# The Role of Arousal in Congruity-Based Product Evaluation

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New products are often incongruent with consumer expectations. Researchers have shown that consumers prefer moderately incongruent products, while being adverse to extremely incongruent products. Evidence from three studies suggests that this phenomenon is highly influenced by a consumer's state of arousal. Specifically, low arousal decreases preference for moderate incongruity while increasing preference for extreme incongruity, whereas high arousal decreases preference for any form of incongruity. Underlying these effects are discrete emotional states brought on by a physiological response to incongruity. Varying arousal subsequently varies the severity of the emotion, be it negative (anxiety) or positive (curiosity), which in turn varies evaluations for the product. This suggests that creating excitement around a product launch may be good for incremental innovation, but it may not be a good idea for something truly innovative.

Imagine approaching Apple's newest concept for the iWatch ("an advanced wearable computer in the form of a bracelet that could double as a watch"; Kosner 2013). Indeed, this watch would be incongruent with one's normative expectations for what a wristwatch ought to be. The question is whether consumers would like it. Now imagine approaching the new iWatch in a store crowded by people, with loud music playing and balloons flying everywhere. Would that make a difference? At the heart of this thought experiment is the concept of arousal.

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Extant research suggests that the level of incongruity between an object and its associated schema can influence a person's evaluations of the object (Cohen and Basu 1987; Fiske 1982; Meyers-Levy and Tybout 1989; Srull 1981; Sujan 1985). It has been argued that this occurs because, all else being equal, people like things that conform to their expectations (Mandler 1982). However, congruent objects are not particularly engaging, and thus the affective response to congruity is often mild but positive; incongruent objects, on the other hand, stimulate arousal and thus motivate individuals to engage in the act of discovery (Mandler 1982). This process follows an inverted-U function, such that moderate incongruity can lead to more positive affect than congruity because people enjoy resolving incongruity without prompting a fundamental shift in their schematic expectation, whereas extreme incongruity can lead to negative affect because it requires individuals to develop an entirely new schema or dramatically alter an existing schema (Meyers-Levy and Tybout 1989). This inverted-U function has been adopted in marketing to explain preference for new products, or extensions, that are only moderately incongruent with consumer expectations (regarding *the schema congruity effect*, see Jhang, Grant, and Campbell 2012; Maoz and Tybout 2002; Meyers-Levy and Tybout 1989; Noseworthy, Cotte, and Lee 2011; Peracchio and Tybout 1996; Stayman, Alden, and Smith 1992).

It was originally speculated that the relationship between schema incongruity and affect intensity is the result of physiological arousal (Mandler 1982). Specifically, the ability to

resolve moderate incongruity leads to an optimal physiological response that manifests in a positive emotional state, whereas the inability to resolve extreme incongruity leads to a more intense physiological response that manifests in a negative emotional state (Mandler 1982). This is consistent with the finding that resolving incongruity can increase task satisfaction (Maoz and Tybout 2002) and that resolution mediates the affective response to incongruity (Jhang et al. 2012). However, despite evidence that resolution can augment evaluations, researchers have yet to examine Mandler's underlying rationale for why this occurs, that is, the role of physiological arousal in framing emotional intensity. Consistent with Mandler's (1982) conceptualization, we define *emotional intensity* as an individual's affective experience of arousal (e.g., curiosity or anxiety; Di Muro and Murray 2012; Russell, Weiss, and Mendelsohn 1989) and *arousal* as the physiological response (e.g., change in heart rate or galvanic skin responses; Pham 1996; Sanbonmatsu and Kardes 1988). Mandler's (1982) point about physiological arousal is important because it raises the distinct possibility that evaluations for incongruity may be highly susceptible to anything that alters a consumer's physiological state.

In exploring this prediction, we make several important theoretical advances. First, we find that the schema congruity effect corresponds with a physiological response to incongruity that manifests as state curiosity when consumers can successfully resolve the incongruity and state anxiety when resolution becomes too taxing. Second, we show that incidental changes in a consumer's state of arousal prior to seeing an incongruent product can alter the physiological response and resulting emotional intensity (be it positive or negative). Specifically, lowering state arousal diminishes the physiological response to incongruity and thus decreases evaluations for moderate incongruity while increasing evaluations for extreme incongruity. High levels of state arousal, however, have a negative effect on evaluations for all types of incongruity. Critically, altering state arousal does not alter consumers' ability to resolve incongruity; it merely alters consumers' emotional intensity when successfully or unsuccessfully doing so. Taken as a whole, our results suggest that the schema congruity effect has much to do with the arousing nature of incongruity and thus that evaluations for incongruent products are contingent upon a consumer's state of arousal.

## CONCEPTUAL BACKGROUND

The *schema congruity effect*, which is also known as the Mandler hypothesis or the moderate incongruity effect, is predicated on a dynamic relationship between arousal and affective judgment (Mandler 1982; Meyers-Levy and Tybout 1989). Mandler argued that schema incongruity activates the autonomic nervous system, which, in turn, determines the intensity of emotion or affect. Whether the emotional outcome is positive or negative will depend, to a large extent, on one's ability to resolve the incongruity. He maintained that the intensity of emotion is a function of the degree of physiological arousal, which, in turn, is a function of the severity of the schematic violation. Therefore, moderate incongruity (i.e., when a new object can be assimilated into an existing schema) should result in mild physiological arousal and thus manifest a positive emotional response. Conversely, extreme incongruity (i.e., when a new object must be accommodated either by reconfiguring an existing schema or by developing an entirely new schema) should result in a more intense physiological arousal and thus manifest an equally intense emotional response (Mandler 1982). Mandler went on to argue that the resulting affect in situations of extreme incongruity will often be negative, "given the absence of structural congruity that could lead to a positive evaluation" (23). Thus, although extreme incongruity does not always result in negative affect, it often will in instances when people struggle to make sense of the object.

A significant amount of research in marketing has explored Mandler's seminal hypothesis (Aggarwal and McGill 2007; Campbell and Goodstein 2001; Jhang et al. 2012; Maoz and Tybout 2002; Meyers-Levy, Louie, and Curren 1994; Meyers-Levy and Tybout 1989; Noseworthy et al. 2011; Noseworthy and Trudel 2011; Peracchio and Tybout 1996; Stayman et al. 1992). Researchers have consistently replicated the inverted-U relationship between the severity of incongruity and a consumer's affective judgments, while identifying numerous boundary conditions such as perceived risk (Campbell and Goodstein 2001), prior category affect/processing goals (Goodstein 1993), taste (Stayman et al. 1992), dogmatism (Meyers-Levy and Tybout 1989), prior knowledge (Peracchio and Tybout 1996), involvement (Maoz and Tybout 2002), and experiential processing (Noseworthy and Trudel 2011). What has yet to be studied is Mandler's foundational belief that the inverted-U relationship is predicated on arousal. We define arousal in this context in line with Mandler's (1982) original conceptualization of the autonomic nervous system, as a visceral physiological response that functions involuntarily below the level of awareness.

We argue that implicit in Mandler's hypothesis is the notion that varying a consumer's state of arousal prior to viewing an incongruent product may alter evaluations for incongruity without altering the resolution process. In fact, Mandler's central thesis was predicated on all else being equal. He acknowledged that the value of familiarity is, in a sense, devoid of meaning: "It arises entirely out of the structure of the valued event, not out of its relation to other knowledge" (Mandler 1982, 28). He further acknowledged that this is a primitive system and thus the emotional response that results from resolving incongruity could indeed vary with external forces. This is particularly important in the marketing context because physiological arousal is often influenced by contextual factors that extend beyond the schematic structure of the object or event (Di Muro and Murray 2012; Sanbonmatsu and Kardes 1988).

Mandler was not the first to propose an inverted-U relationship between arousal and emotional intensity. Berlyne (1960, 1974) theorized that preference for an object is determined by the extent to which the object produces a phys-

iological response. Unlike Mandler, who attributed positive value to the resolution process, Berlyne attributed positive value to the properties of the object itself. In particular, Berlyne posited that arousal functions as an additive effect derived from an object's collative properties (e.g., novelty, complexity, incongruity), psychophysical properties (e.g., intensity, pitch, hue, brightness), and ecological properties (e.g., meaning, associations). A critical component of Berlyne's (1960, 1966) theory was that the arousal resulting from these properties can interact with a person's state of arousal.

Central to Berlyne's (1960) thesis was the idea that arousal from an incongruent object manifests as *state-derived curiosity*, which, in turn, motivates individuals to explore the source of incongruity. Berlyne believed that curiosity was a consequence of conceptual conflict that results from doubt or the perplexing nature of seeing an incongruent object. However, he also believed that if someone was in a low aroused state to begin with (e.g., boredom), they may seek out this conflict as a means of peaking their curiosity (Berlyne 1960, 1966). Thus, according to Berlyne, low arousal should not hinder one's motivation to attend to incongruity. Building on this work, Mandler (1982) agreed that incongruity can evoke curiosity and interest, but he argued that this will only lead to positive affect when the incongruity can be resolved; when the incongruity cannot be resolved, the "unavailability of appropriate perceptions, thoughts, and actions" will often manifest as *state-derived anxiety* (Mandler (1982, 23). Of course, curiosity and anxiety are distinct emotions. Both are inherently arousing; what distinguishes them is the valence of their affective state, and this valence is ultimately what gets attributed to the target.

Despite the wealth of literature exploring the schema congruity effect, and in particular how resolution can augment product evaluations, prior work has yet to explore Mandler's (1982) rationale for why this happens. This is critical because if Mandler is correct about the role of physiological arousal and emotional intensity, it may be that incidental changes in one's state of arousal will weaken or even intensify the emotional response to incongruity without altering the resolution process. Specifically, we predict that, relative to a moderate (control) level of arousal, putting consumers in a low state of arousal will diminish evaluations for moderate incongruity but enhance evaluations for extreme incongruity (study 1). We believe this will occur because low arousal dampens the physiological response to incongruity and thus lowers both the positive affect that results from resolving the incongruity as well as the negative affect that results from the inability to resolve the incongruity (study 2). Finally, we predict that putting consumers in a high state of arousal will diminish evaluations for any form of incongruity because it compounds the emotional intensity, leading to a more negative affective state (study 3). Should the results manifest as expected, they will have significant implications not only for how marketers tailor the release of new products but also for current theoretical accounts.

# STUDY 1

To reiterate, the objective of study 1 was to test the basic prediction that a person's state of arousal will interact with incongruent product evaluations. Specifically, we predict that consumers will evaluate a moderately incongruent product less favorably when they are in a low aroused state than if at a moderate (control) level of arousal. Conversely, consumers will evaluate an extremely incongruent product more favorably when they are in a low aroused state than if at a moderate level of arousal. Critically, if we are correct about the role of state arousal, low arousal should not hinder a person's ability to associate schema-relevant information to the target. Thus, the results will not be due to differences in attention, but more so because arousal is altering the physiological response to incongruity (something we elaborate on further in study 2).

## Method

*Participants and Design.* Students at the University of Guelph ($N = 144$; 46% females; $M_{age} = 19.7$) participated in this study in exchange for course credit, and they were randomly assigned to one of six conditions in a 2 (arousal: low vs. moderate) × 3 (product congruity: congruent vs. moderately incongruent vs. extremely incongruity) between-subjects factorial design. The target product chosen for this study was soft drinks. The soft drink category was selected not only because it was relevant to the sample but also for two additional reasons: first, soft drinks have featured extensively in the congruity literature (Campbell and Goodstein 2001; Meyers-Levy and Tybout 1989; Noseworthy et al. 2011; Noseworthy and Trudel 2011; Stayman et al. 1992); and, second, Campbell and Goodstein (2001, 443) offered a precise description of their manipulation of moderate incongruity (e.g., "a plastic single-serving bottle with a drinking valve on the lid"), which Noseworthy and Trudel (2011) operationalized visually. In this study we use the exact advertisements from Noseworthy and Trudel's (2011) web appendices (see app. A).

*Procedures and Dependent Measures.* Prior to viewing the soft drink ad, arousal was manipulated following procedures that have proven successful in isolating arousal from valence (Bradley et al. 2001). Participants were told they would be looking at several photographs to help them get energized (relaxed). Several pictures were drawn from the *International Affective Picture System* (IAPS; Lang, Bradley, and Cuthbert 1999) and were selected to be similar in rated hedonic valence (pleasantness) but necessarily varied in rated arousal. Care was taken to ensure that the moderate arousal condition was no different than a pretested control. This was important given that prior work supporting the schema congruity effect did so without manipulating arousal up front. Therefore, the moderate condition operated like a control while affording the benefit of holding the experimental procedures constant across conditions.

Each picture was presented for 6 seconds. The entire set

randomly cycled while individuals continuously updated their arousal level using a *continuous response technique* (Eich and Metcalfe 1989). The technique required that participants indicate the progressive change in their arousal level along an adjustable semantic differential scale, with −50 as *very relaxed*, +50 as *very excited*, and 0 as *neither relaxed nor excited*. Participants were told to stop moving the slider bar when they felt no further changes in their level of excitement (relaxation). Once participants' arousal level plateaued (i.e., once they stopped moving the dial for longer than 5 seconds), the software automatically informed them that they were about to view a new soft drink. The soft drink category was explicitly communicated prior to viewing the ad in order to activate the appropriate schema (Meyers-Levy and Tybout 1989). The software then immediately switched to the advertisement. Participants viewed the ad for 30 seconds.

Once the ad had been reviewed, participants were asked to report their affective state while viewing the pictures using the *Affect Grid* (Russell et al. 1989), a graphical scale that simultaneously assesses mood valence and arousal (anchored: 1 = low; 9 = high). Participants then rated their feelings while viewing the pictures (anchored: 1 = not at all; 7 = very strongly). The items were: "I had unpleasant feelings while viewing the pictures"; "The pictures made me feel happy"; "I was disgusted by the pictures"; "The pictures made me feel good"; "I was fearful looking at the pictures"; "The pictures made me feel bad"; "The pictures made me feel angry"; "The pictures made me feel joyful"; "I had pleasant feelings while looking at the pictures"; and "The pictures made me feel sad" (adapted from Pham et al. 2001). Participants then completed a randomized 10-item questionnaire (anchored: 1 = not at all; 7 = extremely). Seven items captured participants' overall attitude toward the product (left a favorable impression, is likeable, is appealing, is desirable, is of good quality, interested in trial, is a high-performance product), and the remaining three captured participants' perceived typicality (is common, is likely, matches expectations; Campbell and Goodstein 2001).

Finally, to confirm the extent to which participants were able to associate schema-relevant information, a *Latency Association Task* (LAT) was administered. The LAT is a measure of relative strength of association between concepts or objects in memory. For example, participants were asked to press "A" with their left hand as quickly as possible when an advertisement, appearing in the middle of the screen, matched the word *carbonated*, which appeared in the top left (right) of the screen, or press "L" with their right hand if the target object matched the word *noncarbonated*, which appeared in the top right (left) of the screen. The ads were made up of prototypical exemplars of the soft drink category (e.g., Coke, Sprite, etc.) as well as nonprototypical members of the superordinate beverage category (e.g., Aquafina, Sunkist, etc.). The soft drink from the main study randomly cycled through the set. The features were made up of prototypical claims (hits) and claims fitting the superordinate beverage concept (e.g., real fruit juice; adopted from Meyers-Levy and Tybout 1989) to serve as false alarms. Given that people can successfully resolve moderate incongruity, latencies may be higher but participants should be quite accurate at mapping schema-relevant information. Conversely, given that people tend not to resolve extreme incongruity, latencies and error rates should increase substantially. Critically, if our theorizing is correct, these effects should not vary by arousal.

## Results

*Manipulation Check: Product Congruity.* An analysis of target typicality ($\alpha = .69$) as a function of arousal and product congruity yielded only a main effect of product congruity ($F(2, 138) = 34.75$, $p < .001$). Pairwise comparisons confirmed that participants perceived the congruent soft drink to be more typical ($M = 5.13$) than the moderately incongruent soft drink ($M = 4.41$; $F(1, 138) = 9.60$, $p < .005$), which in turn was more typical than the extremely incongruent soft drink ($M = 3.19$; $F(1, 138) = 26.56$, $p < .001$). No other effects were significant ($p > .28$).

Next, the LAT results were analyzed. The general prediction was that individuals would be more prone to errors and would take longer to associate prototypical features as the severity of the incongruity increased. Errors are defined as judgments that are at odds with the evoked schema (e.g., selecting noncarbonated when explicitly told the target is a soft drink). To circumvent the problem of raw latencies having a skewed distribution, response times were log-transformed. For the sake of interpretation, all means are listed in milliseconds. The analysis of participants' response latencies revealed only a main effect of product congruity ($F(2, 138) = 8.88$, $p < .001$). Pairwise comparisons confirmed that participants took marginally longer to associate prototypical attributes with the moderately incongruent soft drink ($M = 3{,}071$) than the congruent soft drink ($M = 2{,}516$; $F(1, 138) = 2.86$, $p = .091$) and that they took longer to associate prototypical attributes with the extremely incongruent soft drink ($M = 3{,}891$) than the moderately incongruent soft drink ($M = 3{,}071$; $F(1, 138) = 6.22$, $p < .05$). As expected, these effects did not vary by arousal ($p > .27$).

A similar pattern was observed in participants' accuracy rates. Using a nonparametric *Signal Detection Analysis* (Snodgrass and Corwin 1988), the attributes that were correctly associated with the congruity target (hits) and those that were wrongly associated (false alarms) were used to calculate an index ($A'$; see app. C). Prior to this calculation, hit and false alarm rates were corrected using a log-linear transformation to account for undefined $z$-scores of 0 and 1 (Snodgrass and Corwin 1988). The $A'$ index varied from .5 to 1, with .5 indicating very poor schematic mapping and 1 indicating perfect schematic mapping. Consistent with the latency and typicality results, there was a main effect of product congruity ($F(2, 138) = 8.56$, $p < .001$). Participants were just as accurate when associating the soft drink attributes to the congruent soft drink as to the moderately in-

congruent soft drink ($M_{Cong}$ = .828 vs. $M_{Mod.Inc}$ = .786; $p$ = .18). This is consistent with the idea that consumers can successfully assimilate moderate incongruity. However, as predicted, participants were more prone to error when associating soft drink attributes to the extremely incongruent soft drink relative to the congruent soft drink ($M_{Cong}$ = .828; $F(1, 138) = 16.49$, $p < .001$) or the moderately incongruent soft drink ($M_{Ext.Inc}$ = .702; $F(1, 138) = 7.39$, $p < .01$). These results suggest that regardless of state arousal, participants struggled to link the product with the activated schema as the severity of the schematic violation increased.

*Manipulation Check: Arousal and Affect.* Consistent with prior use of the IAPS to isolate arousal (Bradley et al. 2001), participants reported being more excited in the moderate arousal condition ($M$ = 16.60) and more relaxed in the low arousal condition ($M$ = −14.18; $F(1, 138) = 67.89$, $p < .001$). No other effects approached significance ($p > .15$). To confirm the distinction between arousal and affect, an analysis of the affect grid illustrated that the moderate-arousal pictures induced higher levels of reported arousal ($M$ = 6.36) than did the low-arousal pictures ($M$ = 4.90; $F(1, 138) = 25.86$, $p < .001$). However, the two categories of pictures induced similar feelings of pleasantness ($M_{Low}$ = 6.79 vs. $M_{Moderate}$ = 6.60; $p$ = .37). This was reflected in participants' affective reactions toward the experience ($\alpha$ = .77); participants were generally positive when viewing the pictures ($M > 5$ out of 7), and this did not vary by arousal, congruity, or their interaction ($p > .10$). Therefore, as intended, the two picture categories induced different feelings of arousal but no difference in the valence of the affective state.

*Target Evaluations.* An analysis of target evaluations ($\alpha$ = .94) as a function of arousal and product congruity yielded a significant interaction ($F(2, 138) = 5.25$, $p < .01$). Simple effects revealed that product evaluations varied by the level of incongruity in the moderate arousal condition ($F(2, 138) = 11.98$, $p < .001$), but not in the low arousal condition ($M_{Cong}$ = 4.03 vs. $M_{Mod.Inc}$ = 3.88 vs. $M_{Ext.Inc}$ = 3.76, $p > .37$). Consistent with Mandler's (1982) inverted-U prediction, participants in the moderate arousal condition evaluated the moderately incongruent soft drink more favorably ($M$ = 4.54) than both the congruent soft drink ($M$ = 3.81; $F(1, 138) = 5.75$, $p < .05$) and the extremely incongruent soft drink ($M$ = 3.05; $F(1, 138) = 23.95$, $p < .001$), and they evaluated the extremely incongruent soft drink less favorably ($M$ = 3.05) than the congruent soft drink ($M$ = 3.81; $F(1, 138) = 6.23$, $p < .05$). In support of our core predictions, planned contrasts confirmed that participants evaluated the moderately incongruent product more favorably when their arousal level was moderate ($M$ = 4.54) rather than low ($M$ = 3.88; $F(1, 138) = 4.76$, $p < .05$), whereas they evaluated the extremely incongruent product more favorably when their arousal was low ($M$ = 3.76) rather than moderate ($M$ = 3.05; $F(1, 138) = 5.47$, $p < .05$). No other contrasts approached significance ($p > .30$).

## Discussion

The results of study 1 confirm that evaluations for incongruity are highly influenced by a person's state of arousal. Specifically, low arousal decreased preference for moderate incongruity and mitigated the strong aversion to extreme incongruity, and it did so without altering participants' ability to associate schema-relevant information. The question going forward is whether low arousal is inhibiting a physiological response to incongruity, and if so, whether it is altering a person's emotional state. This question is important because, as mentioned, researchers have yet to explore Mandler's (1982) notion of physiological arousal and emotional intensity. Thus, given that Mandler argued for an autonomic physiological response that occurs below the level of awareness, there is a need to employ a direct measure of physiological arousal. Finally, Jhang and colleagues (2012) showed that perceptions of typicality are distinct from measures of schematic resolution. Although we theorized that state arousal would have little influence on a person's ability to resolve incongruity, there is a need to directly explore the resolution process. Study 2 was designed with these objectives in mind.

# STUDY 2

The core objectives of study 2 were (1) to replicate the key results from study 1, (2) to explore Mandler's (1982) notion that there is a physiological response to incongruity that corresponds with changes in a person's emotional state, and (3) to test critically whether varying a person's state of arousal alters evaluations for incongruity by moderating the emotional response to incongruity without influencing the resolution process. Specifically, we predict that mild physiological arousal and state-derived curiosity will correspond with positive evaluations for moderate incongruity, whereas relatively more intense physiological arousal and state-derived anxiety will correspond with the negative evaluations for extreme incongruity. We predict that by lowering a person's state of arousal, we will inhibit both the physiological response and the resulting emotional intensity, therefore decreasing evaluations for moderate incongruity and increasing evaluations for extreme incongruity.

## Method

*Participants and Design.* Participants ($N$ = 144; 52.1% females; $M_{age}$ = 29.8) were recruited through web ads and public posters and were paid $15 for participating in the study. Each individual was randomly assigned to one of four conditions in a 2 (incongruity: moderate vs. extreme) × 2 (aroused state: low arousal vs. control) × 3 (stimulus onset: incongruent vs. congruent #1 vs. congruent #2) mixed factorial design. Incongruity and aroused state served as the between-subjects factors, whereas stimulus onset served as the within-subjects factor.

To test the robustness of the incongruity manipulation, two conceptual replications were nested within the stimulus

onset condition. Thus, in total there were three manipulations of moderate incongruity and three manipulations of extreme incongruity (one for each attribute). As illustrated in figure 1, this design allowed for the congruity manipulations to be compared within as well as between subjects. For example, some participants evaluated Black Tea (congruent), Carbonated Milk (extremely incongruent), and Vitamin-fortified Orange Juice (congruent), whereas others evaluated Black Tea (congruent), Carbonated Water (congruent), and Vitamin-fortified Vodka (extremely incongruent). Designing the study in this manner allowed for the physiological measures taken after each incongruent onset to be compared to two congruent onsets, which in turn were compared to a 30-second baseline leading into the study.

*Stimuli.* The stimuli for this study were adopted from Jhang and colleagues (2012). The stimuli were selected not only because they were previously validated but also because they were attribute-specific and not category-specific: the color *black*, the feature *carbonated*, and the claim *vitamin-fortified* (see fig. 1). Keeping the manipulation attribute specific afforded the ability to test a physiological response to incongruity within subjects without sensitizing participants to any one particular product schema. The only deviation from Jhang and colleagues (2012) was that we included images to go along with the written descriptions (see app. B). The written descriptions remained unaltered. This was done following a pretest ($n = 25$) that indicated that participants were consistently tuning out back-to-back written descriptions but that they remained engaged when they could both read about and see the product.

*Procedures and Dependent Measures.* Participants were brought into a behavioral lab where a lab technician administered a prescreening questionnaire under the guise of screening for physical and psychological health. In fact, the prescreening captured several trait variables, which served as a baseline to assess state emotional changes (see *psychometric measures*). After completing the prescreening, participants were informed that we would be measuring their physiological response to different products using a galvanic skin response (GSR) system.

The study began with a guise that the lab technician must calibrate the GSR equipment prior to commencing the study. In fact, the calibration task served to manipulate arousal. Participants in the control condition were instructed to put on a pair of noise cancellation headphones and wait while the lab technician calibrated the equipment. In the low arousal condition, Albinoni's *Adagio in G Minor* played through the headphones, and participants were instructed to relax while the lab technician calibrated the equipment. A pretest ($n = 44$) using the affect grid confirmed that the low arousal manipulation induced similar feelings of pleasantness ($M_{\text{Low}} = 3.33$ vs. $M_{\text{Control}} = 3.06$; $p = .27$) but different feelings of arousal ($M_{\text{Low}} = 2.21$ vs. $M_{\text{Control}} = 3.11$; $t(42) = -2.90$, $p < .01$). The goal was to refrain from high positive affect, given the notable influence of cognitive flexibility on preference for extreme incongruity (Jhang et al. 2012). The calibration task ran for exactly 3 minutes. The track looped for the duration in the low arousal condition.

Upon completing the calibration task, a 30-second baseline measure of physiological arousal was taken. Participants then immediately proceeded to the main task, which began by informing participants that they would be evaluating several different products. Three products (i.e., the within-subjects stimulus onset condition) then appeared in random order. Each product appeared for 30 seconds. Participants filled out a brief electronic questionnaire following each appearance. The skin conductance responses (SCRs) were sampled for the duration of the task. The key comparison was the 1 second to 5 second window after each stimulus onset relative to the 30-second baseline leading into the study (see app. D for details of the GSR procedure).

*Psychometric Measures.* The questionnaire consisted of the product evaluation and perceived typicality measures discussed in study 1. Then to explore whether incongruity alters one's emotional state, and whether state arousal subsequently intensifies or attenuates these emotions, participants responded to the state component of the *State-Trait Personality Inventory* (STPI; Spielberger and Reheiser 2009). As mentioned, the trait component was administered during prescreening. The STPI was included specifically to capture participants' state curiosity and state anxiety. The

**FIGURE 1**

EXAMPLE OF STIMULUS ONSET CONDITION FOR STUDY 2 (BLOCKED AND RANDOMIZED WITHIN SUBJECTS)

**Moderately Incongruent Condition**

| *Incongruent →* | *Congruent #1 →* | *Congruent #2* |
|---|---|---|
| (black rice) | (carbonated water) | (vitamin-fortified orange juice) |
| (carbonated coconut water) | (vitamin-fortified orange juice) | (black tea) |
| (vitamin-fortified coffee) | (black tea) | (carbonated water) |

**Extremely Incongruent Condition**

| *Incongruent →* | *Congruent #1 →* | *Congruent #2* |
|---|---|---|
| (black toilet paper) | (carbonated water) | (vitamin-fortified orange juice) |
| (carbonated milk) | (vitamin-fortified orange juice) | (black tea) |
| (vitamin-fortified vodka) | (black tea) | (carbonated water) |

10-item *trait curiosity* subscale assessed general tendencies to learn new things and experience feelings of interest (e.g., "I am curious"; "I am stimulated"; anchored: 1 = almost never; 4 = almost always), whereas the 10-item *state curiosity* scale asked participants to "indicate how you feel right now; that is, at this moment when thinking of the product" (e.g., "curious," "inquisitive"; anchored: 1 = not at all; 4 = very much so). Similarly, the 10–item *trait anxiety* scale measured participants' general tendency to feel anxious (e.g., "I am nervous and restless," "I am a steady person"; anchored: 1 = almost never; 4 = almost always), whereas the 10-item *state anxiety* scale measured participants' current state of anxiety (e.g., "tense," "nervous"; anchored: 1 = not at all; 4 = very much so).

Finally, participants were asked to indicate their ability to resolve the incongruity on two 7-point items that captured the extent to which the new product made sense to them (makes no sense/makes sense) and whether they understood the rationale of the product (disagree/agree; Jhang et al. 2012). After seeing all three stimuli and filling out each separate questionnaire, participants were then asked to type their open-ended opinion about whether the incongruity manipulation does or does not make sense (e.g., "What did you think about the Vitamin-Fortified Coffee?"; adapted from Jhang et al. 2012). Both the thought-listing exercise and the measure of resolution served as confirmation of whether the changes in state arousal altered the resolution process. The questionnaire concluded with basic demographic information.

## Results

*Manipulation Check: Perceived Typicality.* Two separate one-way ANOVAs crossing the three moderately incongruent replications and the three extremely incongruent replications revealed no significant differences in perceived typicality by arousal ($p > .10$). There was, however, considerable variance around the vitamin-fortified attribute. Nevertheless, the operationalization was kept consistent with Jhang and colleagues (2012), and given there was no statistical difference by arousal across the replications, they were collapsed.

A repeated measures analysis of variance (*r*ANOVA) with arousal and product congruity as the between-subjects factors and the three typicality measures taken after each stimulus onset as the repeated measure ($\alpha$ range = .68 to .71) yielded a significant incongruity × stimulus onset interaction ($F(2, 280) = 12.45$, $p < .001$). Simple effects confirmed that participants perceived the extremely incongruent products to be less typical ($M = 2.45$) than the moderately incongruent products ($M = 3.46$; $F(1, 140) = 41.09$, $p < .001$); however, both were seen as less typical than the congruent products ($M_{Cong1} = 5.47$, $M_{Cong2} = 5.28$; $p < .001$). Critically, the three-way interaction was not significant ($p = .98$). Therefore, the stimuli altered perceived typicality as intended, and this did not vary by the arousal manipulation.

*Incongruity Resolution.* A *r*ANOVA with product congruity and arousal as the between-subjects factors and the two-item resolution measure taken after each stimulus onset as the repeated measure (*r* range = .76 to .87) yielded a significant incongruity × stimulus onset interaction ($F(2, 280) = 113.32$, $p < .001$). Simple effects confirmed that participants found it easier to make sense of the moderately incongruent products ($M = 4.95$) than to make sense of the extremely incongruent products ($M = 2.31$; $F(1, 140) = 251.07$, $p < .001$). However, in support of the notion that consumers can successfully resolve moderate incongruity, participants found it just as easy to make sense of the moderately incongruent products as the congruent products ($p > .26$). Once again, the three-way interaction was not significant ($p = .66$). Thus, the ease or difficulty with which participants made sense of incongruity did not vary by arousal.

To further examine the resolution process, we focused on the open-ended question to see whether participants explicitly made sense of the stimuli. Following a similar procedure as used by Jhang and colleagues (2012), two independent coders blind to the hypotheses coded the open-ended responses into three categories. All responses showing successful resolution were coded as 1 (e.g., "I could see the [vitamin-fortified] coffee appealing to people who are pressed for time in the morning and need to supplement their breakfast while still getting their fix"), responses showing unsuccessful resolution were coded as –1 (e.g., "I'm not sure if this [adding vitamins to coffee] would taste good"), and any responses that did not pertain to the resolution process were coded as 0 (e.g., "I don't like coffee!"). The two coders had 78% agreement; all outstanding disagreements were resolved through discussion. The results yielded only a main effect of congruity. Specifically, participants were more likely to indicate resolving the moderately incongruent products ($M = .18$) than the extremely incongruent products ($M = -.31$; $F(1, 140) = 16.11$, $p < .001$). The interaction between arousal and incongruity was not significant ($p = .91$). Furthermore, there was no significant difference in the number of thoughts provided across the arousal conditions ($p > .37$). Taken as whole, the results suggest that arousal did not influence the resolution process.

*Target Evaluations.* A *r*ANOVA with product congruity and arousal as the between-subjects factors and the three evaluation measures taken after each stimulus onset as the repeated measure ($\alpha$ range = .90 to .93) yielded a significant three-way interaction ($F(1.95, 280) = 4.01$, $p < .05$; *df* modified with the Huynh-Feldt adjustment for lack of sphericity). The nature of the interaction was such that the relationship between product congruity and stimulus onset varied by arousal. Specifically, as illustrated in table 1, multivariate simple effects confirmed that control participants evaluated the extremely incongruent products less favorably ($M = 3.68$) than the congruent products ($M_{Cong1} = 4.96$, $p < .005$; $M_{Cong2} = 4.63$, $p < .05$) while evaluating the moderately incongruent products more favorably ($M = 5.36$) than the congruent products ($M_{Cong1} = 4.39$, $p < .01$; $M_{Cong2}$

**TABLE 1**

MEANS AND STANDARD DEVIATIONS FOR STUDY 2

| | Low arousal | | | | Moderate (control) arousal | | | |
|---|---|---|---|---|---|---|---|---|
| Incongruity condition | Baseline | Incongruent onset | Congruent onset #1 | Congruent onset #2 | Baseline | Incongruent onset | Congruent onset #1 | Congruent onset #2 |
| Moderate incongruity: | | | | | | | | |
| Typicality | | 3.57 (.82) | 5.57 (.77) | 5.31 (.93) | | 3.33 (.98) | 5.60 (.85) | 5.15 (1.03) |
| Resolution | | 5.10 (1.13) | 5.13 (.86) | 5.07 (1.04) | | 4.82 (1.22) | 5.17 (.85) | 5.10 (.95) |
| Evaluations | | 4.65 (1.01)[a] | 4.25 (1.09) | 4.52 (1.12) | | 5.36 (1.29)[a] | 4.39 (1.16) | 4.64 (1.18) |
| Arousal (SCRs) | 2.02 (1.05) | 2.01 (.52) | 1.98 (1.01) | 1.97 (.80) | 2.21 (1.04) | 2.55 (1.01)[c] | 2.25 (.91) | 2.24 (1.12) |
| Curiosity* | | 2.96 (.68)[d] | 2.99 (.62) | 3.03 (.64) | | 3.32 (.60)[d, e] | 3.03 (.59) | 3.08 (.43) |
| Anxiety* | | 2.04 (.47) | 2.00 (.45) | 1.99 (.40) | | 2.11 (.46)[f] | 2.09 (.44) | 2.08 (.41) |
| *Open-ended response* | | Unsuccessful resolution | Neither | Successful resolution | | Unsuccessful resolution | Neither | Successful resolution |
| *Coding for resolution* | | (Coded = −1) | | (Coded = 1) | | (Coded = −1) | (Coded = 0) | (Coded = 1) |
| *Percent* | | 22.2 | 36.1 | 41.7 | | 19.4 | 44.4 | 36.2 |
| | | | $M$ = .19 (.79) | | | | $M$ = .16 (.74) | |
| Extreme incongruity: | | | | | | | | |
| Typicality | | 2.52 (.88) | 5.29 (.89) | 5.33 (.87) | | 2.38 (1.05) | 5.44 (.94) | 5.31 (.94) |
| Resolution | | 2.31 (.83) | 5.07 (1.16) | 5.18 (1.15) | | 2.30 (.75) | 5.14 (.86) | 5.13 (1.08) |
| Evaluations | | 4.36 (1.42)[b] | 4.47 (1.07) | 4.52 (1.34) | | 3.68 (1.89)[b] | 4.96 (1.15) | 4.63 (1.41) |
| Arousal (SCRs) | 1.95 (.56) | 1.98 (.44) | 1.97 (.71) | 1.99 (.70) | 2.34 (.94) | 3.23 (.92)[c] | 2.54 (.97) | 2.38 (.92) |
| Curiosity* | | 3.09 (.76) | 2.92 (.67) | 2.97 (.64) | | 2.99 (.50)[e] | 3.03 (.52) | 3.02 (.54) |
| Anxiety* | | 2.09 (.36)[g] | 2.03 (.37) | 1.98 (.36) | | 2.37 (.47)[f, g] | 2.09 (.43) | 2.08 (.43) |
| *Open-ended response* | | Unsuccessful resolution | Neither | Successful resolution | | Unsuccessful resolution | Neither | Successful resolution |
| *Coding for resolution* | | (Coded = −1) | (Coded = 0) | (Coded = 1) | | (Coded = −1) | (Coded = 0) | (Coded = 1) |
| *Percent* | | 38.9 | 52.8 | 8.3 | | 47.2 | 36.1 | 16.7 |
| | | | $M$ = −.32 (.63) | | | | $M$ = −.30 (.75) | |

NOTE.—Standard deviations are reported in parentheses. The incongruity condition represents the type of incongruity introduced. The superscripts represent the key significant pairwise comparisons.

*Means with adjusted covariate for trait curiosity ($M$ = 2.98) and trait anxiety ($M$ = 2.05).

= 4.64, $p < .05$). This pattern is consistent with the schema congruity effect. Once again, this pattern did not manifest in the low arousal condition ($p > .12$). As predicted, planned contrasts confirmed that low arousal dropped participants' evaluations for the moderately incongruent products ($M_{Low}$ = 4.65 vs. $M_{Control}$ = 5.36; $F(1, 140) = 4.35$, $p < .05$) while increasing participants' evaluations for the extremely incongruent products ($M_{Low}$ = 4.36 vs. $M_{Control}$ = 3.68; $F(1, 140) = 3.97$, $p < .05$). In the analyses that follow, we dig deeper into the physiological and resulting emotional response underlying this pattern of results.

*Physiological Arousal.* A *r*ANOVA with product congruity and arousal as the between-subjects factors, and participants' SCRs as the repeated measure (including the baseline) verified the low arousal manipulation with a significant between-subjects effect of arousal ($F(1, 140) = 14.17$, $p < .005$). Specifically, participants were less aroused in the low arousal condition (relative to the control) across each stimulus onset ($p < .05$), including the baseline ($M_{Low}$ = 1.98 vs. $M_{Control}$ = 2.27; $F(1, 140) = 3.53$, $p < .05$). This main effect was qualified by a significant three-way interaction ($F(2.83, 385) = 3.09$, $p < .05$). The nature of the interaction was such that physiological arousal varied by incongruity in the control condition ($F(2.72, 190) = 7.40$, $p < .01$) but not in the low arousal condition ($p$ = .94). Specifically, in the control condition, the incongruent onset significantly enhanced physiological arousal ($M$ = 2.90) relative to the baseline ($M$ = 2.27; $F(1, 70) = 81.03$, $p < .001$) and relative

to both congruent onsets ($M_{Cong1} = 2.40$; $F(1, 70) = 44.55$, $p < .001$; $M_{Cong2} = 2.31$; $F(1, 70) = 53.69$, $p < .001$). This pattern was fully suppressed in the low arousal condition ($p > .74$). Planned contrasts within the control condition revealed that participants were generally more aroused when viewing the extremely incongruent products ($M = 3.23$) than when viewing the moderately incongruent products ($M = 2.55$; $F(1, 140) = 14.96$, $p < .001$). This lends support for Mandler's (1982) notion that the physiological response to extreme incongruity is more severe than for moderate incongruity. The next step was to isolate the specific emotions that correspond to these different levels of arousal.

*Emotional State.* Controlling for trait curiosity, a *r*-ANCOVA with arousal and product congruity as the between-subjects factors and state curiosity as the repeated measure ($\alpha$ range = .89 to .92) yielded a significant three-way interaction ($F(1.89, 278) = 3.36$, $p < .05$). The trait covariate was also significant ($F(1, 139) = 8.24$, $p < .01$). Planned contrasts revealed that participants in the control condition were more curious about the moderately incongruent product ($M = 3.32$) than either the extremely incongruent product ($M = 2.99$; $F(1, 139) = 4.43$, $p < .05$) or the two congruent products ($p < .05$). Similarly, participants were more curious about the moderately incongruent product in the control condition ($M = 3.32$) than in the low arousal condition ($M = 2.96$; $F(1, 139) = 5.94$, $p < .05$). No other effects were significant ($p > .25$).

A second *r*ANCOVA, controlling for trait anxiety with state anxiety as the repeated measure ($\alpha$ range = .95 to .96), yielded a marginally significant three-way interaction ($F(1.96, 272) = 2.93$, $p = .056$). The trait anxiety covariate was significant ($F(1, 139) = 6.44$, $p < .05$). Planned contrasts revealed that participants in the control condition displayed a greater state of anxiety after being exposed to the extremely incongruent product ($M = 2.37$) than after being exposed to either the moderately incongruent product ($M = 2.11$; $F(1, 139) = 6.78$, $p < .05$) or the two congruent products ($p < .05$). Similarly, participants were more anxious about the extremely incongruent product in the control condition ($M = 2.37$) than in the low arousal condition ($M = 2.09$; $F(1, 139) = 8.02$, $p < .01$). No other effects approached significance ($p > .31$).

To determine whether discrete emotional states accounted for the variations in participants' evaluations of the incongruent stimuli, the data from the incongruent onset were isolated and a mediated-moderation analysis was conducted (Hayes 2012; Model 8; bootstrapped with 5,000 draws). As predicted, there was a conditional indirect effect of product incongruity (coded: $-1$ = moderate incongruity, 1 = extremely incongruent) through both state curiosity and state anxiety on participants' evaluations of the incongruent products. Specifically, state curiosity mediated evaluations for moderate incongruity when state arousal was moderate (95% CI: $-.153$, $-.006$), but not when state arousal was low (95% CI: $-.029$, .123). Conversely, state anxiety mediated evaluations for extreme incongruity when state arousal was moderate (95% CI: $-.247$, $-.010$), but not when state arousal was low (95% CI: $-.106$, .063). This suggests that Mandler (1982) was correct both about the role of curiosity for moderate incongruity and the role of anxiety for extreme incongruity. Critically, as predicted, low arousal extinguished the emotional intensity of both of these effects and subsequently dampened their influence on evaluations.

## Discussion

The findings from study 2 are the first to test Mandler's (1982) prediction that the ability to resolve incongruity corresponds with a mild physiological response that manifests in state-derived curiosity, whereas the inability to resolve incongruity corresponds with a more intense physiological response that manifests in state-derived anxiety. As predicted, reducing participants' arousal level suppressed the physiological response as well as the resulting emotional states, which subsequently lowered evaluations for moderate incongruity and raised evaluations for extreme incongruity. The finding that low arousal (relative to the control) altered evaluations is notable because it did not influence the resolution process. Instead, it seemed that evaluations were being altered in line with the valence of the emotion that was being inhibited.

Despite the absolute means for anxiety being relatively low (significance driven by low SDs from participants responding at the bottom of the scale), the observation that anxiety corresponds with an aversion to extreme incongruity raises another interesting question: What about high arousal? If this is truly about physiological arousal interacting with discrete emotional states, then heightened arousal should compound the anxiety for extreme incongruity, but would it create anxiety for moderate incongruity? Study 3 was designed to answer these questions.

# STUDY 3

The objective of study 3 was to use a physiological manipulation to explore the influence of high arousal on evaluations of incongruity. Extant research has linked high arousal to stress or tension (Hasher and Zacks 1979; Thayer 1978, 1986). When arousal becomes too severe, it often manifests as anxiety (Thayer and Carey 1974; Malmo 1957). Given that Mandler (1982) regarded schema incongruity as a form of tension brought on from a physiological response, there is the question whether compounding this tension with high incidental arousal will result in anxiety and thus negative evaluations for any form of incongruity. Critically, this may occur even when consumers can still successfully resolve the incongruity.

Mandler (1975) argued that attention is more selective when people are in a highly aroused state because the feedback from the heightened autonomic nervous system becomes salient and thus competes with other cues for the limited attentional capacity. This need not suggest that high arousal will inhibit resolution. In fact, using a dual-task paradigm, researchers have found that under high arousal conditions, performance on secondary tasks tends to dete-

riorate, whereas performance on primary tasks remains the same and in some instances can actually improve (Bacon 1974; Easterbrook 1959). It is in this respect that high arousal can actually focus attention (Pham 1996; Sanbonmatsu and Kardes 1988). Therefore, given the correlation between arousal and anxiety, and given the finding from study 2 that state arousal interacts with stimulus arousal, we predict that incongruity will lead to negative evaluations when state arousal compounds stimulus arousal. Specifically, we predict that low state arousal will lower evaluations for moderate incongruity and raise evaluations for extreme incongruity. However, we expect that high state arousal will lower evaluations for all forms of incongruity, regardless of the resolution process.

## Method

*Participants and Design.* Participants ($N = 290$; 43.8% females; $M_{age} = 25.2$) were recruited through web ads and public posters and were paid $10 for participating in the study. Each individual was randomly assigned to one of nine conditions in a 3 (physiological arousal: low vs. moderate vs. high) × 3 (extension congruity: congruent vs. moderately incongruent vs. extremely incongruent) between-subjects factorial design. The manipulation of incongruity was adopted from Meyers-Levy and colleagues (1994), who matched company brand names to different product extensions to elicit different levels of incongruity. Consistent with the schema congruity hypothesis, the authors found that consumers favored moderately incongruent extensions while showing an aversion to extremely incongruent extensions.

In step with Meyers-Levy and colleagues (1994), a pretest ($n = 40$) was conducted by creating ads for magazines that linked the Coppertone brand—a company brand name associated with sun screening products—to specific topics that represent ostensibly different levels of congruity (app. C). The ad descriptions were constructed to be identical in length (180 words) and to be as similar as possible in content and structure. Participants were asked to rate how likely each magazine would be offered by Coppertone (anchored: 1 = extremely unlikely, 9 = extremely likely). The results confirmed that Coppertone releasing a magazine on how to apply skin lotion was seen as more congruent ($M = 7.80$) than Coppertone releasing a magazine on the benefits of Vitamin D ($M = 4.13$, $p < .01$), which in turn was seen as more congruent than Coppertone releasing a magazine on how to prepare steak ($M = 1.77$, $p < .005$). Presumably, linking Coppertone to extensions that directly or indirectly relate to a by-product of the sun (Vitamin D) takes consecutively greater steps to assimilate. To be sure, participants were asked to indicate how many mental steps would be needed to make sense of the extensions (anchored: 0 = few steps; 5 = many steps; Jhang et al. 2012). As expected, the more incongruent the extension, the more mental steps participants required to make sense of it ($M_{Lotion} = 0.98$ vs. $M_{Vit\text{-}D} = 2.26$ vs. $M_{Steak} = 3.20$; $p < .05$). The results confirmed the manipulation of incongruity.

*Procedures and Dependent Measures.* Participants were prescreened for health issues prior to taking part in the study. Due to random assignment, all participants were informed of the possibility of engaging in strenuous physical exercise. Individuals were explicitly told that participation was voluntary and that they should stop if they felt the task might be harmful.

Upon entering the behavioral lab, participants' resting heart rate was captured using a pulse plethysmograph (see app. D). The task began with a lab technician calculating participants' maximum heart rate. Extant research suggests that maximum heart rate can be predicted by age alone and is independent of gender and physical activity status (Tanaka, Monahan, and Seals 2001). This was important given that peak performance on an exercise task can vary widely depending on a person's age. Given the age range in the current study, maximal heart rate was computed using the formula 220 – age (Tanaka et al. 2001).

Following the preliminary calculation, participants were randomly assigned to one of the three physiological conditions. In the low arousal condition, participants sat without cycling on an ergometer for 10 minutes while actively trying to calm their resting heart rate. In the moderate arousal condition, participants cycled on the ergometer for 10 minutes while actively trying to maintain their heart rate at 50% of their maximum heart rate. This was done following evidence that exercise around 60% of one's maximum heart rate becomes highly arousing (Schmidt, Mussel, and Hewig 2013). Finally, in the high arousal condition, participants cycled on the ergometer for 10 minutes while actively trying to maintain their heart rate at 70% of their maximum heart rate (the aerobic zone). In line with prior work, mean heart rate was assessed again in the last 5 minutes of each condition (Schmidt et al. 2013). A pretest ($n = 43$), using the affect grid and participants' heart rate in terms of beats per minute (bpm), confirmed that the three arousal manipulations varied both participants' self-report psychological arousal ($M_{Low} = 3.33$ vs. $M_{Moderate} = 5.36$ vs. $M_{High} = 6.37$; $p < .01$) and actual physiological arousal ($M_{Low} = 48.41$ bpm [similar to meditation] vs. $M_{Moderate} = 86.75$ bpm [similar to brisk walking] vs. $M_{High} = 133.75$ bpm [similar to jogging]; $p < .001$), but that it led to no significant difference in mood valence ($M_{Low} = 5.93$ vs. $M_{Moderate} = 6.55$ vs. $M_{High} = 6.36$; $p > .10$).

Immediately following the exercise task, participants were given a booklet while sitting on the ergometer. This allowed us to continue monitoring participants' heart rate while they viewed the stimuli. The booklet included an Amazon ad promoting a newly released Coppertone magazine, which was accompanied by a questionnaire. The questionnaire included the previously discussed measures of product evaluations, schema resolution (both the two-item measure and the open-ended response discussed in study 2), and the STPI. Furthermore, instead of perceived typicality as a manipulation check, post-evaluation perceptions of fit between the Coppertone brand and the book extension was assessed on a 9-point semantic differential scale (very good fit/very bad

**TABLE 2**

MEANS, STANDARD DEVIATIONS, AND CELL COUNTS FOR STUDY 3

| | Low physiological arousal | | | Moderate physiological arousal | | | High physiological arousal | | |
|---|---|---|---|---|---|---|---|---|---|
| | Congruent | Moderately incongruent | Extremely incongruent | Congruent | Moderately incongruent | Extremely incongruent | Congruent | Moderately incongruent | Extremely incongruent |
| Fit judgments | 7.09 (1.25) | 5.30 (1.74) | 2.55 (1.07) | 6.42 (1.35) | 5.03 (1.25) | 2.48 (.97) | 6.16 (1.55) | 4.74 (1.42) | 1.91 (.89) |
| Resolution | 5.80 (.94) | 5.68 (.77) | 5.55 (.78) | 5.58 (1.29) | 5.44 (1.24) | 5.37 (1.02) | 2.66 (.99) | 2.61 (1.09) | 2.59 (1.15) |
| Evaluations | 3.37 (1.11) | 3.18 (1.15)[a] | 3.02 (1.25)[c,d] | 3.12 (.98)[e,f] | 3.88 (1.03)[a,b,e] | 2.47 (1.17)[c,f] | 3.46 (.98)[g,h] | 2.42 (.87)[b,g] | 2.13 (.82)[d,h] |
| Arousal (BPM) | 49.03 (11.07) | 48.21 (12.13) | 51.22 (14.87) | 86.79 (13.47) | 98.26 (16.29)[q] | 107.91 (22.69)[q] | 130.90 (28.39) | 139.01 (31.51) | 141.59 (35.17) |
| Curiosity* | 2.58 (.47) | 2.60 (.47)[g] | 2.50 (.51) | 2.58 (.60)[i] | 3.08 (.95)[g,h,i,j] | 2.26 (.47) [j] | 2.54 (.49) | 2.41 (.43)[h] | 2.27 (.44) |
| Anxiety* | 1.85 (.39) | 1.91 (.37)[n] | 2.06 (.57)[l] | 1.86 (.26) | 2.07 (.41)[m] | 2.35 (.59)[k] | 2.04 (.36)[o,p] | 2.53 (.74)[m,n,o] | 2.70 (.75)[k,l,p] |
| *Thought coding for resolution* | .19 (.39) | .15 (.36). | .16 (.37) | .42 (.79) | .41 (.76) | .44 (.76) | −.19 (.74) | −.27 (.87) | −.25 (.65) |
| *Percent of unsuccessful resolution* | 0 | 18.2 | 40.6 | 0 | 16.1 | 51.5 | 0 | 15.6 | 43.8 |
| Cell size | 32 | 33 | 32 | 34 | 31 | 33 | 31 | 32 | 32 |

NOTE.—Standard deviations are reported in parentheses. Superscripts represents the key significant pairwise comparisons.
*Raw means with adjusted covariate for trait curiosity ($M = 2.74$) or trait anxiety ($M = 2.31$).

fit; Maoz and Tybout 2002). The questionnaire concluded with basic demographic questions.

## Results

*Manipulation Check: Post-Evaluation Judgments of Fit.* Overall, there was a significant main effect of extension congruity of participants' judgments of fit ($F(2, 281) = 260.29$, $p < .001$). Not surprisingly, the congruent brand extension was perceived to fit better ($M = 6.56$) than the moderately incongruent extension ($M = 5.03$; $F(1, 281) = 65.47$, $p < .001$), which in turn was seen to fit better than the extremely incongruent extension ($M = 2.31$; $F(1, 281) = 206.87$, $p < .001$). Although not predicted, there was also a main effect of arousal ($F(2, 281) = 7.13$, $p < .005$). Low arousal led to higher judgments of fit ($M = 4.98$) than moderate arousal ($M = 4.60$; $F(1, 281) = 3.22$, $p = .074$), which, in turn, led to higher judgments of fit than high arousal ($M = 4.25$; $F(1, 281) = 4.51$, $p < .05$). Critically, the arousal × congruity interaction was not significant ($p = .71$). Therefore, the influence of low arousal on judgments of fit did not vary by incongruity.

*Incongruity Resolution.* An analysis of schema resolution ($r = .93$) yielded a main effect of congruity ($F(2, 281) = 258.95$, $p < .001$). Overall, participants found it easier to make sense of both the congruent extension ($M = 5.67$) and moderately incongruent extension ($M = 5.46$) than the extremely congruent extension ($M = 2.61$; $F(1, 281) = 3065.66$, $p < .001$ and $F(1, 281) = 358.86$, $p < .001$, respectively). Consistent with study 2, participants found it just as easy to make sense of the moderately incongruent extension as the congruent extension ($M_{Cong} = 5.67$ vs. $M_{Mod.Inc} = 5.46$; $p = .16$). No other effects approached significance ($p > .52$). To further examine the resolution process, we focused on the open-ended response for resolution ($r = .81$; coded: −1 = unsuccessful, 0 = inapplicable, 1 = successful). The results yielded a main effect of congruity ($F(2, 281) = 23.65$, $p < .001$). Participants were more likely to resolve the moderately incongruent extension ($M = .43$) than either the extremely incongruent extension ($M = -.24$; $F(1, 281) = 46.64$, $p < .001$) or the congruent extension ($M = .17$; $F(1, 281) = 7.26$, $p < .01$). The lower mean resolution for the congruent extensions was the result of there being nothing to resolve (i.e., higher inapplicable thoughts). The interaction between arousal and incongruity was not significant ($p = .98$). Thus, once again, arousal did not influence the resolution process.

*Target Evaluations.* An analysis of participants' target evaluations ($\alpha = .96$) yielded a significant arousal × product congruity interaction ($F(4, 281) = 7.39$, $p < .001$). As illustrated in table 2, participants evaluated the moderately incongruent product more favorably when arousal was moderate ($M = 3.88$) rather than low ($M = 3.18$; $F(1, 281) = 6.98$, $p < .01$) or high ($M = 2.42$; $F(1, 281) = 30.35$, $p < .001$), whereas they evaluated the extremely incongruent product more favorably when arousal was low ($M = 3.02$) rather than moderate ($M = 2.47$; $F(1, 281) = 4.62$, $p < .05$) or high ($M = 2.13$; $F(1, 281) = 11.51$, $p < .005$). Another way to look at this is that the schema congruity effect was robust in the moderate arousal condition ($M_{Cong} = 3.12$ vs. $M_{Mod.Inc} = 3.88$; $F(1, 281) = 8.89$, $p < .01$; and $M_{Cong} = 3.12$ vs. $M_{Ext.Inc} = 2.47$; $F(1, 281) = 6.46$, $p < .05$), but not in the low arousal condition ($M_{Cong} = 3.37$ vs. $M_{Mod.Inc} = 3.18$ vs. $M_{Ext.Inc} = 3.02$; $p > .17$), and in the high arousal condition, participants favored the congruent brand extension ($M_{Cong} = 3.46$ vs. $M_{Mod.Inc} = 2.42$, $F(1, 281) = 15.79$, $p <$

.001; and $M_{Cong} = 3.46$ vs. $M_{Ext.Inc} = 2.13$, $F(1, 281) = 25.75$, $p < .001$). No other contrasts approached significance ($p > .18$). If our theorizing is correct, this pattern should be reflected in participants' physiological response to incongruity as well as participants' distinct emotional states.

*Physiological Arousal.* Consistent with the pretest results, the pulse plethysmograph data revealed a main effect of the arousal manipulation ($F(2, 281) = 374.17$, $p < .001$). Pairwise comparisons confirmed that riding the ergometer at 70% of one's maximum heart rate led to higher levels of physiological arousal ($M = 137.23$ bpm) than riding at 50% of one's maximum heart rate ($M = 97.53$ bpm; $F(1, 281) = 153.63$, $p < .001$), which in turn led to higher levels of physiological arousal than sitting and actively trying to calm one's resting heart rate ($M = 49.47$ bpm; $F(1, 281) = 227.48$, $p < .001$). Critically, there was also a significant main effect of extension congruity ($F(2, 281) = 6.31$, $p < .01$). Pairwise comparisons confirmed that the moderately incongruent extension ($M = 94.64$ bpm) and the extremely incongruent extension ($M = 100.32$ bpm) encouraged a greater physiological response than the congruent extension ($M = 88.43$ bpm; $F(1, 281) = 3.75$, $p = .054$, and $F(1, 281) = 13.85$, $p < .001$, respectively). Although the interaction was not significant ($p = .17$), a planned contrast was administered to explore whether a similar pattern emerged as in study 2. As expected, the observed influence of congruity on physiological arousal was robust in the moderate arousal condition ($M_{Cong} = 86.79$ bpm vs. $M_{Mod.Inc} = 98.26$ bpm; $F(1, 281) = 4.09$, $p < .05$, and vs. $M_{Ext.Inc} = 107.91$ bpm; $F(1, 281) = 14.96$, $p < .001$). Once again, in support of Mandler's thesis, the physiological response to the extremely incongruent extension was more severe than for the moderately incongruent extension ($M_{Mod.Inc} = 98.26$ bpm vs. $M_{Ext.Inc} = 107.91$ bpm; $F(1, 281) = 3.14$, $p = .078$). Consistent with study 2, the low arousal condition dampened the physiological response to incongruity ($M_{Cong} = 49.03$ bpm vs. $M_{Mod.Inc} = 48.21$ bpm vs. $M_{Ext.Inc} = 51.22$; $p > .42$). Conversely, the high arousal condition amplified the physiological response to both moderate and extreme incongruity ($M_{Cong} = 130.90$ bpm vs. $M_{Mod.Inc} = 139.01$ bpm; $F(1, 281) = 2.84$, $p = .093$, and vs. $M_{Ext.Inc} = 141.59$ bpm; $F(1, 281) = 4.62$, $p < .05$), and it did so to such an extent that the two did not differ ($p = .64$). If our theorizing is correct, this should reflect in increased anxiety from compounding the tension of riding the ergometer with the tension of making sense of the incongruity.

*Emotional State.* An analysis of state curiosity ($\alpha = .87$) while controlling for trait curiosity ($F(1, 280) = 24.54$, $p < .001$) yielded a significant arousal × product congruity interaction ($F(4, 280) = 5.19$, $p < .005$). As expected, participants were more curious about the moderately incongruent extension when arousal was moderate ($M = 3.08$) rather than low ($M = 2.60$; $F(1, 280) = 12.01$, $p < .005$) or high ($M = 2.41$; $F(1, 280) = 24.29$, $p < .001$). Furthermore, when arousal was moderate, participants were more curious about the moderately incongruent extension ($M = 3.08$) than the congruent extension ($M = 2.58$; $F(1, 280) = 12.98$, $p < .001$) or the extremely incongruent extension ($M = 2.26$; $F(1, 280) = 36.48$, $p < .001$). No other effects approached significance ($p > .12$). These results replicate the curiosity effects from study 2.

The analysis of state anxiety ($\alpha = .81$) while controlling for trait anxiety ($F(1, 280) = 4.71$, $p < .001$) yielded a marginally significant arousal × product congruity interaction ($F(4, 280) = 2.07$, $p = .085$). As predicted, participants were more anxious about the extremely incongruent extension when arousal was high ($M = 2.70$) rather than low ($M = 2.06$; $F(1, 280) = 24.69$, $p < .001$) or moderate ($M = 2.35$; $F(1, 280) = 7.38$, $p < .01$). Similarly, participants were more anxious about the moderately incongruent extension when arousal was high ($M = 2.53$) rather than low ($M = 1.91$; $F(1, 280) = 23.18$, $p < .001$) or moderate ($M = 2.07$; $F(1, 280) = 12.08$, $p < .005$). Critically, when arousal was high, anxiety levels for the extremely incongruent and moderately incongruent extensions did not differ ($M_{Ext.Inc} = 2.70$ vs. $M_{Mod.Inc} = 2.53$; $p = .28$), and both encouraged more anxiety than the congruent extension ($M = 2.04$; $F(1, 280) = 21.40$, $p < .001$, and $F(1, 280) = 14.68$, $p < .001$, respectively). No other effects approached significance ($p > .14$). These results suggest that despite successful resolution, moderate incongruity evoked a similar affective valence as extreme incongruity when state arousal was high.

*Discussion.* The results of study 3 not only replicate the moderating role of state arousal in schema-based product evaluations, they further reinforce the role of distinct emotional states. Importantly, the inclusion of the high arousal condition was consistent with the prediction that state arousal alters preference by compounding the emotional intensity brought on when people attempt to make sense of incongruity. Under high arousal, state-anxiety increased for all levels of incongruity, leading to negative evaluations of the target. This occurred despite state arousal having little influence on participants' ability to resolve the incongruity. This finding suggests that the valence of the emotion is indeed being attributed to the product.

## GENERAL DISCUSSION

Our results demonstrate a dynamic relationship between state arousal and the arousal that results from making sense of incongruent products or extensions. Evidence from three studies suggests that the schema congruity effect is subject to consumers' state of arousal when they first encounter the incongruent product. This research is the first to test Mandler's (1982) fundamental assumption that there is a physiological response to resolving incongruity that corresponds with distinct emotional states. Moreover, we make the novel prediction and indeed find that because Mandler's fundamental assumption is correct, varying a consumer's state of arousal can enhance and inhibit emotional intensity and thus alter product evaluations. Importantly, this occurs without altering the resolution process.

To recap, we find that low state arousal decreases the intensity of positive affect from state-derived curiosity when people can resolve incongruity and that it decreases the intensity of negative affect from state-derived anxiety when people cannot resolve incongruity. This suggests that consumers prefer extremely incongruent products more when relaxed rather than excited but that they prefer moderately incongruent products more when excited rather than relaxed. When arousal levels were too severe, all levels of incongruity encouraged state-derived anxiety, and thus even moderate incongruity resulted in negative evaluations. This is critical as it relates to recent interests in how to manage the strong aversion consumers have to extremely incongruent products (Jhang et al. 2012; Noseworthy et al. 2011).

This work affords several important insights, particularly given the renewed interest in schema congruity theory over the last 5 years (Jhang et al. 2012; Krishna, Elder, and Caldara 2010; Landwehr, Wentzel, and Hermann, 2013; Noseworthy et al. 2011; Noseworthy, Finlay, and Islam 2010; Noseworthy and Trudel 2011; Roggeveen, Goodstein, and Grewal 2014). Where the results may have particular theoretical relevance is in reflecting on past work. Many of the existing boundary conditions of the schema congruity effect either did not require the assumption or did not explicitly test if participants failed to resolve the incongruity (e.g., Campbell and Goodstein 2001; Noseworthy and Trudel 2011; Peracchio and Tybout 1996). In fact, some moderators (e.g., perceived risk; experiential positioning) actually encouraged preference for congruity. If one accepts that risk is in and of itself arousing (Schmidt et al. 2013), as too is focusing on hedonic consumption (Zuckerman 1979), the pattern fits remarkably well with our high arousal condition in study 3. Furthermore, in conceptualizing dogmatics, Meyers-Levy and Tybout (1989) adopted a quote from Shaffer and Hendrick (1974, 602): "The open mind is regulated by a need to know and understand, whereas the closed mind is oriented to defend against anxiety and threat." Thus, incongruity may be highly arousing for dogmatic individuals. This too would fit the high arousal condition.

Alternately, in exploring the moderating role of prior knowledge, Peracchio and Tybout (1996, 188) noted that "because little elaboration is required and resolution is always achieved [for those with high prior knowledge], minimal cognitive-based affect is generated." This is consistent with the moderating role of taste or product trial: "Prior knowledge and prior expectations are likely to influence memory-based processing (e.g., the reliance on memory-based schemas) and the effort required to perform alternative [resolution] processes" (Stayman et al. 1992, 253). Perhaps consumers with prior knowledge or exposure do not have the same physiological response to incongruity, or if they do, it may be muted. These results would fit well with our low arousal condition. Future research could explore physiological arousal as a possible unifying construct for many of the observed moderators in the literature.

Beyond illustrating how they may impact past work, our findings also have implications for future research. Meyers-Levy and Tybout (1989) found that different levels of incongruity can be achieved by activating a different schema along a hierarchy, from superordinate (e.g., beverages), to basic (e.g., soft drinks), to subordinate (e.g., diet colas). Thus, what may be moderately incongruent at the basic level may be seen as extremely incongruent at the superordinate level. The results of the current work suggest that introducing a product at a different schematic level may result in a more or less severe physiological response. Future research could explore this as a potential tactic to strategically generate interest during a product launch or to avoid compounding arousal during the initial excitement of a release. In a similar vein, future research could explore the impact of specific product categories that are inherently more arousing than others (e.g., smartphones may be more exciting than toasters). Thus, would resolving incongruity in each of these categories lead to a similar physiological response? Indeed, it would be rather interesting if the mild physiological response to moderate incongruity was compounded by the inherent arousing nature of the category to such an extent that it results in negative evaluations (consider the high arousal condition in study 3).

This work also lends a cautionary note. Given the general lack of evidence confirming the role of physiological arousal in schema-based evaluation, many scholars have abandoned the idea. This has led some to use schema congruity theory to explain how consumers respond to any innovation that is novel. We suggest that the theory may not be appropriate in instances where the new product affords greater utility (i.e., radical innovation). For instance, it may not be schema congruity if the Dyson Bladeless Fan is evaluated more favorably than a normal fan, despite that a measure of typicality would show it was indeed incongruent with one's normative expectations for what a fan ought to be. Are evaluations increased because of the emotional response to resolving the incongruity, or are they increased because the fan boasts superior performance over existing models? In such an example, increased utility can confound the evaluation results. Mandler's (1982) theory is not predicated on the utility of the object but on the arousal potential of the act of discovery. Thus, it is critical that researchers isolate where participants' affect is coming from. This was done particularly well by Jhang et al. (2012).

From a substantive perspective, the results lend some unique insights into various marketing tactics that could assist in introducing incongruent products. Specifically, new products that violate consumers' schematic representations may fare better under relaxed and calm positioning. This currently is at odds with the contemporary push to make the rollout of technological innovations exciting. This practice may only benefit incremental adjustments that can be easily assimilated, whereby the tactic creates a consistency between the object's optimal arousal potential and the arousal derived from the marketing campaign.

Finally, this work is in line with recent efforts to highlight the role that discrete emotions play in consumption (Di Muro and Murray 2012; Di Muro and Noseworthy 2013; Pham

2001). New products indeed encourage state-driven curiosity, but they do so only up to a certain point. When they are too incongruent with one's schematic expectations, new products become taxing and manifest state-derived anxiety. Consistent with the valence of these emotions, the resulting outcome is higher evaluations for moderately incongruent products and an aversion to extremely incongruent products. It is worth noting that in no study did varying state arousal increase evaluations for congruity. Although this was rather surprising given the wealth of evidence that incidental arousal, particularly from exercise, can intensify the affect elicited by a target (Reisenzein 1983; White, Fishbein, and Rutstein 1981), we speculate that this null effect had more to do with the relatively benign affect generated from our selection of congruent products. Indeed, being aroused and then seeing what would constitute an average-looking soft drink bottle is quite different from a male being aroused and then seeing an attractive female (White et al. 1981). In sum, there has been a great deal of recent interest in exploring when and how marketers can help curb the downward slope in preference for extreme incongruity. Similarly, increased attention has been put on the role that arousal plays in framing product choice. The cumulative results from the current work suggest one of the simplest methods to help facilitate the introduction of extremely incongruent products may be to facilitate consumer relaxation.

## DATA COLLECTION INFORMATION

The first author supervised the collection of all data by a team of research assistants at the University of Guelph's NOESIS behavioral lab in the fall, winter, and summer of 2014. The first author analyzed these data along with an RA trained in biometric recording.

## APPENDIX A

**FIGURE A1**

STIMULI FOR STUDY 1

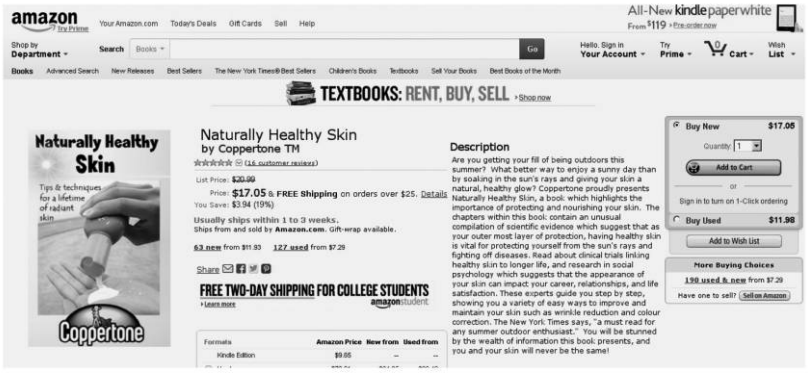
# APPENDIX B

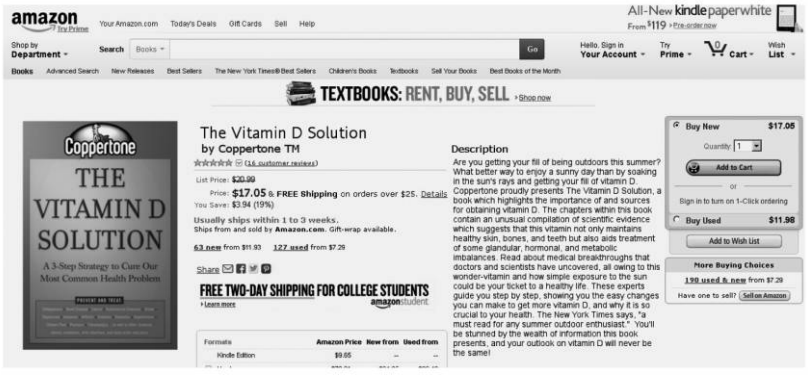
## FIGURE B1

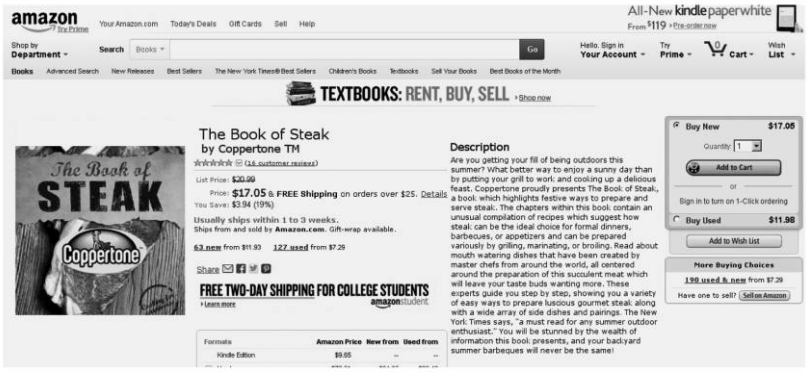
STIMULI FOR STUDY 2

# APPENDIX C
## FIGURE C1

STIMULI FOR STUDY 3



# APPENDIX D
# METHODOLOGICAL DETAILS

## Study 1

The A′ index is computed from Hit ($H$) and False Alarm (FA) rates as follows:

$$\text{If } H > \text{FA}: A' = 0.5 + [(H - \text{FA})(1 + H - \text{FA})]/[(4H(1 - \text{FA})].$$

$$\text{If FA} > H: A' = 0.5 - [(\text{FA} - H)(1 + \text{FA} - H)]/[(4\text{FA}(1 - H)].$$

## Study 2

Participants' GSR was monitored using a constant voltage system (iWorx Four Channel Computer Interface with Two Built-In Isolated Biopotential Amplifiers and LabScribe2 Data Recording Software; IX-214). Skin conductance was recorded using Ag/AgCl electrodes (A-GC-7165; 0.8-cm diameter) attached to the volar surface of the third digit of the left hand and absolute measures of skin conductance were recorded (a procedure followed by Taylor, Liberzon, and Koeppe 2000). An electrode paste (Johnson & Johnson K-Y gel) was placed on the electrodes in order to increase skin conductance. The SCRs were sampled at a rate of 1,000 per second. GSR was selected as the measure of arousal following evidence that SCRs are a particularly good measure of physiological arousal in the context of media research (Krahé et al. 2011; Ravaja 2004). Eighteen participants were removed due to excessive movement rendering their SCRs unreliable (original $N = 162$).

## Study 3

Respiration and cardiac cycle was captured on an iWorx PT-104. Using LabScribe2 software, heart rate was calculated using built in pattern recognition functions. Specifically, this function analyzed the pressure waves caused by cardiac contractions and worked to count the periods of peak systolic pressure. In addition, a valid range of beats per minute was specified in order to remove anomalies (these were typically due to a poor signal caused by movement as a sudden jerk could result a sharp spike or drop in the computed heart rate). Any readings higher than 202 bpm or lower than 36 bpm were discarded. After the beats per minute for each sample were calculated, an average was computed over the length of 60 seconds to yield a final beats per minute reading specific to each participant.

## Note

All simple effects and pairwise comparisons were analyzed using the "COMPARE" and "CONTRAST = SPECIAL" syntax in SPSS, as opposed to splitting the file with two or more unique error terms. Therefore, the degrees of freedom shown in text for each comparison represent a pooled error term (thus the inflated denominator degrees of freedom) from the full ANOVA. The degrees of freedom should not be mistaken for indication of how many individuals made up the comparison.

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