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The Effects of Curiosity-Evoking Events on Activity Enjoyment

Elif Isikman, Deborah J. MacInnis, Gülden Ülkümen, and Lisa A. Cavanaugh
University of Southern California

Whereas prior literature has studied the positive effects of curiosity-evoking events that are integral to focal activities, we explore whether and how a curiosity-evoking event that is incidental to a focal activity induces negative outcomes for enjoyment. Four experiments and 1 field study demonstrate that curiosity about an event that is incidental to an activity in which individuals are engaged, significantly affects enjoyment of a concurrent activity. The reason why is that curiosity diverts attention away from the concurrent activity and focuses attention on the curiosity-evoking event. Thus, curiosity regarding an incidental event *decreases* enjoyment of a positive focal activity but *increases* enjoyment of a negative focal activity.

Keywords: curiosity, activity enjoyment, distraction, attention, cell phone

Individuals spend significant amounts of time engaging in experiential activities. Indeed, in the United States, individuals over age 15 spend an average of 5 hr per day watching TV, playing games, and socializing (Bureau of Labor Statistics, 2013). A fundamental goal of most experiential activities is to maximize enjoyment. Indeed, individuals value opportunities to enhance such enjoyment (Clarkson, Janiszewski, & Cinelli, 2013). Enjoyable activities are more likely to be repeated, which, in some cases like socializing with friends and exercising, can have positive mental and physical health benefits that contribute to well-being (Otto et al., 2007; Stroebe & Stroebe, 1996). Recent research suggests that compared with material purchases (e.g., a luxury car), experiences (e.g., attending a sports or entertainment event, visiting a spa, going on vacation, dining at a fancy restaurant) lead to greater satisfaction and emotional well-being (e.g., Nicolao, Irwin, & Goodman, 2009; Van Boven & Gilovich, 2003).

Maximizing enjoyment of experiential activities is important not only to individuals but also to businesses (Schmitt, 1999), which invest in and earn significant revenue from the design of environments that maximize enjoyment in service and retail stores (e.g., The Disney Institute & Kinni, 2011; Michelli, 2007). Businesses also spend substantial resources on advertising and promotional events to enhance consumer enjoyment. These efforts are well placed, since the more individuals enjoy experiential products, services, stores, and advertising, the more likely they will be to discuss ads, repeatedly buy experiential goods, and spread positive word of mouth about them to others (Moore, 2012). Thus, individuals' enjoyment of experiences has important economic implications. To illustrate, the economic value of the arts and cultural production industry alone contributes $689.7 billion to U.S. gross domestic product (Bureau of Economic Analysis, 2015). Indeed, even small changes (positive or negative) in consumers' enjoyment of experiences can have significant implications for businesses and the economy (Anderson, Fornell, & Rust, 1997).

Notably, though, engagement in experiential activities is often disrupted by a variety of events that arouse individuals' curiosity. For example, while engaging in experiential activities like watching TV, spending time online, or having dinner, people are frequently exposed to curiosity-evoking events like ringing cell phones or incoming text messages. Whether for work or play, most individuals carry a mobile curiosity-evoking device wherever they go. The ubiquitous usage of Facebook, Instagram, Twitter, and instant messaging further illustrates that individuals have a relatively insatiable curiosity for knowing about what is happening in the world around them and ensuring that they are not missing out on information or opportunities (Przybylski, Murayama, DeHaan & Gladwell, 2013). In this article we explore to what extent such curiosity-evoking events affect individuals' enjoyment of a concurrent activity in which they are engaged.

Theory and Hypotheses

Curiosity

Litman (2008) defined curiosity as "the desire for knowledge that motivates individuals to learn new ideas, eliminate information gaps and solve intellectual problems" (p. 1586; see also Berlyne 1954; Loewenstein 1994). Litman and Jimerson (2004; see also Litman & Silvia, 2006; Litman, 2008) propose that curiosity is a complex concept that can be decomposed into two distinct (though related) types, and among which there might be individual differences. Interest-type (I-type) curiosity, reflects a desire to acquire knowledge for purposes of intrinsic enjoyment and mastery-oriented learning. I-type curiosity is positive from an affective standpoint, as it is associated with positive anticipation of new knowledge and joy from knowledge acquisition and mastery. Deprivation-type (D-type) curiosity is conceptualized as an unsat-

Elif Isikman, Deborah J. MacInnis, Gülden Ülkümen, and Lisa A. Cavanaugh, Department of Marketing, Marshall School of Business, University of Southern California.

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Correspondence concerning this article should be addressed to Elif Isikman, Department of Marketing, Marshall School of Business, University of Southern California, 701 Exposition Blvd, 3rd floor Los Angeles, CA 90089. E-mail: Elif.Isikman.2013@marshall.usc.edu

isfied need state that results when individuals are bothered by lack of knowledge. D-type curiosity is intense and appetitive, and it motivates a desire to reduce knowledge gaps and obtain missing information (see Litman, 2005; Loewenstein, 1994). Given its appetitive intensity, D-type curiosity can induce sustained effort to acquire knowledge in the pursuit of knowledge acquisition. In this way, it is related to absorption (Litman & Mussel, 2013) and the inability to let go of the pursuit of information until the state of knowledge deprivation is resolved. Although I-type and D-type forms of curiosity have traditionally been conceptualized as individual difference variables, curiosity can also be evoked situationally. Our interest centers on the arousal of curiosity evoked in a given situation.

Integral and Incidental Curiosity

Past literature has mostly explored instances in which curiosity is part of, or integral to, the activity in which one is engaged, such as when one is curious about the subject matter of a book, TV show, lecture, or some other ongoing activity involving one's attention (i.e., *integral curiosity*; see Kashdan, Rose, & Fincham, 2004; Kashdan & Silvia, 2009; Litman, Hutchins, & Russon, 2005). Such instances could reflect either I-type curiosity or D-type curiosity. To illustrate, when reading a book, one may be motivated to acquire general knowledge (I-type curiosity) or learn what ultimately happens to the main character in a novel (D-type curiosity).

Our inquiry, however, focuses on curiosity-evoking events (e.g., a ringing cell phone) that are unrelated to, or incidental to, a coincident experiential activity (e.g., reading a book). Although situations that evoke incidental curiosity are exceedingly common, little is known about whether, how, and why incidental curiosity-evoking events might impact enjoyment of positive and negative experiential activities. Answers to these questions are not obvious, particularly after considering extant theory and data. Indeed, theoretical arguments summarized in Table 1 and described subsequently make divergent predictions relevant to these questions.

Effects of Integral Curiosity on Activity Enjoyment

It is possible that a curiosity-evoking event has no impact on enjoyment of a coincident experiential activity. Specifically, if individuals are absorbed in an experiential activity, the motivational draw of an incidental curiosity-evoking stimulus may be insufficient to significantly detract from enjoyment of that activity. Preliminary survey data collected by the authors (using an MTurk survey of 201 respondents) are consistent with this notion. We found that people prefer to keep their cell phones on during and across a variety of positive and negative activities, even when they know that circumstances will not allow them to check to see who is contacting them (see Table 2). One might infer from these results that individuals intuit that such incidental curiosity arousing events have no impact on their enjoyment of such experiences.

Table 1
Potential Effect of Curiosity on Activitiy Enjoyment

Process account	Effect on enjoyment of a *positive* experiential activity	Effect on enjoyment of a *negative* experiential activity
No impact	No impact	No impact
Positive affect transfer	Enhance	Enhance
Negative affect transfer	Reduce	Reduce
Attentional diversion	Reduce	Enhance

Alternatively, if the coincident activity is one that is congruent with a long-standing interest and hence related to I-type curiosity, then curiosity about a coincident event could enhance enjoyment of an experience. I-Type curiosity is both pleasurable (Litman, 2005, 2008; Spielberger & Starr, 1994) and emotionally evocative (Silvia, 2006). Perhaps because it reflects a positive state of interest, positive affect from I-type curiosity might spill over to the coincident focal activity (i.e., positive affect transfer) and increase enjoyment of it.

However, it is also possible that D-type curiosity about a coincident event could reduce enjoyment of an experience. First, D-type curiosity, by definition, is marked by a state of knowledge deprivation and an appraisal of uncertainty (Silvia, 2006). Being deprived of knowledge might make people feel unsettled (Loewenstein, 1994), inducing frustration, irritation and tension. Such negative affective reactions may reduce activity enjoyment through a negative affect transfer process. These affective accounts might also predict that incidental curiosity, because it is mixed in affective character, has negligible effects of enjoyment of experiences as positive affect is nullified by negative affect (see Table 1).

Either D-type or I-type curiosity might reduce enjoyment of a coincident consumption activity for nonaffective reasons. Specifically, both I-type and D-type curiosity-evoking events should require attention. As such, they should divert attention away from a target experience and toward an unrelated, coincident event. D-type curiosity may be particularly diverting because it is highly appetitive. As it motivates an impulsive search for answers, attention will be sustained on the curiosity-evoking event until curiosity is resolved. D-type curiosity is also associated with absorption (Litman & Mussel, 2013). Thus, the attentional shift caused by curiosity may not be merely momentary but sustained, amplifying its potential effects on consumption enjoyment, and differentiating curiosity from those of related constructs such as mere distraction.

Until curiosity is resolved, the state of interest or knowledge deprivation created by curiosity may motivate sustained attention on the curiosity-evoking event. Thus, the curiosity-evoking event and the experiential activity may compete for attention. Because attention is a limited resource (Coull, 2004) and individuals can only attend to one stimulus at a time (Lavie, 2005), attention allotted to the focal activity may be reduced. As a result, incidental curiosity might reduce opportunities to process the focal activity's experiential aspects and, thus, impact enjoyment. Note that this attentional explanation would predict that incidental curiosity would reduce enjoyment of a positive focal activity (e.g., a massage) but enhance enjoyment of a negative focal activity (e.g., waiting in line); see Table 1.

It is important to distinguish our research on the effects of incidental curiosity on a coincident experience with the effects of interruption. We focus on situations in which the curiosity-evoking event and the experience happen at the same time. Interruption is not a coincident activity; it represents a break in the activity before the activity starts again. For example, TV commercials interrupt TV programs; they are not coincident with them. Nelson, Meyvis, and Galak (2009) showed that enjoyment of a positive experience is enhanced when the experience is interrupted. The reason why is

Table 2
Pilot Study: Preferences Under Different Situations

Situation	Prefer to turn cell phone off	Prefer to keep cell phone on (silent), even though won't be able to check it
1. You are taking a class/workshop	34%	66%
2. You are watching an enjoyable movie in the theatre	44%	56%
3. You are having a tasty meal with friends	16%	84%
4. You are listening to your favorite band in a concert	27%	73%
5. You are watching an enjoyable movie at home	13%	87%
6. You are playing a video game	11%	89%
7. You are watching a boring documentary in the theatre	26%	74%
8. You are visiting dentist's office	27%	73%
9. You are reading a good book	14%	86%
10. You are listening to a long, tedious presentation at work/school	29%	71%
11. You are getting a relaxing massage	49%	51%
12. You are having a bad meal with friends	12%	88%
13. You are viewing a funny clip on the Internet	7%	93%

that the break in the experience afforded by the interruption prevents hedonic adaptation. Our focus on the diversion of attention from the experience to a coincident curiosity-evoking event represents an entirely different phenomenon from that of interruptions. Moreover, its effects are predicted to be due to an entirely different mechanism (i.e., limited attention to the experience vs. a disruption of hedonic adaptation).

In this article, we use manipulations to induce state-level shifts in incidental curiosity. The key aspect of our manipulations is that they create a strong drive to collect information in an effort to close a specific information gap, focusing attention on the curiosity-evoking stimulus. Prior studies in trait-level curiosity (e.g., Litman, 2005, 2010) have shown that D-type (vs. I-type) trait curiosity leads to similar effects in information search and attention. The sustained nature of the attentional diversion we observe in our studies of curiosity is also similar to the previously observed effects of D-type curiosity. Along with these important commonalities, we note the distinction between our manipulation of curiosity, which is at state-level, and the D-type curiosity, which operates at the trait level.

Subsequently, we report four experiments using actual, sensory-rich, experiential activities. We observe results that are consistent with the proposed sustained attention account. Our studies use various operationalizations of curiosity-evoking events (i.e., receiving an unidentified call on one's cell phone, receiving a gift box with unknown contents) and various experiential activities (i.e., reading, getting a massage, playing a video game, viewing a music video). We do not manipulate or measure the exact type of curiosity being evoked (I- or D-type), although we suspect that many of the curiosity-evoking events we study resemble more of the D- than the I-type. Experiments 1 through 3 demonstrate that individuals enjoy a positive focal activity less when exposed to an incidental curiosity-evoking event. We find these results using self-report, indirect, and behavioral measures of attention. Experiment 4 provides additional support for the attentional account by showing that whereas incidental curiosity reduces enjoyment of a positive focal activity it enhances enjoyment of a negative focal activity. Table 3 summarizes the findings from our four main experiments. We also include a field study to provide an additional demonstration of incidental curiosity's effect on activity enjoyment.

Field Study

As a preliminary test of our attentional diversion explanation, we asked 300 members of a university community to indicate how much they enjoyed a movie they had just watched at the campus movie theater. Respondents had watched one of five films (*Tomboy*, *My Week with Marilyn*, *Melancholia*, *The Bourne Ultimatum*, and *A Simple Life*). Each movie was reasonably good as indicated by IMDb and Rotten Tomatoes critics and users. Specifically, each had an IMDb score above 7.0 and Rotten Tomatoes critic and user scores above 70%. As they exited the theater, we asked respondents to indicate how much they liked the movie and whether they had received a call, message, or e-mail during the movie and subsequently checked their cell phones. Checking one's cell phone during the movie as a result of an incoming message presumably evokes incidental curiosity. Our attentional diversion account would predict that consumers who received a phone message during the movie and checked it during the movie would enjoy the movie less than would those who did not receive a phone message during the movie. Supporting this prediction, those who received a notification during the movie and checked their phones during the movie enjoyed the movie significantly less ($M = 6.61$, $SD = 1.97$, $n = 33$) than did those who got a notification after the movie but did not check their phones during the movie ($M = 7.71$, $SD = 1.55$, $n = 56$, $t(87) = 2.92$, $p = .005$, $\eta^2 = .09$) and those who did not get a notification either during or after the movie and did not check their phones during the movie ($M = 7.57$, $SD = 1.48$, $n = 127$, $t(158) = 3.09$, $p = .003$, $\eta^2 = .05$). Although the results are consistent with our attentional diversion account, this field study lacks the necessary control of an experiment from which causal conclusions can be made.

Experiment 1

Experiment 1 provides a controlled test of whether incidental curiosity impacts enjoyment of a coincident activity and, if so, what the direction of that effect is. Because individuals regularly feel a need to immediately review and respond to incoming texts, calls, or e-mail messages (Balding, 2012), we anticipate that such stimuli are curiosity evoking. Thus, in Experiment 1 we operation-

Table 3
Summary of Results: Experiments 1–4

Experiment details	Experiment 1	Experiment 2	Experiment 3	Experiment 4
Stimulus				
Curiosity evoking stimulus	Vibrating cell phone	Vibrating cell phone	Opaque gift box	Opaque gift box
Control condition	No curiosity	Low curiosity- iPod	1) No curiosity 2) Curiosity resolved translucent gift box	Curiosity resolved translucent gift box
Experiential activity	Receiving a massage	Playing a video game	Reading a magazine article	Watching a music video
Measure				
Measure of experience enjoyment	Self reported enjoyment, pleasure and satisfaction (α = .92)	Self reported enjoyment, pleasure and satisfaction (α = .86)	Self reported enjoyment, pleasure and satisfaction (α = .91)	Self reported enjoyment, pleasure and satisfaction (α = .97)
Attentional diversion away from the experiential activity/sustained attention on the curiosity-evoking event	Self-reported measure of attentional diversion away from the experiential activity (α = .74)	Behavioral measure of attention diverted from the experiential activity toward the curiosity-evoking stimulus	Attentional diversion (self-reported measure of attentional conflict)/ sustained attention-(ruminative thoughts listed about curiosity-evoking stimulus)	
Results of significance				
Effect on enjoyment of positive experience	Reduce	Reduce	Reduce	Reduce
Curiosity	M = 6.38, SD = 1.80	M = 6.81, SD = 1.60	M = 7.34, SD = 1.58	M = 5.46, SD = 2.19
Control	M = 7.22, SD = 1.08	M = 7.62, SD = 1.00	M = 7.97 (curiosity resolved), SD = 1.11 M = 8.17 (no curiosity), SD = .99	M = 6.82, SD = 1.46
Effect on enjoyment of negative experience				Enhance
Curiosity				M = 5.81, SD = 2.04
Control				M = 4.51, SD = 2.08
Effect on attention	Diverts attention away from experiential activity	Results in more "looks" at curiosity-evoking stimulus	Increases thoughts on curiosity-evoking stimulus and increases reported attentional conflict	
Curiosity	M = 4.88, SD = 1.76	Behavioral "looks" M = 1.33, SD = 1.17	Open-ended thoughts about curiosity evoking stimulus M = .66, SD = 1.13 (curiosity-resolved) Attentional conflict M = 2.88, SD = 1.71 (curiosity-resolved)	
Control	M = 3.62, SD = 1.17	Behavioral "looks" M = .41, SD = .59	Open-ended thoughts about curiosity evoking stimulus M = .22, SD = 1.46 (curiosity-resolved) M = .00, SD = .00 (no-curiosity) Attentional conflict M = 2.24, SD = 1.44 (curiosity-resolved)	
Indirect effect of attention diversion/focusing on experience enjoyment	β = −.32 (SE = .16)	β = −.22 (SE = .13)	Open-ended thoughts about curiosity-evoking stimulus and attentional conflict β = −.06 (SE = .05)	

alize incidental curiosity using a naturalistic and relatively common experience, that is, receiving a phone call of unknown origin.

Method

Participants and procedures. Sixty-one university students contacted by e-mail were asked to complete two separate lab studies, 5 days hence. One study, described as a "product testing study" involved a foot massage product. A second study, described as a "cell phone coverage study" purportedly aimed to assess cell phone coverage in various campus locations, and required respondents to disclose their cell phone numbers and providers prior to their participation in the study. In reality, cell phone numbers were collected so as to create incidental curi-

osity by calling respondents on their cell phones during the product testing study.

Once at the lab, participants were randomly assigned to one of two conditions: curiosity and no curiosity. They were told that they would participate in the product testing study, followed by the cell phone coverage study. On entering the room, participants were asked to leave their cell phones on a nearby table, which was close to them but out of their reach. The experimenter also asked participants to put their cell phones on vibrate mode, so as not to disturb participants in adjacent rooms. Participants sat in a comfortable chair and received a 3-min foot massage. Respondents' feet were placed inside the massage unit, which made it exceedingly difficult for them to check their cell phones.

The experimenter, who sat in a nearby room, surreptitiously called participants in the curiosity condition on their cell phones, at 1 and then at 2 min into the massage. Curiosity was operationalized using the vibration sound that came from participants' cell phones. Participants' phones vibrated for approximately 15 s for each call, resulting in approximately 30 s of phone vibration during the 3-min foot massage. Participants in the no curiosity condition did not receive a call.

Pilot study. We developed our stimuli with a comprehensive pilot study to obtain valid emotion checks. To ensure that the curiosity manipulation had the intended effect, we recruited a separate sample of participants ($N = 22$) from the same population and randomly assigned them to one of two conditions: curiosity and no curiosity. The manipulations were identical to that described in Experiment 1. Pilot study participants completed a three-item curiosity manipulation check measure, indicating whether at any point during the massage they felt (1) curious, (2) interested in, and (3) intrigued by something other than the massage they were having (1 = *not at all*, 9 = *very much*). A *t* test comparing the Curiosity Scale measure ($\alpha = .97$) showed that curiosity was significantly higher in the curiosity condition than in the no curiosity condition, $t(20) = 3.07$, $p < .01$; $M_{\text{curiosity}} = 4.45$, $SD = 1.22$ vs. $M_{\text{no-curiosity}} = 1.79$, $SD = 2.61$, confirming the success of the curiosity manipulation.

Main experiment measures.

Activity enjoyment. At the conclusion of the massage, all participants in Experiment 1 rated their enjoyment, pleasure, and satisfaction with the foot massage (1 = *not at all*, 9 = *very much*). Scores were averaged to create an Activity Enjoyment Scale ($\alpha = .92$).

Positive and negative affect. To test whether pleasant and unpleasant feelings evoked by curiosity might directly impact activity enjoyment, we asked participants, "How do you feel right now?" Respondents completed a set of items indicating positive affect (i.e., happy, relaxed, joyful, excited, hopeful, energetic, calm, and surprised) and negative affect (i.e., frustrated, tense, and irritated) at that moment, using 9-point scales (1 = *not at all*, 9 = *very much*). These affect measures were collected after the focal activity enjoyment measure so as to not bias measurement of enjoyment or interfere with the massage itself. We calculated a positive affect index ($\alpha = .83$) and a negative affect index ($\alpha = .73$) by averaging the corresponding emotions previously listed.

Attentional diversion. Participants indicated the extent to which they felt absorbed in the experience of having a massage, distracted from the experience of having a massage, and the extent to which their mind wandered away to things that were not related to the massage they were getting (1 = *not at all*, 9 = *very much*). We reverse-coded the absorption item before averaging the three items to create an index of attentional diversion ($\alpha = .74$), such that higher numbers indicate greater diversion of attention away from the focal activity (i.e., foot massage).

Control variables. We also measured several control variables. Some individuals might be attached to their cell phones more so than others, creating a stronger need to respond to incoming texts, calls, or e-mail messages. To assess this possibility, participants were asked to indicate to what extent they were attached to and involved with their cell phones (1 = *not at all*, 9 = *very much*). Additionally, individuals who are inherently intolerant of ambiguity may be more prone to responding to events that arouse their curiosity. Thus, participants completed the 22-item Tolerance for Ambiguity Scale (McLain, 1993). Responses to these items did not differ across conditions and are not discussed further.

Data from 3 participants who checked their cell phones after the massage but before completing the questionnaire measures were removed from the analysis, as curiosity was resolved for these participants, making the curiosity manipulation ineffective. Also, data from 2 participants from the curiosity condition ($M_{\text{enjoyment}} = 4.60$) and 2 participants from the control condition ($M_{\text{enjoyment}} = 4.05$) who reported finding the foot massage highly uncomfortable were removed from the analysis.

Results

Activity enjoyment. A *t* test revealed that enjoyment of the foot massage was significantly lower in the curiosity condition ($M_{\text{curiosity}} = 6.38$, $SD = 1.80$, $n = 24$) than in the no curiosity condition ($M_{\text{no-curiosity}} = 7.22$, $SD = 1.08$, $n = 30$), $t(52) = -2{,}19$, $p = .03$, $\eta^2 = .08$, casting doubt on several of the potential explanations noted in Table 1.

Positive and negative affect. A series of *t* tests showed that compared with those in the no curiosity condition, participants in the curiosity condition did not report significantly higher positive affect ($M_{\text{curiosity}} = 5.38$, $SD = 1.21$ vs. $M_{\text{no-curiosity}} = 6.01$, $SD = 1.30$), $t(52) = -1.84$, $p = .07$, or negative affect ($M_{\text{curiosity}} = 2.17$, $SD = 1.05$ vs. $M_{\text{no-curiosity}} = 1.84$, $SD = 0.83$), $t(52) = 1.26$, $p = .21$, compared with those in the no curiosity condition. Thus, we do not find evidence consistent with a simple affect transfer account for the relationship between curiosity and activity enjoyment (see Table 1) in this experiment or in those that follow. As such, we do not discuss positive and negative affect transfer accounts further.

Attentional diversion. A *t* test comparing the three-item attentional diversion index showed that participants in the curiosity condition felt that their attention was diverted away from the focal massage experience to a greater extent than those in the no-curiosity condition ($M_{\text{curiosity}} = 4.88$, $SD = 1.76$ vs. $M_{\text{no-curiosity}} = 3.62$, $SD = 1.17$), $t(52) = 3.13$, $p = .01$.

To test our prediction that curiosity impacts activity enjoyment through attentional diversion, we conducted a mediation analysis using PROCESS (Model 4) with 5,000 bootstrapped samples (Hayes, 2013). The indirect effect of curiosity on activity enjoyment was significant ($B = -.32$, $SE = .16$; 95% CI [$-.71$, $-.06$]). This result supports the prediction that curiosity reduces activity enjoyment because it diverts attention away from the coincident

activity. The total direct effect of curiosity on enjoyment ($B = -.85$) became insignificant after removing the effect of attention on enjoyment from curiosity ($B = -.53$, $SE = .41$; 95% CI [−1.36, .29]).

Discussion

Experiment 1 provides an initial demonstration that incidental curiosity decreases (vs. increases or has no impact) enjoyment of a pleasurable coincident focal activity relative to a no curiosity control condition. We also find preliminary evidence to suggest that the effect is driven by attention being diverted from the focal activity to the curiosity-evoking event. Curiosity was not associated with an increase in positive or negative affect; thus, affect did not explain the observed change in activity enjoyment. We note, however, that our affect measures may not be sufficiently sensitive to detect moment-to-moment changes possibly occurring during the massage but perhaps dissipating by the time of our affect assessment.

Experiment 2

Experiment 2 has several goals: (1) to determine whether the effect of curiosity on activity enjoyment observed in Experiment 1, which involved a hedonic and relaxing experience (receiving a massage), will replicate when individuals engage in a more stimulating focal activity (playing a video game) and (2) to provide additional evidence for the proposed attentional explanation proposed. To this end, we use an objective, behavioral (vs. a self-report) measure of attention. We analyze the number of times participants look at the curiosity-evoking stimulus, while playing the video game. This behavioral measure allows us to explore whether the attention-diverting effect of incidental curiosity is indeed sustained, rather than merely momentary. Finally, whereas Experiment 1 demonstrated that a cell phone call of unknown origin creates high levels of curiosity relative to a no phone call control condition, Experiment 2 uses a more conservative test and compares the effects of high versus low incidental curiosity on activity enjoyment.

Pilot Study and Stimuli Development

To select stimuli that induce two different levels of curiosity, we ran another pilot study. We recruited 51 participants from an online panel in exchange for a small payment. Participants were randomly presented with seven different and potentially curiosity-evoking events. For each event, participants indicated how curious, interested, and intrigued they would feel (1 = *not at all*, 7 = *very much*) if the event happened to them. We created a curiosity index by averaging these three items. The reliability statistics and means for the different events are summarized in Table 4.

The results of a within subjects analysis of variance (ANOVA) confirms that the seven events we tested varied in the levels of curiosity they evoked, $F(6, 300) = 25.16$, $p < .001$. As expected, a buzzing cell phone whose caller could not be identified was found to be the most curiosity evoking, an iPod that unexpectedly started playing classical music was viewed as mildly curiosity evoking, followed by other events that evoked even lower levels of curiosity. Importantly, the iPod evoked significantly less curiosity than did the cell phone, $t(50) = 3.58$, $p < .001$. On the basis of the results of this pilot study, and in an effort to use two devices that are relatively comparable in other aspects (i.e., physical size, shape, level of technology), in Experiment 2 we operationalize high incidental curiosity by participants receiving an unexpected and unidentified call on their cell phone, and we operationalize low incidental curiosity by an iPod that unexpectedly starts to play music.

Table 4
Experiment 2: Reliability Statistics, Means, and Standard Errors for the Curiosity Index Across Various Events

Event	$\alpha_{\text{Curiosity index}}$	$M_{\text{Curiosity index}}$	*SE*
Your cell phone buzzes, but you cannot see who is calling you because your phone is out of your reach	.87	4.88	.22
An iPod located in the room begins to play classical music	.93	3.76	.25
You hear a dog barking from outside	.96	2.74	.25
It starts raining outside, and you hear the raindrops thumping against the window	.93	3.03	.27
A car in traffic honks a horn outside	.94	2.50	.24
You hear the laughter of the kids playing in the playground nearby	.95	2.16	.21
A bird chirps on the tree outside your window	.96	2.56	.24

Note. Curiosity index reflects average rating of the extent to which participants felt curious, interested and intrigued by the event noted ($\alpha = .96$).

Method

Participants. One week before the study, 50 undergraduate students were recruited, ostensibly to test a video game. Participants provided their cell phone number as part of the study sign up. Once at the lab, participants entered a room that included a 40-in. plasma TV (on which the video game was displayed), a floor lamp, a table, and a chair. Participants completed the study individually and were randomly assigned to one of the two conditions: high curiosity and low curiosity.

Procedures. Participants were told that research shows that most people play video games in a comfortable room and have their cell phones and a music device (e.g., an iPod) nearby. As such, the room was equipped to mimic this environment. An iPod was placed on the table. Participants were asked to place their cell phones on the same table. This table was located near the participant's chair but purposely out of reach.

Once seated, participants played a Mario Kart Nintendo Wii driving game. Playing the game required participants to use a wheel-shaped controller, which made it difficult for them to place their hands on anything other than the controller (e.g., cell phone or an iPod). All participants first completed a warm-up phase to familiarize them with the Wii wheel and buttons. They then moved on to the game phase, which lasted for four minutes. We unobtrusively video-recorded participants while they played the game. The

video recording was used to behaviorally track where participants' attention was directed.

In the high-curiosity condition, the experimenter covertly called the participants on their cell phones during the game, expecting the phone call to evoke a high level of curiosity. As with Experiment 1, cell phones were close by but out of reach, and participants were unable to check their phones while holding the video game control wheel. Thus, participants were unable to resolve their curiosity about the identity of the caller. In the low-curiosity condition, the experimenter remotely activated the iPod, which played a song (Chopin's *Waltz in C-Sharp Minor Op. 64 No. 2*), which has previously been established as neutral in valence (Davey, Startup, Zara, MacDonald, & Field, 2003). Because participants were engaged in playing the video game when the cell phone or iPod was activated, neither device could be closely examined during the game. The location of the devices and the duration and the timing of the sounds from the phone and iPod were consistent across conditions.

On the basis of the pilot study results, we expected that curiosity would be higher when participants heard their own cell phone ring versus when they heard an iPod play music. However, the pilot data suggest that unexpected activation of the iPod should also evoke some degree of curiosity. This low-curiosity condition provides a more conservative test of the effect of curiosity than documented in Experiment 1, that is, where curiosity was not evoked in the control condition.

We expected that participants in the low-curiosity condition would attend to the sound of the iPod momentarily and then shift their attention back to the main video game task quickly after realizing its source. However, we expected that participants in the high-curiosity condition would be curious as to who is calling them, and hence would look more frequently at the cell phone to resolve the source of the call. Thus, we expected that participants would cast a greater number of "looks" toward the source of the sound in the high curiosity than the low-curiosity condition.

Four participants received a phone call from an outside number during the massage causing their phone to buzz outside the parameters of the experiment; thus, they were removed prior to analysis leaving 24 participants in the high-curiosity condition and 22 participants in the low-curiosity condition.

Measures.

Activity enjoyment. Immediately following the game, participants were asked to rate their enjoyment, pleasure, and satisfaction with the video game experience (1 = *not at all*, 9 = *very much*). The average of these items indicated video game enjoyment (α = .86).

Behavioral measure of attentional diversion. Independent raters who were blind to the purpose of the study coded the video recordings of participants to determine the number of times they looked at the iPod or the cell phone. Initial coder agreement was high (r = .92), and disagreements were resolved by joint videotape review and discussion. We used "looks" as a behavioral measure of attentional diversion.

Results

Activity enjoyment. A t test showed that enjoyment of the videogame was significantly lower in the high-curiosity condition ($M_{\text{high-curiosity}}$ = 6.81, SD = 1.60, n = 24) than in the low-curiosity condition ($M_{\text{low-curiosity}}$ = 7.62, SD = 1.00, n = 22), $t(44) = -2.05$, $p < .05$, $\eta^2 = .09$.

Behavioral measure of attention. A t test comparing the behavioral measure of attentional diversion revealed a significant main effect of condition, $t(44) = 3.34$, $p < .01$, such that the number of looks was significantly higher in the high-curiosity condition ($M_{\text{high-curiosity}}$ = 1.33, SD = 1.17) than in the low-curiosity condition ($M_{\text{low-curiosity}}$ = .41, SD = .59). These results suggest that although the unexpected sounds coming from both the iPod and the cell phone attracted participants' attention, as expected, compared to the low-curiosity condition, the high curiosity focused attention away from the focal activity, and toward the device in a more sustained way.

We conducted a mediation analysis using Hayes' (2013) PROCESS (Model 4) with 5,000 bootstrapped samples, with the high-curiosity (1) and low-curiosity (0) conditions coded respectively to test whether the effect of condition on enjoyment is explained by attentional diversion. The indirect effect of incidental curiosity on activity enjoyment was significant ($B = -.22$, SE = .13; (95% CI [−.50, −.01]), suggesting that attention diverted from the focal activity to the devices (as indicated by the number of looks) mediated the effect of incidental curiosity on enjoyment. The total direct effect of curiosity on enjoyment ($B = -.41$) became insignificant after removing the effect of attention on enjoyment from curiosity ($B = -.18$, SE = .21; (95% CI [−.61, .25]).

Discussion

Experiment 2 shows that curiosity-evoking events significantly decrease enjoyment of a coincident focal activity. These results replicate those of Experiment 1, using a stimulating (Experiment 2) rather than a relaxing (Experiment 1) focal activity, a more conservative control condition, and a behavioral indicator of sustained attentional diversion. Moreover, we found additional evidence for an attentional mechanism explaining the effect of incidental curiosity on activity enjoyment.

Experiment 3

Experiment 3 augments the previous studies in several ways. First, we compared the effect of unresolved curiosity to a condition where curiosity is quickly resolved. When curiosity is resolved, individuals are no longer in a state of knowledge deprivation and the curiosity-evoking event should cease to evoke interest. As a result, attention can be redirected back to the focal activity. Thus, we anticipate that individuals will enjoy the focal activity more when incidental curiosity is resolved than when it is unresolved. This manipulation allows us to test the effect of unresolved curiosity that leads to sustained attentional diversion, against the effect of resolved curiosity that leads to a momentary attentional diversion. Second, we use a different indirect measure of sustained attentional diversion. If individuals' attention is indeed diverted from the focal activity to the curiosity-evoking event, we should see evidence of rumination about the curiosity-evoking event. Third, to enhance generalizability we use a different curiosity-evoking stimulus (a gift box instead of a cell phone), and we test the effect using a more cognitively-focused task (reading) as opposed to the more experiential activities reported in Experiment 1 (massage) and Experiment 2 (video game).

The use of a reading context also allows us to control for several potentially confounding explanations for the negative effect of curiosity in Studies 1 and 2. Ringing cell phones might be regarded as annoying, with annoyance perhaps explaining the negative effects we observed on enjoyment. Although our affect results showed no evidence of the curiosity-evoking event on the individual items of annoyance or frustration, Experiment 3 uses a curiosity manipulation (a gift) that should be perceived as more universally positive. Experiment 3's procedure also enables us to collect additional process measures.

Method

Participants. One hundred and five university students participated in what was described as a study on reading enjoyment. Participants were randomly assigned to either the curiosity treatment condition: curiosity-unresolved or one of two control conditions: curiosity-resolved and no curiosity. The focal activity consisted of reading a 5-page passage from a commencement speech given by Steve Jobs.

Procedures. A gift box was used to manipulate curiosity. At the beginning of the second page of the speech, participants in the curiosity-unresolved and curiosity-resolved conditions were instructed to pull out a gift box from a paper bag adjacent to their computer. Because the gift box is unexpected in the context of an experiment it stimulates interest and creates a gap in information about what the gift is. Participants were told to keep the gift box in front of them but not open it until the end of the study. Participants in the curiosity-unresolved condition received a gift box with opaque packaging, which did not allow them to see the gift box contents (see Figure 1). Moreover, in this condition participants' curiosity about the content of the box should not be resolved until they open the box. We expect the gift box to divert participants' attention away from the focal reading task and focus attention on the gift box, until the participants are allowed to open the gift box and see its contents (a pen) at the end of the study.

Participants in the curiosity-resolved condition received an identically sized gift box with the same contents; however, their boxes were transparent, as opposed to opaque, allowing participants to see that the box contained a pen (see Figure 1). In this condition, participants' curiosity about receiving an unexpected gift should be quickly resolved. Because curiosity has been resolved, the shift in attention should be momentary (rather than sustained) for those in the curiosity-resolved condition. Hence the negative effects on enjoyment should be attenuated. In a third, no-curiosity control condition, participants did not receive a gift box. After participants finished the reading task, they responded to questions designed to measure enjoyment of the speech, rumination, attentional conflict, and curiosity.

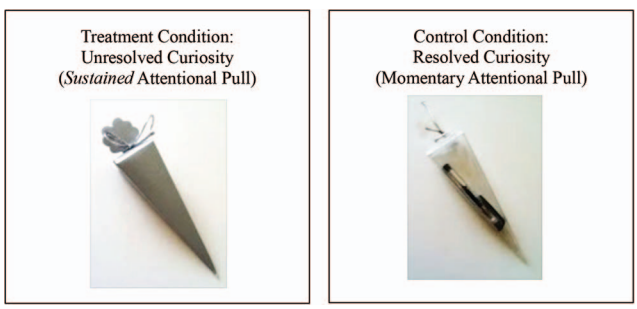

Figure 1. Experiments 3 and 4: Gift box used to manipulate curiosity. See the online article for the color version of this figure.

Measures.

Activity enjoyment. Immediately after the reading task, participants were asked to indicate their enjoyment, pleasure, and satisfaction with the overall experience of reading the passage (1 = *not at all*, 9 = *very much*). These items were averaged to form an overall measure of reading enjoyment ($\alpha = .91$).

Attentional diversion and sustained attention. We assessed attentional diversion following the enjoyment measure. We used an established paradigm (Curci, Lanciano, Soleti, & Rimé, 2013) to assess sustained attention on the curiosity-evoking stimulus. Specifically, after the enjoyment questions, we used an open-ended protocol that asked participants what went through their minds during the reading task. If attention is in fact focused on the curiosity-evoking stimulus, we should see more ruminative thoughts about what is inside the gift box in the curiosity-unresolved condition compared to the curiosity-resolved and no curiosity conditions. Two hypothesis and condition-blind coders coded the number of gift-related ruminative thoughts. Coder agreement was ($r = .98$), and disagreements were resolved by joint discussion. After listing their thoughts, participants indicated the extent to which they felt conflicted about whether to read the passage or think about what the gift box included (1 = *not at all*, 7 = *very much*). If their attention is diverted from the focal activity to the curiosity-evoking event, individuals should feel an attentional approach-approach conflict. Because participants in the no curiosity condition did not receive a gift box, this question was not presented to them.

Curiosity manipulation check. Finally, as a check on the curiosity manipulation, participants indicated the extent to which they would like to know more about the gift and how curious they were about the gift they had just received (1 = *not at all*, 7 = *very much*). The two questions were averaged to form an index of curiosity ($\alpha = .92$). Participants in the no curiosity condition did not receive a gift box; hence, they did not complete these questions.

Results

Manipulation check. A *t* test showed that curiosity was significantly higher in the curiosity-unresolved condition ($M_{\text{unresolved}} = 5.18$, $SD = 1.46$) than in the curiosity-resolved condition ($M_{\text{resolved}} = 4.14$, $SD = 1.81$), $t(76) = 2.82$, $p < .01$. Hence the curiosity manipulation was successful. Since respondents in the no-curiosity control condition did not receive a gift box, their curiosity should not have been aroused.

Activity enjoyment. A one-way ANOVA revealed a significant main effect of condition, $F(2, 102) = 4.04$, $p < .02$, $\eta^2 = .07$, such that reading enjoyment was significantly lower in the curiosity-unresolved condition ($M_{\text{unresolved}} = 7.34$, $SD = 1.58$, $n = 41$) than in the curiosity-resolved ($M_{\text{resolved}} = 7.97$, $SD = 1.11$, $n = 37$), $t(102) = -2.16$, $p < .03$, and no curiosity ($M_{\text{no curiosity}} = 8.17$, $SD = .99$, $n = 27$), $t(102) = 2.60$, $p < .01$, conditions, which did not differ, $t(102) = .61$, *ns*.

Attentional diversion and sustained attention. A one-way ANOVA on the sustained attention measure (i.e., rumination) revealed that gift-related ruminative thoughts were significantly

higher in the curiosity-unresolved ($M_{unresolved}$ = .66, SD = 1.13) than in the curiosity-resolved ($M_{resolved}$ = .22, SD = 1.46), $t(102) = 2.51$, $p < .02$, and no curiosity ($M_{no\ curiosity}$ = .00, SD = .00, $t(102) = -3.42$, $p < .001$) conditions, which did not differ ($t(102) = -1.1$, NS. Thus, confirming our expectations, the opaque box in the curiosity-unresolved condition focused more attention on the gift than did the transparent box in the curiosity-resolved condition.

When individuals' attention focuses on the curiosity-evoking event (as indicated by ruminative thoughts), attentional conflict ensues. Recall that the participants in the two curiosity conditions were asked to respond to an additional item where they rated the extent to which they felt conflicted between attending to the reading task and the gift. A t test comparing the attentional diversion measure (i.e., conflict) revealed a marginally significant effect, $t(76) = 1.77$, $p < .08$. Conflict was higher in the curiosity-unresolved ($M_{unresolved}$ = 2.88, SD = 1.71) than in the curiosity-resolved ($M_{resolved}$ = 2.24, SD = 1.44) condition.

To provide another test of whether curiosity impacts enjoyment through an attentional mechanism (here, rumination, and attentional conflict), we tested a serial mediation analysis using PROCESS (Model 6; Hayes, 2013) with 5,000 bootstrapped samples using rumination and conflict measures as serial mediators. The indirect effect of sustained incidental curiosity on enjoyment through rumination and conflict was significant ($B = -.06$, SE = .05), 95% CI [−.22, −.01]. This result suggests that rumination focuses individuals' attention on the curiosity-evoking event, causing conflict regarding to which stimulus they should attend. The specific indirect effects through rumination alone (95% CI [−.05, .31]) and through conflict alone (95% CI [−.27, .05]) were not significant; thus neither was an independent mediator of the effect of incidental curiosity on enjoyment. The total direct effect of curiosity on enjoyment ($B = -.63$) became insignificant after removing the effect of attention on enjoyment from curiosity ($B = -.59$, SE = .32), 95% CI [−1.23, .10].

Discussion

Consistent with previous studies, Experiment 3 demonstrates that curiosity has a negative effect on enjoyment of a coincident positive activity and that this effect is mediated by attentional focus on the curiosity-evoking event and attentional diversion from the focal activity.

Experiment 4

Our theoretical framework suggests that incidental curiosity impacts enjoyment of a coincident focal activity because it motivates a search for resolution, directing attention away from the focal activity and reducing an individual's ability to take in its experiential aspects. If this proposed attention-based theoretical account is true, then, curiosity evoked by a coincident event should not only decrease enjoyment of a positive focal activity, but it should also increase enjoyment of a negative focal activity (see Table 1). Experiment 4 tests this prediction.

Whereas Experiments 1 through 3 have provided support for the attentional process via mediation, Experiment 4 provides additional process evidence through moderation of a demonstrated effect (Baron & Kenny, 1986; Spencer, Zanna, & Fong, 2005). Specifically, we examine whether the same curiosity-evoking stimulus reduces enjoyment of a positive experience but enhances enjoyment of a negative experience as suggested by the attentional diversion account in Table 1. Experiment 4 also tests the effects of curiosity with different activity: viewing a music video.

Method

Participants. One hundred and seven university students participated in a study on video clip enjoyment. Participants were randomly assigned to one of four conditions in a 2 (curiosity: unresolved vs. resolved) × 2 (valence: positive vs. negative) between-subjects design.

Procedures. The focal activity involved watching a video of a musical artist performing a song. Valence of the focal activity was manipulated by the quality of the video. In the positive valence condition, we used the original, professionally recorded clip of the song *Elements* by the artist Lindsey Stirling. In the negative valence condition, we used a nonprofessional recording of a live performance of the same song, performed by the same artist, which had poor sound and picture quality. Participants in a pilot study (N = 37) conducted on the same population viewed either the positive or the negative video clip and indicated the extent to which the experience of watching the video was positive (1 = *not at all*, 9 = *very much*). A greater proportion of participants marked above the midpoint of this scale in the positive valence condition (72%) than in the negative valence condition (37%; $\chi^2 = 4.66$, p = .03); thus, our manipulation of valence of the focal activity was successful. Moreover, mean enjoyment scores were higher for those exposed to the positive valence condition ($M_{positive}$ = 6.28, SD = 1.52, n = 19) than the negative valence condition ($M_{negative}$ = 4.42, SD = 2.55, n = 18), $t(35) = 2.66$, $p < .05$.

To manipulate curiosity, we used the same gift-box manipulation as in Experiment 3. Halfway through the video clip, participants were asked to pull a gift-box from a paper bag. This gift-box was opaque in the curiosity-unresolved condition and transparent in the curiosity-resolved condition. After viewing the video, participants indicated their enjoyment of the focal activity.

Measures. Immediately after they viewed the video, participants were asked to indicate their level of enjoyment, pleasure, and satisfaction with this experience (1 = *not at all*, 9 = *very much*). These scores were averaged to form an index of enjoyment (α = .97).

Results

A 2 × 2 ANOVA on the enjoyment measure showed that participants in the positive valence condition ($M_{positive}$ = 6.15, SD = 2.10) enjoyed the video significantly more than did those in the negative valence condition ($M_{negative}$ = 5.13, SD = 2.21), $F(1, 105) = 6.78$, p = .01. This valence effect was qualified by a significant interaction between valence and curiosity conditions, $F(1, 105) = 5.11$, p = .03. Compared with resolved curiosity, unresolved curiosity reduced enjoyment of a positive experience ($M_{resolved}$ = 6.82, SD = 1.46, n = 21; $M_{unresolved}$ = 5.46, SD = 2.19, n = 34), $F(1, 105) = 6.37$, $p < .05$, $\eta^2 = .09$, but increased enjoyment of a negative experience ($M_{resolved}$ = 4.51, SD = 2.08, n = 23; $M_{unresolved}$ = 5.81, SD = 2.04, n = 27), $F(1, 105) = 5.00$, $p < .05$, $\eta^2 = .07$.

Discussion

The results of Experiment 4 demonstrate that unresolved curiosity causes a significant decrease in enjoyment of a coincident activity relative to resolved curiosity, providing another conceptual replication of our findings in Studies 1 through 3. Most importantly, relative to resolved curiosity, unresolved curiosity increases enjoyment of a negative focal activity, providing strong support for the attentional process mechanism we note in Table 1.

We conducted a meta-analysis to statistically assess the combined results of our studies and to measure the overall significance of the effect of curiosity on enjoyment of a coincident activity. We analyzed the results of our studies using the Exploratory Software for Confidence Intervals (ESCI) software package for Microsoft Excel. ESCI is based on the argument that *p* values can be uninformative and potentially confounding to the interpretations of a meta-analysis (Cumming, 2012, 2014). ESCI focuses on the precision and size of the estimated overall effect rather than depending on the use of *p* values from null-hypothesis testing.

We used meta-analysis of *d* between two independent group means option from ESCI to conduct the meta-analysis. We included results of four experiments and the field study in the meta-analysis. For Experiment 4, we examined only the positive valence condition. For the field study, we analyzed the enjoyment comparison for two possible curiosity and control groups. Including two comparisons from the field study would increase the weight of that study in the meta-analysis, so we used only one of the tested comparisons (the comparison between the curiosity group, who got a notification during the movie and checked it during the movie, and the control group, who did not get a notification during or after the movie and did not check their phone during the movie). For each study we used the standardized effect sizes, which ESCI automatically calculates by removing the bias from Cohen's *d* and using sample sizes as inputs. Random effects model is more appropriate than a fixed-effects model when population estimates are assumed to vary widely and when the goal of the meta-analysis is to generalize the findings (Kozary, 2014). We assumed the population estimates as heterogeneous and used the random effects model.

Results

The overall effect size was $d = .598$ [.377, .819]. Cohen suggested that $d = 0.2$ is a small effect size, $d = 0.5$ represents a medium effect size and $d = 0.8$ a large effect size (Cohen, 1988). Figure 3 displays the results graphically. On the basis of Cohen's suggestion, this effect is classified as a medium effect size. Overall, the meta-analysis results indicate that curiosity decreases enjoyment of a coincident activity and this effect is considered to be a medium size effect.

General Discussion

Summary of Findings

Whereas considerable research on integral curiosity finds positive effects of curiosity, we reliably observe that curiosity-evoking events that are incidental to a coincident activity can reduce activity enjoyment. We replicate this finding using relaxing (e.g., a foot massage), stimulating (e.g., a video game), cognitively engaging (e.g., reading), and multisensory (e.g., audiovisual musical performance) focal activities. Our effects also replicate using different curiosity-evoking events (a vibrating cell phone, a gift box with unknown contents) and with various control conditions (no curiosity, low curiosity, resolved curiosity).

Studies 1 through 3 consistently demonstrate that the negative impact of curiosity on enjoyment of a coincident activity is driven by a motivated and sustained shift in attentional resources from the focal activity to the curiosity-evoking event. This shift is shown by self-report measures of attentional diversion (Experiment 1), behavioral measures of attentional diversion away from the focal activity and sustained attention on the curiosity-evoking stimulus (Experiment 2), and reflective measures of sustained attention (rumination) and attentional diversion (attentional conflict; Experiment 3). Experiment 4 further supports this process mechanism, showing that the findings for enjoyment are reversed when the focal activity is negative. Thus, reduced attention to a positive (negative) focal activity makes individuals experience it as less positive (negative).

Theoretical contributions. More broadly, our research contributes to a wider body of research on curiosity and reveals a more complete picture of the link between curiosity-evoking events and activity enjoyment. Prior research finds that curiosity that is integral with the focal activity enhances the enjoyment of that same experience. We demonstrate that curiosity that stems from an incidental event can either enhance or reduce activity enjoyment, depending on the valence of the focal activity.

Notably, our attention-based process mechanism provides the basis for an overarching theoretical explanation that integrates both incidental and integral curiosity findings, as shown in Figure 2. Specifically, and consistent with our findings, when the curiosity-evoking event is incidental to the focal activity, attention is diverted away from the focal activity and shifts to the curiosity-evoking stimulus, negatively impacting one's focus on the focal activity. When curiosity is integral to the focal activity, attention is focused on the focal activity itself. Greater focus on the focal activity allows one to extract more enjoyment from the experience when it is positive (and presumably less enjoyment when it is

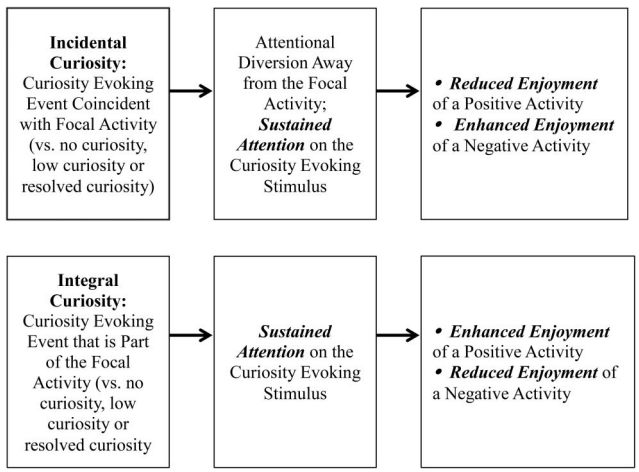

Figure 2. Effects of incidental and integral curiosity on consumption enjoyment.

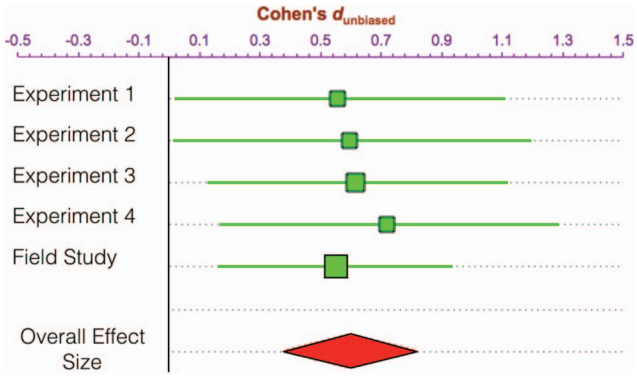

Figure 3. Forest plot showing estimates of effect sizes with 95% confidence interval for the meta-analysis (random-effects model) examining the impact of curiosity-evoking events on activity enjoyment. See the online article for the color version of this figure.

negative). Thus, although our results on the surface seem to suggest outcomes of curiosity that are opposite one another when the curiosity-evoking event is incidental to versus integral to the focal activity, our process mechanism provides a unifying account of how these findings can be integrated into a broader explanation of when and why curiosity impacts activity enjoyment (i.e., through attentional diversion and sustained attention).

Implications

People are constantly engaged in activities of some sort, whether it's listening to a lecture, eating a meal, waiting in traffic, shopping, or visiting the dentist. Moreover, activities can range from the wildly positive (e.g., seeing one's newborn for the first time) to the devastatingly negative (e.g., attending a funeral, waiting to receive negative medical news). Our findings that enjoyment of moderately positive (negative) activities is undermined (facilitated) by a concurrent curiosity-evoking event have implications for the design of environments where activity enjoyment is a relevant consideration. For example, in movie theaters, restaurants, salons, and medical offices it is quite common to encounter announcements that motivate patrons to turn off their cell phones during movies so as not to disturb others. Our results suggest that beyond disturbing others, ringing phones might reduce enjoyment of positive experiences and enhance enjoyment of mildly negative ones (e.g., visiting a dentist, driving in heavy traffic, waiting in line for a service). Some movie theaters ask quiz-type questions to audience members before the start of the film. Our results suggest that such questions should minimize the pain of waiting. Surprise promotions that are used by some retailers that make consumers curious about the amount of discount they have won may be beneficial if they reduce the pain of paying, which is a negative aspect of many consumption experiences.

Future Research

One might ask whether curiosity is unique in its ability to produce these effects or whether any stimulus that diverts attention from the ongoing experience has similar effects. Although our results do not speak directly to this issue, we believe that curiosity is particularly apt to produce the observed effects. Although some events may temporarily distract attention, curiosity may be unique in its absorptive quality and its impact on sustained attention. Future research might manipulate curiosity and distraction and compare whether the effects of curiosity that we observe here are greater than what is observed for merely distracting, but not curiosity-evoking events.

Our findings also raise multiple questions for future research. Given the prevalence of curiosity-evoking events people encounter every day, it may be important to explore how different kinds of curiosity-evoking events, including those that may evoke different levels of positive and negative emotions, influence enjoyment of positive and negative activities. Previous research (e.g., Litman, 2005) suggests that the anticipation of satiating curiosity may have considerable reward value. Future research can more explicitly explore the relationship between expectations and curiosity-related effects. While our studies focus on the link between attentional diversion and enjoyment, future work may identify additional proximal or distal factors in the causal chain. Future work might also include dispositional measures of I-type and D-type curiosity and different forms of ambiguity, including varying the type of information gap to examine possible moderators of the demonstrated effect.

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