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The dynamics of surprise and curiosity

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References

- Abelson, R. P., Aronson, E., McGuire, W., Newcomb, T., Rosenberg, M., & Tannenbaum, P. (1968). *Theories of cognitive consistency: A sourcebook*. Chicago, IL: Rand McNally.
- Aiken, L. S., & West, S. G. (1991). *Multiple regression: Testing and interpreting interactions*. Thousand Oaks, CA: Sage Publications, Inc.
- Alexander, W. H., & Brown, J. W. (2011). Medial prefrontal cortex as an action-outcome predictor. *Nature Neuroscience*, 14, 1338–1344.
- Alter, A. L., Oppenheimer, D. M., Epley, N., & Eyre, R. N. (2007). Overcoming intuition: Metacognitive difficulty activates analytic reasoning. *Journal of Experimental Psychology: General*, 136, 569–576.
- Antico, M., & Kleijnen, M. (2010). Consumer adoption of technological innovations: Effects of psychological and functional barriers in a lack of content versus a presence of content situation. *European Journal of Marketing*, 44, 1700–1724.
- Asplund, C. L., Todd, J. J., Snyder, A. P., Gilbert, C. M., & Marois, R. (2010). Surprise-induced blindness: A stimulus-driven attentional limit to conscious perception. *Journal of Experimental Psychology: Human Perception & Performance*, 36, 1372–1381.
- Aronson, E., & Carlsmith, J. M. (1962). Performance expectancy as a determinant of actual performance. *Journal of Abnormal Social Psychology*, 65, 178–183.
- Attardo, S. (1997). The semantic foundations of cognitive theories of humor. *Humor: International Journal of Humor Research*, 10, 395–420.
- Bain, A. (1859/2006). *The emotions and the will*. New York: Cosmo Classics.
- Barrett, L. F. (2012). Emotions are real. *Emotion*, 12, 413–429.
- Barrett, L. F., Mesquita, B., Ochsner, K. N., & Gross, J. J. (2007). The experience of emotion. *Annual Review of Psychology*, 58, 373–403.
- Behrens, T. E., Woolrich, M. W., Walton, M. E., & Rushworth, M. F. (2007). Learning the value of information in an uncertain world. *Nature Neuroscience*, 10, 1214–1221.
- Bench, S. W., & Lench, H. C. (2013). On the function of boredom. *Behavioral Science*, 3, 459–472.
- Bennett, D. S., Bendersky, M., & Lewis, M. (2002). Facial expressivity at 4 months: A context by expression analysis. *Infancy*, 3, 97–113.
- Berlyne, D. E. (1954). A theory of human curiosity. *British Journal of Psychology*, 45, 180–191.

- Berger, J., & Fitzsimons, G. (2008) Dogs on the street, pumas on your feet: How cues in the environment influence product evaluation and choice. *Journal of Marketing Research*, 45, 1–14.
- Berlyne, D. E. (1960). *Conflict, arousal, and curiosity*. New York, NY: McGraw-Hill.
- Berlyne, D. E. (1971). *Aesthetics and psychobiology*. New York, NY: Appleton-Century-Crofts.
- Berridge, K. C. (1999). Pleasure, pain, desire, and dread: Hidden core processes of emotion. In D. Kahneman, E. Diener, & N. Schwarz (Eds.), *Well-being: Foundations of hedonic psychology* (pp. 527–559). New York, NY: Russell Sage Foundation.
- Berridge, K. C. (2003). Pleasures of the brain. *Brain & Cognition*, 52, 106–128.
- Bettencourt, B. A., Dill, K. E., Greathouse, S. A., Charlton, K., & Mulholland, A. (1997). Evaluations of ingroup and outgroup members: The role of category-based expectancy violations. *Journal of Experimental Social Psychology*, 33, 244–275.
- Biernat, M. (2005). *Standards and expectancies: Contrast and assimilation in judgments of self and others*. New York, NY: Psychology Press/Taylor and Francis.
- Blascovich, J., & Mendes, W. B. (2000). Challenge and threat appraisals: The role of affective cues. In J. Forgas (Ed.), *Feeling and thinking: The role of affect in social cognition* (pp. 59–82). Paris, France: Cambridge University Press.
- Bless, H., Clore, G. L., Schwarz, N., Golisano, V., Rabe, C., & Wölk, M. (1996). Mood and the use of scripts: Does a happy mood really lead to mindlessness? *Journal of Personality and Social Psychology*, 71, 665–679.
- Blijlevens, J., Carbon, C. C., Mugge, R., & Schoormans, J. P. L. (2012). Aesthetic appraisal of product designs: Independent effects of typicality and arousal. *British Journal of Psychology*, 103, 44–57.
- Botvinick, M. M., Braver, T. S., Barch, D. M., Carter, C. S., & Cohen, J. D. (2001). Conflict monitoring and cognitive control. *Psychological Review*, 108, 624–652.
- Breugelmans, S. M., Poortinga, Y. H., Ambadar, Z., Setiadi, B., Vaca, J. B., & Widiyanto, P. (2005). Body sensations associated with emotions in Rarámuri Indians, rural Javanese, and three student samples. *Emotion*, 5, 166–174.

- Bush, G., Luu, P., & Posner, M. I. (2000). Cognitive and emotional influences in anterior cingulate cortex. *Trends in Cognitive Science*, 4, 215–222.
- Camras, L. A., Meng, Z., Ujiie, T., Dharamsi, S., Miyake, K., Oster, H., Wang, L., Cruz, J., Murdoch, A., & Campos, J. (2002). Observing emotion in infants: Facial expression, body behavior, and rater judgments of responses to an expectancy violating event. *Emotion*, 2, 179–193.
- Cano, M. E., Class, Q. A., & Polich, J. (2009). Affective valence, stimulus attributes, and P300: Color vs. black/white and normal vs. scrambled images. *International Journal of Psychophysiology*, 71, 17–24.
- Carbon, C. C., Faerber, S. J., Gerger, G., Forster, M., & Leder, H. (2013). Innovation is appreciated when we feel safe: On the situational dependence of the appreciation of innovation. *International Journal of Design*, 7, 43–51.
- Carbon, C. C., & Leder, H. (2005). The Repeated Evaluation Technique (RET): A method to capture dynamic effects of innovativeness and attractiveness. *Applied Cognitive Psychology*, 19, 587–601.
- Carbon, C. C., & Leder, H. (2007). Design evaluation: From typical problems to state-of-the-art solutions. *Marketing Review St. Gallen (Thesis)*, 2, 33–37.
- Carbon, C. C., & Schoormans, J. P. L. (2012). Rigidity rather than age as a limiting factor to appreciate innovative design. *Swiss Journal of Psychology*, 71, 51–58.
- Castaño, R., Sujan, M., Kacker, M., & Sujan, H. (2008). Managing consumer uncertainty in the adoption of new products: Temporal distance and mental simulation. *Journal of Marketing Research*, 45, 320–336.
- Castellion, G., & Markham, S. K. (2012). Perspective: New product failure rates: Influence of argumentum ad populum and self-interest. *Journal of Innovation Management*, 30, 976–979.
- Collet, C., Vernet-Maury, E., Delhomme, G., & Dittmar, A. (1997). Autonomic nervous system response patterns specificity to basic emotions. *Journal of the Autonomic Nervous System*, 62, 45–57.
- Collins, R. P., Litman, J. A., & Spielberger, C. D. (2004). The measurement of perceptual curiosity. *Personality and Individual Differences*, 36, 1127–1141.

- Collins, A. M., & Loftus, E. F. (1975). A spreading-activation theory of semantic processing. *Psychological Review*, 82, 407–428.
- Conroy, M. A., & Polich, J. (2007). Affective valence and P300 when stimulus arousal level is controlled. *Cognition and Emotion*, 21, 891–901.
- Cumming, G. (2014). The new statistics: Why and how. *Psychological Science*, 25, 7–29.
- Darwin, C. (1998). *The expression of the emotions in man and animals* (3rd ed.) Exford: Oxford University Press. (Original work published 1872).
- Day, H. I. (1971). The measurement of specific curiosity. In H. I. Day, D. E. Berlyne, & D. E. Hunt (Eds.), *Intrinsic motivation: A new direction in education* (pp. 99–112). New York, NY: Holt, Rinehart & Winston.
- De Hooge, I. E., Nelissen, R. M. A., Breugelmans, S. M., & Zeelenberg, M. (2011). What is moral about guilt? Acting “prosocially” at the disadvantage of others. *Journal of Personality and Social Psychology*, 100, 462–473.
- Den Uyl, M., & Van Kuilenburg, H. (2005). The FaceReader: Online facial expression recognition. In L. P. J. J. Noldus, F. Grieco, L. W. S. Loijens, & P. H. Zimmerman (Eds.), *Proceedings of Measuring Behavior 2005, 5th International Conference on Methods and Techniques in Behavioral Research* (pp. 589–590). Wageningen, The Netherlands: Noldus Information Technology.
- Derbaix, C., & Vanhamme, J. (2003). Inducing word-of-mouth by eliciting surprise: A pilot investigation. *Journal of Economic Psychology*, 24, 99–116.
- D'Mello, S., & Graesser, A. (2012). Dynamics of affective states during complex learning. *Learning and Instruction*, 22, 145–157.
- D'Mello, S., & Graesser, A. (2014). Confusion and its dynamics during device comprehension with breakdown scenarios. *Acta Psychologica*, 151, 106–116.
- D'Mello, S., Lehman, S., Pekrun, R., & Graesser, A. (2014). Confusion can be beneficial for learning. *Learning and Instruction*, 29, 153–170.
- Donchin, E. (1981). Presidential Address, 1980: Surprise!...Surprise? *Psychophysiology*, 18, 493–513.

- Du, S., Tao, Y., & Martinez, A. M. (2014). Compound facial expressions of emotion. *Proceedings of the National Academy of Sciences*, 111, 1454–1462.
- Dunlop, W. P., Cortina, J. M., Vaslow, J. B., & Burke, M. J. (1996). Meta-analysis of experiments with matched groups or repeated measures designs. *Psychological Methods*, 1, 170–177.
- Egner, T. (2011). Surprise! A unifying model of dorsal anterior cingulate function? *Nature Neuroscience*, 14, 1219–1220.
- Ekman, P. (2003). *Emotions revealed. Understanding faces and feelings*. London, UK: Weidenfeld & Nicolson.
- Ekman, P., & Friesen, W. V. (1971). Constants across cultures in the face and emotion. *Journal of Personality and Social Psychology*, 17, 124–129.
- Ekman, P., Friesen, W. V., & Hager, J. C. (Eds.). (2002). *Facial action coding system*. Salt Lake City, UT: Research Nexus, Network Research Information.
- Ekman, P., Friesen, W. V., O'Sullivan, M., Chan, A., Diacoyanni-Tarlatzis, I., Heider, K., Krause, R., Lecompte, W. A., Pitcairn, T., Ricci-Bitti, P. E., Scherer, K. R., Tomita, M., & Tzavaras A. (1987) Universals and cultural differences in the judgments of facial expressions of emotion. *Journal of Personality and Social Psychology*, 53, 712–717.
- Elliot, A. J., & Devine, P. G. (1994). On the motivational nature of cognitive dissonance: Dissonance as psychological discomfort. *Journal of Personality and Social Psychology*, 67, 382–394.
- Escera, C., Alho, K., Winkler, I., & Näätänen, R. (1998). Neural mechanisms of involuntary attention to acoustic novelty and change. *Journal of Cognitive Neuroscience*, 10, 590–604.
- Faerber, S. J., Leder, H., Gerger, G., & Carbon, C. C. (2010). Priming semantic concepts affects the dynamics of aesthetic appreciation. *Acta Psychologica*, 135, 191–200.
- Feiereisen, S., Wong, V., & Broderick, A. J. (2008). Analogies and mental simulations in learning for really new products: The role of visual attention. *Journal of Product Innovation Management*, 25, 593–607.
- Ferrari, V. J. (2010). Detecting novelty and significance. *Journal of Cognitive Neuroscience*, 22, 404–411.

- Fontaine, J. R. J., Scherer, K. R., Roesch, E. B., & Ellsworth, P. C. (2007). The world of emotions is not two-dimensional. *Psychological Science*, 18, 1050–1057.
- Forabosco, G. (1992). Cognitive aspects of the humor process: The concept of incongruity. *Humor: International Journal of Humor Research*, 5, 45–68.
- Friedlund, A. J. (1991). Sociality of solitary smiling: Potentiation by an implicit audience. *Journal of Personality and Social Psychology*, 60, 229–240.
- Frijda, N. H. (1986). *The emotions*. London, UK: Cambridge University Press.
- Gawronski, B., & Strack, F. (Eds.). (2012). *Cognitive consistency: A fundamental principle in social cognition*. New York, NY: Guilford Press.
- Gendolla, G. H. E., & Koller, M. (2002). Surprise and need for causal explanation: How are they affected by outcome valence and importance? *Motivation and Emotion*, 25, 327–349.
- Gillebaart, M., Förster, J., & Rotteveel, M. (2012). Mere exposure revisited: The influence of growth versus security cues on evaluations of novel and familiar stimuli. *Journal of Experimental Psychology: General*, 141, 699–714.
- Goldsmith, R. E., & Hofacker, C. F. (1991). Measuring consumer innovativeness. *Journal of the Academy of Marketing Science*, 19, 209–221.
- Goldstein, A., Spencer, K. M., & Donchin, E. (2002). The influence of stimulus deviance and novelty on the P300 and novelty P3. *Psychophysiology*, 39, 781–790.
- Graf, L. K. M., & Landwehr, J. R. (2015). A dual-process perspective on fluency-based aesthetics: The pleasure-interest model of aesthetic liking. *Personality and Social Psychology Review*, 19, 395–410.
- Gregan-Paxton, J., Hibbard, J. D., Brunel, F. F., & Azar, P. (2002). So that's what that is: Examining the impact of analogy on consumers' knowledge development for really new products. *Psychology & Marketing*, 19, 533–550.
- Gross, J. J., & John, O. P. (1997). Revealing feelings: Facets of emotional expressivity in self-reports, peer ratings, and behaviour. *Journal of Personality and Social Psychology*, 72, 435–448.

- Gruber, M. J., Gelman, B. D., & Ranganath, C. (2014). States of curiosity modulate hippocampus-dependent learning via the dopaminergic circuit. *Neuron*, 84, 486–496.
- Hajcak, G. (2012). What we've learned from mistakes insights from error-related brain activity. *Current Directions in Psychological Science*, 21, 101–106.
- Hajcak, G., & Foti, D. (2008). Errors are aversive: Defensive motivation and the error-related negativity. *Psychological Science*, 19, 103–108.
- Hajcak, G., Holyroyd, C. B., Moser, J. S., & Simons, R. F. (2005). Brain potentials associated with expected and unexpected good and bad outcomes. *Psychophysiology*, 42, 161–170.
- Han, C., Li, P., Warren, C., Feng, T., Litman, J., & Li, H. (2013). Electrophysiological evidence for the importance of interpersonal curiosity. *Brain Research*, 15, 45–54.
- Hawkins, S. A., & Hastie, R. (1990). Hindsight: Biased judgments of past events after the outcomes are known. *Psychological Bulletin*, 107, 311–327.
- Hekkert, P., Snelders, D., & Van Wieringen, P. C. W. (2003). Most advanced, yet acceptable: Typicality and novelty as joint predictors of aesthetic preference in industrial design. *British Journal of Psychology*, 94, 111–124.
- Hidi, S., & Berndorff, D. (1998). Situational interest and learning. In L. Hoffman, A. Krapp, K. A. Renninger, & J. Baumert (Eds.), *Interest and learning* (pp. 74–90). Kiel: IPN.
- Higgins, T. E., Rholes, W. S., & Jones, C. R. (1977). Category accessibility and impression formation. *Journal of Social Psychology*, 13, 141–154.
- Hoeffler, S. (2003). Measuring preferences for really new products. *Journal of Marketing Research*, 40, 406–421.
- Holroyd, C. B., & Coles, M. G. (2002). The neural basis of human error processing: reinforcement learning, dopamine, and the error-related negativity. *Psychological Review*, 109, 679–709.
- Horstmann, G. (2002). Evidence for attentional capture by a surprising color singleton in visual search. *Psychological Science*, 13, 499–505.

- Horstmann, G. (2005). Attentional capture by an unannounced color singleton depends on expectation discrepancy. *Journal of Experimental Psychology: Human Perception and Performance*, 31, 1039–1060.
- Horstmann, G. (2006). Latency and duration of the action interruption in surprise. *Cognition and Emotion*, 20, 242–273.
- Horstmann, G. (2015). The surprise-attention link: A review. *Annals of the New York Academy of Sciences*, 1339, 106–115.
- Horstmann, G., & Herwig, A. (2015). Surprise attracts the eyes and binds the gaze. *Psychonomic Bulletin & Review*, 22, 743–749.
- Hull, C. L. (1932). The goal-gradient hypothesis and maze learning. *Psychological Review*, 39, 25–43.
- Ito, T. A., Larsen, J. T., Smith, N. K., & Cacioppo, J. T. (1998). Negative information weighs more heavily on the brain: The negativity bias in evaluative categorizations. *Journal of Personality and Social Psychology*, 75, 887–900.
- Jepma, M., Verdonschot, R. G., Van Steenbergen, H., Rombouts, S. A. R. B., & Nieuwenhuis, S. (2012). Neural mechanisms underlying the induction and relief of perceptual curiosity. *Frontiers in Behavioral Neuroscience*, 6, 1–9.
- Joireman, J., Shaffer, M., Balliet, D., & Strathman, A. (2012). Promotion orientation explains why future oriented people exercise and eat healthy: Evidence from the two-factor consideration of future consequences 14 scale. *Personality and Social Psychology Bulletin*, 38, 1272–1287.
- Kahneman, D., Fredrickson, B. L., Schreiber, C. A., & Redelmeier, D. A. (1993). When more pain is preferred to less: Adding a better end. *Psychological Science*, 4, 401–405.
- Kahneman, D., & Miller, D. T. (1986). Norm theory: Comparing reality to its alternatives. *Psychological Review*, 93, 136–153.
- Kang, M. J., Hsu, M., Krajbich, I. M., Loewenstein, G., McClure, S. M., Wang, J. T., & Camerer, C. F. (2009). The wick in the candle of learning: Epistemic curiosity activates reward circuitry and enhances memory. *Psychological Science*, 20, 963–973.
- Kashdan, T. B., Gallagher, M. W., Silvia, P. J., Winterstein, B. P., Breen, W. E., Terhar, D., & Steger, M. F. (2009). The Curiosity and Exploration Inventory-II: Development, factor structure, and psychometrics. *Journal of Research in Personality*, 43, 987–998.

- Kashdan, T. B., & Silvia, P. J. (2009). Curiosity and interest: The benefits of thriving on novelty and challenge. In C. R. Snyder & S. J. Lopez (Ed.), *Handbook of positive psychology* (2nd ed., pp. 367–374). New York, NY: Oxford University Press.
- Kay, A. C., Whitson, J. A., Gaucher, D., & Galinsky, A. D. (2009). Compensatory control: Achieving order through the mind, our institutions, and the heavens. *Current Directions in Psychological Science*, 18, 264–268.
- Keltner, D., & Shiota, M. N. (2003). New displays and new emotions: A commentary on Rozin and Cohen (2003). *Emotion*, 3, 86–91.
- Kim, J. S., Hahn, M., & Yoon, Y. (2015). The moderating role of personal need for structure on the evaluation of incrementally new products versus really new products. *Psychology & Marketing*, 32, 144–161.
- Kivetz, R., Urminsky, O., & Zheng, Y. (2006). The goal-gradient hypothesis resurrected: Purchase acceleration, illusionary goal progress, and customer retention. *Journal of Marketing Research*, XLIII, 39–58.
- Kleijnen, M., Lee, M., & Wetzels, M. (2009). An exploration of consumer resistance to innovation and its antecedents. *Journal of Economic Psychology*, 30, 344–357.
- Kline, R. B. (2013). *Beyond significance testing: Statistics reform in the behavioral sciences* (2nd ed.). Washington: American Psychological Association.
- Kruger, J., & Evans, M. (2009). The paradox of Alypius and the pursuit of unwanted information. *Journal of Experimental Social Psychology*, 45, 1173–1179.
- Lakens, D. (2013). Calculating and reporting effect sizes to facilitate cumulative science: A practical primer for *t*-test and ANOVAs. *Frontiers in Psychology*, 4, 1–12.
- Lane, R. D., Reiman, E. M., Axelrod, B., Yun, L. S., Holmes, A., & Schwartz, G. E. (1998). Neural correlates of levels of emotional awareness: Evidence of an interaction between emotion and attention in the anterior cingulate cortex. *Journal of Cognitive Neuroscience*, 10, 525–535.
- Larsen, J. T., McGraw, A. P., & Cacioppo, J. T. (2001). Can people feel happy and sad at the same time? *Journal of Personality and Social Psychology*, 81, 684–696.

- Lauriola, M., Litman, J. A., Mussel, P., De Santis, R., Crowson, H. M., & Hoffman, R. R. (2015). Epistemic curiosity and self-regulation. *Personality and Individual Differences*, 83, 202–207.
- Leder, H., Carbon, C. C., & Ripsas, A. L. (2006). Entitling art: Influence of title information on understanding and appreciation of paintings. *Acta Psychologica*, 121, 176–198.
- Lewinski, P., Den Uyl, T. M., & Butler, C. (2014). Automated facial coding: Validation of basic emotions and FACS AUs in FaceReader. *Journal of Neuroscience, Psychology, and Economics*, 7, 227–236.
- Litman, J. A. (2005). Curiosity and the pleasures of learning: Wanting and liking new information. *Cognition and Emotion*, 19, 793–814.
- Litman, J. A. (2008). Interest and deprivation dimensions of epistemic curiosity. *Personality and Individual Differences*, 44, 1585–1595.
- Litman, J. A. (2010). Relationships between measures of I- and D-type curiosity, ambiguity tolerance, and need for closure: An initial test of the wanting-liking model of information-seeking. *Personality and Individual Differences*, 48, 397–402.
- Litman, J. A., Hutchins, T. L., & Russon, R. K. (2005). Epistemic curiosity, feeling-of-knowing, and exploratory behaviour. *Cognition and Emotion*, 19, 559–582.
- Litman, J. A., & Jimerson, T. L. (2004). The measurement of curiosity as a feeling-of-deprivation. *Journal of Personality Assessment*, 82, 147–157.
- Litman, J. A., & Mussel, P. (2013). Development and validation of German translations of interest and deprivation-type epistemic curiosity scales. *Journal of Individual Differences*, 34, 59–68.
- Litman, J. A., & Spielberger, C. D. (2003). Measuring epistemic curiosity and its diversive and specific components. *Journal of Personality Assessment*, 80, 75–86.
- Loewenstein, G. (1994). The psychology of curiosity: A review and reinterpretation. *Psychological Bulletin*, 116, 75–98.
- Macedo, L., Cardoso, A., Reisenzein, R., Lorini, E., & Castelfranchi, C. (2009). Artificial surprise. In J. Vallverdu and D. Casacuberta (Eds). *Handbook of Research on Synthetic Emotions and Sociable Robotics: New Applications in Affective Computing and Artificial Intelligence*. (pp. 267–291). Hershey, PA: IGI Global.

- Macrae, C. N., Bodenhausen, G. V., Schloerscheidt, A. M., & Milne, A. B. (1999). Tales of the unexpected: Executive function and person perception. *Journal of Personality and Social Psychology*, 76, 200–213.
- Maguire, R., Maguire, P., & Keane, M. T. (2011). Making sense of surprise: An investigation of the factors influencing surprise judgments. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 37, 137–186.
- Maril, A., Simons, J. S., Weaver, J. J., & Schacter, D. L. (2005). Graded recall success: An event-related fMRI comparison of tip-of-the-tongue and feeling-of-knowing. *NeuroImage*, 24, 1130–1138.
- McGraw, P. A., Mellers, B. A., & Ritov, I. (2004). The affective costs of overconfidence. *Journal of Behavioural Decision Making*, 17, 1–15.
- Mellers, B., Fincher, K., Drummond, C., & Bigony, M. (2013). Surprise: A belief or an emotion. *Progress in Brain Research*, 202, 3–19.
- Mellers, B. A., Schwartz, A., Ho, K., & Ritov, I. (1997). Decision Affect Theory: Emotional reactions to the outcomes of risky options. *Psychological Science*, 8, 423–429.
- Mendes, W. B., Blascovich, J., Hunter, S. B., Lickel, B., & Jost, J. T. (2007). Threatened by the unexpected: Physiological responses during social interactions with expectancy-violation partners. *Journal of Personality and Social Psychology*, 4, 698–716.
- Menon, S., & Soman, D. (2002). Managing the power of curiosity for effective web advertising strategies. *Journal of Advertising*, 31, 1–14.
- Metcalfe J. & Mischel, W. (1999). A hot/cool-system analysis of delay of gratification: Dynamics of willpower. *Psychological Review*, 106, 3–19.
- Meyer, W. U., Niepel, M., Rudolph, U., & Schützwohl, A. (1991). An experimental analysis of surprise. *Cognition and Emotion*, 5, 295–311.
- Meyer, W. U., Reisenzein, R., & Schützwohl, A. (1997). Towards a process analysis of emotions: The case of surprise. *Motivation and Emotion*, 21, 251–274.
- Miceli, M., & Castelfranchi, C. (2002). The mind and the future: The (negative) power of expectations. *Theory & Psychology*, 12, 335–366.
- Miceli, M., & Castelfranchi, C. (2015). *Expectancy and Emotion*. Oxford, UK: Oxford University Press.

- Miller, N. A. (1959). Liberalization of basic S-R concepts: Extensions to conflict behavior, motivation, and social learning. In S. Koch (Ed.), *Psychology: The study of a science*, (pp. 196–292). New York: McGraw-Hill.
- Mischel, W. (1974). Processes in delay of gratification. In D. Berkowitz (Ed.), *Advances in Experimental Psychology* (Vol. 7, pp. 249–292). New York, NY: Academic Press.
- Mischel, W., Ebbesen, E. B., & Zeiss, A. R. (1972). Cognitive and attentional mechanisms in delay of gratification. *Journal of Personality and Social Psychology*, 21, 204–218.
- Miller, N. A. (1959). Liberalization of basic S-R concepts: Extensions to conflict behavior, motivation, and social learning. In S. Koch (Ed.), *Psychology: The study of a science*, (pp. 196–292). New York: McGraw-Hill.
- Millis, K. (2001). Making meaning brings pleasure: The influence of titles on aesthetic experience. *Emotion*, 1, 320–329.
- Mukherjee, A., & Hoyer, W. D. (2001). The effect of novel attributes on product evaluation. *Journal of Consumer Research*, 28, 462–472.
- Muth, C., Raab, M. H., & Carbon, C. C. (2015). The stream of experience when watching artistic movies. Dynamic aesthetic effects revealed by the continuous evaluation procedure (CEP). *Frontiers in Psychology*, 6, 365–383.
- Näätänen, R. (1990). The role of attention in auditory information processing as revealed by event-related potentials and other brain measures of cognitive function. *Behavioural and Brain Sciences*, 13, 201–288.
- Neely, J. H. (1977). Semantic priming and retrieval from lexical memory: Roles of inhibitionless spreading activation and limited capacity attention. *Journal of Experimental Psychology: General*, 106, 226–254.
- Niepel, M. (2001). Independent manipulation of stimulus change and unexpectedness dissociates indices of the orienting response. *Psychophysiology*, 38, 84–91.
- Noordewier, M. K., & Breugelmans, S. M. (2013). On the valence of surprise. *Cognition and Emotion*, 27, 1326–1334.
- Noordewier, M. K., Topolinski, S., & Van Dijk, E. (2016). The temporal dynamics of surprise. *Social and Personality Psychology Compass*, in press.

- Noordewier, M. K., & Van Dijk, E. (2016). Surprise: Unfolding of facial expression. *Manuscript submitted for publication*.
- Noordewier, M. K., & Van Dijk, E. (2016). Curiosity and time: From not knowing to almost knowing. *Cognition and Emotion, in press*.
- Noordewier, M. K., & Van Dijk, E. (2016). Interest in complex novelty. *Manuscript submitted for publication*.
- Noseworthy, T. J., Di Muro, F., & Murray, K. B. (2014). The role of arousal in congruity-based product evaluation. *Journal of Consumer Research, 41*, 1108–1126.
- Oishi, S., Miao, F. F., Koo, M., Kisling, J., & Ratliff, K. A. (2012). Residential mobility breeds familiarity-seeking. *Journal of Personality and Social Psychology, 102*, 149–162.
- Oliver, R. L. (1997). *Satisfaction: A Behavioural Perspective on the Consumer*. New York, NY: McGraw Hill.
- Oreg, S. (2003). Resistance to change: Developing an individual differences measure. *Journal of Applied Psychology, 88*, 680–693.
- Oreg, S., & Goldenberg, J. (2015). *Resistance to innovation: Its sources and manifestations*. Chicago, IL: University of Chicago Press.
- Oliver, R. L. (1997). *Satisfaction: A Behavioural Perspective on the Consumer*. New-York, NY: The McGraw-Hill Companies, Inc.
- Parrott, W. G., & Gleitman, H. (1989). Infants' expectations in play: The joy of peek-a-boo. *Cognition and Emotion, 3*, 291–311.
- Pezzo, M. (2003). Surprise, defence, or making sense: What removes hindsight bias? *Memory, 22*, 421–441.
- Picton, W. T. (1992). The P300 wave of the human event-related potential. *Journal of Clinical Neurophysiology, 9*, 456–479.
- Piotrowski, J. T., Litman, J. A., & Valkenburg, P. (2014). Measuring epistemic curiosity in young children. *Infant and Child Development, 23*, 542–533.
- Plutchik, R. (1980). *Emotion: A psychoevolutionary synthesis*. New York, NY: Harper & Row.
- Proulx, T., & Heine, S. J. (2006). Death and black diamonds. Meaning, mortality, and the meaning maintenance model. *Psychological Inquiry, 17*, 309–318.
- Proulx, T., Inzlicht, M., & Harmon-Jones, E. (2012). Understanding all inconsistency compensation as a palliative response to violated expectations. *Trends in Cognitive Sciences, 16*, 285–291.

- Reisenzein, R. (2000a). Exploring the strength of association between the components of emotion syndromes: The case of surprise. *Cognition and Emotion*, 14, 1–38.
- Reisenzein, R. (2000b). The subjective experience of surprise. In H. Bless & J. P. Forgas (Eds.), *The message within: The role of subjective experience in social cognition and behaviour* (pp. 262–279). Philadelphia, PA: Psychology Press.
- Reisenzein, R., Bördgen, S., Holtbernd, T., & Matz, D. (2006). Evidence for strong dissociation between emotion and facial displays: The case of surprise. *Journal of Personality and Social Psychology*, 91, 295–315.
- Reisenzein, R., & Meyer, W. U. (2009). Surprise. In D. Sander & K. R. Scherer (Eds.), *Oxford companion to the affective sciences* (pp. 386–387). Oxford, UK: Oxford University Press.
- Reisenzein, R., Meyer, W. U., & Niepel, M. (2012). Surprise. In V. S. Ramachandran (Ed.), *Encyclopedia of Human Behaviour* (2nd ed., pp. 564–570). Amsterdam, The Netherlands: Elsevier.
- Rindova, V. P., & Petkova, A. P. (2007). When is a new thing a good thing? Technological change, product form design, and perceptions of value for product innovations. *Organization Science*, 18, 217–232.
- Roelofs, K., Hagenaars, M. A., & Stins, J. (2010). Facing freeze: Social threat induces bodily freeze in humans. *Psychological Science*, 21, 1575–1581.
- Rogers, E. M. (2003). *Diffusion of innovations* (5th ed.). New York, NY: Free Press.
- Russell, J. A. (1980). A circumplex model of affect. *Journal of Personality and Social Psychology*, 39, 1161–1178.
- Russell, J. A. (2003). Core affect and the psychological construction of emotion. *Psychological Review*, 110, 145–172.
- Rutjens, B. T., van Harreveld, F., & Cunningham, W. (2015). A balance perspective on threat compensation. *Manuscript in preparation*.
- Rutjens, B. T., van Harreveld, F., van der Pligt, J., Kreemers, L. M., & Noordewier, M. K. (2013). Steps, stages, and structure: Finding compensatory order in scientific theories. *Journal of Experimental Psychology: General*, 142, 313–318.
- Schachter, S., & Singer, J. E. (1962). Cognitive, social, and physiological determinants of emotional state. *Psychological Review*, 69, 379–399.

- Scherer, K. R. (1999). On the sequential nature of appraisal processes: Indirect evidence from a recognition task. *Cognition and Emotion*, 13, 763–793.
- Scherer, K. R. (2001). Appraisal considered as a process of multilevel sequential checking. In K. R. Scherer, A., Schorr, & T. Johnstone (Eds.), *Appraisal processes in emotion: Theory, methods, research* (pp. 92–120). New York, NY: Oxford University Press.
- Scherer, K. R., Zentner, M. R., & Stern, D. (2004). Beyond surprise: The puzzle of infants' expressive reactions to expectancy violation. *Emotion*, 4, 389–402.
- Schneider, J., & Hall, J. (2011). Why most product launches fail. *Harvard Business Review*, 89, 21–23.
- Schubert, L., Topolinski, S., & Strack, F. (2015). Athletic midwives, literate butchers, and greedy hooligans: The independent contributions of stereotype valence and consistency on evaluative Judgments. *Manuscript submitted for publication*.
- Schützwohl, A. (1998). Surprise and schema strength. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 24, 1182–1199.
- Schützwohl, A., & Borgstedt, K. (2005). The processing of affectively valenced stimuli: The role of surprise. *Cognition and Emotion*, 19, 583–600.
- Schützwohl, A., & Reisenzein, R. (2012). Facial expressions in response to a highly surprising event exceeding the field of vision: A test of Darwin's theory of surprise. *Evolution and Human Behavior*, 33, 657–664.
- Schwarz, N. (1990). Feelings as information: Informational and motivational functions of affective states. In E. T. Higgins & R. M. Sorrentino (Eds.), *Handbook of motivation and cognition: Foundation of social behaviour* (vol. 2, pp. 527–561). New York, NY: Guilford Press.
- Shani, Y., Tykocinski, O., & Zeelenberg, M. (2008). When ignorance is not bliss: How distressing uncertainty drives the search of negative information. *Journal of Economic Psychology*, 29, 643–653.
- Shepperd, J. A., & McNulty, J. K. (2002). The affective consequences of expected and unexpected outcomes. *Psychological Science*, 13, 85–88.

- Sherman, J. W., Allen, T. J., & Sacchi, D. L. M. (2012). Stereotype confirmation and disconfirmation. In B. Gawronski & F. Strack (Eds.), *Cognitive Consistency: A Fundamental Principle in Social Cognition*. (pp. 390–423). New York, NY: Guilford Press.
- Siddle, D. A. T. (1991). Orienting, habituation, and resource allocation: An associative analysis. *Psychophysiology, 28*, 245–259.
- Silvia, P. J. (2003). Self-efficacy and interest: Experimental studies of optimal incompetence. *Journal of Vocational Behavior, 62*, 237–249.
- Silvia, P. J. (2005). What is interesting? Exploring the appraisal structure of interest. *Emotion, 5*, 89–105.
- Silvia, P. J. (2008). Interest: The curious emotion. *Current Directions in Psychological Science, 17*, 57–60.
- Silvia, P. J., (2010). Confusion and interest: The role of knowledge emotions in aesthetic experience. *Psychology of Aesthetics, Creativity, and the Arts, 4*, 75–80.
- Silvia, P. J. (2012). Curiosity and motivation. In R. M. Ryan (Ed.), *Oxford handbook of motivation* (pp. 157–166). New York, NY: Oxford University Press.
- Silvia, P. J., & Kashdan, T. B. (2009). Interesting things and curious people: Exploration and engagement as transient states and enduring strengths. *Social and Personality Psychology Compass, 3/5*, 785–797.
- Simmons, J. P., Nelson, L. D., & Simonsohn, U. (2011). False-positive psychology: Undisclosed flexibility in data collection and analysis allows presenting anything as significant. *Psychological Science, 22*, 1359–1366.
- Simmons, J. P., Nelson, L. D., & Simonsohn, U. (2013). *Life after p-hacking*. Paper presented at the Fourteenth Annual Meeting of the Society for Personality and Social Psychology, New Orleans, LA.
- Smedslund, J. (1990). A critique of Tversky and Kahneman's distinction between fallacy and misunderstanding. *Scandinavian Journal of Psychology, 31*, 110–120.
- Smith, E. R., & Semin, G. R. (2007). Situated social cognition. *Current Directions in Psychological Science, 16*, 132–135.
- Suls, J. M. (1972). A two-stage model for the appreciation of jokes and cartoons: An information processing analysis. In J. H. Goldstein & P. E. McGhee (Eds.), *The psychology of humor: Theoretical perspectives and empirical issues* (pp. 81–100). New York, NY: Academic Press.

- Swann, W. B. (1990). To be adored or to be known? The interplay of self-enhancement and self-verification. In E. T. Higgins & R. M. Sorrentino (Eds.), *Handbook of motivation and cognition: Foundations of social behavior* (Vol. 2, pp. 408–450). New York, NY: Guilford.
- Teigen, K. H., & Keren, G. (2003). Surprises: Low probabilities or high contrasts? *Cognition*, 87, 55–71.
- Tomkins, S. S. (1984). Affect theory. In K. R. Scherer & P. Ekman (Eds.), *Approaches to emotion* (pp. 163–196). Hillsdale, NJ: Erlbaum.
- Topolinski, S. (2012). Non-propositional consistency. In B. Gawronski & F. Strack (Eds.), *Cognitive Consistency: A Fundamental Principle in Social Cognition*. (pp. 112–131). New York, NY: Guilford Press.
- Topolinski, S. (2013). The sources of fluency: Identifying the underlying mechanisms of fluency effects. In: C. Unkelbach & R. Greifeneder (Eds.), *The Experience of Thinking*. New York, NY: Psychology Press.
- Topolinski, S. (2014). A processing fluency-account of funniness: Running gags and spoiling punchlines. *Cognition and Emotion*, 28, 811–820.
- Topolinski, S., & Deutsch, R. (2012). Phasic affective modulation of creativity. *Experimental Psychology*, 59, 302–310.
- Topolinski, S., & Deutsch, R. (2013). Phasic affective modulation of semantic priming. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 39, 414–436.
- Topolinski, S., Likowski, K. U., Weyers, P., & Strack, F. (2009). The face of fluency: Semantic coherence automatically elicits a specific pattern of facial muscle reactions. *Cognition and Emotion*, 23, 260–271.
- Topolinski, S., & Reber, R. (2010a). Gaining insight into the “Aha”-experience. *Current Directions in Psychological Science*, 19, 402–405.
- Topolinski, S., & Reber, R. (2010b). Immediate truth: Temporal contiguity between a cognitive problem and its solution determines experienced veracity of the solution. *Cognition*, 114, 117–122.
- Topolinski, S., & Strack, F. (2015). Corrugator activity confirms immediate negative affect in surprise. *Frontiers in Psychology*, 6, 1–8.
- Trafimow, D., & Marks, M. (2015) Editorial, *Basic and Applied Social Psychology*, 37, 1–2.
- Valenzuela, A., Strelbel, J., & Mellers, B. (2010). Pleasurable surprises: A cross-cultural study of consumer responses to unexpected incentives. *Journal of Consumer Research*, 36, 792–805.

- Van Boxtel, A., & Jessurun, M. (1993). Amplitude and bilateral coherency of facial and jaw-elevator EMG activity as an index of effort during a two-choice serial reaction task. *Psychophysiology*, 30, 589–604.
- Van Dijk, E., & Zeelenberg, M. (2007). When curiosity killed regret: Avoiding or seeking the unknown in decision-making under uncertainty. *Journal of Experimental Social Psychology*, 43, 656–662.
- Van Horen, F., & Pieters, R. (2013). Preference reversal for copycat brands: Uncertainty makes imitation feel good. *Journal of Economic Psychology*, 37, 54–64.
- Van Kuilenburg, H., Wiering, M., & Den Uyl, M. (2005). A model-based method for facial expression recognition. In J. Gama, R. Camacho, P. Brazdil, A. Jorge, & L. Torgo (Eds.), *Lectures notes in computer science: Vol. 3720. Machine learning: ECML 2005* (pp. 194–205). Berlin, Germany: Springer-Verlag.
- Whittlesea, B. W. A. (1993). Illusions of familiarity. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 19, 1235–1253.
- Winkielman, P., & Cacioppo, J. T. (2001). Mind at ease puts a smile on the face: Psychophysiological evidence that processing facilitation elicits positive affect. *Journal of Personality and Social Psychology*, 81, 989–1000.
- Yeung, N., Botvinick, M. M., & Cohen, J. D. (2004). The neural basis of error detection: conflict monitoring and the error-related negativity. *Psychological Review*, 111, 931–959.