Collective Satiation:

How Co-Experience Accelerates a Decline in Hedonic Judgments

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Abstract

Individuals often mutually experience a stimulus with a relationship partner or social group (e.g., snacking with friends). Yet, little is currently understood about how a sense of co-experiencing affects hedonic judgments of experiences that unfold over time. Research on the shared attention state has suggested that hedonic judgments are intensified when individuals co-experience a stimulus (vs. experiencing it alone), and other related work has found that the social environment influences hedonic judgments in shared (vs. solo) experiences. While this past work has focused on judgments of single instances of a stimulus, the present work examines how co-experience affects hedonic judgments of stimuli over time. This work documents the 'collective satiation effect' wherein satiation—a diminished enjoyment of pleasant stimuli with repeated experience—is accelerated by a sense of co-experiencing the stimulus with others. We propose this happens because shared attention makes the repetitive nature of the experience more salient, by promoting and incorporating thoughts of others also repeatedly having the same shared experience. Five studies document the collective satiation effect, support the proposed mechanism, and show moderators of the effect. Taken together, this research contributes to an understanding of how the social environment influences the experience of hedonic stimuli, which has broad implications for the value individuals place on the time that they spend with others.

KEYWORDS: shared experiences, hedonic judgments, social context, satiation.

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Experiences with others are common as well as pivotal events in social relationships. For instance, two people might sit together to watch a movie, and in addition to their physical proximity, their social closeness may foster a sense of co-experience (Boothby, Smith, Clark, & Bargh, 2016). Technology now allows for co-experience at great distances, such as when friends play a mobile game with each other remotely. In these examples, each person might form ongoing hedonic judgments of the experience over time, and though the shared aspect could influence these judgments, the role of co-experience in these settings is relatively unclear.

Recent research has found that the sense of co-experiencing a stimulus with others affects perceptions of the stimulus (Boothby, Clark, & Bargh, 2014; Boothby et al., 2016; Shteynberg et al., 2014; Shteynberg, 2015). A co-experienced stimulus is perceived under a state of "shared attention," which amplifies the individual's sense of experiencing the stimulus. However, less is known about the hedonic implications of the shared attention state, which could influence people's future decisions regarding shared experiences, including the variety of experience sought and the value placed on social occasions with others.

Additionally, research has yet to examine how effects of shared attention arise and vary during this state. Past work has shown how co-attention affects judgments of a single instance of a stimulus–e.g., evaluating one piece of candy (Boothby et al., 2014). Different from this past work, we examine judgments that dynamically fluctuate over time–e.g., individuals' ongoing evaluations while eating multiple pieces of candy. Thus, our work augments the literature by studying multiple exposures and evaluations of a stimulus under co-attention.

Our research documents a phenomenon that we term the 'collective satiation effect,' wherein a sense of co-experiencing within a pair or social group leads to an accelerated decrease in hedonic judgments over time for a pleasant stimulus. We show that this effect occurs because co-experience causes the repetition of the stimulus to become relatively more salient. When undergoing the stimulus in a state of shared attention, individuals think about others repeatedly experiencing the same stimulus, and they incorporate others' experience into their own subjective sense of repetition, which is thus amplified. Ultimately, given the role of perceived repetition for satiation (Redden, 2015), this mechanism accelerates the rate of satiation.

Our findings contribute to the literatures on co-attention and social context of experiences. Research has shown that the shared attention state alters how stimuli are processed and judged (Boothby et al., 2014; Boothby et al., 2016; Shteynberg, 2010; Shteynberg & Apfelbaum, 2013; Shteynberg et al., 2014; Shteynberg, 2015), and that it can directly influence experienced affect (Wagner et al., 2015). Meanwhile, other work has documented social influence and emotional contagion in shared experiences (Raghunathan & Corfman, 2006; Ramanathan & McGill, 2007; Ratner & Kahn, 2002; Ratner & Hamilton, 2015), or the public nature of consuming among strangers (Chugani & Irwin, 2012). However, beyond this limited set of works, very little is known about experiencing as a group as it pertains to thoughts and enjoyment during the experience and whether to partake in, continue, or halt the experience. In particular, no prior research has examined the effects of co-experience that emerge over time and influence ongoing enjoyment, the focus of our investigation.

The present research also has broad implications for social relationships and emergent behaviors and decisions. In particular, our work contributes to a fundamental understanding of how social context influences experienced affect (Fischer, Manstead, & Zaalberg, 2003); we

highlight how this influence can be indirect, through changes in the enjoyment of co-experienced stimuli. Additionally, our work suggests that decisions emerging from collectives may differ from individuals' decisions, because of how groups experience targets of co-attention over time. For instance, sensitivity to the repetition of shared products, like music, art, and technologies, might be greater in social groups (vs. individuals), and this can trigger a sharp drop in value for these products when they are repeated in social groups.

Theoretical development

Satiation and experiential social context

'Satiation' refers to the pervasive tendency for people to enjoy a pleasant stimulus less and less as it is continued or repeated (Coombs & Avrunin, 1977; Redden, 2008). As a result of satiation, people may decide to stop the experience and avoid the stimulus in the future. For instance, when satiation leads to little enjoyment of an initially pleasant juice at the end of the portion, it will discourage drinking the same juice on future occasions (Garbinsky, Morewedge, & Shiv, 2014). As well, satiated individuals would be less likely to pour more juice in their glass on this occasion once they have finished their initial portion.

The rate of satiation is greatly influenced by the extent to which repetition is construed within the experience. Individuals typically assess repetition in experiences negatively, in part because repetition undermines personal choice and uniqueness, though these considerations play larger roles in Western cultures (Kim & Drolet, 2003). Yet, satiation is multi-faceted and ubiquitous, affected also by automatic spontaneous processes that surface during extended experiences (Redden, 2014), which can ultimately make the perception of repetition highly malleable (Galak & Redden, 2017; Redden & Galak, 2013; Redden, Haws, & Chen, 2017). Individuals seemingly determine their ongoing enjoyment by reflecting on their own experience

and asking themselves if they have repeated the item a lot. This self-reflection contributes to a feeling of satiation, and so making repetition seem greater or more salient accelerates satiation. Conversely, decreasing feelings of repetition, especially via increased perceptions of variety within an experience, slows satiation (Redden, 2008).

Past work on satiation has largely examined solo contexts, with little research attention on how social context affects satiation, or its critical antecedent of perceived repetition (Redden, 2015). Research on the role of social context in attitude formation has found that in shared contexts, people assimilate others' reactions into their own attitudes for stimuli (Raghunathan & Corfman, 2006; Ramanathan & McGill, 2007). We build on this idea of assimilation, but given our interest in enjoyment of extended experiences, we focus on the assimilation of others' experience into the subjective sense of repetition. Also, different from this past work, our results do not rely on social influence (e.g., sharing of verbal or non-verbal reactions), just the perception that others are co-experiencing the same stimulus—the shared attention state.

Co-experiences and shared attention

A growing stream of research on the shared attention state (Boothby et al., 2014; Boothby et al., 2016; Shteynberg, 2010; Shteynberg & Apfelbaum, 2013; Shteynberg et al., 2014; Shteynberg, 2015) has observed that when individuals sense that they are attending to some aspect of the world with others, this amplifies the experience of the target for those individuals. This effect does not depend on social influence, occurring even when communication between individuals is not possible (e.g., silent and online co-experience). A shared attention state tends to spontaneously emerge from a sense of co-experiencing a hedonic stimulus—that is, when the target is the same stimulus and experienced at the same time as others.

In our conceptualization, the sense of co-experience lies on a continuum, where the two extremes are solo versus shared experiential context. In solo contexts, the individual undergoes the stimulus alone with nobody else mentally activated, whereas in shared contexts, the individual co-experiences the same stimulus at the same time with socially and physically proximate others. This conceptualization also takes into account intermediate levels to which individuals adopt a perspective of co-experiencing, as this will depend on particulars like group intimacy, the setting, and individuals' traits. Still, we contend that in many everyday situations, as well as many meaningful occasions, a sense of co-experience is highly activated (e.g., family vacations, couple watching a movie, etc.). Past research has suggested that this sense of co-experience may even occur in situational social groups that are transient and established on a minimal basis for affinity (Shteynberg, 2015; Tajfel, 1970).

According to past work, a sense of co-experience and the corresponding shared attention state can trigger broad implications through an increase in individuals' cognitive resources devoted to the co-attended target (see Shteynberg, 2015 for a review). Because individuals think about their own as well as others' experience of the target, there is an overall amplification of the experience, which affects memory, emotions, motivation, and behavioral adoption for the target. For instance, in one study, participants remembered words better when other people from the participants' social group co-attended the same words during learning (Shteynberg, 2010).

Pertaining to our investigation, a shared attention state could also affect hedonic judgments of pleasant stimuli, though limited work has examined this possibility (Boothby et al., 2014; Boothby et al., 2016; Shteynberg et al., 2014). For instance, in one study, a single piece of a tasty chocolate was liked more when co-experienced with another person (Boothby et al., 2014). As potential implications of this boost in positivity, co-experiencing the chocolate with

others could enhance future consumption for this chocolate, positive affect for the individual, and affinity for the co-experiencing partner. While we acknowledge that co-attention could increase the positivity of pleasant stimuli, this should mainly occur when co-attending individuals focus on positive features of the experience. Yet, we propose that other effects of shared attention and other implications of the state may occur for extended experiences, in which *repetition* is a key (negative) feature to consider for hedonic judgments over time.

The collective satiation effect

We propose that the shared attention state, characteristic of a sense of co-experience, accelerates satiation. As such, our work focuses on the *rate of satiation*, whereas we are agnostic on initial hedonic judgments in an extended experience. Notably, initial evaluations may be seen as indeterminate. For instance, ultimate enjoyment is quickly resolved when an individual eats only one chocolate piece, but when the individual goes into the experience already expecting to eat many pieces, enjoyment may manifest differently even upon the first piece, as has been observed in past work comparing open versus completed experiences (Galak & Meyvis, 2011; Gu, Botti, & Faro, 2013; O'Brien & Ellsworth, 2012). Because our goal is to test the rate of satiation, our predictions relate to drops in evaluations over time, rather than initial evaluations.

In particular, our predicted collective satiation effect synthesizes the co-attention literature with findings in the satiation literature on repetition. According to work on the shared attention state (Boothby et al., 2014; Boothby et al., 2016; Shteynberg, 2010; Shteynberg & Apfelbaum, 2013; Shteynberg et al., 2014; Shteynberg, 2015), co-experience should lead individuals to assimilate others' experience into their own subjective experience. We contend that even when others' affective reactions are unknown, individuals may still assimilate some aspects of others' ongoing experiences. In particular, an ongoing co-experience over time may

cause individuals to spontaneously think about others repeatedly experiencing the stimulus that is common to the group, and these thoughts may then be assimilated into the individual's own subjective sense of repetition. Drawing from past work that has shown an association between perceived repetition and experienced satiation on pleasant stimuli (Redden, 2015), we predict that this greater overall sense of repetition will accelerate the drop in hedonic evaluations over time.

Hypotheses and overview of studies

Next, we derive two formal predictions from our theory that a sense of co-experiencing triggers a shared attention state in which repetition of an experience becomes more salient. First, H1 relates to our proposed outcome of this process, the collective satiation effect:

H1: A sense of co-experiencing a pleasant stimulus within a social group will accelerate satiation on the stimulus. This collective satiation effect will be reflected by a faster reduction in hedonic judgments in shared (vs. solo) experiential contexts.

Second, our proposed mechanism is based on an increase in the salience of repetition. Under a sense of co-experience, individuals think about others' experience of the same target, and they assimilate these thoughts into their own subjective perceptions. Therefore, with experiences comprised by repetition, the added impact of others' repeatedly experiencing the stimulus, along with one's own repeated experience with the same stimulus, jointly amplifies the sense of repetition over time. Ultimately, greater salience of repetition accelerates satiation on the stimulus. Thus:

H2: An increase in the salience of repetition will mediate the collective satiation effect. Greater salience will be reflected by more thoughts of others repeating the stimulus and greater subjective perception of repetitiveness of the experience.

We report five studies that test these predictions. In Study 1, we confirmed our core prediction of a collective satiation effect (H1) on candies by testing a shared versus solo experiential context. We also found initial evidence for process by showing how thoughts of others' repetition of the stimulus mediates the effect (H2). In studies 2 - 4, we used different stimulus domains (online slideshows and music) to generalize our effect, and we measured and manipulated aspects of the experience to further support our proposed theory rooted in a shared attention state. Finally, in Study 5, we showed the downstream process evidence as a greater subjective sense of repetition mediated the effect (H2). The collective satiation effect consistently replicated across these studies, and in combination, the studies offer robust support and a range of process evidence for our predictions and proposed theory.

Study 1: Skittles® with mediating role of group-induced repetition thoughts

Study 1 tested the prediction that shared (vs. solo) experiential context increases satiation on an item (H1). We manipulated social context by having participants eat many pieces of a candy (Skittles®) either while alone (solo condition) or with a group of people (shared conditions). There were two shared conditions that differed in the candy consumption procedure; participants either did or did not chat while eating. Our *a priori* prediction for the effect of chatting in a shared context was mixed. Both shared conditions should prompt a sense of co-experience (vs. the solo condition), yet chatting might be a distraction, which is known to slow satiation (Higgs & Woodward, 2009). The interpersonal interaction could also encourage greater commitment to the group, which might increase the salience of what others are experiencing and could accelerate satiation further. Therefore, the two shared conditions (chatting vs. not) allows us to test for both boundary and enhancing effects, or interestingly allows us to generalize our effects to different shared experiential contexts.

A second goal of Study 1 was to test our proposed process. According to H2, a sense of co-experience should accelerate satiation, because when people continue to have an item with others, they recruit greater thoughts about others' experienced repetition, and they incorporate these thoughts into their own subjective experience. To support this proposed mechanism, we measured group-induced thoughts about others' repetition of the candy, and we tested the mediating role of these thoughts in our findings for satiation.

Method

Participants and design. Undergraduate students (N = 197, 55.84% female, M_{Age} = 20.83) participated for course credit in a behavioral lab. The study had a 3-cell (social context: solo vs. shared with control instructions vs. shared + chat) between-subjects design. These conditions were alternated across lab sessions of 3 to 6 participants. Sample sizes for all studies were determined *a priori* with the program *G*Power* (Erdfelder, Faul, & Buchner, 1996) using effect sizes provided and sample sizes utilized in past research on satiation effects (Redden & Galak, 2012). More specifically, we utilized an effect size of f = 0.18 as past work on satiation has shown effects sizes ranging from small to medium. In addition, we conducted a post hoc power analysis for each of our studies using *G*Power*. The power to detect an effect of the observed size on experience evaluations in Study 1 was determined to be 0.99.[1]

Procedure and materials. We manipulated a sense of co-experience of the candy by positioning participants to be with each other (vs. separate from them) while they ate the candy over time. In solo lab sessions, participants sat at individual stations with privacy partition panels, whereas in shared lab sessions they sat together at a large table (see Appendix A for

[1] Post hoc power analyses for Studies 2-5 were respectively 0.74, 0.85, 0.70, and 0.83. The power was lower in Study 4 than the others due to slightly lower participant recruitment than anticipated.

depiction). In both shared conditions, participants started the task by discussing their university courses. This icebreaker was included as an aspect of the co-experience manipulation, so that participants felt both socially and physically proximate to others in the group (Boothby et al., 2016). Solo condition participants were given a control activity to replace the icebreaker; they were asked to write about the same topic on a paper-pencil survey for an equivalent time. In solo lab sessions, proctors gave instructions individually to each participant to ensure that other participants' in-lab activities were not top-of-mind.

There were two shared conditions, one in which participants were silent while they ate ("shared-control"), and one in which they were encouraged to chat while they ate ("shared + chat"). In the latter condition, lab proctors took notes on the level of interpersonal interaction of each group, and while rapport varied across groups, overall this condition was qualitatively different from the other shared condition without any conversations, as validated by measures that we report below. As such, this condition incorporates some organic conversation that can arise during shared experience.

In all conditions, participants were given a small plastic bag containing 16 Skittles® candies (equivalent to a "fun size" package) that they poured into paper bowls (see Appendix A for depiction). Skittles® packages are most commonly sold in five Original Fruit flavors that differ in taste and color. Each bag had one of these flavors, and across lab sessions, we alternated the five flavors so that all participants in a given session had the same flavor repeatedly.

Participants completed the candy eating procedure and responded to all measures on a paper survey. The printed instructions asked them to eat two pieces and evaluate the experience on a two-item, 101-point scale of enjoyment (0 = *hating it*, 100 = *loving it*), and desire to continue (0 = *not at all*, 100 = *very much*), adapted from scales used in previous satiation

research (Redden, 2008). They continued with this procedure until they had eaten 16 pieces, with evaluations after every two pieces. These measures were averaged for each time point to create eight indices of ongoing experience evaluations (αs > .91).

After the final evaluation, for our key process measures, participants rated how often they thought about other students in the behavioral lab (1) eating the candy, and (2) enjoying the candy. Each item was measured on a 7-point scale (1 = *never had this thought*, 7 = *often had this thought*), and we combined the two items (α = .84) to create an index of group-induced thoughts of repetition. Solo condition participants could have these thoughts as well, because it was known to them (though not necessarily salient) that other students were participating in the lab session. Of course, we expected those in the solo (vs. shared) condition to have fewer of these thoughts because they were not part of a shared group context. Participants were later asked to rate how committed they were to the group on a 2-item (α = .70), 7-point scale of group commitment (1 = *not at all committed to the group*, 7 = *very committed to the group*), and desire to be in the group setting (1 = *did not want at all*, 7 = *wanted very much*). These questions were included as manipulation checks to test for differences between the two shared conditions.

Results

Group commitment. As an expected effect of the procedural differences by condition, participants in the shared + chat condition were more committed to the group (M = 5.77, SD = 1.89) versus the shared condition with control task instructions (M = 4.72, SD = 2.14; $t(126)$ = 2.93, $p < .01$, d = 0.52). We next tested whether this increased commitment translated to even greater thoughts of the group having the candy, beyond other differences potentially introduced by the diversity of each ongoing conversation.

Group-induced repetition thoughts. As expected, participants in the solo condition rated a lower frequency of thoughts of others' consumption (M = 3.00, SD = 2.11) compared to both the shared condition with control task instructions (M = 4.52, SD = 2.08; $t(194) = 17.79$, $p < .001$, $d = 0.73$), and the shared condition with chatting (M = 4.10, SD = 2.07; $t(194) = 9.18$, $p <$. 01, $d = 0.53$). Ratings on this measure did not significantly differ between the latter two shared conditions ($t(194) = 1.29$, $p = .26$, $d = 0.20$). It seems that simply being assigned to the group is enough to spontaneously create a wealth of group-induced thoughts of others' consumption, thereby limiting the effects of enhancing group commitment.

Eating experience evaluations. We conducted an analysis of the eight eating experience evaluations with a repeated measures regression. The model included a between-subjects factor of social context condition with three levels (solo, shared-control, and shared + chat), timing (1st through 8th evaluation) as a continuous factor, and a repeated measure with an unstructured error term. The main effect of social context condition was not significant ($F(2, 194) = 0.07$, $p = .94$, $\eta_p^2 < .001$), but there was a significant main effect of timing ($F(1, 194) = 269.75$, $p < .0001$, $\eta_p^2 = .58$); participants satiated on the candies as they ate more. Most importantly, and consistent with H1, there was a significant social context condition X timing interaction ($F(2, 194) = 3.38$, $p = .04$, $\eta_p^2 = .02$), see Table 1 and Figure 1.

Social context affected evaluations for later trials, but not early trials of candy eating. We conducted planned contrasts by social context condition separately for the first and the final evaluations. There were no significant differences on first evaluations (all ps > .4; M_{Solo} = 79.75, SD = 23.90; $M_{Shared\text{-}Control}$ = 77.54, SD = 23.20; $M_{Shared+Chat}$ = 76.89, SD = 26.87). However, final evaluations were significantly higher in the solo condition (M = 49.44, SD = 35.58) compared to the shared-control condition (M = 36.37, SD = 31.24; $t(194) = 5.05$, $p = .03$, $d = 0.34$), and to the

shared + chat condition (M = 34.67, SD = 33.91; $t(194) = 6.35$, $p = .01$, $d = 0.42$). Final evaluations did not significantly differ between the two shared conditions ($t(194) = 0.08$, $p = .78$, $d = 0.05$).

To illustrate these results further, Table 1 reports the slope of evaluations over the eight trials calculated using individual-level regressions, where a more negative number reflects increased satiation. The slope was more negative in both shared contexts compared to the solo context (M_{Solo} = -4.66, SD = 4.62; $M_{Shared\text{-}Control}$ = -6.04, SD = 4.35, $t(194) = 2.94$, $p = .09$, d = 0.42; $M_{Shared+Chat}$ = -6.53, SD = 4.92, $t(194) = 5.35$, $p = .02$, $d = 0.77$).

Mediation analysis. For the mediation analysis, we collapsed the two shared conditions, shared-control and shared + chat, because these conditions had similar results on satiation rates and group-induced thoughts of others' consumption. Our independent variable was social context (1 = solo, 2 = shared), our dependent variable was satiation rate reflected by the slope of evaluations over the eight trials calculated using individual-level regressions, and our mediator was ratings of group-induced thoughts of others' consumption. We first confirmed that the slope of evaluations was predicted by both social context (b = -1.62, SE = 0.69, $t(195) = -2.34$, p = .02), and group-induced thoughts of others' consumption (b = -0.51, SE = 0.15, $t(195) = -3.41$, $p < .001$). We used Preacher and Hayes' (2008) macro to obtain 95% bias-corrected confidence intervals with 5,000 bootstrap samples to test for mediation. Consistent with H2, this analysis exhibited complete mediation. That is, when the group-induced thoughts of others' consumption was included as a mediator, we no longer found a direct effect of social context on slope of evaluations (b = -1.03, SE = 0.71, $t(194) = -1.46$, $p = .15$), and the indirect mediation effect was significant (b = -0.58, SE = 0.26, *95% CI* = [-1.23, -0.19]), see Figure 2.

Discussion

Study 1 confirmed H1 and the collective satiation effect: participants consuming candies in a shared setting satiated faster than those in a more isolated setting. In a broader sense, this study establishes that social context matters for the ongoing enjoyment of repeated experiences. Moreover, Study 1 found some initial process evidence for the phenomenon. Consistent with H2 and our theory, we found that a shared (vs. solo) context prompted thoughts of others' repeated consumption of the same item, which then accounted for the accelerated satiation. We expect that these thoughts increased the salience of repetition experienced (presumably a focal aspect here), and accordingly increased satiation in the shared (vs. solo) conditions.

Interestingly, we also found that shared (vs. solo) experience did not influence initial evaluations. It seems that the anticipation of eating more candies may have reduced an intensification of positivity that had been observed in some previous studies on shared attention. Unlike our setting of an extended experience, past work examined settings in which participants expected the experience to be singular (eating one chocolate piece; Boothby et al., 2014), or non-repetitive (eating and judging two different chocolate pieces; Boothby et al., 2016). We return to this issue later in the General Discussion, but we note here that our theory rooted in repeated experiences inherently remains silent on initial enjoyment.

Study 1's results suggest that collective satiation occurs in shared settings that vary in verbal interaction and commitment to the group activity. In showing how this effect generalizes, our goal is not to make a broad claim about the pervasiveness of the collective satiation effect. Rather, generalizing across shared contexts increases our confidence that the results emerge from a sense of co-experience, rather than an idiosyncratic experimental artifact. Next, in Study 2 we extend our findings to a different experiential domain and a different operationalization of our

independent variable, a measured sense of co-experience, to parallel natural variations in co-experience that individuals may feel.

Although these results supported our theory, other alternative accounts could still contribute here. The indulgent stimulus domain (eating candies) and the possibility for non-verbal and verbal interaction might have invited public scrutiny under shared (vs. solo) eating (Ratner & Kahn, 2002), which may have ultimately diminished enjoyment. Given all participants here ate the same flavor of candy, and consumed an equal and relatively modest amount, we believe a public scrutiny account of the results is unlikely. Nonetheless, to directly address this possibility, we tested non-indulgent stimuli with no self-control dilemma in our subsequent studies. By generalizing the stimuli, we can also address alternative explanations related to the idiosyncratic consumption norms in the domain of candy eating. We also largely examined private settings (except for Study 4), wherein individuals could perceive co-experience but not directly observe or interact with others. This increases our confidence that public scrutiny and/or social influence did not account for the observed effects.

Other potential alternate accounts of the Study 1 findings are that the shared context was more distracting than the solo context, which led participants to focus relatively more on social cues than the candy stimulus, or that the social context simply induced more fatigue in general. Accordingly, we should observe lower later evaluations from being in a mentally sapping shared context for a longer time. While we acknowledge this possibility, it is unlikely that the brief and casual interpersonal interaction in Study 1 was mentally depleting. Furthermore, past work has found that lower levels of attention to the stimulus (e.g., through a distraction such as thinking about others) generally slows satiation (Epstein et al. 2005), which seemingly cannot account for our pattern of results. Still, to directly test for any role of general attention, depletion, or fatigue,

Study 2 somewhat decouples the association between timing of measurement and repetition by testing the moderating role of stimulus variety and level of repetition.

Study 2: Perceptions of co-experience

In Study 2, we sought to generalize our proposed effects to a different experiential domain—enjoyment of images. This domain also allowed us to examine online media, which is gaining in importance for many individuals that spend a large proportion of their social lives on the Internet (Shteynberg, 2015). To that end, we measured Internet users' sense of co-experience for an online slideshow, which allows this sense to vary on a continuum (as we theorized earlier), but without the potential for public scrutiny or interpersonal interaction. Even still, we predicted that participants with greater (vs. lesser) felt co-experience while viewing the images with others online would satiate faster on these images (H1).

Additionally, in Study 2, we probed for further evidence to support our theory on the salience of repetition, so we tested if an image set with less repetition would attenuate the collective satiation effect. Our theory posits that co-experience accelerates satiation by affecting thoughts about repetition, and if so, then the relationship of co-experience and satiation should depend on the level of repetition. Put another way, we can directly test our theory by adding some variety to the experience (while still retaining some repetition). We expected that all participants would generally satiate on the image viewing experience, but that there would be an interaction of the variety manipulation and sense of co-experience. Specifically, the effect of co-experience on satiation should be less when participants experienced inherently less repetition due to a greater variety of stimuli.

Moreover, finding a moderating role of variety would help address some alternative explanations for Study 1's results. Co-experience could produce distraction, fatigue, or an

increased perception that one's experience is being scrutinized by others. All of these factors may account for reduced hedonic evaluations in later (vs. earlier) measurements. However, these alternative explanations could not readily account for the moderating role of stimulus variety on the collective satiation effect. That is, distraction, fatigue, and public scrutiny would seemingly predict lower later evaluations with co-experience regardless of the amount of perceived repetition comprising the experience (e.g., high vs low variety). Therefore, the demonstration that lower experience repetition (via the introduction of variety in an experience of equivalent length) attenuates the collective satiation effect should rule out these possibilities.

Method

Participants and design. U.S.-based participants (N = 202, 53.96% female, M_{Age} = 35.85) on Amazon mTurk completed an online survey for a small payment. We manipulated the composition of the image set between-subjects (low variety vs. high variety), and the sense of co-experience was a measured natural difference between-subjects.

Procedure and materials. All participants were told that they would view a slideshow of images. To ensure some between-subjects variation along the sense of co-experience, the task instructions were ambiguously written to allow for this sense without overtly activating it. More specifically, we wanted all participants to be cognizant that they were part of a group of participants that were completing the same survey at the same time. To that end, our task instructions highlighted that participants were part of a "micro-batch" group, a real feature of mTurk that we used to gather the participants in this study in groups of nine or fewer at a given time. They were told that all participants in the group would view and evaluate a slideshow, but they were not told whether their slideshow was in common with or distinct from others (see

Appendix B). Given these instructions, we expected that participants would spontaneously differ in the inferences and feelings that they had with respect to co-experiencing the images.

After reading the task instructions, participants viewed one image in the set and evaluated it on the same two-item scale (enjoyment: 0 = *hating it*, 100 = *loving it*; desire to continue: 0 = *not at all*, 100 = *very much*) as in the previous study. Then, they viewed the remaining 32 images, and evaluations were collected after every eighth image (αs > .92). Each image was presented for a fixed time (five seconds) on the screen, after which participants advanced the slideshow. Participants were told their progress in the sequence during the slideshow.

The composition of the image set differed in a between-subjects manipulation of intermittent changes in the sequence. In the low variety condition, participants viewed a series of Mount Fuji photos, and all images were photos of this mountain from slightly different perspectives. In contrast, in the high variety condition, participants viewed these Mount Fuji photos alongside photos and paintings of different places interspersed in the sequence. Of the 33 photos, 19 images in this set were identical to the low variety condition (i.e., Mount Fuji), and 14 images were paintings or photos of other Japanese scenes. See Appendix C for further details. We note that while we manipulated the variety of photos presented in the sequence, participants in both conditions still had a fairly repetitive experience in which they continuously viewed images related to Japanese scenery.

After the final experience evaluation, participants were asked about the respondents in the mTurk micro-batch group. Participants rated the extent to which they felt that they had co-experienced the images with the group on a 2-item (α = 0.82), 7-point scale (1 = *not at all*, 7 = *very much*) of "others experienced the same with me" and "my experience was common with others." We note that these statements are consistent with a shared attention state, in which

individuals perceive that others have the same target of experience and that they are undergoing this experience together with others. As a check of the variety manipulation, participants rated the variety contained in the slideshow (1 = *very little variety*, 9 = *a lot of variety*).

Results

Manipulation check. As expected, the manipulation of stimuli differences increased ratings of the slideshow's variety ($M_{Low\text{-}Variety}$ = 4.51, *SD* = 2.12 vs. $M_{High\text{-}Variety}$ = 6.17, *SD* = 1.87; (*t*(200) = 5.91, *p* < .001, *d* = 0.83). This manipulation did not affect the sense of co-experience ($M_{Low\text{-}Variety}$ = 4.78, *SD* = 1.60 vs. $M_{High\text{-}Variety}$ = 4.79, *SD* = 1.47; *t*(200) < .1, *p* = .96, *d* < 0.00), presumably because participants did not know about the other condition or differences in variety.

Experience evaluations. We conducted an analysis of the five experience evaluations with a repeated measures regression. The model included a between-subjects factor of image set composition (low variety or high variety), measured sense of co-experience, timing (1st through 5th evaluation) as a continuous factor, and a repeated measure with an unstructured error term. The only significant effects were the two-way interaction of sense of co-experience X timing (*F*(1, 198) = 7.97, *p* < .01, η_p^2 = .04), consistent with H1, and the three-way interaction of image set composition X sense of co-experience X timing (*F*(1, 198) = 3.90, *p* = .05, η_p^2 = .02). All other factors failed to reach statistical significance (*p*s > .13).

The slope of evaluations from individual-level regressions was negative and significantly different from zero in both conditions ($M_{Low\text{-}Variety}$ = -6.13, *SD* = 7.56 and $M_{High\text{-}Variety}$ = -2.93, *SD* = 5.15; vs. slope of zero, both *t*(201) > -5.70, *p* < .0001, *d* > 0.80). The presence of satiation in both conditions indicated that while the manipulation of image set composition somewhat reduced repetition, it did not add an especially great level of variety that would allow enjoyment to improve or remain high over time. Instead, as expected, the slope of evaluations was simply

more negative in the low variety versus high variety condition ($t(200) = 3.51$, $p < .001$, $d = 0.49$). The variety manipulation did not affect initial evaluations ($M_{Low\text{-}Variety} = 82.08$, $SD = 22.25$ vs. $M_{High\text{-}Variety} = 81.39$, $SD = 17.17$; $t(200) = 0.25$, $p = .80$, $d = 0.04$), but evaluations were more positive in the high versus low variety condition in the final measurement ($M_{Low\text{-}Variety} = 56.73$, $SD = 34.93$ vs. $M_{High\text{-}Variety} = 67.92$, $SD = 25.61$; $t(200) = 2.60$, $p = .01$, $d = 0.37$).

Given our focus on satiation, we further analyzed the pattern of evaluations over time, especially interactions with our measure of the sense of co-experience ($M = 4.78$, $SD = 1.53$). In an ANOVA, our dependent variable was the slope of evaluations (from individual-level regressions) with independent factors of variety condition and sense of co-experience. The main effect of variety condition was not significant ($F(1, 198) = 0.91$, $p = .34$, $\eta_p^2 < .01$), but there was a significant main effect of sense of co-experience ($F(1, 198) = 9.39$, $p < .01$, $\eta_p^2 = .05$) and a significant interaction of sense of co-experience with variety condition ($F(1, 198) = 4.66$, $p = .03$, $\eta_p^2 = .02$). In the low variety condition, a higher sense of co-experience was associated with a more negative slope of evaluations ($b = -1.09$, $SE = 0.46$, $t(99) = -2.34$, $p = .02$, $d = 0.47$). In the high variety condition, however, the sense of co-experience no longer had a statistically significant effect on this rate of satiation ($b = -0.27$, $SE = 0.35$, $t(99) = -0.75$, $p = .46$, $d = 0.15$).

Table 2 reports estimated slope coefficients for the low versus high variety condition, a spotlight analysis at low and high levels of co-experience (±1 SD), and values of the experience evaluation measures over time by condition. These results show that adding more variety to the experience reduced satiation for participants with a high sense of co-experience ($b = 4.28$, $SE = 1.28$, $t(197) = 3.36$, $p < .01$, $d = 0.48$), but the effect of variety was not significant for participants with a low sense of co-experience ($b = 1.01$, $SE = 1.23$, $t(197) = 0.82$, $p = 0.41$, $d = 0.12$).

Discussion

Study 2 generalizes the collective satiation effect to an image viewing experience and online setting. This helps to address two competing explanations that relate to the domain and setting of Study 1, in which participants ate candy in a lab. First, viewing images (unlike eating candy) is not generally considered to be an indulgent experiential domain, and everyone's behavior here was private. Thus, differences in how people exercise self-control around others (vs. alone) has difficulty explaining the findings. Second, in this online setting we entirely eliminated verbal and non-verbal social influence (Raghunathan & Corfman, 2006; Ramanathan & McGill, 2007), as well as public scrutiny (Ratner & Kahn, 2002).

Study 2 also tested the collective satiation effect using a natural measure of the sense of co-experience as our independent variable. This measure was focused on a core construct in our theoretical framework: the shared attention state. Moreover, Study 2 showed how the variety of items moderated the phenomenon, in accord with our theory. Specifically, we argue that the image set with higher variety reduced the overall level of repetition, thereby attenuating the collective satiation effect that relies on such thoughts. Study 2 supported this as a stronger sense of co-experience increased satiation when there was less variety (and more repetition), but this relationship disappeared with the addition of more variety (and hence less repetition). This moderating role of stimulus variety helps to address alternative explanations related to distraction, fatigue, and public scrutiny induced by a sense of co-experience.

We note that Study 2's variety manipulation was designed to reduce the level of repetition, not eliminate it. To that end, participants exhibited satiation even when the image set contained a relatively higher level of variety, perhaps due to satiation at the category level (e.g., images of Japanese scenes) that was still repeated in all conditions. Interestingly, it is possible that with a more extreme variety manipulation with no hint of repetition, a greater sense of co-

experience might amplify the positive impression of variety to possibly produce more positive hedonic evaluations (Boothby et al., 2014, 2016). Of course, since we did not seek to test this in the current study, future work will need to explore this possibility.

In the next study, we further clarify the centrality of *co-experience* in our framework by returning to online image viewing with a manipulated sense of co-experience. In doing so, we also seek to more directly rule out general attention or distraction during co-experience as an alternative explanation. While Study 2 provided some evidence in this regard, we acknowledge that distraction (e.g., thoughts of others) could still vary in the high versus low variety conditions. Study 2's online setting eliminated the visual distraction of others, but an awareness of others could still be distracting, and even more so during extremely repetitive experiences.

The next study also address whether thinking of others could induce vicarious effects on enjoyment. According to past work, simply imagining a repetitive experience can diminish subsequent enjoyment (Larson, Redden, & Elder, 2013; Morewedge, Huh, & Vosgerau, 2010); similarly, in our studies participants may have satiated just because they thought of the experience itself rather than others sharing the experience. We note, however, that participants in our studies were not asked to imagine others' experience, in stark contrast to past work on imagined experience. Thus, the next study tests whether the collective satiation effect emerges when individuals experience a stimulus together, but not when they are merely thinking about others experiencing the same stimulus.

Study 3: Online art viewing and separation in time

In Study 3, we contrasted experience evaluations when people viewed art online at the same time as another individual versus at a separate time. The purpose of testing a separation in time was to operationalize our independent variable, a sense of co-experiencing a stimulus, in an

alternative manner. Research in the co-attention literature has found that people feel this sense when experiencing the same stimulus at about the same time as a socially connected other (Shteynberg et al., 2014; Shteynberg, 2015). In contrast, if people experience the stimulus at noticeably different times, this tends to reduce any sense of co-experience. So, we expect faster satiation (vs. solo art viewing) when an individual views art at the same time as another, but this collective satiation effect should attenuate when the other person views art instead before or after the individual—viewing conditions that diverge from a shared attention state.

This study and our predictions also further rule out two alternative accounts. Specifically, consuming with others could serve to affect the attention generally given to the stimulus which has been linked to satiation (Epstein et al., 2005), or it could lead one to imagine and mentally simulate the experience itself which can lead to habituation (Larson et al., 2013; Morewedge et al., 2010). However, if either of these alternative accounts underlie our effects, then simply shifting another's consumption by just one minute should seemingly have little effect on the rate of satiation. Alternatively, our theory predicts that satiation should be less in the co-experience conditions when the timing is no longer a close match.

Method

Participants and design. U.S.-based participants (N = 278, 58% female, M_{Age} = 35.03) on Amazon mTurk completed an online survey for a small payment. The study had a four-cell between-subjects design, in which we contrasted a concurrent experience condition to three distinct conditions (others either pre-view, post-view, or never view) that we describe later.

Procedure and materials. The social context of photo viewing was manipulated between subjects using procedures adapted from Shteynberg et al. (2014). Participants in some conditions were given task instructions that encourage a perception of being paired with an

online partner for the experience. To reinforce this cover story, at the start of the task, participants were told that they may encounter slight delays during the survey while waiting to be paired with an online partner. In the solo condition, there was never any mention of other online participants, and given the private online participation, we expected this condition to have an impoverished, or quite likely non-existent, sense of co-experience.

After the initial task instructions, all participants were asked to select an avatar to represent themselves, one of two owls, koalas, or elephants (Appendix D). While solo participants did not have a paired partner, participants in the shared condition were then given the participant ID# of a paired online partner who had (incidentally) chosen an avatar from the same animal species. The avatar match encouraged participants to feel a superficial similarity to their paired partner, thereby evoking a felt social connection (Shteynberg et al., 2014). As in previously published studies that used this protocol, there was no actual online partner. Participants were later debriefed that their paired partner was merely represented by the avatar and task instructions within the survey program.

After the avatar procedure, participants rated their baseline enjoyment of art in a neutral setting, wherein they saw a set of five non-repeated art paintings (see Appendix D) one page at a time at a pace that they controlled (M = 42.69 seconds total, SD = 53.64). This self-paced presentation was done to ensure that participants would have enough time to view each painting and form their initial impressions of the artwork. At the end of the sequence, participants rated their enjoyment of the art set on the two-item, 101-point scale ($\alpha = 0.81$) of enjoyment (0 = *hating it*, 100 = *loving it*) and desire to continue (0 = *not at all*, 100 = *very much*).

We then manipulated the sense of co-experience during the repeated art viewing. Participants were told that they would next watch a video of the same artwork, and the

conditions of viewing were manipulated between-subjects. In one condition, (1) solo viewing, no social presence was mentioned; participants viewed the video alone after selecting their own avatar. In the other conditions, participants were explicitly paired with an online partner (with a similar avatar) who would watch the same video. These conditions were: (2) online partner watches the video one minute before the participant (post-viewing); (3) online partner watches the video one minute after the participant (pre-viewing); and (4) online partner watches the video at the same time as the participant (concurrent viewing). Presenting the art in a timed video (rather than the self-controlled pace used to gather baseline enjoyment), helped to support our cover story for these conditions (Shteynberg et al., 2014).

Participants learned that they would watch the video slideshow of art with, after, or before a paired partner, or alone, depending on the assigned condition. The video immediately played in three conditions, except the post-experience condition in which participants had to wait on their online partner for one minute before watching the video. The video lasted one minute, during which the same five art pieces (shown earlier) were repeated three times each, in a randomly-determined order, with four seconds spent on each image view. Then, participants rated how much they were currently enjoying the art on the same two-item, 101-point scale (α = 0.87) that was used for the initial enjoyment measures.

Results

Final enjoyment ratings were subjected to an ANCOVA with the independent between-subjects factor of viewing condition (solo, post, pre, or concurrent), and controlling for baseline enjoyment as a covariate as it was measured before the manipulation. Ratings of baseline enjoyment were similar by condition (M_{Solo} = 75.43, SD = 22.57; M_{Post} = 74.19, SD = 17.16; M_{Pre} = 70.29, SD = 23.65; $M_{Concurrent}$ = 70.37, SD = 22.60; all comparisons had ps > .16). More

importantly, there was a significant effect of viewing condition on final enjoyment ($F(1, 273) = 5.05$, $p = .03$, $d = .27$). Final enjoyment was consistently lower in the concurrent viewing condition ($M_{Concurrent} = 59.34$, $SD = 25.92$) versus the other conditions ($M_{Solo} = 68.89$, $SD = 27.73$; $M_{Post} = 66.72$, $SD = 21.22$; $M_{Pre} = 63.07$, $SD = 26.97$), see Table 3.

As predicted, the drop in evaluations was greater in concurrent viewing ($M = 11.03$, $SD = 14.42$) compared to the other three conditions ($M = 7.08$, $SD = 11.58$; $F(1, 274) = 5.34$, $p = .02$, $d = .28$). The three control conditions had a relatively smaller drop in enjoyment ($M_{Solo} = 6.54$, $SD = 10.57$; $M_{Post} = 7.47$, $SD = 12.78$; $M_{Pre} = 7.22$, $SD = 11.43$), with no significant differences between these three conditions (ps > .65). In planned contrasts, the drop in enjoyment was significantly greater in the concurrent versus solo condition ($t(274) = 4.62$, $p = .03$, $d = 0.36$), though this result was above the conventional significance level in contrasting concurrent to pre-viewing ($t(274) = 3.27$, $p = .07$, $d = 0.31$) and concurrent to post-viewing ($t(274) = 2.88$, $p = .09$, $d = 0.29$). This may indicate that the pre-viewing and post-viewing conditions still elicited some small sense of co-experience, though not nearly as much as concurrent viewing.

Discussion

In Study 3, we found that satiation on art was accelerated by viewing with an online partner, but this effect was reduced when the online partner's experience was separated in time (i.e., before or after). Thus, increased satiation from shared experience is not about just having the same thing or having an experiential partner, rather it is also about experiencing the stimulus *together*. Our theory proposes that such a separation in time reduces a feeling of co-experience, and thus dissipates the shared attention state and thoughts of others' experiences. Alternatively, other accounts struggle to explain these results. For example, if co-experience produces a vicarious experience that habituates one on subsequent stimuli (Larson et al., 2013; Morewedge

et al., 2010), then this effect should be largely unaffected by a one-minute shift in the actual timing of the imagined event. Likewise, an alternative explanation rooted in general attention to the stimuli would seemingly be equally affected in all conditions as participants always had an online partner that could serve as a potential distraction. The next study further argues against this account by having all participants listen to music while working on another task, which should increase the overall distraction for everyone thereby reducing any relative difference in distraction between solo and shared contexts.

Study 4: Music in the lab

One goal of Study 4 was to assess individuals' thoughts about the salience of repetition and thoughts of others' experiencing the stimulus, using an alternative thought-listing measure. We predicted that these thoughts will be greater in a shared (vs. solo) context, consistent with our theory. Another goal was to examine the collective satiation effect in a more distracting environment, using music as the domain of experience.

In Study 4, all participants completed a writing task (unrelated to music) while they listened to a segment of classical music that was repeated. We argue that multi-tasking is a realistic feature of experiences in this domain; many people today listen to music while engaging in other activities. A multi-tasking context also allowed us to measure the salience of repetition in an alternative manner. By giving participants something outside of the music to think about, we were able to ask participants to write, in an open-ended prompt, on the thoughts they had during the experience. Despite the inclusion of a potentially distracting second task, we expected that participants would be more likely to mention thoughts of others' experience of the music and thoughts about repetition of the music in a shared (vs. solo) context.

Method

Participants and design. Undergraduate students at a large U.S. university (N = 84, 71% male, M_{Age} = 21.33) participated for course credit in a lab. Each lab session had 3-6 participants that all were initially seated at individual stations with privacy partition panels. The study had a 2-cell (solo vs. shared) between-subjects design with the treatment alternated across lab sessions.

The first part of the experiment was administered on a computer survey. Participants read an introduction to the music listening experience in which they were told that a local symphony orchestra had practiced a segment of music. Next, they heard the music for the first time: a 50-second selection from Johannes Brahms' String Quintet in F Major, Op. 88. The music played from the computer through headphones. They then rated their current enjoyment on a two-item (α = 0.90), 101-point scale of enjoyment (0 = *hating it*, 100 = *loving it*), and desire to continue (0 = *not at all*, 100 = *very much*) by typing numbers in two small boxes.

Procedures next diverged by social context similar to Study 1. In shared context sessions, participants moved to a table in the center of the lab. Here, as an icebreaker, they were asked to chat with each other about their favorite university courses and their plans for the upcoming summer. Participants in the solo sessions were given a comparable, control activity. They were still seated at their individual desks, but they were asked to just think about the same topics for an equivalent amount of time. In solo sessions, the proctor gave verbal instructions individually to each participant, and participants were not told about others' in-lab tasks.

Next, participants were given a writing task that they completed on a paper-based survey. Both solo and shared context participants briefly wrote about their favorite courses and their summer plans, topics that they had encountered just before the writing task (while chatting in the shared sessions, or while thinking about the topics in the solo sessions). While participants completed this task, the same segment of classical music from earlier was repeated four more

times (200 seconds total). Participants in the solo sessions listened to the music individually via computer headphones, whereas participants in the shared sessions listened as a group via a common computer speaker, which was pre-tested to have the same volume level (and confirmed in the present study). Thus, critically, in the shared (but not solo) condition, participants experienced the repeated part of the music in a shared attention state. At the end of the music, participants rated their continued enjoyment of the music on the same 2-item ($\alpha = 0.89$), 101-point scale on their paper survey.

Shared context participants then returned to their computer stations. In solo sessions, participants were already seated at their desks. The remaining measures were collected on the computer-based survey. To detect salience of repetition (as well as other thoughts), participants were asked to describe, in an open-ended prompt, what they were thinking about during the earlier writing task, and we later coded these responses.

Results

Experience evaluations. The final enjoyment ratings were subjected to an ANCOVA with the independent factor of social context (solo vs. shared), and controlling for initial baseline enjoyment as a covariate as it was measured before the manipulation. There was a significant effect of social context ($F(1, 81) = 6.39$, $p < .02$, $\eta_p^2 = .07$). As predicted by H1, the drop in evaluations was bigger in the shared versus solo context ($M_{Solo} = 6.45$, $SD = 15.37$ vs. $M_{Shared} = 16.45$, $SD = 22.22$; $t(82) = 2.39$, $p = .02$, $d = 0.53$), see Table 4.[2] .

[2] We also examined final evaluations without the inclusion of baseline enjoyment as a covariate. Consistent with H1, final evaluations were higher in the solo versus shared condition ($M_{Solo} = 59.79$, $SD = 24.01$ vs. $M_{Shared} = 50.34$, $SD = 28.19$), though without the covariate to capture individual differences in baseline enjoyment, this effect did not reach conventional significance levels ($t(82) = 1.65$ $p = .10$, $d = 0.36$). First evaluations did not differ by social context ($M_{Solo} = 66.24$, $SD = 25.99$ vs. $M_{Shared} = 66.80$, $SD = 27.28$; $t(82) = 1.10$, $p = .76$, $d = 0.24$)

Open-ended thoughts. Three independent coders, blind to the hypotheses, read participants' statements on what they were thinking about during the writing task when the repeated music played. They counted three numbers: (1) total number of distinct thoughts listed, (2) participants' thoughts of others' experience of the music (e.g., "I started thinking about other people's thoughts and reactions.", "I was thinking about what the other students were thinking about the experience."); and (3) participants' thoughts of repetition in the experience (e.g., "Hearing the same notes over and over was irritating.", "The repetition of playing the song multiple times became uninteresting and almost annoying."). Initial agreement between the three coders was 92%, and disagreements were resolved through discussion.

An analysis of total number of thoughts revealed no effect of social context (M_{Solo} = 2.00, SD = 0.89 vs. M_{Shared} = 1.79; SD = 0.80, $F(1, 82) = 1.28$, $p = .26$, $\eta_p^2 = .015$). More importantly, as predicted, thoughts of others' experience of the music were greater in the shared versus solo context (M_{Solo} = 0.00, SD = 0.00 vs. M_{Shared} = 0.41; SD = 0.48, $F(1, 82) = 30.52$, $p < .001$, $\eta_p^2 = .27$). Furthermore, thoughts about repetition contained within the experience were also greater in the shared versus solo context (M_{Solo} = 0.33, SD = 0.68 vs. M_{Shared} = 0.65, SD = 0.75; $F(1, 82) = 4.14$, $p = .045$, $\eta_p^2 = .05$).[3]

Consistent with our expectations and our theorizing, our analysis showed that no participants in the solo condition reported thoughts of others' experience. Our contention is that shared experiences induce people to consider others' responses to the experience, which then enhances thoughts of repetition in this condition. We do not expect this causal link for people in

[3] We also conducted a modal analysis of the open-ended thoughts. Zero participants (0.0%) in the solo condition reported thoughts of others' experience, compared to 26 participants (60.5%) in the shared condition. Ten participants (24.4%) in the solo condition reported thoughts of repetition, compared to 23 respondents (53.5%) in the shared condition.

solo experiences as they do not perceive that others are experiencing something along with them. Thus, we tested for mediation of thoughts of others' experience and thoughts of repetition specifically in the shared condition. Having more thoughts of others' experience was indeed correlated with a greater focus on repetition ($r = .64$, $p < .001$). Furthermore, we found evidence of the mediating mechanism for the collective satiation effect (H2). More specifically, thoughts of repetition fully mediated the effect of thoughts of others' experience of the music on satiation rate (initial minus final evaluations; $b = 11.11$, $SE = 6.72$, *95% CI* = [1.91, 27.20]), see Figure 3. Further analysis also tested the alternative direction of causality, and thoughts of others' experience did not mediate the effect of thoughts of repetition on satiation ($b = 2.27$, $SE = 3.65$, *95% CI* = [-5.88, 8.35]). Overall, this pattern of results directly supports our theory, predictions, and proposed process rooted in a focus on others' experience of the shared stimulus and subsequent thoughts of repetition inherently contained in the experience.

Discussion

Study 4 replicated the collective satiation effect in a different stimulus domain—music. Compared to candy eating and image viewing, this domain has different norms and expectations for experiencing the stimulus as a group, allowing us to address any alternative explanations about how the delivered experience differed from these norms. It is also notable that the collective satiation effect replicated despite the presence of the potential distraction of others and the accompanying task. Although the writing task may not have entirely eliminated differences in distraction between the solo and shared contexts, the relatively higher level of distraction in Study 4 (vs. our previous studies) likely reduced any relative differences in distraction between the two conditions. These results increase our confidence that the collective satiation effect generalizes to many kinds of experiences, even when other things compete for attention.

Importantly, Study 4 also provided further insight into how the collective satiation effect may arise. In shared listening, participants not only satiated more on the music, but they also thought more about others' experience of the music and the repetition contained in the experience. The next study explores this underlying process even further by focusing on the sense of repetition and whether it mediates our effects.

Study 5: Online viewing partner and perceived repetition

In Study 5, we sought to provide even more direct downstream evidence for our proposed process. According to our theory, a shared (vs. solo) experience increases the salience of others' experience of repetition, which is integrated into the individual's own subjective sense of repetition. To directly test this hypothesis (H2), we explicitly measured the effect of shared (vs. solo) experience on the subjective perception of repetition in an experience, and tested its mediating role in satiation. Study 5 leverages our previous stimuli and procedures; we manipulated the sense of co-experience using the online partner procedure from Study 3, and we presented the Mount Fuji photo viewing experience from Study 2.

Participants and design. U.S.-based participants (N = 125, 54.40% female, M_{Age} = 35.21) on Amazon mTurk completed an online survey for a small payment. We manipulated social context as either solo or shared viewing using a between-subjects design, with all participants experiencing a low variety sequence of photos.

Procedure and materials. In this study, we again used the online partner and avatar procedure described in Study 3 (Shteynberg & Apfelbaum, 2013; Shteynberg et al., 2014). In this procedure, all participants selected an avatar before the experience. Participants in the shared condition were then paired with an online partner who has selected a similar avatar, whereas no online partner or social presence was mentioned in the solo condition.

After these initial task instructions, participants then had a Mount Fuji photo viewing experience (similar to Study 2's low variety condition, see Appendix C for details), with the five experience evaluation measures (αs > .92). As in Study 2, participants were told how many photos they had viewed during the course of the experience. In the shared condition, we reinforced the social context manipulation by telling participants where they and their online partner were in the experience. Participants were always told that they were in the same position of the sequence as their online partner. Of course, in the solo condition, there was no mention of anyone else's position in the sequence. After the final experience evaluation, participants then rated on a 9-point scale their own perception of the repetition contained in the experience (1 = *not at all repetitive*, 9 = *very repetitive*).

Results

Perceived repetition. Perceived repetition was greater in the shared (vs. solo) context (M_{Solo}= 6.13, *SD* = 1.63 vs. M_{Shared} = 6.77, *SD* = 1.73; *t*(123) = 2.15, *p* = .03, *d* = 0.38). This confirms the aspect of our theory (H2) that proposes co-experience heightens the individual's own subjective sense of repetition.

Experience evaluations. We conducted an analysis of the five experience evaluations with a repeated measures regression. The model included a between-subjects factor of social context, timing (1st through 5th evaluation) as a continuous factor, and a repeated measure with an unstructured error term. The main effect of social context was not significant (*F*(1, 123) = 0.09, *p* = .77, η_p^2 < .001), but there was a significant main effect of timing (*F*(1, 123) = 166.87, *p* < .0001, η_p^2 = .58), reflecting satiation on the images. Most importantly, and consistent with H1, there was a significant social context X timing interaction (*F*(1, 123) = 5.14, *p* = .03, η_p^2 = .04). Reflecting greater satiation in the shared versus solo context, the slope of evaluations was more

negative in the shared context (M_{Solo}= -6.25, *SD* = 6.36 vs. M_{Shared} = -8.84, *SD* = 6.77; *t*(123) = 2.20, *p* = .03, *d* = 0.39), see Table 5 and Figure 4. First evaluations did not significantly differ by social context (M_{Solo}= 82.94, *SD* = 16.77 vs. M_{Shared} = 81.21, *SD* = 14.65; *t*(123) = 0.61, *p* = .54, *d* = 0.11), whereas final evaluations were higher in the solo versus shared context (M_{Solo}= 58.33, *SD* = 31.62 vs. M_{Shared} = 46.29, *SD* = 31.89; *t*(123) = 2.20, *p* = .04, *d* = 0.40).

Mediation analysis. In our mediation analysis, social context was the independent variable, perceived repetition was the mediator, and slope of evaluations was the dependent variable. Perceived repetition fully mediated the effect of social context on the slope of evaluations (*b* = -0.83, *SE* = 0.44, *95% CI* = [-1.94, -0.13]), see Figure 5. This pattern indicates that a greater sense of co-experience led to faster satiation because it heightened subjective perceptions of overall repetition, as proposed by our theory (H2).

Discussion

In Study 5, we again replicated the collective satiation effect (H1) using an established paradigm from the shared attention literature (Shteynberg & Apfelbaum, 2013; Shteynberg et al., 2014). We also found direct and downstream process evidence: Shared (vs. solo) experience increased subjective perceptions of repetition, which in turn accelerated satiation on the images (H2). This finding, taken together with our earlier results, provides a more comprehensive picture of how co-experiencing with others affects the salience of repetition through a shared attention state. In studies 1 and 4, we measured this salience indirectly, by assessing how frequently participants thought of others repeatedly having the item. In studies 2-3, we manipulated and measured aspects of the shared attention state that would turn off the salience of repetition. Finally, in Study 5, we measured this salience directly, through subjective ratings of

perceived repetition of the experience itself. In sum, as posited by our theory, the salience of repetition provides a parsimonious theoretical account across all of our studies.

General Discussion

Summary of findings

Hedonic experiences that extend over time are often done with others (e.g., snacking with family, touring a museum with friends, etc.). Despite the importance of these settings, there is scant work examining such experiences, and what has been done is limited in that it has largely focused only on singular judgments of co-experienced stimuli and social influence effects. We augment this literature by establishing that the effects of co-experiencing with others could emerge over time during the experience, thereby influencing perceptions of the stimulus, the experience, and the time spent with others.

Our findings show that a sense of co-experiencing accelerates satiation on a pleasant stimulus that is repeated over time, a phenomenon that we term the 'collective satiation effect.' This effect replicated across five studies using different stimuli (candies, images, and music), and various ways of operationalizing a sense of co-experience. We manipulated social context in the lab as solo versus shared (studies 1 and 4), measured the natural sense of co-experience on a scale (Study 3), and tested online co-experience (studies 2, 3, and 5). The generalizability of the effect increases our confidence in the constructs and the phenomenon itself.

These studies also support our hypothesized process: Under a sense of co-experience, a shared attention state raises the salience of repetition, in turn accelerating satiation. More specifically, as a positive experience unfolds, individuals think about others' experience of the same stimulus, and they assimilate these thoughts into their own subjective sense of repetition. Consistent with this, we found that shared (vs. solo) experience increased thoughts of others'

repetition of the stimulus (studies 1 and 4), and increased the individual's subjective sense of repetition (Study 5), and greater salience of repetition mediated the collective satiation effect. Moreover, this effect was moderated by greater item variety in the experience, consistent with an amplified response to repetition under a sense of co-experience (Study 2).

Further, our studies supported a shared attention state framework to explain the findings. In Study 2, the measure for sense of co-experience was based on key aspects of co-attention—perception of a shared stimulus that is experienced together. Moreover, in Study 3, building on past work in this literature (Shteynberg et al., 2014), we moderated the collective satiation effect by separating the experience in time from an online partner. Thus, in addition to providing evidence for our proposed process, our studies offer clarity to the constructs in our framework, including the antecedents and outcomes of co-attention and satiation.

Our studies also address a number of competing explanations for the findings using various study designs. To briefly review, we addressed alternative explanations related to social influence (e.g., distraction, fatigue; Raghunathan & Corfman, 2006; Ramanathan & McGill, 2007), public scrutiny (Ratner & Kahn, 2002), and vicarious experience (Larson et al., 2013; Morewedge et al., 2010). None of these explanations is able to anticipate the totality of our findings, including the moderating roles of item variety and concurrent experience, and the direct mediation evidence in several studies.

Contributions

Co-experience and shared attention literatures. Our research contributes to the literature on co-experiences and the shared attention state (Boothby et al., 2014; Boothby et al., 2016; Shteynberg, 2010; Shteynberg & Apfelbaum, 2013; Shteynberg et al., 2014; Shteynberg, 2015). Some past work has shown that co-experiencing a pleasant stimulus with others increases

the positivity of hedonic judgments. Yet, this research has mainly focused on single instances of judging a stimulus, whereas we examine the effect of a shared attention state on multiple judgments over time. Our results suggest that past work with a single exposure likely understates the resulting effect of sharing a co-experience on ultimate enjoyment.

The finding that co-experiencing affects hedonic judgments over time also contributes to research on social context of experiences (Raghunathan & Corfman, 2006; Ramanathan & McGill, 2007; Ratner & Hamilton, 2015). Other work has studied social motivations and perceptions that cause individuals to curtail their eating or overindulge on food (McFerran, Dahl, Fitzsimons, & Morales, 2010). Yet, this past work has focused less on continued enjoyment, which likely contributes to any further consumption of foods and many other stimuli. To our knowledge, we are the first to examine how the shared aspect of group experience influences enjoyment over time when a stimulus is continued or repeated. In addition, we add to this literature by showing that social context can affect enjoyment simply as a byproduct of a sense of co-experience, which triggers a state of shared attention. This adds to our understanding of the mechanisms by which shared (vs. solo) experiential contexts differ.

Satiation literature. Our work advances the satiation literature, which previously has primarily studied solo experiences, with little attention to social factors in satiation. Some past work has shown that public (vs. private) experience can affect an individual's ongoing hedonic judgments due to others admiring one's chosen item (Chugani & Irwin, 2015), or scrutiny of the set of items chosen by one over time (Ratner & Kahn, 2002). In contrast, our theory does not rely on any admiration, scrutiny, or any such judgment that public consumption might encourage. We emphasize mutual experience of the same thing with others (i.e., co-experience), rather than the public versus private distinction (Chugani & Irwin, 2015; Ratner & Kahn, 2002).

The collective satiation effect is a distinct finding compared to other processes known to affect satiation, such as imagining others' experience (Larson et al., 2013; Morewedge et al., 2010), or monitoring and tracking quantity (Higgs, 2008; Redden & Haws, 2013). The novel perspective offered by our framework could shed light on past satiation results, as well as suggest ideas for future work. Additionally, we broaden the notion of perceived repetition to include the repetition from co-experience, which is important as it is a ubiquitous factor that some might expect (ironically) to increase enjoyment and reduce satiation.

Our research also builds upon work that has shown the moderating role of item variety in satiation (Galak, Kruger, & Loewenstein, 2013; Galak, Redden, & Kruger, 2009; Ratner, Kahn, & Kahneman, 1999; Rolls, Rolls, Rowe, & Sweeney, 1981). We suggest that highly varying stimuli reduce the sense that others are feeling repetition. Stimulus variety can interact with the social environment to reduce the rate of satiation, but we believe that this exact effect of variety will be situation specific. We do not claim that an experience must be composed entirely of repetition for the collective satiation effect to occur, and it was not in our studies 2 and 5, though experiences like these are quite common (e.g., drinking a glass of wine from a single shared bottle). Rather, we contend that the collective satiation effect occurs when there is an overarching sense of repetition that is felt to be mutually experienced with others—a sense that applies to many situations.

Practical implications of the findings

Fundamentally, our work adds to growing knowledge on how the social environment influences individuals' affect (Fischer et al., 2003), and in particular we highlight an effect through changes in the enjoyment of co-experienced stimuli. This has practical implications for individuals' social relationships and choices of shared experiences. In solo contexts, individuals

might feel that they can continually enjoy a stimulus over time. Our work suggests that this is more difficult in shared contexts, where satiation will tend to accelerate. This general effect could apply to a wide range of settings, including social media live sharing, family style meals, group exercise class, and many other examples of co-experience.

Our findings also suggest some specific interventions that individuals can use to try to fend off the collective satiation effect. In particular, accommodating the length of an experience in shared (vs. solo) contexts may ameliorate the quicker decline in enjoyment. That is, rather than drawing out an experience to offer continued enjoyment over a considerable time, individuals might want to conclude the repeated stimulus relatively earlier when co-experiencing with others. This might be beneficial if the experience is still not seen as too brief, considering the cost, time allocated by the group, and group norms. As well, the experience would still need to be long enough to fulfill affiliation motives, which are central to participation in shared experiences (Raghunathan & Corfman, 2006; Ramanathan & McGill, 2007).

Finally, and relatedly, our research addresses an important societal phenomenon of greater potential for online shared attention. With the proliferation of social media, content spreads rapidly, and many people view the same pictures and videos almost simultaneously. Our findings suggest that people may satiate on such experiences more quickly, prompting them to search for more variety in online content. In a similar vein, product information spreads quickly via the Internet, and society may be infused with shared product experiences and simultaneous adoption of new products (e.g., latest iPhone). Shared attention on these products may perpetuate consumers' desire for more variety in purchases and a "hedonic treadmill" of wanting more and more novelty in product domains that are subject to collective satiation.

Suggestions for future inquiry

One could argue that the collective satiation effect was also complemented by a sense of shared reality with respect to the target stimulus, wherein individuals infer or observe coherence with others (Echterhoff, Higgins, & Levine, 2009). For instance, in studies 3 and 5, we presented an online partner's avatar choice to be similar to increase social connection, though this could have also caused participants to feel that their online partner agrees with them in response to the target stimulus. However, it is noteworthy that across our studies, participants generally had no direct knowledge of others' reactions to the stimulus, suggesting that explicit subjective reactions are not necessary to trigger collective satiation. Thus, our results seem to better align with the concept of the shared attention state, rather than coherence of opinions.

Although our work focused on the shared attention state, future work could focus on how shared reality contributes to our findings. We speculate that if individuals feel disagreement with their co-experiencing partners on the shared stimuli, this might reduce the sense of co-experience and thus attenuate the collective satiation effect. Our studies replicated past work that has shown that a shared attention state can emerge without observing the explicit verbal and non-verbal reactions of others. (Boothby et al., 2014; Boothby et al., 2016; Shteynberg et al., 2014). Even so, individuals may infer agreement or disagreement with others absent any explicit reactions. So, future work might study how implicit coherence contributes to our findings by testing the inferences that individuals make about their agreement with others on the shared stimuli. Implicit coherence may depend on the social context and other particulars of the experience, and while we did not test this in our research, future work might examine this more closely.

Our work demonstrates the collective satiation effect in settings that differ in social context and the target stimulus. This increases our confidence that our effects will generalize, but future work could test this in various kinds of experiences. For instance, the collective satiation

effect may not hold in experiences that possess a narrative or a critical outcome (e.g., watching a film or sporting event), because of any inherent pattern in how enjoyment dynamically fluctuates over time. Further, another boundary condition is that more participative group activities (e.g., rock climbing or ritual chanting) may engender less negative responses to repetition. Research has found that culture influences preference for stimulus repetition (Kim & Drolet, 2003), and our study participants were primarily individualistic Westerners that tend to react more negatively to repetition (vs. Easterners). Future work could extend our findings to other cultures which may have different perceptions of repetition as a facet of an experience. While our work identifies perceptions of repetition as a driver of the collective satiation effect, an examination of other types of shared experiences that are not perceived to be repetitive may yield a differential focus on other facets of the experience.

Another avenue for future work is uncovering factors that affect a sense of co-experience. In our studies, this sense appeared across variations in group size (2–10) and interpersonal interaction (e.g., talking vs. not). We believe that this sense is highly context-dependent, and better understanding these contextual factors would help outline the boundaries of our findings. For example, we speculate that people are better able to observe smaller (vs. larger) groups to notice that their experience is held in common, but larger groups might aggrandize the state of shared attention. So, additional research could investigate how group size moderates the collective satiation effect, and we expect that it may not be a simple answer (e.g., non-linear). Also, in our studies, participants had a minimal basis for social connection in shared contexts, such as the selection of a similar avatar (Studies 3 and 5) or attending the same university (Studies 1 and 4). Thus, future inquiries could also focus on the extent to which social

connection is a necessary factor for the shared attention state to influence satiation, and what types and degrees of connections produce the effect.

Research might also examine the effect of a sense of co-experience on how quickly individuals and groups partake in stimuli, a known factor in satiation (Galak et al., 2013; Redden, 2015). In our studies, stimulus quantity was fixed across participants, so this necessarily restricted variance in the quantity and pace of experience. To test such differences, future research could study experiences that are more open-ended in time and amount of the stimulus. If research finds that individuals systematically undergo experiences faster or slower with others, this could be an additional factor that would moderate our findings.

Another interesting question concerns how expectations for the experience moderate effects of shared attention on hedonic judgments. To review, past work showed an amplification of positivity for a co-attended pleasant stimulus in experiences that were singular (Boothby et al., 2014) or non-repetitive (Boothby et al., 2016). We believe that participants' expectations for the experience might explain why we did not see this result emerge here in initial judgments. For instance, an effect on the first hedonic judgment may only occur if this is expected to be the only moment of co-experience (vs. when sharing will extend over time). Our judgment task was also different; after the first instance of the stimulus, participants evaluated their desire to continue the experience, rather than judging liking and intensity (Boothby et al., 2014; Boothby et al., 2016). So, in our studies, an amplification of initial positivity may have been much weaker, due to the greater salience of the subsequent stimuli and ceiling effects. We leave this question for future work that varies expectations for the experience and the type of judgment task.

Of note, our work focused on hedonic judgments of pleasant stimuli. Yet, individuals may also undergo experiences with others that are unpleasant (e.g., boring work meeting) or

mixed (e.g., painful dental procedure with enjoyable rests). So, further research might examine the effect of a shared attention state on how individuals respond to the repetition of negative elements. It is possible that a sense of co-experience may amplify the effect of repetition even in these cases, resulting in less adaptation to the negative element, and thus more negative affect overall. Alternatively, sharing a particularly negative experience may lead to later positive thoughts of successfully completing the challenging experience (e.g., rigorous academic program, military prisoners, athletic training camps). Generally speaking, the shared attention state could induce other effects in negative domains not directly addressed by our framework, but which future research might uncover.

Finally, a particularly fruitful next direction is to study how the goals underlying co-experience affects hedonic judgments. Research has proposed that in shared experiences, individuals attend to and are influenced by others for two purposes (Echterhoff et al., 2009). One, the social group assists the individual in making sense of the experience—an epistemic motive, and two, the individual has a relational motive to connect with others. In our framework, increased pursuit of epistemic motives should also increase thoughts about others' experience of the same item, thereby promoting the collective satiation effect. However, stronger relational motives might prompt other forces that act with or against this effect.

Compared to the settings that we examined, relational motives could be stronger for pairs and groups with closer relationships (Wagner et al., 2015), when undergoing more meaningful experiences, and in more collectivistic cultures (Kim & Drolet, 2003). We speculate that in these conditions, satiation will also depend on how co-experience of a stimulus reinforces or hinders relational goals. If continued co-experiencing of the same item enhances affiliation, this might improve subjective feelings (Wagner et al., 2015) that act against collective satiation, especially

if it triggers a social identity (Chugani, Irwin, & Redden, 2015). For instance, as a family watches a movie together, their closeness may increase over time, relative to each family member watching a different movie. Yet, watching the movie together could actually *impair* relational goals in some contexts. If some family members preferred another movie, then as the movie goes on, the movie may feel progressively like an imposition on certain family members, producing negative feelings that reduce enjoyment. These examples illustrate that in addition to the collective satiation effect, relationship dynamics can deeply affect continued enjoyment and so are important to better understand.

There are countless other directions in which to extend our findings because of the robust nature of the two underlying constructs in our research – social contexts of groups, and experienced enjoyment. The present work provides a start in understanding this undoubtedly rich relationship. While providing an interesting and important result on its own, we expect our work to also encourage a stream of future work.

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Table 1. *Evaluations by trial of Skittles® in Study 1*

		Experience evaluation at eating trial							
		1		2		3		4	
Condition	*n*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Solo	69	79.75	23.9	79.57	23.48	75.46	25.84	71.67	27.56
Shared-control	65	77.54	23.2	75.31	22.89	69.35	24.67	63.72	26.64
Shared-chat	63	76.89	26.87	73.64	26.34	68.15	27.1	60.62	28.42

		Experience evaluation at eating trial							
		5		6		7		8	
Condition	*n*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Solo	69	65.85	28.83	59.92	31.45	54.11	33.3	49.44	35.58
Shared-control	65	56.93	26.61	50.54	28.06	44.13	30.04	36.37	31.24
Shared-chat	63	52.71	30.06	45.29	30.83	38.29	31.21	34.67	33.91

		Drop in evaluations (1st trial – 8th trial)		Slope of evaluations over all 8 trials	
Condition	*n*	*M*	*SD*	*M*	*SD*
Solo	69	30.31	31.68	-4.67	4.62
Shared-control	65	41.17	29.29	-6.04	4.35
Shared-chat	63	42.22	32.28	-6.53	3.93

Table 2. *Relationships between variables and predicted values in Study 2*

Variety	Relationship between sense of co-experience and slope of evaluations (satiation rate)
Low	b = -1.32, SE = 0.40, t(197) = -3.34, p < .01, d = 0.48
High	b = -0.25, SE = 0.42, t(197) = -0.60, p = .55, d = 0.09

Sense of co-experience	Relationship between high (vs. low) variety condition and slope of evaluations (satiation rate)
Low	b = 1.01, SE = 1.23, t(197) = 0.82, p = 0.41, d = 0.12
High	b = 4.28, SE = 1.28, t(197) = 3.36, p < .01, d = 0.48

		Image experience evaluation at trial				
Sense of co-experience	Variety condition	1	2	3	4	5
Low	Low	80.1	74.9	69.3	69.5	63.6
	High	78.2	72.7	71.7	70.3	65.9
High	Low	85.7	72.4	63.4	57.2	53.9
	High	82.9	74.4	73.7	71.4	66.5

Sense of co-experience	Variety condition	Drop in evaluations (1st - 5th trial)	Slope of evaluations over all 5 trials
Low	Low	16.47	-3.85
	High	12.31	-2.82
High	Low	31.82	-7.88
	High	16.47	-3.59

Note. The estimated values are image experience evaluations over time and the slope of evaluations over all five trials, based on a spotlight analysis at ±1 SD on the sense of co-experience scale, Low co-experience (-1 SD) = 3.25, High co-experience (+1 SD) = 6.31.

Table 3. *Evaluations of image viewing experience in Study 3*

		Initial enjoyment		Final enjoyment		Drop in evaluations	
Condition	*N*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Solo	70	75.43	22.57	68.89	27.73	6.54	10.57
Post	69	74.19	17.16	66.72	21.22	7.47	12.78
Pre	69	70.29	26.65	63.07	26.97	7.22	11.43
Concurrent	70	70.37	22.60	59.34	25.92	11.03	14.42

Note. The four conditions were: participant views with no mention of online partner (solo), participant views after online partner (post), participant views before online partner (pre), or participant views concurrently with online partner (concurrent).

Table 4. *Experience evaluations and thoughts measures in Study 4 (music study)*

		Evaluation at measure			
		1		2	
Social context	*n*	*M*	*SD*	*M*	*SD*
Solo	41	66.24	25.99	59.79	24.01
Shared	43	66.79	27.28	50.34	28.19

		Drop in evaluations 1st – 2nd measurement		Thoughts of others' experience		Thoughts of repetition	
Social context	*n*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Solo	41	6.45	15.37	0.00	0.00	0.33	0.68
Shared	43	16.45	22.22	0.41	0.48	0.65	0.75

Table 5. *Evaluations of image viewing experience in Study 5*

	Image experience evaluation at trial									
	1		2		3		4		5	
Social context	*n*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Solo	63	82.93	16.77	76.51	19.25	67.54	24.73	63.17	27.41	58.33	31.63
Shared	62	81.21	14.64	72.58	19.56	61.29	24.12	54.03	29.43	46.29	31.89

		Drop in evaluations 1st – 5th measurement		Slope of evaluations over all 5 measurements		Perceived repetition	
Social context	*n*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Solo	63	24.60	25.18	-6.25	6.35	6.13	1.63
Shared	62	34.92	26.15	-8.84	6.77	6.77	1.73

Figure 1. Evaluations of the Skittles® in Study 1, by trial. Two settings of shared social context accelerated satiation relative to a solo social context.

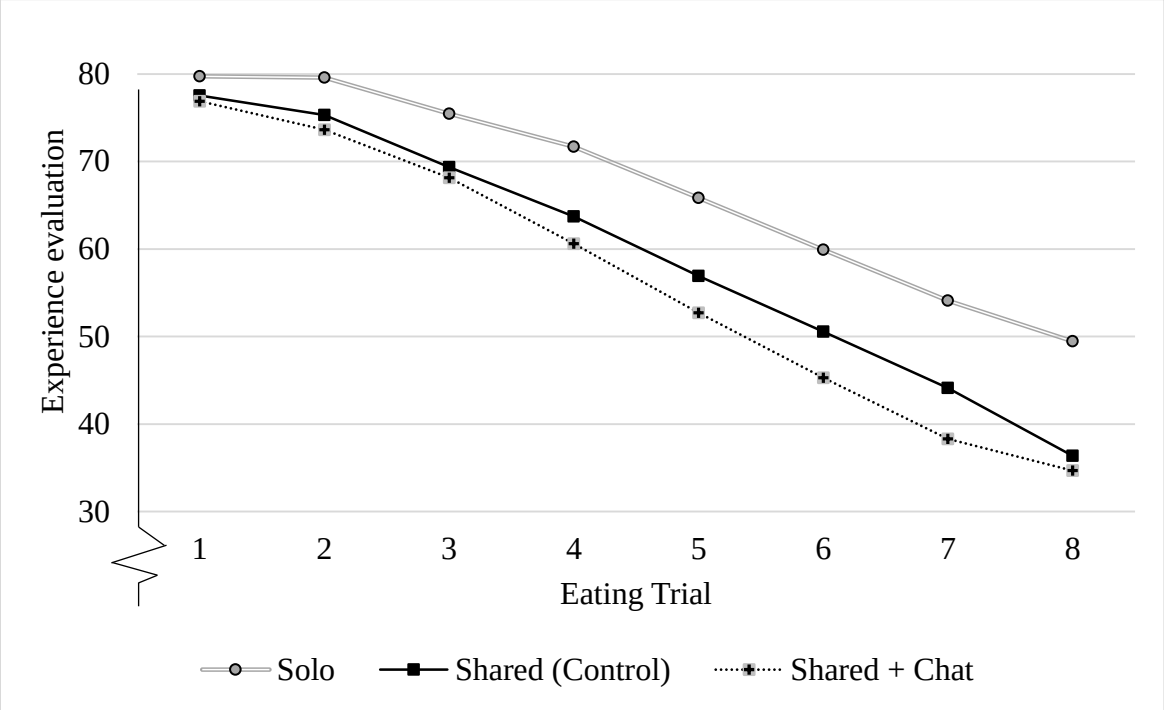
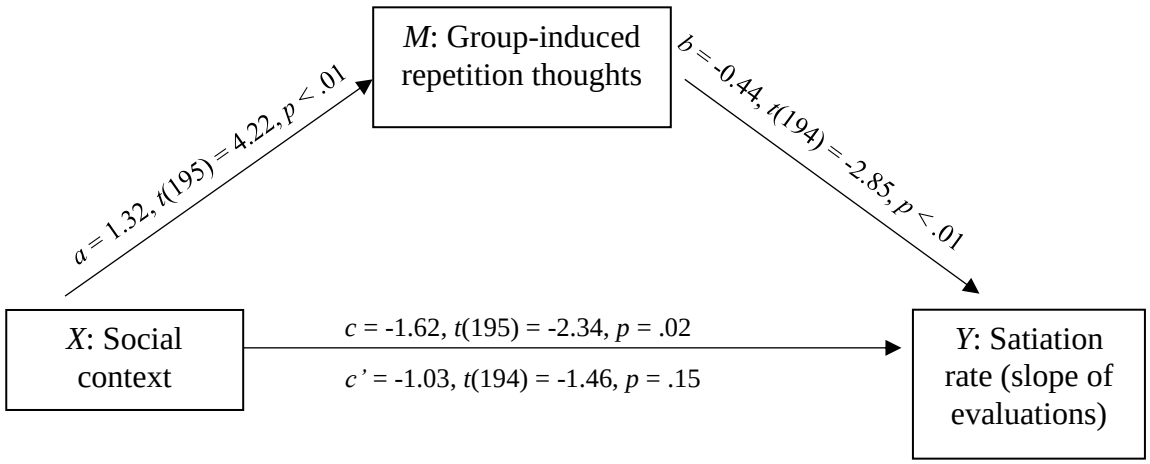
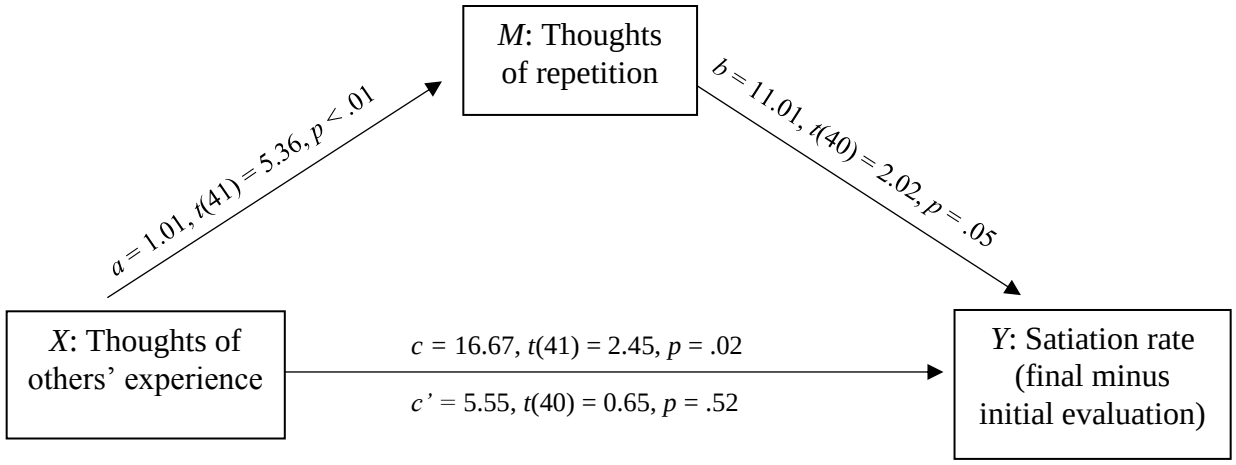


Figure 2. Mediation model in Study 1. Group-induced repetition thoughts mediated the impact of social context of consumption on satiation rate.



Indirect mediation effect: b = -0.58, SE = 0.26, *95% CI* = [-1.23, -0.19]).

Figure 3. Mediation model in Study 4. Thoughts of repetition mediated the effect of thoughts of others' experience on satiation rate for shared social context.



Indirect mediation effect: $b = 11.11$, $SE = 6.72$, *95% CI* = [1.91, 27.20].

Figure 4. Evaluations of the images in Study 5 over the five measurements. Shared (vs. solo) viewing accelerated satiation.

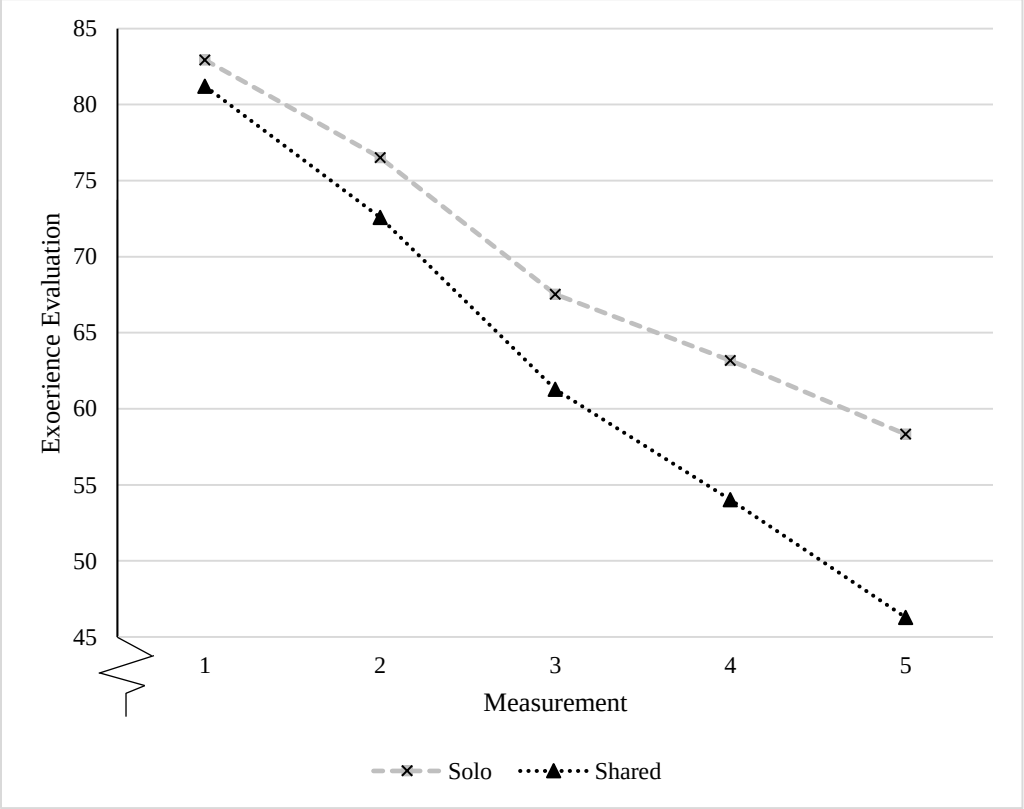
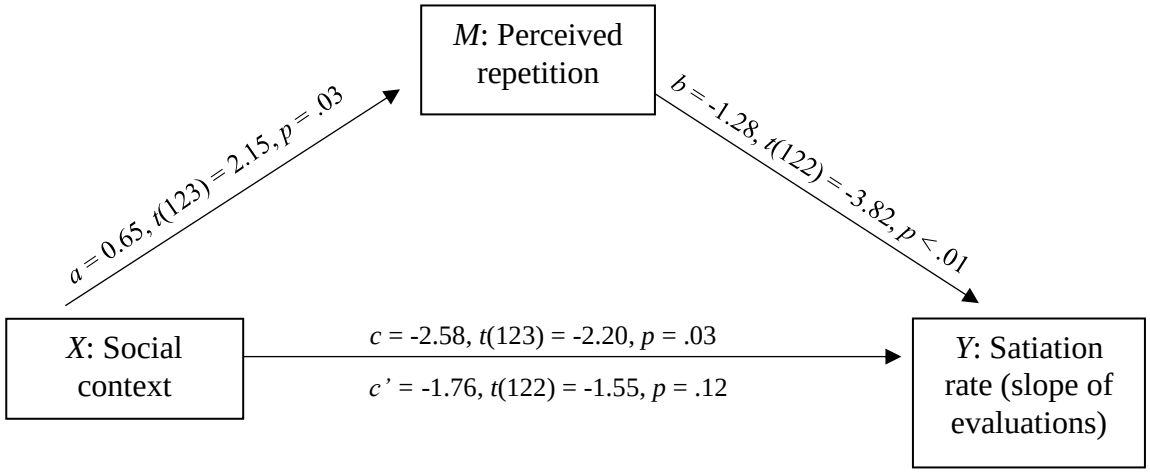


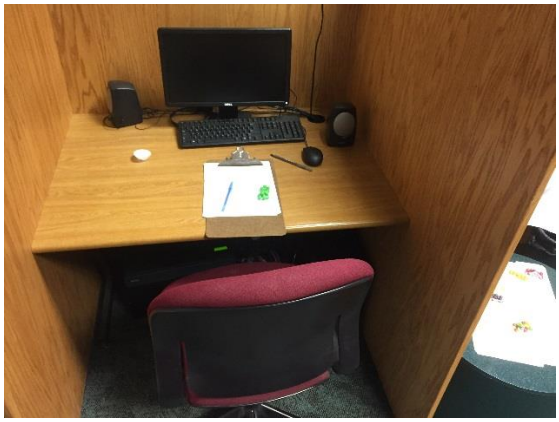
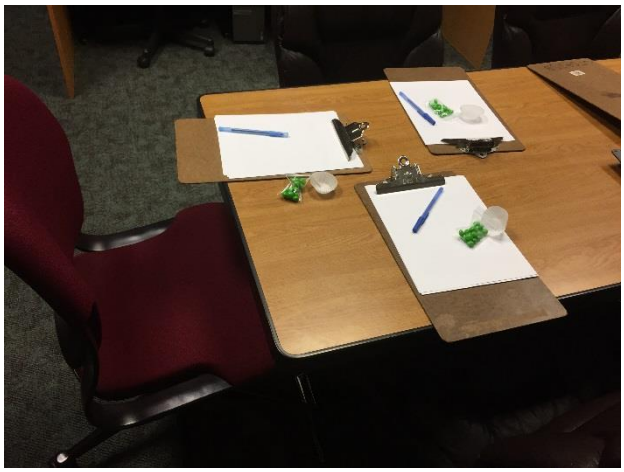
Figure 5. Mediation model in Study 5. Perceived repetition mediated the effect of social context on satiation rate.



Indirect mediation effect: b = -0.83, SE = 0.44, *95% CI* = [-1.94, -0.13].

Appendix A

Consumption settings and candy bags in Study 1

Individual Stations	Group Table
	

The repeated flavor was alternated across lab sessions, such that all participants in a given session (both shared and solo context conditions) had the same flavor (grape, lemon, green apple, orange, or strawberry).

Appendix B

Social context information in Study 2

Task instructions provided at the start of the survey:

- PAGE 1: *In this task, you will view a slideshow and answer a series of questions about your experience. Several mTurk participants that are based in the U.S. will enter the survey at roughly the same time to view photos. There may be a slight delay during parts of the survey while we wait on the data from other participants.*
- PAGE 2: *You will next participate in the focus group part. Please wait a few seconds to allow some time to gather data from other mTurk respondents that are completing the survey at roughly the same time. In a few moments you will be able to advance to the next screen. Please do not navigate away from this page.* [12 second delay inserted here, after which the submit button text read "Others are ready. Press >> to join"]
- PAGE 3: *This HIT is being run by "micro-batching", wherein we open up the HIT to a small group of people at a given time. At this time, we have a few U.S.-based mTurk respondents, including you, completing this survey. All of you will also view and evaluate a slideshow, but each of you will control the pace of the slideshow viewing experience.*

NOTES:

- There was no further mention of the micro-batch group during slideshow viewing.
- Participants were not explicitly told whether other mTurk respondents in the micro-batch group viewed the same or different images.

Appendix C

Image set composition manipulation in Study 2

19 of the 33 images were the same in both conditions, but in the high variety condition, images #4, 5, 8, 13, 14, 16, 20, 21, 23, 25, 27, 29, 31, and 32 were photos and paintings of other Japanese scenes. Below are the first five of 33 photos, illustrating the differences. An adaptation of the low variety condition sequence was used in Study 5, in which we repeated some photos within the sequence (19 photos were shown once while 7 photos were shown twice at various points of the sequence).

	Low Variety Condition	High Variety Condition
Image #1		
Image #2		
Image #3		
Image #4		
Image #5		

Appendix D

Study 3 and 5 stimuli

Avatars used to enter focus group in studies 3 and 5, sourced from Shteynberg and Apfelbaum (2013) p. 6.

Art paintings shown in slideshow of Study 3