



UvA-DARE (Digital Academic Repository)

To know, to feel, to share? Exploring the motives that drive curiosity for negative content

Niehoff, E.; Oosterwijk, S.

DOI

[10.1016/j.cobeha.2020.07.012](https://doi.org/10.1016/j.cobeha.2020.07.012)

Publication date

2020

Document Version

Final published version

Published in

Current Opinion in Behavioral Sciences

License

CC BY

[Link to publication](#)

Citation for published version (APA):

Niehoff, E., & Oosterwijk, S. (2020). To know, to feel, to share? Exploring the motives that drive curiosity for negative content. *Current Opinion in Behavioral Sciences*, 35, 56-61. <https://doi.org/10.1016/j.cobeha.2020.07.012>

General rights

It is not permitted to download or to forward/distribute the text or part of it without the consent of the author(s) and/or copyright holder(s), other than for strictly personal, individual use, unless the work is under an open content license (like Creative Commons).

Disclaimer/Complaints regulations

If you believe that digital publication of certain material infringes any of your rights or (privacy) interests, please let the Library know, stating your reasons. In case of a legitimate complaint, the Library will make the material inaccessible and/or remove it from the website. Please Ask the Library: <https://uba.uva.nl/en/contact>, or a letter to: Library of the University of Amsterdam, Secretariat, Singel 425, 1012 WP Amsterdam, The Netherlands. You will be contacted as soon as possible.

UvA-DARE is a service provided by the library of the University of Amsterdam (<https://dare.uva.nl>)

To know, to feel, to share? Exploring the motives that drive curiosity for negative content[☆]

Esther Niehoff¹ and Suzanne Oosterwijk^{1,2}



In recent years, empirical work has documented a curiosity for negative content – people deliberately view images detailing death, violence or harm or engage with other aversive stimuli. The question that emerges from this work is *why* people are curious about aversive information. Our central premise is that curiosity for negative content can be valuable – it may serve fundamental psychological functions and have beneficial outcomes. In terms of benefits, negative content may provide an individual with an opportunity to acquire knowledge, reduce uncertainty, experience valued emotions, or engage with the experiences of others. At the same time, the exploration of negative information may be costly. In this article, we discuss which factors may motivate or discourage the exploration of negative content.

Addresses

¹ University of Amsterdam, Department of Social Psychology, Netherlands

² Amsterdam Brain and Cognition Centre, Netherlands

Corresponding author: Oosterwijk, Suzanne (s.oosterwijk@uva.nl)

Current Opinion in Behavioral Sciences 2020, 35:xx–yy

This review comes from a themed issue on **Curiosity (Explore versus Exploit)**

Edited by **Daphna Shohamy** and **Ran Hassin**

<https://doi.org/10.1016/j.cobeha.2020.07.012>

2352-1546/© 2020 The Authors. Published by Elsevier Ltd. This is an open access article under the CC BY license (<http://creativecommons.org/licenses/by/4.0/>).

Curiosity for negative content is a common phenomenon in daily life. People deliberately expose themselves to negative information; they click the link detailing a terrorist attack, choose to watch a gruesome documentary or visit the location of a terrible event. Although many people can relate to this phenomenon, there is limited scientific understanding of *why* people are curious about aversive information [1,2[☆],3]. The present article takes a first step in charting the potential motives that drive curiosity for negative content.

Curiosity for negative content

In the last 15 years, scientists from a variety of different backgrounds have taken an interest in the ubiquitous behavior of seeking out aversive experiences. Several studies support the idea that people can enjoy negative experiences [4,5[☆]], such as horror movies [6] or sad novels [7]. Nevertheless, enjoyment is not a prerequisite for seeking out negative information; people also report curiosity, interest, or fascination for information that is experienced as deeply unpleasant, including disturbing art [8], news coverage of the 9/11 attacks [9] and videos of beheadings [10[☆]].

In line with views that emphasize that curiosity drives information-seeking behavior [11–13], recent work has specifically targeted the behavioral component of curiosity for negative content. For example, Hsee and Ruan [14] demonstrated that people deliberately exposed themselves to electric shocks, unpleasant sounds and images of insects, even when they had a non-aversive, alternative choice. Furthermore, Oosterwijk [2[☆]] demonstrated ‘morbid curiosity’ for images portraying death, violence or harm using a behavioral paradigm (see also Ref. [15[☆]]). She found that people are particularly inclined to explore intensely negative *social* scenes (e.g. violent social conflicts, rescue workers helping victims). These scenes were chosen more often than images with graphic mutilation, and were preferred over viewing neutral social scenes. The burning question that follows from these findings is why people act like this. What is the value of engaging with negative information?

Curiosity versus curiosity for negative content

A first relevant question to ask is whether curiosity for negative content is simply a different ‘flavor’ of regular curiosity, with similar underlying mechanisms and functionality, or whether it should be treated as a distinct construct. In this article, we take the first position. We propose that the general definition of curiosity — an intrinsically motivated drive state for information [12,16[☆],17,18] — also applies to curiosity for negative content. This position is supported by a recent study that investigated whether brain regions traditionally associated with curiosity, value computation and reward, are also involved when people deliberately exposed themselves to intensely negative social scenes [15[☆]]. In this

[☆] The writing of this paper was supported by a Netherlands Organization for Scientific Research VENI grant (451-13-008) awarded to Suzanne Oosterwijk.

study, participants made choices to view negative and positive images, based on verbal cues (e.g. a soldier kicks a civilian in the head). As predicted, choosing negative images engaged brain regions (e.g. striatum, inferior frontal gyrus, anterior insula, orbitofrontal cortex and anterior cingulate cortex) associated with regular curiosity [12,19^{*},20,21], and the processing of extrinsic incentives and reward [22,23]. This finding suggests that knowledge acquisition is valuable [16^{*},24], even when people acquire knowledge about the negative aspects of the social world.

Although these neuroimaging findings suggest a similarity between regular curiosity and curiosity for negative content, there are also factors that distinguish them. Regular curiosity is commonly associated with positive affect [11]. Curiosity for negative content, however, may be best characterized as a conflict state in which people want information, without predicting that they will like the information [1,9]. Moreover, although curiosity may generally involve an approach/avoidance dilemma in which people appraise their potential to process information [19^{*}], we propose that a cost-benefit analysis is particularly salient in curiosity for aversive information. Decisions to act on one's curiosity and explore negative information may follow a cost-benefit analysis in which the predicted benefits outweigh the predicted costs. In the next section, we will discuss which factors could reflect these benefits and may motivate curiosity for negative content, while also discussing which factors may discourage the exploration of negative content.

Motives

We distilled the motives that may drive curiosity for negative content from an extensive body of literature, spanning topics such as curiosity, motivation, emotion regulation, art reception and media consumption. We discuss both theoretical and empirical work that explicitly targets curiosity, and work that covers voluntary engagement with negative content more generally. For structural purposes, we grouped the motives into three categories: informational motives (i.e. what is the informational value of exploring negative content), emotional motives (i.e. to what extent does exploring negative content evoke sensations or emotions that are valued), and social motives (i.e. what is the social value of exploring negative content). Note, however, that boundaries between these different groups can be blurry.

Informational motives

Motives to learn, understand or acquire knowledge (i.e. epistemic motives) lie at the core of many models of curiosity [16^{*},25,26]. Such motives, that focus on the information offered by particular content, have rarely been applied to curiosity for negative content. It is not unlikely, however, that negative content offers unique informational value. Learning about negative events

may be adaptive because it contributes to building a realistic model of the world [27]. Moreover, curiosity for the negative experiences of others might be a strategy to 'prepare' for negative events [28], or obtain information about negative situations without the need to experience them yourself [29]. It is important to note; however, that although a desire to 'know' may motivate the exploration of negative content in some circumstances, it is not unlikely that in other circumstances people choose 'not to know' [30^{*}], because they predict that they are unable to cope with the acquired knowledge [31].

Another important informational motive that curiosity for negative content may share with regular curiosity, is a desire to reduce uncertainty [13,17]. People may experience curiosity for uncertain stimuli, because they value the predicted information update when resolving the uncertainty [19^{*},26,32]. The previously discussed work by Hsee and Ruan [14], demonstrated a link between curiosity for negative content and uncertainty by presenting 'prank pens' to participants that could give painful, but harmless shocks. The authors found that participants clicked pens most often when it was uncertain whether they would give a shock as opposed to when it was certain that the pens would (not) shock them. Thus, people preferred a reduction in uncertainty above the negative experience of receiving a shock. In a similar way, people may be motivated to engage with aversive information to resolve the uncertainty it evokes. For example, people may be motivated to reduce uncertainty about the extremity or impact of an event involving death, violence or harm by seeking out more information. For visual stimuli, people may decide to 'look' to resolve uncertainty about the validity of their own mental image of a negative event (e.g. is the accident as extreme as I imagine it to be?).

In addition to uncertainty, scientists have suggested that information that is novel, unusual, complex or challenging is particularly prone to evoke curiosity [11,20,31,33,34]. Based on work that proposes that negative information is more deviant from the norm and less 'alike' as compared to positive information [35^{*},36], we propose that motives to seek out novelty, complexity or challenging information may drive people to explore negative content. Moreover, people may engage with aversive content because they are motivated to engage with 'thought-provoking' information [29] or want to engage in effortful meaning-making [5^{*}]. Motives to seek out the cognitively challenging aspects of negative information may specifically resonate within individuals with a high openness to experience or need for cognition ([16^{*}], see also Ref. [37], this issue) or those who value an eudaimonic search for meaning or personal development in life [29,38,39].

Emotional motives

Negative content can elicit sensations (e.g. arousal) or discrete emotional reactions (e.g. sadness, disgust) that some people may consider costly, resulting in an inhibition of curiosity or exploratory behavior (for a discussion about the role of affect in curiosity, see Ref. [37], this issue). For example, anticipated regret may motivate people to avoid aversive content [40]. Nevertheless, other people may be motivated to seek out aversive content because they actually value the emotional experiences or sensations that are evoked [7].

First, people may value the arousal evoked by aversive information. Research on the personality dimension of sensation seeking has indeed identified a positive relationship between the desire for thrill and adventure and curiosity for negative content ([41,42]; see also Ref. [2]). Berlyne [25] suggests that it is mainly boredom — a prolonged lack of arousal — that motivates people to explore information that elicits arousal. Support for this assumption was recently provided by Bench and Lench [43] as well as Wilson *et al.* [44], who repeatedly observed that experimentally induced boredom prompts people to seek out aversive experiences. Others argue that people may be motivated to approach negative content, because they derive pleasure from experiencing bodily reactions in a relatively safe context [45], or how Rozin *et al.* [7] put it, from ‘mastery of mind over body’.

Second, people may value the discrete negative emotions elicited by aversive information [38,46]. For example, the exploration of negative content may provide a safe way to learn about emotions and the contexts in which they are elicited, which in turn may enhance emotion differentiation skills (i.e. people’s ability to differentiate between discrete negative states, such as fear, sadness, anger; [47]). Additionally, engaging with negative information in a relatively safe context may provide an opportunity to learn and practice emotion regulation skills [48]. To illustrate, research targeting ‘haunted house’ visitors suggests that people choose to expose themselves to fear-inducing experiences, because it allows them to challenge themselves and thereby train distress tolerance [49]. This utility of voluntary exposure to negative content in terms of acquiring emotional skills may be specifically relevant for children and adolescents, who are still developing and fine-tuning their emotional reactions.

Social motives

Finally, negative content may be explored for its social value. Being curious about negative social information may prompt empathy, including sharing another person’s feelings or taking another person’s perspective, which may benefit social affiliation [11]. Additionally, learning about other people’s suffering may increase people’s skills in understanding and predicting other people’s internal states, which may enhance the ability to

successfully navigate social interactions [50,51]. Note, however, that empathy is costly in terms of mental resources [52,53], and thus a high level of predicted empathy may in some circumstances motivate people to refrain from engaging with aversive content. Finally, people may be motivated by a sense of moral obligation to inform themselves about other people’s suffering. In this case, people may choose to approach negative information because the negative emotions elicited by this exploration are congruent with their goal to follow social or moral norms [38,52].

The above argument highlights that the decision to explore negative content does not happen in a social vacuum. Motives to follow social norms or engage in social comparison may be one of many ways in which the social environment impacts curiosity in general [54] and curiosity for negative content in particular. For example, people may decide to explore negative information as a tool for social comparison or reaffirmation of social norms, by comparing one’s own response to that of peers [55]. Moreover, the thoughts, feelings and behaviors of others regarding negative information may serve as a social reference point stimulating people to want to know what other people know [26].

Discussion and future directions

The motives discussed in this article can be unified in the idea that exploring negative content has value. Scientists focusing on regular curiosity have proposed that the reward value that drives curiosity lies in knowledge acquisition [16]. In other words, information may be a reward ‘in and of itself’ [17,18,24]. Building on these theories, we propose that curiosity for negative content may be driven by the expected reward value of an anticipated gain in information (see further [15]). Moreover, negative content may evoke affective or social experiences that people perceive as valuable. Thus, even though it is unlikely that exploring negative content results in the most obvious indicator of reward — a pleasurable experience — it may be intrinsically rewarding [18], because it allows people to acquire knowledge (informational motive), experience a valued emotion or sensation (emotional motive) or fulfill a personal moral goal (social motive). To test these motivational predictors, future research will need to empirically map the potential motives for exploring negative content and formally assess how these motives shape actual behavior.

In doing so, it is important to compare the motives that predict the exploration of negative information, with the motives that predict the exploration of positive or (relatively) neutral information. In the last decade, some progress has been made in uncovering the motives that drive curiosity (e.g. in Ref. [56]). Nevertheless, studies on curiosity demonstrate low diversity in stimulus materials (i.e. predominantly lottery tasks and trivia questions;

[19*,57]) and often ignore valence (but see Refs. [24,30*]). We believe that approaches that include valence as a factor are essential in determining whether the mechanisms that underlie ‘regular’ curiosity generalize to instances in which people express curiosity for emotionally charged information. This could lead to more realistic models of which information piques people’s curiosity, and why.

One factor that may be relevant to integrate into the (small) literature on curiosity for valenced information, is the self-relevance of aversive content. Inspired by real-life examples of people exploring other people’s suffering (e.g. through books, movies and online content), the previously discussed work on ‘morbid curiosity’ demonstrated a curiosity for images displaying negative events happening to *other* people [2*,15*]). These research findings stand in contrast to recent work that demonstrates that people choose to *ignore* information about undesirable self-relevant information, such as outcomes in a personal lottery task [30*]. These findings might be applicable to real-life situations in which people refuse medical tests, because they do not want to know the (potentially negative) outcome [17]. Future research is needed to identify under what circumstances the self-relevance of negative content may inhibit or facilitate information-seeking behavior.

In conclusion, although future research into curiosity for negative content is warranted and many questions remain unanswered, the present review suggests that a deliberate exposure to negative information may contribute to successfully navigating the social world. In other words, curiosity for negative content may have merit.

Conflict of interest statement

Nothing declared.

References and recommended reading

Papers of particular interest, published within the period of review, have been highlighted as

- of special interest

1. Litman JA: **Curiosity and the pleasures of learning: wanting and liking new information.** *Cogn Emotion* 2005, **19**:793-814 <http://dx.doi.org/10.1080/02699930541000101>.
2. Oosterwijk S: **Choosing the negative: a behavioral demonstration of morbid curiosity.** *PLoS One* 2017, **12**: e0178399 <http://dx.doi.org/10.1371/journal.pone.0178399>.
This work gained insight into the dynamic way in which people respond to negative information. Using a behavioral paradigm, presenting both visual and verbal choice cues, the author demonstrated that people deliberately choose to view images that portrayed death, violence or harm. Morbid curiosity was most strongly expressed for negative scenes emphasizing interpersonal interaction.
3. Murayama K: **The science of motivation.** *Psychological Science Agenda* 2018.
4. Harmon-Jones E, Harmon-Jones C, Amodio DM, Gable PA: **Attitudes toward emotions.** *J Pers Soc Psychol* 2011, **101**:1332 <http://dx.doi.org/10.1037/a0024951>.

5. Menninghaus W, Wagner V, Hanich J, Wassiliwizky E, Jacobsen T, Koelsch S: **The distancing-embracing model of the enjoyment of negative emotions in art reception.** *Behav Brain Sci* 2017, **40**: e347 <http://dx.doi.org/10.1017/S0140525X17000309>.

This paper suggests that negative emotions are a general resource in art and presents a model to account for the enjoyment of these negative emotions. The authors propose that psychological distance mechanisms and processes that stimulate the embrace of negative emotions make art reception more intense, interesting and rewarding.

6. Andrade EB, Cohen JB: **On the consumption of negative feelings.** *J Consum Res* 2007, **34**:283-300 <http://dx.doi.org/10.1086/519498>.
7. Rozin P, Guillot L, Fincher K, Rozin A, Tsukayama E: **Glad to be sad, and other examples of benign masochism.** *Judgment Decis Mak* 2013, **8**:439-447.
8. Turner SA Jr, Silvia PJ: **Must interesting things be pleasant? A test of competing appraisal structures.** *Emotion* 2006, **6**:670 <http://dx.doi.org/10.1037/1528-3542.6.4.670>.
9. Rimé B, Delfosse C, Corsini S: **Brief report (Emotional fascination: responses to viewing pictures of September 11 attacks).** *Cogn Emotion* 2005, **19**:923-932 <http://dx.doi.org/10.1080/02699930541000039>.
10. Redmond S, Jones NM, Holman EA, Silver RC: **Who watches an ISIS beheading—and why.** *Am Psychol* 2019, **74**:555-568 <http://dx.doi.org/10.1037/amp0000438>.
The authors investigate, with a large representative sample, the motives for viewing ISIS beheading videos. They find that people often mention information seeking and curiosity as reasons to view these videos.
11. Kashdan TB, Silvia PJ: **Curiosity and interest: the benefits of thriving on novelty and challenge.** In *Oxford Library of Psychology. Oxford Handbook of Positive Psychology*. Edited by Lopez SJ, Snyder CR. New York, NY, US: Oxford University Press; 2009:367-374.
12. Kidd C, Hayden BY: **The psychology and neuroscience of curiosity.** *Neuron* 2015, **88**:449-460 <http://dx.doi.org/10.1016/j.neuron.2015.09.010>.
13. Gottlieb J, Oudeyer P: **Towards a neuroscience of active sampling and curiosity.** *Nat Rev Neurosci* 2018, **19**:758-770 <http://dx.doi.org/10.1038/s41583-018-0078-0>.
14. Hsee CK, Ruan B: **The Pandora effect: the power and peril of curiosity.** *Psychol Sci* 2016, **27**:659-666 <http://dx.doi.org/10.1177/0956797616631733>.
15. Oosterwijk S, Snoek L, Te Koppele J, Engelbert L, Scholte HS: **Choosing to view morbid information involves reward circuitry.** *in press Sci Rep* 2020.

This neuroimaging study found that brain regions that support extrinsic incentives and regular curiosity (e.g. striatum, inferior frontal gyrus), are also involved when people deliberately expose themselves to negative social scenes. The authors suggest that ‘morbid curiosity’ might not be that different from regular curiosity, and generate novel predictions about the value of seeking out negative content.

16. Murayama K, FitzGibbon L, Sakaki M: **Process account of curiosity and interest: a reward-learning perspective.** *Educ Psychol Rev* 2019, **31**:875-895 <http://dx.doi.org/10.1007/s10648-019-09499-9>.
In this article, the authors move away from defining curiosity and interest, and propose a process account that does not involve curiosity per se. In their framework, they emphasize that people engage in information-seeking, because they predict that knowledge acquisition will be rewarding. Curiosity and interest are the concepts that people construct to subjectively represent this knowledge acquisition process.
17. Golman R, Loewenstein G: **Curiosity, information gaps, and the utility of knowledge.** *Information Gaps, and the Utility of Knowledge*. 2015. (April 16, 2015)..
18. Gottlieb J, Oudeyer P, Lopes M, Baranes A: **Information-seeking, curiosity, and attention: computational and neural mechanisms.** *Trends Cogn Sci* 2013, **17**:585-593 <http://dx.doi.org/10.1016/j.tics.2013.09.001>.
19. Gruber MJ, Ranganath C: **How curiosity enhances hippocampus-dependent memory: the prediction, appraisal, curiosity, and exploration (PACE) framework.** *Trends Cogn Sci* 2019:1014-1025 <http://dx.doi.org/10.1016/j.tics.2019.10.003>.

The authors propose a new, transdisciplinary framework that outlines how the detection of prediction errors and the subsequent appraisal of prediction errors triggers curiosity. Curiosity in turn enhances learning and retention of information. The article forwards testable predictions regarding the neural regions involved in these different processes.

20. Sakaki M, Yagi A, Murayama K: **Curiosity in old age: a possible key to achieving adaptive aging.** *Neurosci Biobehav Rev* 2018, **88**:106-116 <http://dx.doi.org/10.1016/j.neubiorev.2018.03.007>.
 21. Kang MJ, Hsu M, Krajbich IM, Loewenstein G, McClure SM, Wang JTY, Camerer CF: **The wick in the candle of learning: epistemic curiosity activates reward circuitry and enhances memory.** *Psychol Sci* 2009, **20**:963-973 <http://dx.doi.org/10.1111/j.1467-9280.2009.02402.x>.
 22. Diekhof EK, Kaps L, Falkai P, Gruber O: **The role of the human ventral striatum and the medial orbitofrontal cortex in the representation of reward magnitude – an activation likelihood estimation meta-analysis of neuroimaging studies of passive reward expectancy and outcome processing.** *Neuropsychologia* 2012, **50**:1252-1266 <http://dx.doi.org/10.1016/j.neuropsychologia.2012.02.007>.
 23. Bartra O, McGuire JT, Kable JW: **The valuation system: a coordinate-based meta-analysis of BOLD fMRI experiments examining neural correlates of subjective value.** *Neuroimage* 2013, **76**:412-427 <http://dx.doi.org/10.1016/j.neuroimage.2013.02.063>.
 24. Marvin CB, Shohamy D: **Curiosity and reward: valence predicts choice and information prediction errors enhance learning.** *J Exp Psychol Gen* 2016, **145**:266-272 <http://dx.doi.org/10.1037/xge0000140>.
 25. Berlyne DE: **Curiosity and exploration.** *Science* 1966, **153**:25-33 <http://dx.doi.org/10.1126/science.153.3731.25>.
 26. Loewenstein G: **The psychology of curiosity: a review and reinterpretation.** *Psychol Bull* 1994, **116**:75 <http://dx.doi.org/10.1037/0033-2909.116.1.75>.
 27. Baumeister RF, Bratslavsky E, Finkenauer C, Vohs KD: **Bad is stronger than good.** *Rev Gen Psychol* 2001, **5**:323-370 <http://dx.doi.org/10.1037/1089-2680.5.4.323>.
 28. Hoffner CA, Fujioka Y, Ye J, Ibrahim AGS: **Why we watch: factors affecting exposure to tragic television news.** *Mass Commun Soc* 2009, **12**:193-216 <http://dx.doi.org/10.1080/15205430802095042>.
 29. Bartsch A, Mares ML: **Making sense of violence: perceived meaningfulness as a predictor of audience interest in violent media content.** *J Commun* 2014, **64**:956-976 <http://dx.doi.org/10.1111/jcom.12112>.
 30. Charpentier CJ, Bromberg-Martin ES, Sharot T: **Valuation of knowledge and ignorance in mesolimbic reward circuitry.** *Proc Natl Acad Sci U S A* 2018, **115**:E7255-E7264 <http://dx.doi.org/10.1073/pnas.1800547115>.
- This neuroimaging study investigated the role of valence in information seeking. Participants were given the possibility to choose knowledge about favorable and unfavorable outcomes in a personal lottery task. For unfavorable outcomes, participants often preferred ignorance over knowledge. The article forwards insight into the role of mesolimbic reward circuitry in seeking knowledge.
31. Silvia PJ: **Interest: the curious emotion.** *Curr Direct Psychol Sci* 2008, **17**:57-60 <http://dx.doi.org/10.1111/j.1467-8721.2008.00548.x>.
 32. Van Lieshout LL, Vandenbroucke AR, Müller NC, Cools R, de Lange FP: **Induction and relief of curiosity elicit parietal and frontal activity.** *J Neurosci* 2018, **38**:2579-2588 <http://dx.doi.org/10.1523/JNEUROSCI.2816-17.2018>.
 33. Kidd C, Piantadosi ST, Aslin RN: **The goldilocks effect: human infants allocate attention to visual sequences that are neither too simple nor too complex.** *PLoS One* 2012, **7**:e36399 <http://dx.doi.org/10.1371/journal.pone.0036399>.
 34. Noordewier MK, van Dijk E: **Interest in complex novelty.** *Basic Appl Soc Psychol* 2016, **38**:98-110 <http://dx.doi.org/10.1080/01973533.2016.1153474>.
 35. Alves H, Koch A, Unkelbach C: **Why good is more alike than bad: processing implications.** *Trends Cogn Sci* 2017, **21**:69-79 <http://dx.doi.org/10.1016/j.tics.2016.12.006>.
- The authors provide a new interpretation for the phenomenon that humans process positive and negative information differently (i.e. valence asymmetry). They propose that negative information is more dissimilar (e.g. less alike) as compared to positive information.
36. Unkelbach C, Fiedler K, Bayer M, Stegmüller M, Danner D: **Why positive information is processed faster: the density hypothesis.** *J Pers Soc Psychol* 2008, **95**:36 <http://dx.doi.org/10.1037/0022-3514.95.1.36>.
 37. Noordewier MK, van Dijk E: **Deprivation and discovery motives determine how it feels to be curious..** *in press Curr Opin Behav Sci* 2020.
 38. Tamir M: **Why do people regulate their emotions? A taxonomy of motives in emotion regulation.** *Pers Soc Psychol Rev* 2016, **20**:199-222 <http://dx.doi.org/10.1177/1088868315586325>.
 39. Oliver MB, Raney AA: **Entertainment as pleasurable and meaningful: Identifying hedonic and eudaimonic motivations for entertainment consumption.** *J Commun* 2011, **61**:984-1004 <http://dx.doi.org/10.1111/j.1460-2466.2011.01585.x>.
 40. Van Dijk E, Zeelenberg M: **When curiosity killed regret: avoiding or seeking the unknown in decision-making under uncertainty.** *J Exp Soc Psychol* 2007, **43**:656-662 <http://dx.doi.org/10.1016/j.jesp.2006.06.004>.
 41. Zaleski Z: **Sensation-seeking and preference for emotional visual stimuli.** *Pers Individual Differences* 1984, **5**:609-611 [http://dx.doi.org/10.1016/0191-8869\(84\)90040-0](http://dx.doi.org/10.1016/0191-8869(84)90040-0).
 42. Zuckerman M, Litle P: **Personality and curiosity about morbid and sexual events.** *Pers Individual Differences* 1986, **7**:49-56 [http://dx.doi.org/10.1016/0191-8869\(86\)90107-8](http://dx.doi.org/10.1016/0191-8869(86)90107-8).
 43. Bench SW, Lench HC: **Boredom as a seeking state: boredom prompts the pursuit of novel (even negative) experiences.** *Emotion* 2018, **19**:242-254 <http://dx.doi.org/10.1037/emo0000433>.
- This paper demonstrates that experimentally induced boredom (by repeated exposure to neutral or positive images) increases choice for negative stimuli. According to the authors, boredom motivates people to pursue novel experiences that elicit feelings different from their current state.
44. Wilson TD, Reinhard DA, Westgate EC, Gilbert DT, Ellerbeck N, Hahn C, Shaked A: **Just think: the challenges of the disengaged mind.** *Science* 2014, **345**:75-77 <http://dx.doi.org/10.1126/science.1250830>.
 45. Zuckerman M (Ed): *Biological Bases of Sensation Seeking, Impulsivity and Anxiety.* Hillsdale, N.J.: Erlbaum; 1983.
 46. Maio GR, Esses VM: **The need for affect: individual differences in the motivation to approach emotions.** *J Pers* 2001, **69**:583-615 <http://dx.doi.org/10.1111/1467-6494.694156>.
 47. Erbas Y, Ceulemans E, Lee Pe M, Koval P, Kuppens P: **Negative emotion differentiation: its personality and well-being correlates and a comparison of different assessment methods.** *Cogn Emotion* 2014, **28**:1196-1213 <http://dx.doi.org/10.1080/02699931.2013.875890>.
 48. Bartsch A, Vorderer P, Mangold R, Viehoff R: **Appraisal of emotions in media use: toward a process model of meta-emotion and emotion regulation.** *Media Psychol* 2008, **11**:7-27 <http://dx.doi.org/10.1080/15213260701813447>.
 49. Kerr M, Siegle GJ, Orsini J: **Voluntary arousing negative experiences (VANE): why we like to be scared.** *Emotion* 2019, **19**:682-698 <http://dx.doi.org/10.1037/emo0000470>.
 50. Kashdan TB, Stikma MC, Disabato DD, McKnight PE, Bekier J, Kaji J, Lazarus R: **The five-dimensional curiosity scale: capturing the bandwidth of curiosity and identifying four unique subgroups of curious people.** *J Res Pers* 2018, **73**:130-149 <http://dx.doi.org/10.1016/j.jrp.2017.11.011>.
 51. Zaki J, Ochsner K: **Reintegrating the study of accuracy into social cognition research.** *Psychol Inquiry* 2011, **22**:159-182 <http://dx.doi.org/10.1080/1047840X.2011.551743>.

6 Curiosity (Explore versus Exploit)

52. Zaki J: **Empathy: a motivated account.** *Psychol Bull* 2014, **140**:1608-1647 <http://dx.doi.org/10.1037/a0037679>.
53. Cameron CD, Hutcherson CA, Ferguson AM, Scheffer JA, Hadjiandreou E, Inzlicht M: **Empathy is hard work: people choose to avoid empathy because of its cognitive costs.** *J Exp Psychol: Gen* 2019, **148**:962-976 <http://dx.doi.org/10.1037/xge0000595>.
54. Bergin DA: **Social influences on interest.** *Educ Psychol* 2016, **51**:7-22 <http://dx.doi.org/10.1080/00461520.2015.1133306>.
55. Tamborini R: **Responding to horror: determinants of exposure and appeal.** In *Responding to the Screen: Reception and Reaction Processes*. Edited by Bryant J, Zillmann D. Hillsdale, NJ: Lawrence Erlbaum Associates, Inc; 1991:305-328.
56. Kobayashi K, Ravaioli S, Baranés A, Woodford M, Gottlieb J: **Diverse motives for curiosity.** *Nat Hum Behav* 2019, **3** <http://dx.doi.org/10.1038/s41562-019-0589-3>.
57. Wade S, Kidd C: **The role of prior knowledge and curiosity in learning.** *Psychon Bull Rev* 2019:1-11 <http://dx.doi.org/10.3758/s13423-019-01598-6>.