienced a heightened impact of art on creativity, while those with a naturally curious nature showed greater epistemic feelings and information-seeking behaviors in response to art. While it might seem that art primarily benefits individuals with certain personality characteristics, recent studies show that personality traits can be fluid, changing in response to specific moments or situations rather than being fixed aspects of our identity. This presents an exciting possibility: if we can temporarily promote traits like curiosity or openness in individuals, we might amplify their responsiveness to art. Our team is currently exploring ways to boost curiosity;⁴⁹ future studies could use these techniques to see if such induction methods amplify the effects of art. Besides personality, people also differ in terms of their cognitive styles, educational backgrounds, and cultural experiences, all of which may shape their interaction with art. How these individual differences influence the relationship between art exposure and creativity could provide much-needed nuance into our observed effects.

The mechanisms through which art exposure influences facets of openness also need to be further explored. It is possible that art influences cognitive capacities related to open-mindedness—like mental flexibility. Art may also promote emotional states that are particularly conducive to openness. Yet another possibility is that art triggers more associative thinking, wherein one idea or concept triggers a related or seemingly unrelated idea. This associative style of thinking may offer a fertile ground for creative connections or help promote visual imag-

48. See Gross and Schooler, “Standing Out.”

49. Gross, “Perceptual, Phenomenological, and Behavioral Processes.”

ery in one's writing or visual art. Art often portrays beautiful or fantastical scenes which may also spark one's imagination, making them more inclined to engage in imaginative play and storytelling. Art may also offer individuals a sense of freedom to express themselves without judgment. This reduction in self-censorship may further encourage exploration, humility, and creative expression. For example, viewing unconventional or avant-garde art may lead individuals to engage with unconventional ideas in their own beliefs, ideas, or creative work. And finally, as our results suggest,⁵⁰ art may generally loosen conceptual boundaries, allowing increased flow and cross-pollination between distantly related ideas and concepts. All of these possible mechanisms should be examined in future research. Once these mechanisms are understood, it opens the possibility of using art in more intentional ways. For instance, educational institutions might integrate art into curricula to enhance students' engagement with challenging or controversial subjects.

The interdisciplinary nature of this work opens a host of future research avenues within various disciplines. Our findings sit at the intersection of art, psychology, and cognitive science with implications for philosophy, art theory, and sociology. By examining the underlying mechanisms central to various cognitive states, this research moves empirical aesthetics into the mainstream arena of cognitive and general psychology. We've examined how art impacts human thought processes, behavior, and emotional comprehension, which represent core concerns of both cognitive science and general psychology disciplines. Additionally, by linking the effects of art to personality traits, our findings offer relevant insights to personality psychology, a branch of psychology concerned with how different stimuli impact individuals based on their personality structures. This research doesn't just use art as a stimulus; it also seeks to understand the role and impact of art, making the research relevant to disciplines focused on art theory and criticism. In exploring how art might fan the flames of curiosity and enhance learning, the research also touches on educational theory—how do we learn, what enhances that learning, and how can various disciplines (like art) be used pedagogically? When considering aspects like the permeability between conscious and nonconscious thoughts, the research borders on philosophical questions of human consciousness. And finally, by examining art's differential impact based on individual differences and its role in fostering empathy and humility, this work speaks to sociological topics, particularly when considering group behaviors and societal impacts. For example, although many advocate for more funding in arts

50. Gross et al., "Can Viewing Films Promote Creative Thinking?"; Gross and Schooler, "Standing Out."

education, these policies are increasingly contingent on tangible, empirical evidence. By integrating methods, theories, and concepts from each discipline, our project doesn't just borrow from various areas of study—it contributes back to them, potentially offering new insights or methodologies that are relevant within the context of each field.

In summary, our research contributed numerous methodological and theoretical advances as well as revealed the positive effects of artistic films on certain types of creative thinking, curiosity, and humility. As exciting as these initial findings are, we also uncovered a frontier of unknowns. Our research invites further investigation into whether different forms of art similarly influence these outcomes, what underlying cognitive processes might underpin these effects, and how various individual differences may amplify or diminish the effects we observed. Understanding the full scope of art's impact on the human mind, therefore, remains an exciting and open venture in cognitive research.

Art Seeking Understanding

Conceptual, Empirical, and Experimental Approaches



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