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On the Cognitive Origins of Aesthetic Pleasure

A dissertation submitted in partial satisfaction of the requirements for the Degree of  
Doctor of Philosophy

in

Psychology

by

Troy Thomas Chenier

Committee in charge:

Professor Piotr Winkielman, Chair  
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2010

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Chair

University of California, San Diego

2010

## TABLE OF CONTENTS

Signature Page.....	iii
Table of Contents.....	iv
List of Figures.....	v
List of Tables.....	vi
Acknowledgements.....	vii
Vita.....	x
Abstract.....	xi
General Introduction.....	1
Chapter 1.....	14
Chapter 2.....	40
Chapter 3.....	60
Chapter 4.....	87
Chapter 5.....	131
General Discussion.....	176
References.....	201

## LIST OF FIGURES

Figure 3.1: General pattern of results from the Bornstein and D'Agostino (1994) and Lee(1994) studies showing liking for old and new items as a function of belief about prior exposure.....	71
Figure 3.2: Results of the present study showing liking for old and new prototypes as a function of belief about prior exposure.....	76
Figure 5.1: Camel and phone sketches used in studies 2a-2d. All sketches were taken from Snodgrass and Feenan (1990).....	162

## LIST OF TABLES

Table 4.1: Literature review comparing liking for objectively old to objectively new items within recollective state.....	96
Table 4.2: Literature review comparing liking for items believed old to those believed new within objective familiarity.....	99
Table 4.3: Proportion of items claimed old (for hits and false alarms) and new (for misses and correct rejections) and reaction time (in milliseconds) to make the decision.....	119

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“You either care or you don't, and I simply don't know where to draw the line between those two points.”

~Stanley Kubrick

“Research is what I'm doing when I don't know what I'm doing.”

~Wernher Von Braun

“Many of the great achievements of the world were accomplished by tired and discouraged men who kept on working.”

~Unknown

“I have never thought of writing for reputation and honor. What I have in my heart must come out; that is the reason why I compose.”

~Ludwig Van Beethoven

“The important thing in science is not so much to obtain new facts as to discover new ways of thinking about them.”

~Sir William Bragg

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Chapter 3 is currently being prepared for submission for publication. Chenier, Troy. “The perceptual fluency/attribution model of the mere-exposure effect: A failure to find evidence.” The dissertation author was the primary investigator and author of these materials.

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Chapter 5 is currently being prepared for submission for publication. Chenier, Troy. “The striving for and the acquisition of meaning: On the origins of aesthetic pleasure.” The dissertation author was the primary investigator and author of these materials.

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Chenier, T. (In Preparation). How recollective state interacts with objective familiarity to shape preference.

Chenier, T. (In Preparation). The striving for and the acquisition of meaning: On the origins of aesthetic pleasure.

ABSTRACT OF THE DISSERTATION

On the Cognitive Origins of Aesthetic Pleasure

by

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Doctor of Philosophy in Psychology

University of California, San Diego, 2010

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The purpose of the present thesis was to characterize the cognitive mechanism that underlies aesthetic pleasure. This problem was attacked using a bottom-up and a top-down approach. The concern of the bottom-up approach was to elucidate the mechanism responsible for a number of well-established historical (i.e., learning-based) preference effects – the mere-exposure effect, preference for prototypicality and structural-relation preferences. Critical literature reviews and empirical results from a

number of experiments that employed a category learning procedure established that these preference effects are best conceptualized as stemming from conscious and inferential processes, that is, from the strategic use of either processing fluency, feelings of familiarity or explicit recognition to determine liking. The concern of the top-down approach was to empirically examine the often articulated notion that aesthetic pleasure may be traced to a psychological process involving ‘the striving for and the acquisition of meaning’. Using a procedure in which participants were first given an impoverished passage or picture to make sense of before being given the full passage or picture to evaluate, the results of a number of experiments showed that the more participants had to strive after meaning (the more impoverished the preceding passage or picture became) the more pleasure that was engendered upon the acquisition of that meaning (the more favorably they subsequently evaluated the full passage or picture). The findings from both approaches led to the following cognitive characterization of aesthetic pleasure: it consists of a ‘meaning making’ process in which difficult and uncertain processing (as one strives for meaning) gives way to easy and certain processing (when one acquires meaning) to produce feelings of relief (because one’s exertions have abated) and joy (because of the challenge that was successfully overcome in acquiring meaning). The relevance of this ‘meaning making’ process for our understanding of a number of preference effects is discussed.

## GENERAL INTRODUCTION

The concern of the present thesis is to characterize the cognitive mechanism that underlies aesthetic pleasure: what set of psychological processes might lead someone to proclaim that some segment of their experience is satisfying or pleasant and that some focal stimulus is preferable or likeable? It's important to emphasize at the outset, however, that in attempting to answer this question no consideration will be given to *what* is being processed, that is, to either the formal properties (e.g., colors or shapes) or semantic aspects (e.g., positive or negative connotations) of the stimulus under consideration. Instead, the aim here is to understand how aesthetic pleasure may arise from the dynamics of information processing, that is, from *how* cognitive processes execute. To accomplish this, both a bottom-up and a top-down-approach are employed. The bottom-up approach starts with an empirically well-defined preference effect and from there tries to elucidate theoretical mechanism, whereas the top-down approach starts with a well-defined theoretical mechanism and from there tries to obtain empirical support for it. The idea, ultimately, is to synthesize the findings from each of these approaches into a concise characterization of the cognitive mechanism that underlies aesthetic pleasure. Each approach is detailed in turn.

### **Bottom-Up Approach – In Search of the Mechanism for Historical Preferences**

Much of the research into the psychology of preference development has focused on how a prior experience with a domain may influence the subsequent appeal of the same or related items from that domain. These historical preference effects come in several forms: the mere-exposure effect – the finding that repeated, unreinforced exposure to a stimulus is sufficient for the development of a preference for that stimulus (e.g., Zajonc, 1968; Moreland & Zajonc, 1976; Bornstein, 1989); the preference for

prototypicality – the finding that more typical or averaged members of familiar categories are preferred over less typical or less averaged members (e.g., Martindale & Moore, 1988; Rhodes & Tremewan, 1996; Halberstadt & Rhodes, 2000; 2003); and structural relation preferences – the finding that novel items that are structurally related to previously learned categories are preferred to novel items that bear little structural relationship to these categories (e.g., Gordon and Holyoak, 1983; Sollberger and Reber, 2004). Given that the goal of psychologists has been to understand how the past may shape preference without appealing to the properties of the historical item in question, it stands to reason that if one wanted to find a source for aesthetic pleasure apart from formal properties or semantic associations that this would be a good place to start. Unfortunately, as it turns out, though the accumulated corpus of research into historical preference effects leaves little doubt about the power of the past to shape preference, there still is no consensus as to the nature of the mechanism responsible for producing such effects. The aim of the first part of the present thesis, therefore, is to try to pinpoint what this mechanism might be. I set the stage for this inquiry by first providing a theoretical overview of current thinking on the matter before spelling out the issues that are in need of further theoretical and empirical scrutiny.

### **Historical Preference Effects – Theoretical Overview**

Generally speaking, the multitude of theories that have been proposed to explain historical preference effects may be conveniently placed into one of two classes. One class of explanations maintains that such effects emerge via unconscious and noninferential processes, while a second class of explanations holds that such effects are



the result of more conscious and strategic mechanisms. Each of these is considered in turn.

### **Unconscious and Noninferential Explanations**

Theories falling within this class hold that the past shapes preference directly by engendering positive affect. Zajonc (1968; 2001), for example, argues that historical preference effects may best be understood in terms of a unique form of associative learning, namely, in terms of the contingencies associated with exposure to the stimulus. Specifically, he suggests that during initial exposure to a novel item there are two tendencies activated that work in opposition to one another: approach and avoidance. Because, however, there are no negative consequences during initial exposure, only the approach tendency is reinforced. As such, when the item is subsequently reencountered, the tendency to approach the item is stronger than the tendency to avoid it. The result is that the organism has a more positive affective response towards the repeated item and, therefore, comes to prefer it over its novel counterpart. Reber, Schwarz and Winkielman (2004) also argue in favor of an affective basis for historical preference effects, except they trace the source of the affect to the dynamics of information processing. Specifically, they posit that a prior encounter with a stimulus increases the fluency (ease) with which the stimulus is processed. Being that the repeated stimulus is easier to process, it carries with it a hedonic tone. Their claim is that it is this hedonic tone in-and-of-itself that is responsible for more favorable stimulus evaluation. Despite these differing explanations for the source of the affective response, both accounts make it clear that cognitive mediation is not required for the past to shape preference; instead,

their common claim is that the past shapes preference directly via unconscious and noninferential affective processes.

### **Conscious and Inferential Explanations**

Theories falling within this class hold that the past shapes preference indirectly via some cognitive route. Berlyne (1970) and Stang (1974), for example, posit that historical preference effects may best be understood in terms of non-associative learning, namely, in terms of processes of recognition. Specifically, they suggest that prior exposure to the stimulus makes the stimulus more familiar and recognizable. This reduces uncertainty associated with the stimulus, thus producing a more positive affective response and, ultimately, a more favorable evaluation. Similarly, Bornstein and D'Agostino (1992) also argue in favor of a cognitive route. Instead of implicating familiarity, however, they suggest, like Reber, Schwarz and Winkielman (2004), that the mediating mechanism is processing fluency. However, unlike the latter theorists, they maintain that fluency does not influence preference directly by engendering positive affect. Rather, they argue that in order for the past to shape preference, the enhanced fluency must be attributed to the quality of the stimulus itself; if it is attributed to something else (e.g., a prior encounter), the stimulus will not be evaluated more favorably. Other theorists, like Whittlesea (1998) and Dechene, Stahl, Hansen and Wanke (2009), though they agree that enhanced fluency leads to greater liking via some process of attribution, are careful to emphasize that it is only when this enhanced fluency becomes discrepant from situational contingencies (i.e., when fluency is higher than expected) that it becomes a salient and, therefore, a convenient basis for evaluative discrimination. The common claim of these theories, then, is that the past shapes

preference indirectly via a conscious and inferential cognitive route: either from an inference that the item has been seen before (e.g., more familiar items are more likeable) or in the form of the strategic use of those stimulus properties that have been influenced by prior exposure (e.g., more fluently processed items are more likeable).

### **Historical Preference Effects – Issues of Concern**

Given the previous theoretical overview of current thinking on the mechanism underlying historical preference effects, several issues are brought to the fore that beckon for further theoretical and empirical scrutiny. The most obvious, of course, is whether such effects may best be understood in terms of unconscious and noninferential or conscious and inferential processes. In the event that the former is correct, then one would need to tackle the issue of whether the mechanism is even a cognitive one to begin with: is preference for the historical stimulus, as the hedonic fluency model suggests, a byproduct of affect engendered from easy information processing or, as the associative learning account suggests, is it the result of affect engendered from conditioning? On the other hand, if the latter were to prove correct, then one would need to deal with the issue of the role that familiarity plays in bringing about the effect: is preference for the historical stimulus, as the perceptual fluency/misattribution model suggests, based solely on the fluency signal itself or, as the uncertainty reduction model suggests, might it also be based on the resultant feeling of familiarity? It is these issues, then, that represent the focus of the bottom-up approach to studying aesthetic pleasure.

### **Top-Down Approach – In Search of the Mechanism Underlying Aesthetic Pleasure**

The long literary and philosophical history of inquiry into the nature of the aesthetic experience has generated countless descriptions and endless explanations, some

convoluted, others esoteric, many, frustratingly, contradictory. This may explain why it is so difficult to find studies on preference within the psychological literature that have as their origins this corpus of writings; it is far easier to further extant research traditions by tweaking parameters in well-established paradigms than to deduce theoretical constructs from a complicated literature and establish new paradigms for empirically testing them. Yet this is the stated aim of the second part of the present thesis. I begin this inquiry by first briefly reviewing psychologically oriented explications of the aesthetic experience. In so doing, I focus on uncovering the commonalities among otherwise disparate musings of prominent aesthetic thinkers. I then set the stage for the empirical work that follows by synthesizing their thoughts into an empirically testable theoretical construct, one that purports to explain, at least in part, the origins of aesthetic pleasure.

### **The Aesthetic Experience – Overview of Theoretical Explications**

In what is perhaps the most comprehensive psychological description of the aesthetic experience, Kate Hevner (1937) traces the essence of the experience to the struggle that is involved in making sense of the stimulus scene, be it a painting, a piece of music or a dancer's movements. It is the consciousness of difficulty overcome, the felt want realized in the course of this process, she emphasizes, that imbues the experience with its satisfaction, its pleasure. And the deeper the want, the more difficult the struggle to achieve the desired perceptual or conceptual configuration, the greater the pleasure felt upon its realization. Indeed, for Hevner so important is this sense-making process for bringing about the aesthetic experience that once there is nothing left to be made sense of – no new element to be discovered and no new connections to be made – the stimulus scene will cease to be pleasant, even becoming objectionable.

Hevner's emphasis on the importance of this sense-making process for the aesthetic experience was subsequently echoed by the well-known art theorist Rudolph Arnheim (1954). Being a student of the Gestalt psychologists Wertheimer, Kohler and Koffka, Arnheim firmly ensconces the aesthetic experience within the Gestalt principles of perceptual organization. In particular, he place emphasis on the superordinate principle of *pragnanz*: that ill-structured stimulus environments create tension and that this tension motivates the viewer to seek relief via the realization of ever better, more clear-cut perceptual configurations. This, according to Arnheim, explains why we tend to makeover irregular and unusual stimuli – why, for example, we remember an asymmetrical figure as being symmetrical or an incomplete figure as being complete; it must to some degree be relieving and, therefore, pleasurable to do so. Similarly, then, as we make sense of a work of art – as ambiguities are cleared-up and as poorer gestalts give way to better ones – tensions abate and pleasure is engendered.

Arnheim's ideas were later picked up and expounded upon by the highly acclaimed art theorist Ernst Gombrich (1979). Like Arnheim, Gombrich stresses the importance of achieving a sense of order for bringing about the aesthetic experience. Unlike Arnheim, however, he is careful to emphasize that the order that is ultimately achieved really only grabs our attention when it is contrasted against some disorder: that the potency of our reaction to the apprehension of some lawful configuration is to some degree dependent upon the unlawfulness of the circumstances from which it arises. As he explains, imagine if we threw a bucket of paint at a canvas and it resulted in some meaningful configuration, such as a portrait or a landscape; as there are so many ways the paint could land, we would expect very few to assume configurations that we could name

or recognize in any terms. Just as our reaction would be one of astonishment in this situation, then, so too is our reaction when we manage to apprehend some configuration that, given the circumstances, turns out to be particularly rare, well-articulated or meaningful.

Recapitulating the processes forwarded by the previous theorists, Ramachandran and Hirstein (1999), in formulating a neurological theory of the aesthetic experience, go on to conjecture about the supporting neural architecture. Specifically, they suggest that in making sense of some stimulus scene, when correlations are discovered that confirm the veracity of a hypothesis about the existence of some configuration, the limbic system provides reinforcement. This reinforcement stabilizes the bond between the correlated elements and in-so-doing encourages the search for further elements that may be integrated into the unfolding whole. They emphasize that it is this reinforcement – the reward received at each step along the way in the course of solving perceptual and conceptual puzzles – that is what makes, in part, our experiences with works of art so pleasurable.

### **Aesthetic Pleasure –Theoretical Formulation of its Origins**

Despite their superficial differences, these aesthetic theorists seem to concur that the pleasure that attends the aesthetic experience may be traced, at least in part, to the act of striving for meaning itself: to the *struggle* involved in making sense of the stimulus scene (Hevner); to the *shift* from ambiguous and poorly structured perceptual configurations to clear and well-defined ones (Arnheim); to the *contrast* between the order that is ultimately apprehended and the disorder that precede it (Gombrich); and to the *discovery* of relationships that clear-up and resolve perceptual and conceptual puzzles

(Ramachandran and Hirstein). The implication, then, is clear: if we want to understand the nature of aesthetic pleasure, we would do well to focus on the hedonics of a psychological process that involves ‘the striving for and the acquisition of meaning’. It is the empirical examination of this theoretical construct, then, that represents the focus of the top-down approach to studying aesthetic pleasure.

### **Thesis Overview**

The present thesis consists of five freestanding chapters. Each chapter addresses one of the aforementioned issues. The first four chapters concern the issues of the bottom-up approach whereas the fifth chapter concerns the issues of the top-down approach. More specifically, chapters 1 and 2 address the issue of whether it is best to conceptualize the mechanism underlying historical preference effects as unconscious/noninferential or as conscious/inferential; chapters 3 and 4 address the issue of the role that recognition plays in bringing about historical preference effects; and chapter 5 addresses issues associated with the hedonics of ‘the striving for and the acquisition of meaning’. A brief outline of how the theoretical and empirical work of each chapter examines these issues is provided below.

In Chapter 1, after discussing difficulties associated with previous approaches to pinpointing the mechanism underlying mere-exposure effects, a novel empirical approach that involves inducing boredom within a mere-exposure paradigm is employed to distinguish between unconscious/noninferential and conscious/inferential theories. The rationale behind this manipulation is as follows. If mere-exposure effects are based on conscious and inferential processes, since boredom has been shown to impair memory and to reduce motivation, bored participants should be less able and/or inclined to use

familiarity as a basis for determining preference; as such, bored participants should exhibit impaired mere-exposure effects. If, however, mere-exposure effects are based on unconscious and noninferential processes, since preference here presumably accrues automatically via a hedonic response, bored participants should not exhibit impaired mere-exposure effects.

In chapter 2, the evidence often cited in favor of unconscious and noninferential theories of mere-exposure effects is gathered together and scrutinized. The purpose in doing so is to critically examine and ultimately determine whether these findings are strong enough to sustain the long held assertion that historical preferences require no inferences.

In chapter 3, the role that recognition plays in bringing about historical preference effects is examined by looking at two studies that attempted to artificially manipulate (via instructional manipulations) beliefs about prior exposure. Unfortunately, since the two studies obtained contradictory results, their findings do not allow us to draw any firm conclusions regarding how recognition might affect historical preference formation. In reviewing their paradigms, however, it is determined that the opposing results may be traced to demand characteristics of their instructional manipulations: that participants' evaluations of repeated and nonrepeated items may reflect their reaction to what they were *told to believe* as opposed to what they *actually believed* about prior exposure. To clarify the situation, the basic paradigm of these studies is replicated except that participants are not explicitly told what has or has not been presented before; instead, they are merely biased towards adopting one belief over the other via more subtle situational cues. With evaluations of the items thus reflecting spontaneously engendered



beliefs about prior exposure, this should provide us with a more ecologically valid and thus definitive test of how recognition might influence historical preference formation: whether believing an item has been seen before impairs (as suggested by the perceptual fluency/misattribution model) or augments (as suggested by the uncertainty reduction model) preference.

In chapter 4, to determine whether the perceptual fluency/misattribution model or the uncertainty reduction model provides a better explanation for mere-exposure effects, the results from all those mere-exposure studies that have coupled recognition with liking judgments are reviewed. If the perceptual fluency/misattribution model is the more viable model, given it holds that recognition should impair liking, we should see old and new items that are believed to be new consistently preferred to old and new items that are believed to be old: misses > hits and correct rejections > false alarms. If, however, the uncertainty reduction model is the more viable model, given it holds that recognition should augment liking, we should see old and new items that are believed to be old consistently preferred to old and new items that are believed to be new: hits > misses and false alarms > correct rejections. This analysis is then followed by novel empirical work that uses a recognition-liking category learning paradigm to examine how beliefs about prior exposure influence liking for two other historical items, namely, prototypes and structurally-related items.

In chapter 5, the hedonics of ‘the striving for and the acquisition of meaning’ is empirically tested over several experiments using a procedure in which participants are first given an impoverished or clear passage or picture to make sense of before being given the final, clear passage or picture to evaluate. If striving for meaning increases the

pleasure of its subsequent acquisition, then we should find more positive evaluations for the passages and pictures when they are preceded by impoverished versions (where participants have to struggle to abstract out meaning) than when they are preceded by clear ones (where participants do not have to struggle to abstract out meaning). In addition, to the extent that ever greater striving for meaning produces ever greater pleasure when that meaning is acquired, we should find ever more positive evaluations of the clear passages and pictures as the versions that precede them become ever more impoverished.

The major theoretical and empirical results from these studies are subsequently summarized in the general conclusion. A synthesis of the findings from the bottom-up and top-down approaches is then attempted, with the goal being to fulfill that which was promised at the outset: to provide a concise characterization of the cognitive mechanism that underlies aesthetic pleasure.

## CHAPTER 1

Bored Participants Do Not Show Mere-Exposure Effects: So Preferences Do Need  
Inferences?

### Abstract

Bornstein, Kale and Cornell (1990) presented two pieces of evidence in support of the notion that a 'state of boredom' may be a limiting condition on the mere-exposure effect: 1) boredom-proneness abolished the effect and 2) greater experiment length reduced the strength of the effect. Since boredom was not properly manipulated and measured in these experiments, however, doubts may be raised as to whether boredom was in fact the mediating process. The present study sought to rectify this situation and in-so-doing to better characterize the relationship between the 'state of boredom' and mere-exposure by manipulating and measuring two components of boredom – arousal and affect – across two mere-exposure experiments. In Experiment 1, while mere-exposure effects were observed in a low boredom (higher arousal/more positive affect) condition, they were not observed in a high boredom (lower arousal/less positive affect) condition. In Experiment 2, lowered affect was found to be insufficient in-and-of-itself to abolish mere-exposure effects, thus suggesting that the null results for the previous experiment were due to lowered arousal. Further analyses suggest that the high boredom condition in Experiment 1 likely produced the null results by biasing participants away from using a feeling of familiarity for evaluatively discriminating between items, thus providing support for a conscious/inferential interpretation of mere-exposure effects.

## Bored Participants Do Not Show Mere-Exposure Effects: So Preferences Do Need Inferences?

The mere-exposure effect is the enhancement of regard for a stimulus following repeated, unreinforced exposure to that stimulus (Zajonc, 1968). After twenty years of studies into the phenomenon, Bornstein (1989) reviewed the available research and reported that the mere-exposure effect was reliable and robust. However, he also noted several conditions that seemed to reduce the strength of the effect: more stimulus exposures (in particular, greater than 10-20), longer stimulus exposures, homogeneous (as opposed to heterogeneous) exposure sequences, and the use of simple (as opposed to more complex) stimuli. But why do these factors reduce the strength of the mere-exposure effect? One possibility is that they do so by inducing boredom: either by making the stimulus itself more boring or by making participants more bored overall. Bornstein, Kale and Cornell (1990) subsequently examined how both kinds of boredom might affect mere-exposure. In regards to boredom attached to a stimulus, they observed a stronger mere-exposure effect for more interesting stimuli (illusory figures) than for less interesting stimuli (Welsh figures), and this was true regardless of whether those stimuli appeared in the same condition (Experiment 2) or in separate conditions (Experiment 3). This evidence is particularly compelling because they found that stimulus interestingness interacted with exposure frequency, with affect ratings for more interesting stimuli rising more rapidly across increasing exposure frequency than for less interesting stimuli. In regards to how a 'state of boredom' affects mere-exposure, they made two observations. First, they observed that *boredom-proneness* completely abolished the effect: while interested participants continued to evaluate stimuli more

positively even through 50 exposures, those highly prone to boredom failed to show any mere-exposure effect whatsoever (Experiment 1). Second, they observed that greater *experiment length* impaired the effect: a longer experiment (more overall exposures) produced a downturn in affect ratings at higher exposure frequencies (at 10 exposures) (Experiment 2), whereas a shorter experiment (fewer overall exposures) produced increasingly positive affect ratings through the maximum number of exposures used (through 50 exposures) (Experiment 3). While this evidence is certainly suggestive of the fact that a ‘state of boredom’ may reduce the strength of the mere-exposure effect, a closer look reveals it to be less than compelling.

### **Bornstein, Kale & Cornell (1990) – Does Boredom Impair Mere-Exposure?**

#### **1. Boredom-proneness**

Though in the first experiment of Bornstein, Kale and Cornell (1990) it appears as if a ‘state of boredom’ was responsible for abolishing the mere-exposure effect, it’s important to point out that boredom was not actually manipulated. Instead, participants were classified as being high or low in boredom-proneness according to a score they received on the Boredom Proneness Scale of Farmer and Sundberg (1996), which is a scale that assesses the degree to which participants see themselves as boredom-prone and the degree to which they are bored in day-to-day situations. Unfortunately, as there are many variables associated with being highly prone to boredom, we cannot conclude in this case that it was boredom per se that adversely affected mere-exposure. It’s quite possible, for example, that high boredom-prone participants were simply less enthused about participating in the experiment and that it was this negative attitude as opposed to boredom per se that was responsible for the null results. Indeed, Burgess and Sales

(1971) previously found that participants' attitudes towards the experiment were predictive of the strength of the mere-exposure effect: those holding positive attitudes showed strong mere-exposure effects while those holding negative attitudes showed no mere-exposure effects at all.

## **2. Experiment length**

Though Bornstein, Kale and Cornell (1990) operationalized boredom in terms of overall study length, it's unclear if the downturn observed at 10 exposures in the long experiment was really due to a 'state of boredom'. First, though they required participants to rate the stimuli on an interesting-boring dimension, they did not obtain a measure of how bored participants were overall. As such, we have no way of knowing whether participants in the long experiment really were more bored than those in the short experiment. Second, the two experiments differed from one another in more than just their length. In the long experiment participants rated two different kinds of stimuli (both optical illusion *and* Welsh figures) while in the short experiment they only rated one (either optical illusion *or* Welsh figures). This fact in combination with the use of an interesting-boring scale as one means of measuring affect (the other being like-dislike) may have biased participants in the long experiment towards the belief that the purpose of the study was boredom. If so, then a convenient rule may have been adopted for evaluative purposes: give frequently seen items lower affect ratings than infrequently seen items. This possibility casts some doubt on whether it really was a 'state of boredom' that was responsible for the downturn in affect that was observed for frequently seen items. Third, the only other study to employ this paradigm actually obtained opposite results. Specifically, Van Den Bergh and Vrana (1998) found that a shorter

experiment (fewer overall exposures) produced a downturn in liking ratings (at 27 exposures) whereas a longer experiment (more overall exposures) produced increasing liking through the maximum number of exposures used (through 27 exposures). This contradictory finding only serves to make Bornstein, Kale and Cornell's (1990) interpretation of their results – that it was boredom in the long study that was responsible for the downturn in affective responding – that much more speculative.

In short, it's difficult to definitively characterize how a 'state of boredom' affects mere-exposure from these experiments because boredom was not properly manipulated and measured. But why should we care so much about how a 'state of boredom' affects mere-exposure? We should care because the outcome may have important repercussions for our understanding of the mechanism underlying the mere-exposure effect itself.

### **Boredom and the Mere-Exposure Effect – A Route to Understanding Mechanism**

Generally speaking, the multitude of theories that have been proposed to explain the mere-exposure effect may be conveniently divided into two classes. One class of explanations maintains that the past shapes preference directly via unconscious and noninferential processes – via positive affect engendered from either associative conditioning (Zajonc, 1968; 2001) or processing fluency (Reber, Schwarz & Winkielman, 2004) – and, as such, that cognitive mediation is not required. A second class of explanations holds that the past shapes preference indirectly via conscious and inferential processes – via the strategic use of either processing fluency (Bornstein & D'Agostino, 1992; Whittlesea, 1998; Dechene, Stahl, Hansen & Wanke, 2009) or feelings of familiarity (Berlyne, 1970; Stang, 1975) – and, as such, that cognitive mediation is required. Previous attempts to resolve the debate between these two classes



of explanation has focused on obtaining the mere-exposure effect in the absence of recognition. The idea is that if participants cannot recognize what they have seen before, then conscious and inferential processes cannot be driving liking. To this end, researchers have attempted to impair recognition of repeated stimuli either by presenting stimuli subliminally (e.g., Kunst-Wilson & Zajonc, 1980) or by using a divided attention task (e.g., Wilson, 1979) during exposure. Using such methodology, researchers found greater preference for mere-exposed items even though recognition was at chance levels. Despite claims to the contrary, however, this does not represent irrefutable evidence for the unconscious and noninferential position. This is because when recognition has been assessed in terms of familiarity (i.e., “What is your *sense* that the item is old?”), liking has been found to closely parallel familiarity-based recognition (e.g., Bonanno & Stillings, 1986). As such, we cannot rule out the possibility that participants in these paradigms were using a conscious and inferential mechanism to determine preference.

Although it appears that we cannot eliminate familiarity entirely, what we still can do is to discourage its use for evaluative purposes. Unfortunately, subliminal and divided attention tasks, if anything, are likely to encourage the use of familiarity; in such paradigms, participants to some extent must become curious as to the stimuli that are being hidden from them at exposure and, as such, will no doubt be sensitive to such stimuli during the rating phase. Accordingly, any sense that an item has been seen before will be rewarding and, consequently, will prompt more positive evaluations.

So how might we discourage participants from using a familiarity-based strategy for evaluative purposes? We bore them. As boredom has been shown to reduce vigilance (e.g., Sawin and Scerbo, 1995) and impair memory (e.g., Carriere, Cheyne and Smilek,

2008), bored participants should be less sensitive to differences in familiarity between items when rating them and, therefore, should be less likely to use it as a basis for evaluative discrimination. Even with this expected memory impairment, however, as boredom is associated with a lack of motivation (e.g., Vodanovich, Weddle and Piotrowski, 1997), bored participants should be more likely to simply “go through the motions” and, therefore, should be less likely to concoct a familiarity-based strategy for evaluatively discriminating between items. For these reasons, then, if the mere-exposure effect is in fact based on conscious and inferential processes, then bored participants should exhibit an impaired mere-exposure effect. Importantly, however, if the mere-exposure effect does not depend on conscious and inferential processes, but rather is being driven by unconscious and noninferential ones, then bored participants should exhibit no such impairment. This prediction follows directly from the assertion by the latter that the only requirement for the mere-exposure effect is that that the items of concern be exposed to the sensory receptors of the organism (see Zajonc, 2001). It stands to reason, then, that no matter how bored participants might become, as long as their eyes remain fixated on the area of exposure, even with reduced vigilance (lapses in attention), impaired memory and a lack of motivation to rate repeated items higher, they should still exhibit the mere-exposure effect: repeated exposure to items should engender positive affect and, thus, should (unconsciously) bias participants towards rating them more favorably.

### **The Present Study**

The previous review established: 1) that we still do not know how a ‘state of boredom’ affects mere-exposure, and 2) that studying how boredom affects mere-

exposure can elucidate the mechanism underlying the effect itself. The purpose of the present study, therefore, was twofold: 1) to properly manipulate and measure two aspects of boredom – arousal and affect – and in-so-doing to better characterize how boredom affects mere-exposure, and 2) to use this design as an opportunity to test between two general classes of explanation for the mere-exposure effect – unconscious/noninferential versus conscious/inferential.

### **Experiment 1**

In reviewing the Bornstein, Kale and Cornell (1990) studies, one confound that was identified was their use of multiple exposure frequencies. As pointed out, the reduction in liking at higher exposure frequencies may not have been due to boredom per se; rather, it may have been the result of demand characteristics: participants arriving at the belief that the purpose of the study was boredom (e.g., “I’ve seen some of these items more than others. I guess this is about how many times I can see the same item before I get bored of it. Fine, I’ll give more frequently seen items lower liking ratings than less frequently seen items.”). Given that a mere-exposure effect emerged in their study after only a single exposure, the use of multiple exposure frequencies appears to be unnecessary. As such, to avoid complications associated with this design, the present study employed a single exposure frequency protocol. Specifically, using a modified version of Posner and Keele’s (1968) category learning procedure, participants first viewed a category of dot patterns whereby each exemplar was viewed only once and then made liking judgments on a number of test patterns. There were six test patterns: three old patterns (patterns related to the category that they were just exposed to) and three new patterns (patterns unrelated to the category that they were just exposed to). More

specifically, the three old patterns consisted of: an old seen pattern (a pattern that was previously seen), an old unseen prototype pattern (the previously unseen prototype pattern for the category that they were just exposed to), and an old unseen generic pattern (a previously unseen generic pattern from the category that they were just exposed to). The three new patterns were taken from a category that was not previously seen: two generic patterns and the prototype pattern. These latter patterns served as controls for assessing any gain in liking that might arise for the former patterns as a result of prior exposure to categorical structure. This design permitted three different types of exposure effects to be examined: 1) the classic mere-exposure effect – by comparing liking for old seen patterns to new generic patterns, 2) the preference for prototypicality – by comparing liking for old unseen prototype patterns to new prototype patterns, and 3) the preference for structurally related stimuli – by comparing liking for old unseen generic patterns to new generic patterns.

To assess how boredom might influence these exposure effects, a Degree of Boredom manipulation was employed in which there were two conditions: a *high boredom* condition and a *low boredom* condition. In both conditions, participants worked their way through several trials of category exposure and rating of test patterns. Between each category exposure and rating of test patterns, participants were required to write down three words. In the *high boredom* condition, the three words did not differ from one another and they did not differ from trial to trial (e.g., pencil, pencil, pencil). In the *low boredom* condition, the three words did differ from one another and they did differ from trial to trial (e.g., pencil, grass, loaf). Pretests indicated that participants found the former procedure somewhat tedious and the latter procedure mildly stimulating. To

assess the effect of this manipulation on boredom, two indices of boredom were taken: affect and arousal. Affect was measured for each participant *indirectly* by taking the average liking rating for all of the patterns they rated. Arousal was measured for each participant *directly* by asking them at the end of the study to report their current level of arousal (i.e., how alert and focused they were). In this way, the consequences of boredom – both its affective and arousal components – for our three exposure effects – mere-exposure, preference for prototypicality and preference for structurally related stimuli – could be assessed.

## **Method**

### **Participants**

Fifty students (twenty-five per condition) from the University of California, San Diego participated. In return for their participation, they received partial fulfillment of credit for their undergraduate psychology courses.

### **Apparatus/Stimuli**

Participants were tested in a private, well-lit 8' x 8' room. All stimuli and instructions were presented on a Dell OPTIPLEX GX270 computer with a 74.4 GB hard-drive and 512 MB of RAM and a 17-in ViewSonic monitor, using E-prime by Psychology Software Tools Inc. As previously mentioned, the stimuli consisted of dot patterns similar to those used by Posner and Keele (1968). Twenty distinct categories of dot patterns were created, with each category consisting of one prototype and fifteen distortions of that prototype. Each of the prototypes and distortions consisted of nine dots. The prototypes were randomly generated using Robert Goldstone's Concept Learning. The distortions were generated by randomly displacing the dots of the

prototype. A distortion level of 30 was chosen, which indicates the number of screen pixels by which each dot of the category's prototype was displaced. A screen pixel is equal to approximately 0.0437 centimeters.

### **Procedure**

For each participant, the experiment consisted of ten separate blocks presented in random order, with each block consisting of a study (exposure) phase and a test (rating) phase. During the study phase the fifteen distortions from a category were presented in random order. Each distortion was presented in the center of the screen for 1000 ms with a 400 ms inter-stimulus interval. Each study list was preceded by a two second "READY?" prompt, cueing the subjects to focus their attention on that area. Before proceeding to the test phase, participants were instructed to write down on a piece of paper the three words they saw on the screen. In the boring condition, the three words were all the same and did not differ from trial to trial – so the same word was written down 30 times over the course of the experiment. In the interesting condition, the three words were all different and differed from trial to trial – so 30 different words were written down over the course of the experiment. During the test phase, each of the test patterns was presented for a duration of 1500 ms. After the stimulus disappeared, a prompt came on the screen indicating that the participant should make their liking judgment. They were informed that they were to indicate how much they liked the pattern on a scale from one to nine, with lower numbers indicating less liking and higher numbers indicating more liking. They used the keys labeled one to nine on the keyboard to make their liking judgments. They made liking judgments on six test patterns: an old seen exemplar, an old unseen prototype, an old unseen exemplar, a new prototype and

two new exemplars. After completing their judgments on the six test patterns for a given block, they continued onto the next block where the procedure was repeated. Participants continued like this through ten blocks. At the end of the ten block, participants were asked to indicate their current level of arousal (i.e., how alert and focused they currently feel) on a scale of 1 to 9, with lower values indicating lower arousal and higher values indicating higher arousal. After completing this, the experiment ended. Participants were then debriefed and dismissed.

As noted, twenty categories of patterns in total were constructed. However, also as noted, each participant was exposed to only ten of these categories. The old test patterns came from the categories that participants were exposed to while the new test patterns came from the other ten categories that they were not exposed to. For half of the participants old test patterns were drawn from categories one to ten while new test patterns were drawn from categories eleven to twenty. For the other half of the participants the situation was reversed. This counterbalanced design thus controlled for any potential differences in liking that might otherwise result from variation in intrinsic appeal between test patterns from different categories.

As a means of disguising the intent of the experiment, participants in both conditions were given the following set of instructions. They were told that we were interested in understanding how we perceptually process simple patterns. To investigate this, we were first going to have them process simple patterns in two different ways: in a passive and in an active manner. During the first phase – the passive processing phase – all as they would have to do is observe a number of patterns as they appeared one at a time on the computer screen. After this phase and prior to the next, as a means of

providing a short break between the two processing phases, we would like them to simply copy down a few words on a piece of paper. During the second phase – the active processing phase – we wanted them to do more than simply observe patterns; we wanted them to actively engage each of the patterns. Specifically, we wanted them to judge each of the patterns according to how pleasing to the eye or likeable they were. Participants were told that after passively and actively processing a number of patterns that they would be shown them again and that perceptual processing of these patterns would be assessed. Of course, the latter was only a cover story and this was never actually done. Importantly, to guard against participants looking away from the patterns during the passive processing phase, they were told that because these patterns would subsequently be used to assess perceptual processing it was imperative that they remain focused on the screen throughout the presentation of ALL the patterns. This instruction was reiterated prior to each passive processing phase.

## **Results and Discussion**

### **Manipulation Check and Preliminary Preference Effects Analysis**

The arousal component of boredom was assessed by comparing self-reported arousal ratings of the *high boredom* group to the *low boredom* group. A two-tailed t-test revealed that the arousal ratings of the *high boredom* group ( $M = 2.84$ ,  $SD = 2.21$ ) were lower than arousal ratings of the *low boredom* group ( $M = 4.04$ ,  $SD = 1.95$ ),  $t(48) = 2.04$ ,  $p < .05$ . The affect component of boredom was assessed as part of a 2x2 mixed ANOVA, whereby Degree of Boredom (*high vs. low*) was the between subjects variable (and thus represented the main effect of interest for the affect manipulation check) and Relationship of Pattern to Exposed Category (*related vs. unrelated*) was the within subjects variable.



The latter variable was created by collapsing across the three related and unrelated test patterns used during each rating phase. This analysis revealed the following: a main effect of Degree of Boredom, with participants in the *high boredom* condition ( $M = 5.08$ ,  $SD = .93$ ) giving lower overall liking ratings than those in the *low boredom* condition ( $M = 5.58$ ,  $SD = .72$ ),  $F(1, 48) = 5.13$ ,  $P < .03$ ; a main effect of Relationship of Pattern to Exposed Category, with *related* patterns ( $M = 5.47$ ,  $SD = .88$ ) receiving higher liking ratings than *unrelated* patterns ( $M = 5.20$ ,  $SD = .84$ ),  $F(1, 48) = 11.03$ ,  $P < .003$ ; and an interaction between Degree of Boredom and Relationship of Pattern to Exposed Category,  $F(1, 48) = 7.37$ ,  $p < .01$ . Follow up one-tailed t-tests to probe this interaction confirmed that although there was an overall exposure effect for the *low boredom* group, with *related* patterns ( $M = 5.82$ ,  $SD = .76$ ) receiving higher liking ratings than *unrelated* patterns ( $M = 5.33$ ,  $SD = .58$ ),  $t(24) = 3.90$ ,  $p < .0004$ , there was no overall exposure effect for the *high boredom* group, with *related* patterns ( $M = 5.11$ ,  $SD = .86$ ) receiving comparable liking ratings to the *unrelated* patterns ( $M = 5.06$ ,  $SD = 1.02$ ),  $t(24) = .48$ ,  $p > .30$ . This analysis thus shows that the manipulation to alter both the arousal and affect components of boredom was successful: participants in the *high boredom* condition exhibited lower arousal and less positive affect (as indexed by the higher overall liking ratings) than those in the *low boredom* condition. Furthermore, though the interest here is with more specific preference effects, the finding of an interaction between Degree of Boredom and Relationship of Pattern to Exposed Category, whereby *low boredom* participants exhibited an *overall* exposure effect and *high boredom* participants did not, provides support for the idea that boredom can be a limiting condition on preferences derived from prior exposure.

### Specific Preference Effects Analysis

To determine the extent to which boredom may be considered a limiting condition on more specific preference effects, one-tailed t-tests were used to probe for the three preference effects of interest within the *high boredom* and *low boredom* conditions. In the *high boredom* condition, no preference effects emerged: there was no mere-exposure effect, as old seen patterns ( $M = 5.06$ ,  $SD = .89$ ) received comparable liking ratings to new generic patterns ( $M = 5.02$ ,  $SD = 1.23$ ),  $t(24) = .21$ ,  $p > .40$ , no preference for prototypicality, as old prototype patterns ( $M = 5.24$ ,  $SD = .96$ ) received comparable liking ratings to new prototype patterns ( $M = 5.25$ ,  $SD = 1.15$ ),  $t(24) = -.05$ ,  $p > .40$ , and no preference for structurally related stimuli, as old unseen generic patterns ( $M = 5.0$ ,  $SD = .87$ ) received comparable liking ratings to new generic patterns ( $M = 4.9$ ,  $SD = .93$ ),  $t(24) = 1.06$ ,  $p > .10$ . However, in the *low boredom* condition, all three preference effects were observed: there was a mere-exposure effect, as old seen patterns ( $M = 6.05$ ,  $SD = .82$ ) received higher liking ratings than new generic patterns ( $M = 5.48$ ,  $SD = .70$ ),  $t(24) = 3.19$ ,  $p < .002$ , a preference for prototypicality, as old prototype patterns ( $M = 5.88$ ,  $SD = .96$ ) received higher liking ratings than new prototype patterns ( $M = 5.40$ ,  $SD = .66$ ),  $t(24) = 3.25$ ,  $p < .002$ , and a preference for structurally related stimuli, as old unseen generic patterns ( $M = 5.55$ ,  $SD = .73$ ) received higher liking ratings than new generic patterns ( $M = 5.12$ ,  $SD = .60$ ),  $t(24) = 3.31$ ,  $p < .002$ .

Since our three exposure effects – the classical mere-exposure effect, preference for prototypicality and preference for structurally related stimuli – were observed in the *low boredom* (higher arousal/more positive affect) condition but were not observed in the *high boredom* (lower arousal/less positive affect) condition, this strongly suggests, as

originally stated by Bornstein, Kale and Cornell (1990), that boredom is in fact a limiting condition on the mere-exposure effect. Importantly, because the present study actually manipulated boredom (i.e., randomly assigned participants to treatment conditions) and measured boredom – both its arousal and affective components – we can now claim the following causal connection between boredom and mere-exposure: that sufficient boredom – a state characterized by low arousal and lowered positive affect – can abolish the mere-exposure effect or, for that matter, any preference effect that depends on prior exposure.

Before addressing the repercussions of this finding for our understanding of the mechanism underlying the mere-exposure effect, it would be informative to know which component of boredom might be responsible for the null result: was it the arousal or the affect component? This was examined in the next experiment.

## **Experiment 2**

To determine whether the results from the first experiment might be due to the arousal or affective component of boredom, in this second experiment arousal was held constant while affect was manipulated. The idea is that if the null result in the high boredom condition of Experiment 1 was in fact due to lowered positive affect and not lowered arousal, then manipulating affect while holding arousal constant should have the same effect: while exposure effects should be obtained for a more positive affect group, they should not be obtained for a less positive affect group. If this interpretation is not correct, however, and it was lowered arousal in Experiment 1 that was responsible for the null effects, then exposure effects should still be observed irrespective of affective state.

To assess how variations in affect might influence prior exposure while holding arousal constant, an Amount of Affect manipulation was employed in which there were two conditions: a *more positive affect* condition and a *less positive affect* condition. For both conditions, the procedure was identical to Experiment 1 except for the task that participants had to perform between the exposure and rating phases: in the *more positive affect* condition participants were required to solve a single anagram (e.g., eret – tree), while in the *less positive affect* condition participants were required to solve three anagrams (e.g., eret – tree, inra – rain, ilan – nail). Pretests indicated that while participants found both procedures stimulating (i.e., arousing), they found the former procedure somewhat pleasant (i.e., a nice reprieve from the dot patterns) and the latter procedure mildly irritating (i.e., more work/effort than they bargained for). In this way, the consequences of variations in affect – high and low positive affect – for our three exposure effects – mere-exposure, preference for prototypicality and preference for structurally related stimuli – could be assessed with arousal, hopefully, held constant.

## **Method**

### **Participants**

Fifty students (twenty-five per condition) from the University of California, San Diego participated. In return for their participation, they received partial fulfillment of credit for their undergraduate psychology courses.

### **Apparatus/Stimuli and Procedure**

Except for the modifications mentioned above, the apparatus/stimuli and procedure were identical in every way to Experiment 1.

## **Results and Discussion**

### Manipulation Check and Preliminary Preference Effects Analysis

Both the arousal and affect components of boredom were assessed in the same way as Experiment 1. A two-tailed t-test on arousal ratings revealed that there was no difference in arousal between the *more positive affect* ( $M = 4.08, SD = 2.24$ ) and *less positive affect* ( $M = 4.00, SD = 2.08$ ) groups,  $t(48) = .13, p > .80$ . A 2x2 mixed ANOVA for Amount of Affect (*more vs. less*) as the between subjects variable (and thus the main effect of interest for our manipulation check) and Relationship of Pattern to Exposed Category (*related vs. unrelated*) as the within subjects variable revealed the following: a main effect of Amount of Affect, with participants in the *more positive affect* condition ( $M = 5.62, SD = .78$ ) giving higher overall liking ratings than those in the *less positive affect* condition ( $M = 4.93, SD = .77$ ),  $F(1, 48) = 9.99, P < .004$ ; a main effect of Relationship of Pattern to Exposed Category, with *related* patterns ( $M = 5.36, SD = .88$ ) receiving higher liking ratings than *unrelated* patterns ( $M = 5.19, SD = .87$ ),  $F(1, 48) = 7.58, P < .009$ ; and no interaction between Amount of Affect and Relationship of Pattern to Exposed Category,  $F(1, 48) = .53, P > .4$ . One-tailed t-tests confirmed *overall* exposure effects for both affect conditions: participants in the *more positive affect* condition rated *related* items ( $M = 5.73, SD = .65$ ) more likeable than *unrelated* items ( $M = 5.51, SD = .73$ ),  $t(24) = 2.00, p < .03$ , and participants in the *less positive affect* condition also rated *related* items ( $M = 4.99, SD = .66$ ) more likeable than *unrelated* items ( $M = 4.86, SD = .59$ ),  $t(24) = 2.07, p < .03$ . This analysis thus shows that the manipulation to alter the affect component of boredom while leaving the arousal component of boredom constant was successful: though participants in the *more positive affect* condition exhibited more positive affect (as indexed by the higher overall liking

ratings) than those in the *less positive affect* condition, the arousal ratings of both groups were comparable. Furthermore, as with Experiment 1 though the interest here is with more specific preference effects, the finding of no interaction between Amount of Affect and Relationship of Pattern to Exposed Category, with both affect groups exhibiting an *overall* exposure effect, provides support for the idea that boredom limits preferences derived from prior exposure not via lowered positive affect but rather via lowered arousal.

### **Specific Preference Effects Analysis**

To determine the extent to which variations in affect may influence more specific preference effects, one-tailed t-tests were used to probe for the three preference effects of interest within the *more positive affect* and *less positive affect* conditions. In the *more positive affect* condition, no mere-exposure effect was observed, as old seen patterns ( $M = 5.85$ ,  $SD = .84$ ) received comparable liking ratings to new generic patterns ( $M = 5.70$ ,  $SD = .86$ ),  $t(24) = .86$ ,  $p > .10$ , and neither was a preference for structurally related stimuli, as old unseen generic patterns ( $M = 5.52$ ,  $SD = .87$ ) received comparable liking ratings to new generic patterns ( $M = 5.32$ ,  $SD = .91$ ),  $t(24) = 1.61$ ,  $p > .06$ , but a preference for prototypicality was observed, as old unseen prototype patterns ( $M = 5.83$ ,  $SD = .99$ ) received higher liking ratings than new prototype patterns ( $M = 5.52$ ,  $SD = .93$ ),  $t(24) = 2.63$ ,  $p < .007$ . Likewise, in the *less positive affect* condition, there was also no mere-exposure effect, as old seen patterns ( $M = 4.90$ ,  $SD = 1.05$ ) received comparable liking ratings to new generic patterns ( $M = 4.88$ ,  $SD = 1.06$ ),  $t(24) = .30$ ,  $p > .30$ , nor was there a preference for structurally related stimuli, as old unseen generic patterns ( $M = 4.88$ ,  $SD = 1.11$ ) received comparable liking ratings to new generic patterns ( $M = 4.74$ ,

$SD = 1.04$ ),  $t(24) = .98$ ,  $p > .10$ , but there was a preference for prototypicality, as old unseen prototype patterns ( $M = 5.19$ ,  $SD = 1.20$ ) received higher liking ratings than new prototype patterns ( $M = 4.99$ ,  $SD = 1.01$ ),  $t(24) = 2.00$ ,  $p < .03$ .

Why didn't we observe the classic mere-exposure effect or the preference for structurally related stimuli in either affect condition in this experiment? It appears that the intervening task – solving anagrams – was sufficiently distracting (i.e., required enough effort and time) that participants, at best, were only able to retain a general overall representation of the category that they were exposed to. Indeed, perhaps surmising that there was some connection between the exposure and rating phases, and knowing they wouldn't be able to retain information about individual patterns, they purposefully sought only to obtain an overall impression of category structure (i.e., the general shape of patterns in the category) and then used this as a basis for evaluatively discriminating between patterns in the rating phase (e.g., if a pattern matches the shape of the previously seen category, give a higher liking rating). Regardless of the exact reason why these other two exposure effects were not observed, what is clear is that even with an affective state comparable to that of the high boredom condition in Experiment 1, sufficiently aroused participants in this experiment showed an overall exposure effect as well as a specific exposure effect – the preference for prototypicality. As such, it's unlikely that the null result in the high boredom condition of Experiment 1 was caused by lowered positive affect; instead, this suggests that the null result in Experiment 1 was caused by lowered arousal.

### **Repercussions of Results for the Mechanism underlying Mere-Exposure**

The fact that sufficient boredom in Experiment 1 abolished all three preference effects argues against an unconscious/noninferential interpretation of the mere-exposure effect. This is because according to such theories as preferences resulting from prior exposure require no cognitive mediation and simply arise from positive affect, it should not have mattered if participants were bored – whether they were simply “going through the motions” or whether their memory for previously seen items was impaired – the mere-exposure effect should have still been observed. As it was not observed, however, this suggests more conscious and inferential mechanisms are required for preference effects based on prior exposure: that such effects require individuals that are focused enough to become sensitive to differences in the familiarity of the items and that are motivated enough to use this familiarity as a basis for evaluatively discriminating between the items. Before this conclusion may be deemed reasonable, however, there are several alternative explanations for the null results that must be eliminated: that the null results for bored participants were due to 1) insufficient attention to patterns at exposure, 2) participants not trying and simply responding randomly, or 3) boredom somehow blunting a positive affective response that would otherwise have accrued from prior exposure. Each of these is addressed in turn.

### **1. Bored participants failed to properly attend to the patterns at exposure**

As previously mentioned, to guard against this possibility it was emphasized both verbally (by the experimenter) and in written form (in the instructions that accompanied the computer program) that it was very important that they attend to ALL the patterns during the passive processing phases. Furthermore, prior to each passive processing phase, they were reminded to remain focused on the patterns throughout the duration of



their presentation. Still, the argument could be made that even if participants did remain focused on the screen throughout the presentation of the patterns that this does not guarantee that they were cognizant of what they were seeing (i.e., their minds may have been wandering); therefore, even with their focus on the screen, they may not have been processing the patterns deeply enough to produce an exposure effect. According to unconscious/noninferential theorists, though, only minimal processing is required to obtain the mere-exposure effect. In fact, mere-exposure effects have been obtained under more impoverished viewing conditions than participants were provided with in the present study: they have been found with divided attention tasks (e.g., Wilson, 1979) and even with subliminal exposures (e.g., Kunst-Wilson & Zajonc, 1980). Surely bored participants in the present study who viewed each pattern for 1000 ms per exposure processed the patterns more deeply than participants in subliminal studies who typically only get to view items for 5 to 20 ms per exposure. It therefore does not seem reasonable to attribute the null results observed for bored participants in the present study to inadequate processing of patterns during the exposure phase.

## **2. Bored participants did not try and simply responded randomly**

As it turns out, in creating the distortions from the prototypes, sometimes two dots in a distortion were placed very close together, even overlapping. The result was that as a set the prototypes ended up being slightly more appealing on average than their distortions. Hence, if bored participants were not trying and simply responding randomly, then the set of prototypes should *not* have been liked any more than the set of distortions in the *high boredom* condition of the first experiment. This, however, was not the case: the set of prototypes ( $M = 5.24$ ,  $SD = .99$ ) received higher liking ratings on

average than the set of distortions ( $M = 5.00$ ,  $SD = .89$ ),  $t(24) = 3.29$ ,  $p < .002$ ; and this was true even when the old items and new items were tested separately, with old prototypes ( $M = 5.24$ ,  $SD = .96$ ) being preferred to old distortions ( $M = 5.04$ ,  $SD = .83$ ),  $t(24) = 2.48$ ,  $p < .02$ , and new prototypes ( $M = 5.25$ ,  $SD = 1.15$ ) being preferred to new distortions ( $M = 5.01$ ,  $SD = 1.03$ ),  $t(24) = 1.73$ ,  $p < .05$ . As such, since boredom selectively abolished the effect of prior exposure on preference while leaving other preferences intact, the null result cannot simply be attributed to unmotivated participants responding randomly.

### **3. Boredom blunted positive affective that would have otherwise accrued**

Those in the unconscious and noninferential camp might argue that the reason why mere-exposure effects were abolished in bored participants is because any positive affect that might have otherwise accrued from prior exposure was offset by the negative affect that accompanied the ‘state of boredom’. The results of Experiment 2, however, all but rule this possibility out: despite participants in the lower affect condition of Experiment 2 having comparable affect to participants in the high boredom condition of Experiment 1, they still exhibited mere-exposure effects. Also arguing against this explanation are the results of previous research that has shown that a negative affective state, if anything, actually strengthens mere-exposure effects (De Vries, Holland, Chenier, Starr & Winkielman, 2010). Interpreting the present null results for bored participants in terms of the ‘state of boredom’ somehow blunting positive affect does not, therefore, seem tenable.

### **Concluding Remarks and Future Directions**

The present study established that boredom can eliminate preferences that would otherwise result from prior exposure (Experiment 1), and that this is mostly likely due to the low arousal, as opposed to any reduction in positive affect, that accompanies boredom (Experiment 2). Furthermore, additional analyses revealed that the null results for bored participants are not easily attributable to: 1) insufficient attention to patterns at exposure, 2) participants not trying, or 3) boredom somehow blunting a positive affective response that would have otherwise accrued from prior exposure. These observations therefore argue in favor of a conscious/inferential interpretation for mere-exposure effects: that these preferences require more than disinterested participants passively viewing and rating items; they require focused and motivated participants that are able and/or willing to connect the present with the past and, thus, to use a feeling of familiarity to determine preference.

The conclusion that boredom can lead participants to abandon the use of a conscious/inferential strategy in a mere-exposure paradigm provides us with a parsimonious explanation for why such factors as supraliminal exposures, more exposures, longer exposures, homogeneous exposure sequences and the use of simple stimuli can lead to a reduction in the strength of the mere-exposure effect: these factors increase the likelihood that participants will become bored and, as such, that they will turn away from using a feeling of familiarity for evaluative purposes. Similarly, perhaps the reason why in supraliminal paradigms mere-exposure effects are not often observed for uninteresting stimuli (Bornstein, Kale & Cornell, 1990) or low arousing stimuli (Bruce, Harman & Turner, 2007) is that such stimuli only receive cursory processing during the exposure phase and, as such, end up not being very memorable during the

rating phase. Somewhat problematic for this interpretation, however, is research by Bornstein and D'Agostino (1992; 1994) demonstrating that recognition, if anything, leads to a reduction in the strength of the mere-exposure effect. How can mere-exposure effects be based on memorial processes if recognition has been shown to impair such effects? Clearly this is an area that requires future theoretical and empirical consideration. Indeed, reconciling these discrepant findings would greatly enrich our understanding of the exact mechanism by which prior exposure can lead to preference development.

Chapter 1 is currently being prepared for submission for publication. Chenier, Troy. "Bored participants do not show mere-exposure effects: So preferences do need inferences?" The dissertation author was the primary investigator and author of these materials.

## CHAPTER 2

### The Unconscious/Noninferential Mechanism of Mere-Exposure Effects: Where is the Evidence?

### Abstract

The present paper challenges unconscious and noninferential mechanistic accounts of mere-exposure effects. A review of the research findings often cited in support of such a mechanism reveals that in most cases inferences can be shown to be driving the observed preference effects; and even where it is not clear that an inference is definitely involved, it can at least be shown that an inference could be involved. This leads to the conclusion that there is little justification to sustain the belief that mere-exposure effects do not require inferences. On the contrary, careful scrutiny of the evidence suggests that these preference effects almost certainly result from a conscious and inferential mechanism – from the strategic use of either processing fluency or feelings of familiarity to infer liking.

## The Unconscious/Noninferential Mechanism of Mere-Exposure Effects: Where is the Evidence?

The mere-exposure effect is a term applied to those preferences that result from repeated, unreinforced exposure to a stimulus or class of stimuli (Zajonc, 1968; 2001). Though mere-exposure effects have been found to be quite robust, having been replicated with all manner of stimuli, there is as yet no general consensus as to the mechanism that mediates between prior exposure and subsequent preference development. Regarding this, there are two general schools of thought. One school maintains that such effects may be traced to a conscious and inferential mechanism that involves cognitive mediation: participants strategically use those stimulus properties that result from prior exposure – either processing fluency (Bornstein & D’Agostino, 1992; Whittlesea, 1998; Dechene, Stahl, Hansen & Wanke, 2009) or feelings of familiarity (Berlyne, 1970; Stang, 1975) – to evaluatively discriminate between items. An opposing school asserts that such effects are brought about via an unconscious and noninferential mechanism that does not require cognitive mediation: reencountering items engenders positive affect that in turn unconsciously biases participants towards rating the items more favorably (Zajonc, 1968; 2001; Reber, Schwarz & Winkielman, 2004). The present paper challenges the tenability of the latter position: is the evidence really strong enough to support the assertion that such preferences do not in fact require inferences? In what follows, I make my way through ten key pieces of evidence frequently cited in support of the unconscious and noninferential position and in-so-doing show that in each case one cannot rule out the possibility that an inference is involved.

### **1. Subliminal mere-exposure effects**

Subliminal mere-exposure effects are perhaps the most often cited piece of evidence for the idea that these preferences do not require inferences. It's important to point out, however, that the occurrence of such effects is hardly robust, as attempts to obtain them have not always been successful (e.g., Fox and Burns, 1993). Indeed, considering null results are usually abandoned and rarely published, it's possible that subliminal mere-exposure effects are the exception rather than the rule. If so, this may be because participants in these studies rarely try to make the connection between the exposure and rating phases, perhaps thinking they could not possibly identify any subliminally exposed items they had presumably seen before. As such, by disregarding feelings of familiarity as a basis for preference, mere-exposure effects that might otherwise be obtained are typically nullified in such paradigms. In any case, we do know that where subliminal mere-exposure effects have been found, they are intimately tied to feelings of familiarity; for though it is true that subliminal mere-exposure studies have demonstrated preferences-without-recognition, there has not been a demonstration of preferences-without-familiarity. On the contrary, when recognition in such studies is assessed in terms of familiarity, liking has been found to closely parallel familiarity-based recognition (e.g., Bonanno and Stillings, 1986).

## **2. There is a preference for the objectively familiar irrespective of recollective state**

Simply demonstrating that items that are truly old are preferred to items that are truly new (i.e., hits > false alarms and misses > correct rejections) irrespective of beliefs about past history (i.e., about whether an item has or has not been seen before), does not preclude the use of a feeling of familiarity as a basis for inferring preference. As pointed out by several investigators (e.g., Birnbaum, 1981; Brooks and Watkins, 1989), if



recognition is considered to vary in a continuous fashion (i.e., confidence that an item was encountered previously) rather than in simply a binary fashion (i.e., old vs. new), then it is reasonable to suppose that even within beliefs about items being old and new that items that are actually old would feel more familiar than items that are actually new. Hence, to the extent that positive affect varies as a function of subjective familiarity we should of course expect items that are actually old to be preferred irrespective of recollective state. Brooks and Watkins (1989) examined this issue more closely by performing a mere-exposure study that coupled recognition with liking. However, instead of simply assessing recognition with a binary scale as was customary (e.g., Matlin, 1971), they made use of a continuous confidence scale. They found that when they collapsed the continuous scale to a binary scale their results mirrored what had been found previously: hits > false alarms and misses > correct rejections. However, when recognition was assessed using the continuous confidence scale they found that liking was in fact positively correlated with recognition. Furthermore, they found that when the effect of prior exposure was partialled out the relationship between liking and recognition remained. However, when the effect of recognition was partialled out the relationship between liking and mere-exposure disappeared. Hence, despite the reasonably robust observation that objectively familiar items are preferred irrespective of recollective state, it appears that preference for these items is still mediated by an inference – either by subjective familiarity or confidence that the item was encountered previously.

### **3. Some mere-exposure studies find no correlation between familiarity and liking**

Despite most mere-exposure effect studies finding a close correlation between recognition and liking, there are rare instances (e.g., Wilson, 1979) where no such

correlation has been observed even though a continuous confidence scale has been used. However, such apparent anomalous findings may be easily accounted for if we consider the differing strategies that participants may bring to bear when approaching the liking and recognition tasks. Specifically, Whittlesea and Price (2001) hypothesized that when asked to recognize stimuli participants by default adopt an analytic approach, making their recognition judgments based on distinctive features of stimuli. But when asked for liking participants by default adopt a nonanalytic approach, making their liking judgments based on their overall impression of stimuli – that is, they use the fluency of their processing and, presumably, any resultant feeling of familiarity to determine preference. Use of the former strategy for recognition, however, invariably fails because: 1) the stimuli in these studies tend to be homogenous, having few distinguishing features, 2) the rapid presentation of stimuli during study prevents effective encoding of the few distinguishing features that there are, and 3) participants are prevented from experiencing fluency of processing the items as a whole and, as such, cannot use the feeling of familiarity that would otherwise result as a basis for effective discrimination. Indeed, Whittlesea and Price (2001) found that as long as participants used their default analytic strategy for recognition, they could not reliably discriminate between old and new items; however, when they were biased towards using a nonanalytic strategy, discrimination became possible, with recognition performance paralleling liking – old items were recognized as much as they were preferred. Interestingly, when participants were biased towards using an analytic strategy for their preference judgments, thus blocking any feelings of familiarity that would otherwise be engendered from fluent processing of old items, the mere-exposure effect disappeared. Hence, even when no correlation is found

between recognition and liking, we cannot assume that a feeling of familiarity is not still driving liking; participants may simply be bringing different strategies to bear for each of the two tasks, thus nullifying any correlation that would otherwise be observed.

#### **4. People are less aroused by and thus are less afraid of mere-exposed items**

To explain how mere-exposure may lead to a preference in the absence of an inference, a number of theories based on stimulus familiarization have been developed. Zajonc (1968; 2001), for example, understands the mere-exposure effect in terms of conditioning. He maintains that when we are initially exposed to an item there is some antagonism as to whether we should approach or avoid the item. Since there are no negative consequences following this initial exposure, the tendency to approach the item is reinforced. When we are subsequently re-exposed to the item, the antagonism that was present the first time has abated such that our dominant tendency is to now approach the item. With less tension between the tendency to approach or avoid the item, we experience more positive affect in its presence and therefore rate it as being more likeable. Similarly, Berlyne's (1966; 1971) optimal arousal theory also points to the importance of stimulus familiarization. That is, because of the uncertainty associated with the features of novel items such items lead to uncomfortably high arousal levels. However, with repeated exposures and continued habituation uncertainty with respect to these features is reduced. And as uncertainty is reduced arousal drops to more comfortable and, presumably, pleasurable levels. As it turns out, these familiarization interpretations fit nicely with the observation that repeated exposure to a stimulus reduces autonomic reactivity to that stimulus. In fact, Zajonc's (1968) seminal work on the mere-exposure effect included a study demonstrating as much. Specifically, he presented 15

nonsense words from between 1 to 25 times each in random order to participants and measured GSR at the end of the presentation sequence. As predicted by familiarization theories, a negative relationship between exposure frequency and autonomic reactivity was found: as the number of repeated, unreinforced exposures to words increased mean GSR activity decreased.

As attractive as these familiarization explanations of the mere-exposure effect are, the GSR evidence cited in their support may be somewhat misleading. While Zajonc's (1968) study and others like it do in fact demonstrate that autonomic reactivity decreases to a stimulus as the number of repeated exposures to that stimulus increases, it's questionable the extent to which this is true in mere-exposure paradigms in general where exposures are often very brief, few in number, interspersed among many other stimuli and where there is often a significant delay between exposures to stimuli and ratings of those stimuli. Indeed, implicit learning paradigms, which really only differ from mere-exposure studies in that they include a recognition judgment instead of a preference judgment, have found the exact opposite: despite an inability on the part of participants to distinguish between old and new items, participants exhibit *greater* autonomic reactivity (i.e., higher GSR's and more pronounced deceleration in heart rate) when viewing old items than when viewing new items (e.g., Bitterman and Marcuse, 1945; Stormark, 2004). Given the similarity between implicit learning and mere-exposure paradigms, the observation of *increased* autonomic reactivity to old items likely best characterizes how participants actually react to such items in mere-exposure studies in general. As such, rather than increases in arousal being indicative of stimulus aversion, as familiarization theories would suggest, it's more likely that increases in arousal reflect processes of

recognition (e.g., feelings of familiarity). However, given that recognition is at chance levels in implicit learning studies, participants are apparently not using these feelings to distinguish between old and new items. As suggested by Whittlesea and Price (2001), this may be because participants are particularly concerned with accuracy and, as such, have opted for an analytic approach. In mere-exposure effect studies, however, where there is no concern with accuracy when making preference judgments, it's reasonable to assume that participants adopt a less taxing nonanalytic approach and simply use these feelings as a basis for their liking judgments.

#### **5. It's evolutionarily adaptive to prefer less arousing items as such items are safer**

As it turns out, learning and conditioning theories fit nicely with evolutionary explanations of the mere-exposure effect. The idea is that mere-exposure reduces autonomic reactivity to an item because the organism has learned via familiarization that it is benign and nonthreatening. As such, the item can readily be ignored thus freeing up cognitive and metabolic resources to deal with other less certain parts of the environment. By contrast, because a novel item still holds the potential to be somewhat dangerous, it produces an orienting response and increases autonomic reactivity. This prepares the organism to deal with whatever contingency might arise from the unknown item. Hence, the familiarization process that characterizes the mere-exposure effect not only engenders a more positive affective response, it also appears to be evolutionarily adaptive: it allows organisms to efficiently learn and make quick decisions about items in their environment – items that engender little arousal require no special attention and may be approached without concern while highly arousing items need to be attended to and should only be approached with considerable caution (Zajonc, 2000).

In spite of the appeal of this explanation, placing the mere-exposure effect within an evolutionary context may be inappropriate. Consider the stimuli and environment of your typical mere-exposure effect study. First, in most mere-exposure effect studies there is little variability between items. In fact, the formal elements between items are typically the same, what differs is how those formal elements are arranged. Is this small amount of novelty really likely to produce a significant ‘anxious’ reaction on the part of participants? Second, the items themselves are usually rather dull and pallid (e.g., simple musical note progressions, Chinese ideographs, dot patterns, etc) and thus can hardly be considered threatening (i.e., participants needn’t worry about being bitten by a mutant, rabid dot pattern). Third, once participants have adjusted to the experiment itself, they typically find the task somewhat tedious and boring. This suggests that unlike more dangerous environments (e.g., the jungle) where novelty could actually pose some meaningful threat, they find the environment of the lab comfortable enough that they do not feel the need to stay particularly vigilant (i.e., on the lookout for something that could be novel and therefore potentially dangerous). In short, there is little reason why in your typical mere-exposure effect study that a novel variant of a Chinese ideograph or dot pattern should produce a ‘fearful orienting response’ or cause an ‘uncomfortable rise in arousal’. And given the autonomic reactivity findings from implicit learning paradigms reported in the previous section, they apparently don’t. As such, appeals to evolutionary theory as a means of bolstering learning and conditioning explanations for the mere-exposure effect would appear to be somewhat misplaced.

Though for the aforementioned reasons we might not expect novel items to increase autonomic reactivity and therefore to be particularly conspicuous, there is a good

intuitively verifiable reason why old items, especially if they go unrecognized, should. Consider the butcher-on-the-bus phenomenon made famous by George Mandler (1980). Though we've seen our butcher innumerable times in the store, when we encounter him out of the context of the store and out of his uniform, say on a bus, he grabs our attention and we're overcome with a feeling of familiarity, "Where have I seen that guy before?" What's important about this scenario for the current discussion is that despite encountering a variety of faces we've never seen before, given normal variation among the features of the faces we've encountered, it's the *familiar* face that ultimately stirs us from our ennui and causes us to pay attention. This everyday scenario is directly analogous to most mere-exposure effect studies where participants must make preference judgments on a set of stimuli where very few differences exist between items: just as in the butcher-on-the-bus-phenomenon where a face stands out by virtue of it being familiar, in mere-exposure effect studies old items also stand out relative to their novel counterparts precisely because they engender a feeling of familiarity. And in the context of a tedious mere-exposure study where the stimuli are somewhat indistinct and dull, it should hardly come as a surprise to find that items that produce a butcher-on-the-bus like subjective experience and a concomitant rise in autonomic arousal are also found to be more preferable.

#### **6. We are capable of responding affectively to a stimulus before we recognize it**

The affective primacy hypothesis suggests that we are capable of evaluating an item even before we've identified it (Arnold, 1960; Zajonc, 1980). As the reasoning goes, since subcortical structures, which are concerned with affective evaluation, evolved before cortical structures, which are concerned with item identification and more

complex elaborative processing, it seems reasonable to assume that affective information is abstracted from a stimulus prior to its identification. Hence the reason why despite an inability to discriminate between old and new items participants in mere-exposure studies prefer the former to the latter: because while cortical structures have yet to resolve whether the item has been seen before subcortical structures have already determined that, whatever it might be, the item can be trusted. There are a number of problems with this interpretation however. First, despite the claims of some (e.g., Bargh, 1997), the notion of affective primacy is far from settled; strong arguments have been forwarded in favor of the view that features of objects must first be integrated and then those objects must be identified and categorized all before affective analysis can occur (see Storbeck, Robinson & McCourt, 2006 for a discussion). Second, when it comes to the mere-exposure effect we are not talking about stimuli that have particularly strong affective associations as might exist, for example, in certain phobias (e.g., fear of spiders). To suggest therefore that we may generalize from the latter to former may be somewhat dubious. Third, subcortical structures appear to be unnecessary for the mere-exposure effect as it is even observed in patients who have extensive damage to those areas that have been implicated as being important for affective stimulus evaluation: 1) in Alzheimer's patients who have considerable damage to the amygdala (e.g., Willems, Adam and Van Der Linden, 2002), and 2) in a patient who had completely lost the connection between his visual cortex and limbic system (Greve and Bauer, 1990). Fourth, there are good reasons for believing that the mere-exposure effect is built solely upon processing achievements within the visual cortex: 1) the visual cortex in-and-of-itself can differentiate between old and new items by assessing differences in overall



neural activity, with neural responsiveness for old items being suppressed relative to new items (e.g., Desimone, 1996), and 2) although mere-exposed items apparently do not alter activation of the amygdala, it has been shown that they increase activation of prefrontal cortical regions, specifically in an area that has been pinpointed as being important for assessing the reward value of a stimulus (e.g., Elliot and Dollan, 1998; Elliot, Dollan and Frith, 2000). These observations thus suggest a solely cortical basis for mere-exposure effects: the visual cortex codes for the familiarity of a mere-exposed item in terms of neural response suppression with affect accruing as the neural code for the familiarity signal is assessed in prefrontal reward centers. As such, given that an explanation based solely on cortical processing can easily be invoked and given that subcortical structures have been shown to be unnecessary, appeals to affective primacy as a means of bolstering support for unconscious and noninferential theories would appear, at least at this point in time, somewhat disingenuous.

### **7. Liking for mere-exposed items results from the fact that they are easier to process**

The hedonic fluency model suggests the mere-exposure effect may be traced solely to the dynamics of information processing: that a prior exposure to an item increases liking for that item because it makes the item more fluent, that is, easier to process. The idea is that processing fluency is intimately associated with positive affect such that as the former increases so does the latter. As such, no inference is necessary as the fluency signal itself may directly lead to positive affect and therefore a more favorable liking response. Unfortunately, while this may explain certain preferences, it proves inadequate when it comes to the mere-exposure effect.

Proponents of this view cite two pieces of supporting evidence: 1) mere-exposed items may be identified more quickly and thus are processed more fluently than novel items (e.g., Reber, Schwarz & Winkielman, 2004), and 2) mere-exposed items result in greater zygomaticus (smiling muscle) activity and therefore engender more positive affect than novel items (Harmon-Jones and Allen, 2001). First, simply showing that old items may be responded to more quickly than new items does not demonstrate that affect is being derived from processing fluency per se; liking may still simply be the result of recognizing old items. Second, the greater zygomaticus activity for old items is as likely to reflect processes of recognition as it is processing fluency; it may simply reflect the successful identification of merely exposed items. Hence, since processing fluency and recognition have not yet been decoupled, and perhaps they simply cannot be, to conclude that the mere-exposure effect is based on affect derived from processing fluency per se is, at this time, completely without merit.

There are further reasons for doubting the notion that there is any simple link between processing fluency and positive affect when it comes to the mere-exposure effect. Specifically, a study by Willems, Linden and Bastin (2007) recently demonstrated: 1) while repeated exposure resulted in a preference when items were very similar to one another, it did not result in a preference when items were more distinctive (Experiment 1), and 2) while repeated exposure resulted in a preference when items were not very fluently processed to begin with, it did not result in a preference when items started at a higher baseline of fluency (Experiment 2). These results show that the effect of processing fluency on liking is mediated by situational contingencies and that people may use processing fluency as a basis for liking in a strategic manner: 1) when there

appears to be no other basis to assess preference (as in Experiment 1 when items were just too similar to one another), or 2) when it becomes a particularly salient source of information for assessing preference (as in Experiment 2 when fluency for repeated items was unexpectedly high). The fact that participants may use processing fluency in this strategic manner, only using it as a basis for inferring preference under certain conditions, calls into question the hedonic fluency model's assumption that there is an automatic link between processing fluency and positive affect. Instead, further data from this study strongly argue in favor of a recognition-based view of the mere-exposure effect.

Specifically, in regards to Experiment 2, for items that started at a lower baseline of fluency, repeated exposure resulted in more correct claims of knowing than was the case for items that started at a higher baseline of fluency. This close connection between repeated exposure and feelings of knowing for low fluency baseline items suggests that when it came time to judge preference that it was in fact the feeling of knowing (familiarity) created by prior exposure that was responsible for biasing participants towards choosing the repeated over the novel items.

### **8. Amnesiacs exhibit the mere-exposure effect**

In suggesting that mere-exposure effects do not require inferences, people are often quick to point to studies that have used amnesic patients (i.e., those with Korsakoff's syndrome or Alzheimer's disease) where despite impaired recognition the mere-exposure effect is preserved. How can individuals that are presumably incapable of recognition possibly use a feeling of familiarity to infer preference? First, it should be made clear that the results from such studies are mixed: while some studies have found mere-exposure effects for amnesiacs (Johnson, Kim and Risse, 1985; Willems, Adam,

Van der Linden, 2002), others have not (Redington, Volpe, Gazzaniga, 1984); Halpern and O'Connor, 2000). Second, where mnemonic and affective dissociations have been found, the results may readily be accounted for in terms of Whittlesea and Price's (2001) analytic-nonanalytic distinction. That is, given that amnesiacs are aware of their memory difficulties, they may be less likely than controls to trust and therefore use any feelings of familiarity for the recognition judgment, a decision that impairs recognition performance. However, where accuracy is not an issue, as is the case when performing a preference judgment, such feelings may readily be used to infer liking. Indeed, Willems, Salmon, and Van der Linden (2008) recently demonstrated that inducing amnesiacs to use a nonanalytic strategy for recognition improved their performance, so much so that it was on par with that of healthy controls; and that inducing amnesiacs to use an analytic strategy for a priming task impaired their performance (see Dorfman, Kihlstrom, Cork, and Misiaszek, 1995; Verfaellie, Giovanello, Keane, 2001 for similar demonstrations). Further complicating the issue is a study by Samson and Peretz (2005) who found a reversal of the typical recognition-liking finding for amnesiacs: that a patient with severe global amnesia (i.e., with bilateral lesions to the temporal lobe) exhibited intact recognition but no mere-exposure effect. Taken together, these observations suggest that while the feeling of familiarity, for whatever reason, is not ordinarily being used by amnesiacs as a basis for recognition, it is still available to them and, as such, may be what is in fact driving preference for mere-exposed items. Third, even if we assume that amnesiacs are using those cognitive, neural, physiological, and/or behavioral changes that support the feeling of familiarity in-and-of-themselves (i.e., without a sense that the item has been repeated) as a basis for making their preference judgments, this does not mean

that normal individuals ordinarily do so. Instead, it's likely that for normal individuals such changes have become so intimately associated with the act of recognition that they automatically engender a feeling of familiarity. Hence, for normal individuals in mere-exposure studies, rather than the cognitive, neural, physiological, and/or behavioral changes per se, it is likely the sense of the familiar (i.e., how certain one is that an item has been seen before) that is ordinarily driving preference.

### **9. Mere-exposure effects are found in non-human animals and prenatally in humans**

It is not uncommon to hear references to non-human animal and prenatal human mere-exposure research when unconscious and noninferential theories of mere-exposure are discussed. Robert Zajonc (2001), for example, in his paper "Mere-Exposure: A Gateway to the Subliminal" references a study by Talyor and Sluckin (1964) in which chicks reared with a cardboard companion subsequently came to prefer this companion over other chicks. And, in an often repeated anecdote, he relates how rats exposed to the music of Mozart but not Schoenberg subsequently came to develop a preference for the former over the latter. Putting aside the question as to whether such observations support an unconscious and noninferential mechanism, it's questionable whether they even constitute the mere-exposure effect at all. In the case of the chicks, we are talking about a special kind of learning called imprinting in which an organism rapidly learns the characteristics of and develops an attachment to a stimulus that it is exposed to during some critical developmental period. It seems somewhat of stretch to equate this kind of attachment to the preferences humans develop in mere-exposure effect studies. In the case of the rats, though Zajonc is short on specifics, it's likely that during exposure to Mozart that the rats developed associations between the music and reward: while

listening to the music, they ate, drank, perhaps ran on a wheel, etc. If so, when subsequently given a choice between a cage playing Mozart and another playing Schoenberg, given that Mozart had been previously associated with reward and Schoenberg had not, it's hardly surprising that the former was preferred over the latter. This also neatly explains how prenatal exposure to a stimulus subsequently leads to a preference for that stimulus in human newborns. Decasper and Fifer (1980), for example, demonstrated that newborns could more readily learn to emit a sucking response when reinforced by the mother's voice than by the voice of another female. Just as in the rats preferring Mozart, as the mother's voice had already become prenatally associated with reward, it's not surprising that her familiar voice was more easily associated with reward after birth than the unfamiliar voice of another female. Since according to Zajonc (2001) the mere-exposure effect is supposed to be a preference that develops in the *absence of reinforcement*, the latter two observations, and those like them, cannot strictly speaking qualify as mere-exposure effects. It therefore seems somewhat misplaced to cite such observations to bolster the case for an unconscious and noninferential mechanism.

#### **10. Mere-exposure effects occur despite no clear link between exposure and rating**

Some may argue that since most mere-exposure effect studies go out of their way to disguise the connection between the exposure and rating phases that it is a moot point to suggest that participants use a feeling of familiarity to infer preference. On the contrary, I believe it's pretty clear for most participants in these studies that there must be some connection between the exposure and rating phases. Indeed, even if participants randomly evaluate items, such that half prefer old and half prefer new, it would only take a small minority of these participants to become "clued-in" enough – that is, to actually

note (whether deliberately or accidentally) the connection between the exposure and rating phases and therefore to consciously use a feeling of familiarity to infer preference – to actually produce a reliable mere-exposure effect.

### **Concluding Remarks**

Though throughout this paper the emphasis has been on showing how familiarity cannot be ruled out as a mediator of mere-exposure effects, this should not be taken to imply that participants must necessarily rely on feelings of familiarity per se; it's quite possible that in some instances participants may use, or at least be influenced by, the underlying fluency signal itself. How so? When Larry Jacoby originally coined the term 'processing fluency' to describe the ease of perceptual operations performed on a stimulus, he described the experience as a kind of 'pop-out' effect whereby the highly fluent stimulus literally jumps out at the perceiver. This change in conscious experience, apart from any feelings of familiarity it may give rise to, may be used by participants, or even just bias them, to rate old (more fluent) items more favorably than new (less fluent) items. This, of course, is still at odds with an unconscious and noninferential mechanism, which maintains that no such cognitive mediation – no change in the conscious experience of repeated items – is necessary to obtain mere-exposure effects.

In conclusion, for all of the evidence that has accumulated in support of the claim that inferences are not required for preference formation in mere-exposure effect studies, it seems pretty clear in most cases that inferences are in fact driving the observed preference effects. And even where it is not clear that an inference is definitely involved, it can at least be shown that an inference could be involved. As such, since we can readily explain extant results in terms of inferences and since we cannot point to any

piece of evidence that clearly shows inferences are not involved, there seems little justification to sustain the conclusion that mere-exposure effects do not require inferences. The latter dictum has only led to the invocation of unnecessary learning and conditioning explanations and esoteric evolutionary conceptualizations. Instead, we need only apply Ockham's razor and appeal to that which is most obvious: that these preference effects result from a conscious and inferential mechanism – from the strategic use of either processing fluency or feelings of familiarity to infer liking.

Chapter 2 is currently being prepared for submission for publication. Chenier, Troy. "The unconscious/noninferential mechanism of mere-exposure effects: Where is the evidence?" The dissertation author was the primary investigator and author of these materials.



## CHAPTER 3

### The Perceptual Fluency/Misattribution Model of the Mere-Exposure Effect: A Failure to Find Evidence

### Abstract

According to the perceptual fluency/Misattribution model of the mere-exposure effect, liking for repeated items should be compromised to the extent that participants come to believe that those items are in fact repeated. Consistent with this, Bornstein and D'Agostino (1994) found that while misinforming participants the items were all old abolished the mere-exposure effect, misinforming them that the items were all new enhanced it (Experiment 2). This evidence, however, has been contradicted by the results of a very similar experiment by Lee (1994). She found the appeal of old items was unaffected by participants' beliefs about whether they had seen the items before, though she did find the appeal of new items to be enhanced by a belief the items were all old. In an attempt to resolve these contradictory findings, the present study conceptually replicated the basic paradigm used in these studies, except that beliefs about prior exposure were manipulated in a less obtrusive manner; instead of explicitly telling participants the items were old or new, a bias was created towards one belief or the other by actually making most of the items to be rated either old or new. Under these conditions, the results of Lee (1994) were replicated while the results of Bornstein and D'Agostino (1994) were not. The implications of these findings for the perceptual fluency/attribution model and for our understanding of the mere-exposure effect in general are discussed.

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## The Perceptual Fluency/Misattribution Model of the Mere-Exposure Effect: A Failure to Find Evidence

The perceptual fluency/misattribution model holds that the mere-exposure effect results from a combination of two processes. First, a prior exposure to a stimulus increases the fluency (i.e., ease) with which the stimulus is processed. Second, this enhanced fluency gets misattributed to the quality of the stimulus under consideration and, as such, results in a higher evaluative rating. Importantly, according to the model, if this enhanced fluency gets attributed to something else (e.g., the fact that the stimulus has been seen before), the stimulus will not be evaluated more favorably. The latter implies that not only does recognition play no part in bringing about the mere-exposure effect, but that it actually impairs it. Given the importance of this ramification for our understanding of the mechanism underlying mere-exposure effects, the present paper evaluates a key piece of evidence often cited in support of the model, namely, the results of two (mis)attribution manipulation mere-exposure experiments by Bornstein and D'Agostino (1994).

In their two experiments, Bornstein and D'Agostino (1994) purportedly show that the strength of the mere-exposure effect varies according to whether or not participants attribute fluency to the familiarization (exposure) procedure: in their first experiment, they observed that when contextual cues were made available that implicated the familiarization procedure as a *likely* cause of why the repeated stimulus was so fluent, liking decreased; in their second experiment, they observed that when contextual cues were made available that implicated the familiarization procedure as an *unlikely* cause of why the repeated stimulus was so fluent, liking increased. These results thus seem to

show that participants will evaluate an item less favorably to the extent that they come to believe that it is one that has been repeated from the exposure phase. But do these results really warrant such a conclusion? To find out, the logic and results of each of these experiments is considered in more detail below.

### **The Bornstein and D'Agostino (1994) Experiments – A Closer Look**

In their first experiment, Bornstein and D'Agostino (1994) endeavored to provide support for their perceptual fluency/misattribution hypothesis by making information available to participants that would bias them *towards* attributing fluency to the familiarization procedure and, as such, that would *reduce* liking for the items under consideration. To accomplish this goal, they employed a *subliminal* mere-exposure effect paradigm with three different information conditions: an old condition, in which participants were told prior to the rating phase that the items they would be rating were all old; a new condition, in which participants were told prior to the rating phase that the items they would be rating were all new; and a standard condition, in which participants were not given any information prior to the rating phase about whether the items were old or new. In the new and standard conditions, given that participants should not be aware of having seen any of the items before (as exposures were subliminal) and given that there is nothing in the instructions to suggest that any of the items may have been seen before (and actually quite the opposite in the new condition), no correction mechanism for the biasing influence of the past should be applied. As such, liking ratings for old and new items in these conditions should mimic what would ordinarily be expected from your typical subliminal mere-exposure experiment. However, in the old condition, given that participants are made aware of the fact that they have seen the items before, they should

be prompted to correct for this biasing influence of the past and, as such, should lower their liking ratings for both old and new items accordingly. This is in fact what they observed: liking ratings for old and new items for those in the old condition were found to be significantly lower than the liking ratings of old and new items for those in the new and standard conditions.

These results led Bornstein and D'Agostino (1994) to conclude that when contextual cues are made available that permit perceptual fluency to be attributed to the familiarization procedure participants will engage in a correction process and effectively lower their liking ratings for the items under consideration. Despite this conclusion, however, there is an equally plausible, and much simpler, alternative explanation as to why liking ratings for both old and new items were lowered in the old condition: being told that the items they were about to rate were all old may have served as a cue to participants that they should find the items as a whole more boring (i.e., less interesting) and, therefore, that liking ratings for the items should be lowered accordingly. Indeed, Bornstein and D'Agostino (1994) subsequently admit in their general discussion that demand characteristics may be responsible for the main effect of instruction condition in the first experiment. To buffer this potential confound, therefore, they defer to the results of their second experiment, suggesting that it represents much stronger evidence for their model.

In their second experiment, Bornstein and D'Agostino (1994) endeavored to provide support for their perceptual fluency/misattribution hypothesis by making information available to participants that would bias them *away* from attributing fluency to the familiarization procedure and, as such, that would *increase* liking for the items

under consideration. To accomplish this goal, they employed a *supraliminal* mere-exposure paradigm with the same three conditions as the previous experiment. They surmised that with a supraliminal familiarization procedure that type of stimulus (old vs. new) and information condition (old, new, standard) should interact to affect liking: while liking for new items should not differ between conditions, liking for old items should increase from the old to the standard to the new condition. More specifically, in the old condition, given that participants are informed that the items they are rating are all old, the fluent processing that characterizes old items should readily be attributed to the familiarization procedure (e.g., “The only reason this item stands out from the rest is because I’ve seen it before; it does not indicate anything about the quality of the item.”). As such, with this correction mechanism consistently being applied to reduce liking for fluently processed items, old items should not be preferred over new items in this condition. In the standard and new conditions, however, where it is not explicitly stated that the items are repeated, when a highly fluent item is encountered, rather than this fluency being attributed to the familiarization procedure, there should be more of a bias towards attributing it to the quality of the item itself. As such, without this correction mechanism being applied consistently to fluently processed items, liking for old items over new items should be larger in these conditions. And since participants in the new condition are informed that the items that they are rating are all new, they should be particularly biased away from attributing highly fluent processing to the familiarization procedure. As such, liking for old items over new items should be most pronounced in this condition. Their predictions were in fact born out: there was no difference in liking for new items between conditions, but liking for old items increased from the old to the

standard to the new condition, with liking for old items in the latter two conditions being significantly above that of new items.

These results led Bornstein and D'Agostino (1994) to conclude that when contextual cues are made available that discourage perceptual fluency from being attributed to the familiarization procedure, participants will be less likely to employ a correction mechanism, instead attributing fluency to the quality of the stimulus under consideration, with the result being higher liking ratings. Presumably, the results of this experiment permit such a conclusion, and thus provide stronger evidence for their model, because of the interaction that was found between type of item (old vs. new) and instruction condition (new vs. standard vs. old): since instruction condition did not simply affect liking for all items as it did in the previous experiment, but rather only affected liking for old items, the results cannot be explained so easily in terms of demand characteristics. Before, however, this evidence may be taken as support for the perceptual fluency/misattribution model, these results must be reconciled with those of another paper published the same year that despite using a very similar paradigm obtained very different results.

### **The Lee (1994) Experiment**

Like the second experiment of Bornstein and D'Agostino (1994), Lee (1994) also employed a supraliminal mere-exposure paradigm and manipulated the instructions given to participants: those in a 'seen' condition were told the patterns they would be rating were ones they had seen during the exposure phase, whereas those in a 'not-seen' condition were told the patterns they would be rating were ones that they had not seen previously. Like Bornstein and D'Agostino (1994), Lee (1994) found that the

discrepancy in liking for old over new items was greater when participants believed they had not seen the items before than when they believed they had. However, unlike Bornstein and D'Agostino (1994), Lee (1994) found that there was no difference in liking for old patterns between instruction conditions. Rather, she observed an apparent difference in liking for new patterns: new patterns in the seen condition were rated marginally more likable than new patterns in the not-seen condition. Thus, in Lee's (1994) study, a belief that the items had been seen before did not, as would be predicted by the perceptual fluency/misattribution model, result in a reduction in liking for old items; instead, it produced the opposite result: an increase in liking for new items. This led Lee (1994) to conclude that knowledge of prior exposure does not impair evaluation of repeated items. Rather, interpreting her results within an uncertainty reduction framework (Berlyne, 1970; Stang, 1975), she suggested knowledge of prior exposure, if anything, augments liking: the reason why new items received higher liking ratings in the seen condition was because participants experienced them as subjectively familiar (i.e., being told that they were all old, they likely had some vague sense of having seen the items before); as such, with less uncertainty regarding the items, participants were prompted to rate them more positively.

### **The Present Study**

The purpose of the present study was to reconcile the results of the Bornstein and D'Agostino (1994) and Lee (1994) studies and in-so-doing to: 1) determine the adequacy of the perceptual fluency/misattribution model as an explanation for the mere-exposure effect, and 2) clarify the role that recognition plays in the mere-exposure effect – whether



a belief that an item has been seen before ultimately impairs (as suggested by Bornstein and D'Agostino, 1994) or augments (as suggested by Lee, 1994) liking.

The contrasting results of these two studies could be attributed to any one of a number of subtle differences: the stimuli used, exposure duration, delay between exposures and ratings, time given for ratings etc. Still, even if we could pinpoint what factor(s) led to the contrasting results, the bottom-line is that the instructional manipulations that were used to alter beliefs about prior exposure may just have been too obtrusive to be at all informative about the construct of interest. That is to say, rather than the results reflecting how an individual evaluates an item *given their own sense* of a prior encounter with the item, the results might simply reflect an individual's contrived reaction to an item *given what they were told* to believe about prior exposure (i.e., whether their own belief about prior exposure agrees/disagrees with what they're supposed to believe about prior exposure). To determine therefore which set of results most accurately reflects how an individual might react given their own beliefs about prior exposure, rather than telling participants whether or not the items they would be rating had been seen before, the present study created experimental contingencies designed to unobtrusively bias them towards adopting one belief over the other. The structure and logic of this design are described below.

## **Overview of Design**

### **Structure**

A modified design based on Posner and Keele's (1968) category learning procedure was employed. Specifically, during each trial participants first viewed a category of dot patterns in which each exemplar was presented once and then made liking

judgments on a small number of test patterns. To manipulate beliefs about prior exposure in an unobtrusive manner, two rating conditions were created: a *believe old* condition and a *believe new* condition. In the *believe old* condition, five out of the six patterns to be rated were old while the remaining pattern was new: there were four old exemplar patterns, an old prototype pattern and a new prototype pattern. In the *believe new* condition, five out of the six patterns to be rated were new while the remaining pattern was old: there were four new exemplar patterns, an old prototype pattern and a new prototype pattern. In both conditions, to assess the influence of prior exposure on subsequent preference, liking for old prototypes was compared to liking for new prototypes.

### **Logic**

The idea in the *believe old* condition was that over the course of rating the patterns, because just about every pattern would invoke a feeling of familiarity, participants would be biased towards developing a belief that the patterns they were rating were in fact all repeated patterns. Of course, there would be some novelty encountered (the new prototype). However, unlike the Bornstein and D'Agostino (1994) and Lee (1994) experiments where that novelty had to be interpreted within the context of what they were told (that all of the items were old), here that novelty would be interpreted within the context of their *self-generated* theory about prior exposure (e.g., "That although most of the patterns seem familiar, there is the odd one that I don't remember seeing.").

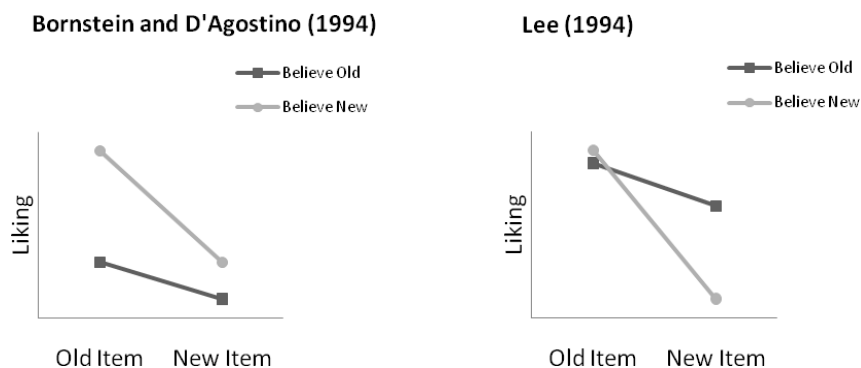
Similarly, the idea in the *believe new* condition was that over the course of rating the patterns, because just about every pattern would invoke a feeling of unfamiliarity,

participants would be biased towards developing a belief that the patterns they were rating were in fact all new patterns. Of course, they would experience some of the items as familiar (the old prototype). But, again, unlike the Bornstein and D'Agostino (1994) and Lee (1994) experiments where that familiarity had to be interpreted within the context of what they were told (that all of the items were new), here that familiarity would be interpreted within the context of their *self-generated* beliefs about prior exposure (e.g., "That although I don't remember seeing any of these before, the odd one does feel familiar.>").

### **Predictions**

Though a number of predictions based on any one of a number of construals could be forwarded, the interest here is with replicating either Bornstein and D'Agostino's (1994) or Lee's (1994) results. Without needing to worry here about how participants interpret their actual experience of the items in light of whether that experience confirms or disconfirms what they were told about prior exposure, replicating the results of one of these studies would go a long way towards affirming that those results were not simply an artifact of demand characteristics stemming from their instructional manipulations. In this regard, of particular importance are the results we should expect for the *believe old* condition; though both studies found a reduction in strength of the mere-exposure effect for the *believe old* condition, they did so for entirely different reasons: Bornstein and D'Agostino (1994) observed a weaker (statistically nonexistent) mere-exposure effect in the *believe old* condition because of a reduction in liking for old items, whereas Lee (1994) observed a weaker mere-exposure effect in the *believe old* condition because of an increase in liking for new items. As such, if the perceptual fluency/misattribution model

as promoted by Bornstein and D'Agostino's (1994) is correct, then the results of their second experiment should be reproduced here. If, on the other hand, the uncertainty reduction explanation as articulated by Lee (1994) is correct, then her results should be replicated. For ease of contrast, these predictions – the general pattern of results from the Bornstein and D'Agostino (1994) and Lee (1994) studies – are reproduced in Figure 1.



**Figure 3.1.** General pattern of results from the Bornstein and D'Agostino (1994) and Lee (1994) studies showing liking for old and new items as a function of belief about prior exposure.

## Method

### Participants

Forty students (twenty per condition) from the University of California, San Diego participated. In return for their participation, they received partial fulfillment of credit for their undergraduate psychology courses.

### Stimuli and Apparatus

Participants were tested in a private, well-lit 8' x 8' room. All stimuli and instructions were presented on a Dell OPTIPLEX GX270 computer with a 74.4 GB hard-drive and 512 MB of RAM and a 17-in ViewSonic monitor, using E-prime by Psychology Software Tools Inc. As previously mentioned, the stimuli consisted of dot

patterns similar to those used by Posner and Keele (1968). Twenty distinct categories of dot patterns were created, with each category consisting of one prototype and fifteen distortions of that prototype. Each of the prototypes and distortions consisted of nine dots. The prototypes were randomly generated using Robert Goldstone's Concept Learning. The distortions were generated by randomly displacing the dots of the prototype. A distortion level of 30 was chosen, which indicates the number of screen pixels by which each dot of the category's prototype was displaced. A screen pixel is equal to approximately 0.0437 centimeters.

### **Procedure**

For each participant, the experiment consisted of ten separate blocks presented in random order, with each block consisting of a study (exposure) phase and a test (rating) phase. During the study phase the fifteen distortions from a category were presented in random order. Each distortion was presented in the center of the screen for 1000 ms with a 400 ms inter-stimulus interval. Each study list was preceded by a two second "READY?" prompt, cueing the subjects to focus their attention on that area. During the test phase, each of the test patterns was presented for a duration of 1500 ms. After the stimulus disappeared, a prompt came on the screen indicating that the participant should make their liking judgment. They were informed that they were to indicate how much they liked the pattern on a scale from one to nine, with lower numbers indicating less liking and higher numbers indicating more liking. They used the keys labeled one to nine on the keyboard to make their liking judgments. They made liking judgments on six test patterns. For those in *believe old* condition, these patterns consisted of: four old exemplars, the old prototype and a new prototype. For those in the *believe new*

condition, these patterns consisted of: four new exemplars, the old prototype and a new prototype. After completing their judgments on the six test patterns for a given block, they continued onto the next block where the procedure was repeated. Participants continued like this through ten blocks after which the experiment ended. Participants were then debriefed and dismissed.

As noted, twenty categories of patterns in total were constructed. However, also as noted, each participant was exposed to only ten of these categories. The old test patterns came from the categories that participants were exposed to while the new test patterns came from the other ten categories that they were not exposed to. For half of the participants old test patterns were drawn from categories one to ten while new test patterns were drawn from categories eleven to twenty. For the other half of the participants the situation was reversed. This counterbalanced design thus controlled for any potential differences in liking that might otherwise result from variation in intrinsic appeal between test patterns from different categories.

Participants in both the *believe old* and *believe new* conditions were given the same set of instructions. They were told that we were interested in understanding how we perceptually process simple patterns. To investigate this, we were first going to have them process simple patterns in two different ways: in a passive and in an active manner. During the passive processing phase all as they would have to do is observe a number of patterns as they appeared one at a time on the computer screen. This actually corresponded to the study (exposure) phase. During the active processing phase we wanted them to do more than simply observe patterns; we wanted them to actively engage each of the patterns. Specifically, we wanted them to judge each of the patterns

according to how pleasing to the eye or likeable they were. This actually corresponded to the test (rating) phase. Participants were told that after passively and actively processing a number of patterns that they would be shown them again and that perceptual processing of these patterns would be assessed. Of course, the latter was only a cover story and this was never actually done. Importantly, these instructions were designed to keep the connection between the passively and actively processed patterns deliberately ambiguous such that any bias created towards seeing them as the same or different would entirely be a function of rating context.

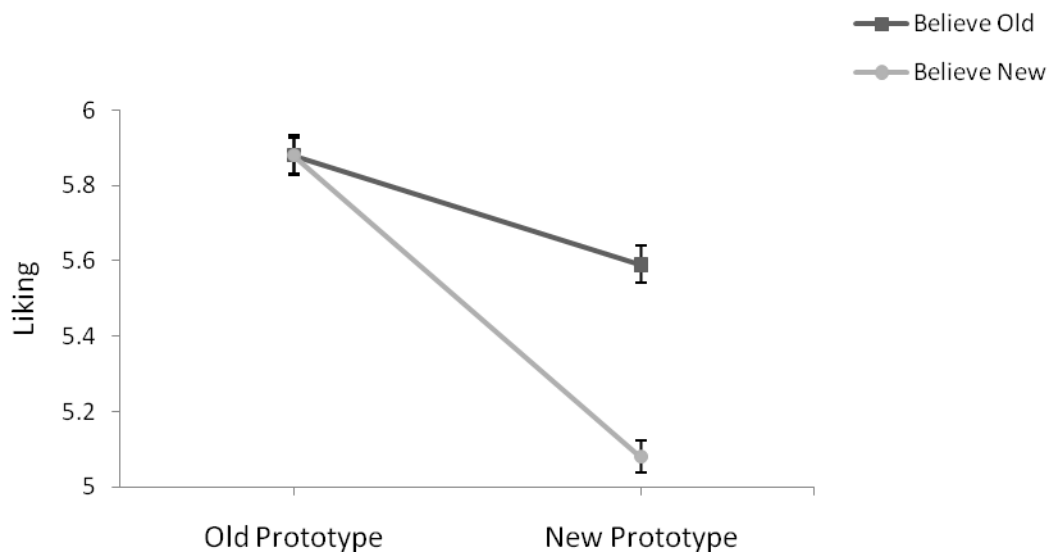
### Results

A 2x2 mixed ANOVA was used to analyze the data, with Beliefs about Prior Exposure (*believe old* vs. *believe new*) as the between-subjects variable and Type of Pattern (*old prototype* vs. *new prototype*) as the within-subjects variable. This analysis revealed a main effect for Type of Pattern, with *old prototypes* ( $M = 5.88, SD = .98$ ) being preferred to *new prototypes* ( $M = 5.33, SD = .94$ ),  $F(1, 38) = 31.58, P < .000$ ; no main effect for Beliefs about Prior Exposure, with liking ratings for the *believe old* ( $M = 5.74, SD = 1.01$ ) and *believe new* ( $M = 5.48, SD = .97$ ) conditions being the same,  $F(1, 38) = .83, p > .30$ ; and a significant interaction between Beliefs about Prior Exposure and Type of Pattern,  $F(1, 38) = 6.91, p < .02$ . To further clarify this interaction, one-way ANOVA's were run within each belief condition to assess the presence and strength of the mere-exposure effect. This analysis revealed that a mere-exposure effect was present for both belief conditions: *old prototypes* ( $M = 5.88, SD = 1.04$ ) were preferred to *new prototypes* ( $M = 5.59, SD = .99$ ) within the *believe old* condition,  $F(1, 19) = 7.07, p < .02$ , and *old prototypes* ( $M = 5.88, SD = .94$ ) were preferred to *new prototypes* ( $M = 5.08,$

$SD = .83$ ) within the *believe new* condition,  $F(1, 19) = 24.87, p < .000$ . However, as was the case for both Bornstein and D'Agostino (1994) and Lee (1994), the mere-exposure effect was much weaker in the *believe old* than in the *believe new* condition, partial eta squared = .271 and .567, respectively.

To assess why the mere-exposure effect was weaker in the *believe old* than in the *believe new* condition, one-way ANOVA's were run between each belief condition comparing liking for old and for new prototypes. In contrast to the prediction of the perceptual fluency/misattribution model of Bornstein and D'Agostino (1994) – that the reduced strength of the mere-exposure effect in the *believe old* condition should be the result of a reduction in liking for the *old prototype* – liking for the *old prototype* did not differ between the *believe old* ( $M = 5.88, SD = 1.04$ ) and *believe new* ( $M = 5.88, SD = .94$ ) conditions,  $F(1, 19) = .000, p > .90$ . Rather, confirming the prediction of the uncertainty reduction model promoted by Lee (1994) – that the reduced strength of the mere-exposure effect in the *believe old* condition should result from an increase in liking for the *new prototype* – liking for the *new prototype* was found to be marginally higher in the *believe old* ( $M = 5.59, SD = .99$ ) than in the *believe new* ( $M = 5.08, SD = .83$ ) condition,  $F(1, 19) = 3.16, p < .09$ . It's worth noting that although the latter result was only marginally significant, it did replicate the marginally significant result of Lee (1994) and, as such, strengthens the evidence in support of the idea that a belief about an item being old, far from motivating participants to reduce liking for the item, appears, if anything, to bias them towards giving the item a higher liking rating. The results of this analysis are summarized in Figure 2.





**Figure 3.2.** Results of the present study showing liking for old and new prototypes as a function of belief about prior exposure.

### Discussion

Since the results of Lee (1994) were replicated while the results of Bornstein and D'Agostino (1994) were not, the present experiment weakens the evidence often cited in support of the perceptual fluency/misattribution model while at the same time strengthening the evidence for an uncertainty reduction model. Importantly, given that participants in the present experiment could only have arrived at their beliefs about prior exposure *on their own*, as opposed to being told what they should believe, the results reported here represent a more ecologically valid and, therefore, definitive test of the perceptual fluency/misattribution model. And, in this regard, contrary to the model's prediction that recognition should impair liking, it appears that recognition, if anything, augments liking.

#### The Believe Old and Believe New Conditions – Interpreting the Results

Lee (1994) suggested the greater liking for new items in her seen condition resulted from the fact that these items felt subjectively familiar (perhaps being mistaken for old items), with the reduced uncertainty associated with such a subjective state producing a more a favorable evaluation. Still, according to the uncertainty reduction model, she should have found old items in her seen condition (where there was both objective and subjective familiarity) to be rated more positively than old items in her not-seen condition (where there was only objective familiarity). She explained this apparent anomaly away by suggesting this may represent a ceiling effect achieved in terms of uncertainty reduction when the items were actually old: that when an item was actually old uncertainty towards it may have already been maximally reduced.

While Lee's (1994) interpretation of her results may be valid, given the differences between her paradigm and the one used here, the present results allow for an alternative, albeit not necessarily antithetical, interpretation. In particular, it's possible that participants in the present study approached the evaluative task the same way in both belief conditions: establish a baseline for rating items and then rate items more favorably to the extent that they feel more similar or familiar to items seen previously. As suggested by Lee (1994), then, one reason why new items in the *believe old* condition may have been rated higher is that some of these items just felt subjectively familiar (i.e., were mistaken for old items). Another possibility, though, is that with so many of the items actually being old, that in addition to being rewarded for spotting old items, participants developed an orientation towards, and therefore were rewarded for, spotting new items.

As investigators typically go out of their way to hide what has been seen before, it may just be that the *believe new* condition in the present study actually reflects the usual state of affairs for most mere-exposure paradigms – that participants in these studies tend to experience most of the items as unfamiliar. In fact, it's quite possible that some critical state of uncertainty regarding prior exposure is a necessary condition to obtain mere-exposure effects; that is to say, it is only when participants become reasonably unsure about what has been presented previously that they adopt a familiarity-based evaluative strategy and, therefore, that mere-exposure effects emerge. A recent study by Dechene, Stahl, Hansen and Wanke (2009) suggests that this may be the case: while they found that a mere-exposure effect emerged when repeated items were evaluated amongst unrepeated ones, it did not emerge when repeated and unrepeated items were evaluated in separate lists. Indeed, this notion would go a long way towards explaining why the so-called *believe new* conditions of all three studies (Bornstein & D'Agostino, 1994; Lee, 1994; and the present study) produced the strongest mere-exposure effects, and why factors that make the connection between the exposure and rating phase *less* obvious (e.g., shorter exposures, fewer exposures, longer delays between exposure and rating) tend to increase the strength of the mere-exposure effect (see Bornstein, 1989 for review): because as uncertainty as to what has been seen before increases so does the probability that participants will turn to an unfamiliar-familiar (or dissimilar-similar) dimension for evaluative purposes.

### **Explaining the Bornstein and D'Agostino (1994) Results**

The Bornstein and D'Agostino (1994) results may readily be accounted for without appealing to a perceptual fluency/misattribution mechanism to do so. Indeed, an

equally plausible and simpler familiarity-based explanation may be invoked to show how their instructional manipulations might have produced the results they did.

In their old condition, informing participants that the items they would be rating had all been seen before may have actually turned them away from using familiarity as a basis for evaluative discrimination; after all, if all of the items are old, then it's not very useful to discriminate between them based on which feels more familiar. Even if participants had tried to do so, however, considering that the first five items Bornstein and D'Agostino (1994) had participants rate were actually new, they may have quickly come to the conclusion that even if the items were old that recognizing them as such was not going to be easy. As such, with participants turning to an alternative, orthogonal dimension (e.g., simple-complex) for evaluative purposes, old and new items would have received comparable liking ratings.

In their new condition, it's likely that telling participants that the items they would be rating were not seen before actually had the opposite effect than was intended; being ever skeptical as participants tend to be, this instruction likely motivated them to find out if the experimenter was really telling them the truth, with the search for previously presented items eventually paying affective and evaluative dividends. It should also be pointed out that though participants were informed the items they would be rating were not the exact same items they saw before, they were told the items would be similar. This instruction may have actually served as a cue to use a similar-dissimilar dimension for evaluatively discriminating between the items. Of course, with old items being deemed more similar than new items to items that had been seen before, use of this strategy would have produced a relatively large mere-exposure effect.

In short, rather than showing that familiarity impairs mere-exposure effects, the Bornstein and D'Agostino (1994) results may actually show the opposite: that an evaluative strategy based on familiarity is necessary to obtain such effects.

### **Reevaluating the Evidence for the Perceptual Fluency/Misattribution Model**

Though the present experiment compromises the integrity of the perceptual fluency/misattribution model, the model is still supported by two other key pieces of evidence: 1) a Bornstein (1989) meta-analysis showing stronger mere-exposure effects for factors that make stimuli less recognizable, and 2) a Bornstein and D'Agostino (1992) study showing within the same experiment, using the same stimulus materials a stronger mere-exposure effect for subliminal (i.e., less recognizable) than for supraliminal (i.e., more recognizable) stimulus presentations. Each of these is considered in turn.

#### **1. The Bornstein (1989) Meta-Analytic Findings**

The perceptual fluency/misattribution model was initially formulated by Bornstein (1989) to account for a number of factors that reduce the strength of the mere-exposure effect: more stimulus exposures, longer stimulus exposures, homogenous exposure sequences and shorter delays between exposure to the stimuli and ratings of the stimuli. Presumably, each of these factors makes repeated items more recognizable and, as such, makes it more likely that participants will apply a correction mechanism to compensate for the biasing influence of having seen the items before. There are, however, several other reasonable explanations as to why these factors might reduce the strength of the mere-exposure effect. As alluded to already, one possibility is that each of these factors simply biases participants towards a belief that the items to be rated are all old (e.g., "A lot of these look familiar – maybe they are all items I've seen previously?")

and, therefore, that an unfamiliar-familiar dimension isn't a particularly good dimension for evaluatively discriminating between the items (e.g., "Well, if they're all old, I guess using familiarity as a basis for liking isn't terribly useful."). If so, with even some participants turning to an alternative dimension for evaluative purposes, the discrepancy in liking for old and new items would necessarily be reduced. A second possibility is that each of these factors simply makes the study more boring and that this in turn is what is responsible for reducing the strength of the effect. Indeed, Bornstein (1990) has demonstrated that boredom can act as a limiting condition on the mere-exposure effect: the effect is abolished with boredom-prone participants and with conditions that make the study particularly tedious (e.g., with a large number of stimulus exposures). In addition, Chenier (in press) recently found that while mere-exposure effects were exhibited under conditions of lower participant boredom (higher arousal/more positive affect), they were not observed under conditions of higher participant boredom (lower arousal/less positive affect). A third possibility is that each of these factors makes the link between the exposure and rating phases so obvious that participants come to view their act of recognition as no special achievement (e.g., "I've clearly seen many of these items before; obviously this study isn't about my ability to discern old items from new ones."). If so, with little affective kick for recognizing items from the exposure phase, liking for old items would, once again, necessarily be reduced relative to new ones. In short, although Bornstein's (1989) meta-analytic findings are consistent with the perceptual fluency/misattribution model, because there are several other reasonable explanations that may account for them, they may hardly be taken as definitive support for the model.

## **2. The Bornstein and D'Agostino (1992) Study**

The Bornstein and D'Agostino (1992) study presumably provides support for the idea that participants engage a correction mechanism to reduce liking for recognizable stimuli by showing within the same experiment, using the same stimulus materials a larger mere-exposure effect for subliminal (i.e., less recognizable) than for supraliminal (i.e., more recognizable) stimulus presentations. Unfortunately, a recent attempt by Newell and Shanks (2007) to replicate the Bornstein D'Agostino (1992) findings failed. Specifically, instead of finding a stronger mere-exposure effect for subliminally presented stimuli, Newell and Shanks (2007) found no mere-exposure effect for such stimuli; rather, they only found a mere-exposure effect for supraliminally presented stimuli, and only then when recognition was at its highest. What might account for this discrepancy? The most conspicuous difference between the two studies is that Bornstein and D'Agostino (1992) used four different exposure frequencies (1, 5, 10 and 20) while Newell and Shanks (2007) used only two (3 and 9). Perhaps the greater number of different exposure frequencies in addition to the greater number of overall exposures in the Bornstein and D'Agostino (1992) study biased participants in the supraliminal condition, where it would have been quite obvious that some stimuli were being repeated more than others, into believing that the study was concerned with boredom (e.g., "Some of these items are being repeated more than others – maybe this study is about how many times I can see the same item before I begin to get bored of it?"). If so, some participants in this condition may have actually been compelled to give highly repeated stimuli lower liking ratings than less repeated stimuli. Of course, under subliminal conditions, where participants would not have been so readily able to discern that some stimuli were being repeated more than others, participants would have been much less likely to arrive at this

conclusion. Instead, finding it difficult to clearly discriminate between old and new items, they would have been more likely to fall back on an unfamiliar-familiar dimension for evaluative purposes (e.g., “Some of these items seem familiar or, at least, similar to ones I’ve seen before. OK, I’ll rate those more likable.”). This would certainly explain why Bornstein and D’Agostino (1992) found a stronger mere-exposure effect for subliminal than for supraliminal stimulus presentations. Regardless of the exact reason, though, the fact that Newell and Shanks (2007) were unable to replicate them, instead finding contrary results, seriously compromises the integrity of this evidence for the perceptual fluency/misattribution model.

#### **Viability of the Perceptual Fluency/Misattribution Model - Conclusions**

Given the previous critical analysis and the results of the present study, it would appear that the evidence often cited in support of the perceptual fluency/misattribution model is less than compelling. First, although the findings from the Bornstein (1989) meta-analytic review are consistent with the perceptual fluency/misattribution model, as they are open to too many alternative explanations, they do not in-and-of-themselves provide definitive support for it. Second, while the results of the Bornstein and D’Agostino (1992) subliminal-supraliminal mere-exposure study are intriguing, the fact that a subsequent attempt to replicate them failed calls their veracity into question. Third, although the results of the first experiment by Bornstein and D’Agostino (1994) are consistent with the model, because the instruction that all of the items had been seen before reduced liking for both old and new items and not just old items selectively, it’s questionable whether this reflects misattribution of fluency to familiarization per se or whether participants came to conclude that they were supposed to find such items less



interesting and, therefore, were supposed to rate them lower as a whole. And Fourth, while the results of the second experiment by Bornstein and D'Agostino (1994) provides perhaps the most direct evidence for the model, in light of the contradictory results of a very similar study by Lee (1994) and a less confounded replication here, this evidence does not seem very credible.

Given these findings, then, there really is only one conclusion: the perceptual fluency/misattribution model simply cannot be considered a viable model of the mere-exposure effect. Indeed, the lack of compelling evidence for the perceptual fluency/misattribution model suggests that under ordinary circumstances participants do not adjust their liking ratings downwards when they recognize items from the exposure phase. Instead, the results of the present study and others reviewed here suggest quite the opposite: that recognizing items from the exposure phase, if anything, prompts participants to give the items higher liking ratings. Still, as alluded to earlier, there may be extenuating circumstances in which participants feel compelled to give lower liking ratings to more recognizable items: 1) when either the participants themselves are prone to boredom or the study itself is particularly tedious, or 2) when demand characteristics lead participants to believe the study is actually concerned with boredom and, as such, that they are *supposed* to give more repeated and, therefore, recognizable items lower liking ratings.

### **The Role of Recognition in Mere-Exposure – Do Preferences Need Inferences?**

So what do the present findings tell us about the role that recognition plays in bringing about mere-exposure effects? One vehemently defended view of the mere-exposure effect holds that recognition plays no role whatsoever but rather that the effect

is based entirely on unconscious and noninferential processes (e.g., Zajonc, 1968; 2001). In support of this view, proponents often point to subliminal mere-exposure studies showing mere-exposure effects in the absence of recognition: if participants cannot recognize what they have seen before but still prefer old items to new ones, then recognition cannot be the driving force behind the mere-exposure effect. Despite claims to the contrary, however, this finding does not in fact show the mere-exposure effect in the absence of recognition. This is because when recognition in such paradigms has been assessed in terms of familiarity (i.e., what is your *sense* that the item is old), liking has been found to closely parallel familiarity-based recognition (e.g., Bonnano and Stillings, 1986). The present finding that recognition actually augments liking, then, makes this finding that much more potent: given that participants are in fact able to use a feeling of familiarity to discriminate between old and new items and given that participants readily rate items they believe they have seen before more positively, there really is no reason for believing that the mere-exposure effect in subliminal paradigms, or in any mere-exposure paradigm for that matter, is based on anything other than processes of recognition.

### **Future Directions**

One obvious way to see how people might react to recognizing an item from their past would be to look at all those mere-exposure experiments that have in one way or another coupled recognition with liking judgments. To the extent that the perceptual fluency/misattribution model is correct, looking within objectively old items, we should consistently find that unrecognized items (misses) are preferred to recognized items (hits), whereas looking within objectively new items, we should consistently find that unfamiliar items (correct rejections) are preferred to familiar items (false alarms). If,

however, we consistently find the opposite, given the contradictory evidence already proffered by the present analysis, this would all but discredit the perceptual fluency/misattribution model as a viable explanation for the mere-exposure effect.

Chapter 3 is currently being prepared for submission for publication. Chenier, Troy. "The perceptual fluency/attribution model of the mere-exposure effect: A failure to find evidence." The dissertation author was the primary investigator and author of these materials.

## CHAPTER 4

### How Recollective State Interacts with Objective Familiarity to Shape Preference

### Abstract

To understand how preferences for previously encountered items are formed two factors should be considered: recollective state and objective familiarity. The perceptual fluency/misattribution and uncertainty reduction models are two competing models of the mere-exposure effect that take these two factors into account. A review of the literature leads to the conclusion that the uncertainty reduction model better accounts for extant results and therefore that it provides us with a better conceptualization of how recollective state and objective familiarity interact to shape preference. Experiments 1 and 2 reaffirm this conclusion and extend the explanatory power of the model to include two other historical preference effects – the preference for prototypicality and structural relation preferences. In addition, Experiment 2 tests a hypothesis concerning what might be considered anomalous findings for an uncertainty reduction explanation and in-so-doing finds that the inconsistent results reported in the literature may be traced to the simultaneous use of two goal-based strategies to infer liking – a feeling of familiarity and a feeling of accuracy. The repercussions of these findings for the mere-exposure effect and for preference formation in general are addressed.

## How Recollective State Interacts with Objective Familiarity to Shape Preference

In evaluating an item that has been previously encountered, there are potentially two separate sources of affect that may influence liking: ‘recollective state’ – our *belief* about the historical status of the item – and ‘objective familiarity’ – the *actual* historical status of the item. As such, to understand how preferences for previously encountered items are formed, we need to examine the interaction between recollective state and objective familiarity. Our current understanding of how these two factors interact to shape preference comes from work that has focused on the mere-exposure effect. The mere-exposure effect is the finding that a simple, unreinforced exposure to a stimulus is a sufficient condition to enhance liking for that stimulus (Zajonc, 1968; 2001). Mere-exposure effects have proven robust, being obtained with a variety of stimuli – faces (Bornstein, Leone, & Galley, 1987), ideographs (Zajonc, 1968), music (Wang and Chang, 2004), paintings (Cutting, 2003), and abstract patterns (Stang and O’Connell, 1974) – and with a variety of dependent measures – force-choice preference judgments (Kunst-Wilson and Zajonc, 1980), liking rating scales (Zajonc, Marcus, & Wilson, 1974), and physiological responses (Harmon-Jones and Allen, 2001). Though many models have been forwarded to explain the mere-exposure effect, two models that speak to how recollective state interacts with objective familiarity to shape preference and thus that are particularly pertinent to the present inquiry are the perceptual fluency/misattribution model and the uncertainty reduction model.

### **Overview of Perceptual Fluency/Misattribution and Uncertainty Reduction Models**

The perceptual fluency/misattribution model (Bornstein and D’Agostino, 1992; 1994) of the mere-exposure effect proposes that a prior exposure to a stimulus enhances

perceptual fluency – the ease of perceiving the stimulus – relative to novel stimuli. To the extent that the perceiver is unaware that the source of this enhanced fluency is the past, he or she will misattribute this experience of ease to the properties of the item itself, thus resulting in a more positive evaluation of the item than would otherwise be the case. However, to the extent that the perceiver becomes aware that the source of the enhanced fluency is the past he or she may be inclined to adjust for this obtrusive influence by giving the item a lower liking rating. Thus, according to this model, enhancement of regard for mere-exposed stimuli should be most pronounced when our recollective state is one of having not encountered the item before – in particular, when we are *unaware* of the influence of the past.

The uncertainty reduction model refers to the first factor of the two-factor model of the mere-exposure effect (Berlyne, 1970; Stang, 1975). In particular, the latter explains the mere-exposure effect in terms of habituation and satiation. That is, at first, initial repeated exposure habituates an organism to a stimulus. This habituation makes the stimulus more familiar, reducing uncertainty regarding the stimulus, and consequently engenders positive affect and a more favorable response. As repeated exposure makes the stimulus even more familiar and recognizable, uncertainty continues to drop and positive affect continues to rise. However, at some point satiation sets in, making the stimulus boring, and consequently engenders negative affect and a less favorable response. Thus, according to this model, at least in the absence of stimulus satiation, enhancement of regard for mere-exposed stimuli should be most pronounced when our recollective state is one of having encountered an item before – in particular, when we are *aware* of the influence of the past.

### **Perceptual Fluency/Misattribution and Uncertainty Reduction Models Compared**

According to a meta-analytic review by Bornstein (1989) of some two hundred mere-exposure effect studies, the mere-exposure effect was found to be enhanced with: heterogeneous (as opposed to homogenous) exposure sequences; a small number of exposures (10-20); longer delays between exposure to the stimuli and ratings of the stimuli; subliminal (as opposed to supraliminal) stimulus exposures; and stimuli that are not recognized from the exposure phase. Since all of these factors function to reduce awareness of the exposed stimuli, these observations support the perceptual fluency/misattribution prediction that enhancement of regard for mere-exposed stimuli should be most pronounced when we are *unaware* of the influence of the past. However, while the uncertainty reduction model can account for the first three findings in terms of satiation (i.e., that these factors increase liking because they reduce boredom), it has difficulty explaining the last two findings: subliminal mere-exposure effects and the negative relationship between liking and explicit recognition.

Because the uncertainty reduction model predicts that positive affect and liking should vary as a function of subjective familiarity and explicit recognition (as both factors reduce uncertainty associated with an item), Bornstein (1989) notes that it could not as originally formulated (i.e., as outlined in the two-factor theory of Berlyne, 1970, and Stang, 1975) account for the findings of subliminal mere-exposure effect studies in which there was enhancement of regard for stimuli that were not in fact recognized. Bornstein (1989) suggested this apparent flaw could be remedied if we allow for the fact that learning may occur implicitly and unconsciously. If so, subliminal exposure could reduce uncertainty associated with the stimulus via familiarization and thereby increase



liking even though explicit stimulus recognition was absent. This apparent qualification by Bornstein (1989), however, seems unnecessary. This is because the original model does not restrict itself to explicit recognition as the sole means by which uncertainty may be reduced; rather, it clearly states that uncertainty may also be reduced via subjective familiarity (i.e., a sense that the item has been seen before). And though subliminal mere-exposure paradigms show that the mere-exposure effect may occur in the absence of explicit recognition (e.g., Kunst-Wilson & Zajonc, 1980), such paradigms do not in fact demonstrate preference in the absence of feelings of familiarity. On the contrary, it appears that within these paradigms there is an intimate association between liking and subjective familiarity. Bonnano and Stillings (1986), for example, demonstrated that although following subliminal exposure participants could not reliably discriminate between old and new items based on explicit recognition (i.e., when they were asked to ‘remember’ items they had seen previously) they could based on feelings of familiarity (i.e., when they were asked which items ‘felt’ old). And when subjects based their recognition of the items on how familiar the items felt, previously seen items were recognized as much as they were preferred. In short, as participants in subliminal mere-exposure effect studies are in fact able to differentiate between old and new items, there is no need to suggest some unconscious familiarization mechanism – that somehow participants are familiar with the properties of an item without being aware of having seen it before – to explain uncertainty reduction in these paradigms.

Even though the uncertainty reduction model can explain subliminal mere-exposure effects, the prediction that enhancement of regard for mere-exposed stimuli should be most pronounced when we are *aware* of the influence of the past contradicts

one of the principle findings of Bornstein's (1989) meta-analytic review: items not recognized are liked more than those that are recognized from the exposure phase. Regarding this point, Bornstein (1989) makes two specific observations: 1) the combined effect size for those experiments that used stimuli that were not recognized at better than chance accuracy was much larger than the mean effect size for all mere-exposure effect experiments combined and 2) the combined effect size for those experiments that used subliminal stimulus presentations was much larger than the combined effect size for those experiments that used briefly presented, but supraliminal, stimulus presentations. Since Bornstein (1989) is making comparisons across studies, however, there are a number of variables besides stimulus recognition that have not been controlled for that may otherwise account for the observed effect sizes (e.g., stimulus complexity, delay between exposures and ratings, type of stimuli used, homogeneous versus heterogeneous stimulus presentation, number of exposures, etc). As such, although these results are suggestive, taken by themselves they cannot be viewed as conclusive. In recognition of this fact, Bornstein and D'Agostino (1992), within the same experiment, using the same stimulus materials, directly compared subliminal to supraliminal stimulus exposures and found the mere-exposure effect to be stronger for the former than the latter. This key piece of support for the perceptual fluency/misattribution view, however, has recently been called into question. Across three experiments, Newell and Shanks (2007) not only failed to replicate the Bornstein and D'Agostino (1992) results, but actually observed the exact opposite: a positive correlation between recognition and liking, with a reliable mere-exposure effect only being obtained when recognition was at its highest level. Given these findings, it would appear that there exists an intractable stalemate between these

two models in regards to the relationship between recognition and liking. However, resolution may yet be achieved by comparing their differing predictions in those mere-exposure experiments that have employed a procedure coupling recognition with liking judgments.

### **Recollective State and Objective Familiarity in Interaction – Comparing Predictions**

The predictions each of these models make for how recollective state (belief about whether an item is old or new) interacts with objective familiarity (whether an item is actually old or new) to shape preference will be examined through two separate routes: 1) how objective familiarity shapes preference given recollective state and 2) how recollective state shapes preference given objective familiarity.

### **How Objective Familiarity Shapes Preference Given Recollective State**

The perceptual fluency/misattribution model assumes that when people recollect that they have seen an item before they engage in a correction mechanism to reduce liking for that item. If we assume that this correction mechanism is applied equally to objectively old and new items and if we assume that items that are actually old are processed with greater ease (because they have been processed previously) than items that are actually new (because they have not been processed previously), then even with the correction mechanism items that are actually old will still be processed more fluently than items that are actually new. Hence, we should expect that within items that are believed to be old that items that are actually old (higher fluency items) will be preferred to items that are actually new (lower fluency items). That is, given that recollective state is that the items have been encountered before, the pattern of preference should be: hits > false alarms. Of course, since no such correction mechanism is engaged for items

believed to be new, perceptual fluency is freed from cognitive inhibition and can thus influence liking in an unfettered manner. Hence, for items believed to be new we should expect a similar pattern of results: that items that are actually old (higher fluency items) will be preferred to items that are actually new (lower fluency items). That is, given that recollective state is that items have not been encountered before, the pattern of preference should be: misses > correct rejections.

The uncertainty reduction model assumes that evaluation of an item is enhanced to the extent that uncertainty regarding the item is reduced. If we assume that items that are actually old will still feel more familiar than items that are actually new regardless of beliefs about whether the items are old or new, then to the extent that subjective familiarity reduces uncertainty associated with an item, items that are truly old should always be preferred to items that are truly new. That is, given that recollective state is that the items have been encountered before, the pattern of preference should be: hits > false alarms; whereas given that recollective state is that the items have not been encountered before, the pattern of preference should be: misses > correct rejections.

Unfortunately, as can be seen, since the perceptual fluency/misattribution and uncertainty reduction models make identical predictions for how objective familiarity should shape preference given recollective state, we cannot distinguish between these two models by comparing liking for hits to false alarms and misses to correct rejections. However, it is still of theoretical interest to know whether the predictions of these models are actually born out empirically. For this reason, the following literature review was undertaken.

To facilitate evaluation of the predictions of the two models, the results for all mere-exposure effect studies that have coupled recognition with liking to date are summarized in Table 1. As many of these studies had concerns different from those of the present inquiry, statistical analysis that would be of interest here was not in all cases carried out. However, where relevant statistical analysis was performed, a star is used to indicate that the difference was in fact reliable. Otherwise, observed differences may only be taken to be indicative of trends.

**Table 4.1:** Literature review comparing liking for objectively old to objectively new items within recollective state.

Study	Recollective State	
	Believe Old	Believe New
<b>Matlin (1971)</b>	hits > false Alarms*	misses > correct rejections*
<b>Wilson (1979)</b>		
<b>Experiment 1</b>	hits (4.22) > false alarms (3.77)	misses (4.00) > correct rejections (3.04)*
<b>Experiment 2</b>	hits (3.51) > false alarms (3.03)	misses (3.85) > correct rejections (3.02)*
<b>Obermiller (1985)</b>		
<b>For 1-3 Exposures</b>	hits (12.8) > false alarms (12.2)*	misses (12.3) > correct rejections (12.2)
<b>For 6 Exposures</b>	hits (13.2) > false alarms (12.2)*	misses (12.0) < correct rejections (12.2)
<b>Brooks &amp; Watkins (1989)</b>	hits > false alarms	misses > correct rejections
<b>Anand &amp; Sternthal (1991)</b>		
<b>Experiment 1</b>	hits (5.26) > false alarms (4.73)	misses (3.95) > correct rejections (3.41)
<b>Experiment 2</b>	hits (5.26) > false alarms (4.59)	misses (3.41) > correct rejections (3.22)
<b>Experiment 3</b>	hits (5.32) > false alarms (5.15)	misses (3.40) < correct rejections (3.53)
<b>Lee (2001)</b>		
<b>Within "Sure"</b>	hits (.65) > false alarms (.36)	misses (.41) < correct rejections (.46)
<b>Within "Half-Sure"</b>	hits (.22) > false alarms (-.09)	misses (.08) > correct rejections (-.39)
<b>Wang &amp; Chang (2004)</b>		
<b>Experiment 1</b>		
<b>Within Remember</b>	hits (3.51) > false alarms (3.23)*	misses (2.68) > correct rejections (2.64)
<b>Within Know</b>	hits (3.11) > false alarms (2.92)*	misses (2.68) > correct rejections (2.64)
<b>Experiment 2</b>		
<b>Within Remember</b>	hits (3.44) > false alarms (3.25)*	misses (2.79) > correct rejections (2.75)
<b>Within Know</b>	hits (3.16) > false alarms (3.02)*	misses (2.79) > correct rejections (2.75)

Note: Objectively old items = hits and misses. Objectively new items = false alarms and correct rejections. Where reported, actual numbers are provided in brackets. A higher number indicates a higher preference rating. Where statistical analyses were performed, a star indicates statistical reliability.

Taking a look at liking for hits and false alarms, we can see that in every case hits were preferred to false alarms. Furthermore, this difference was reported to be reliable

for seven of the fifteen analyses, with independent verification coming from three separate investigators. Given the unanimity of liking for hits over false alarms and the fact that this difference has been found to be reliable on so many different occasions and by several different investigators, it would appear to be a very robust occurrence.

Taking a look at liking for misses and correct rejections, we can see misses were preferred to correct rejections for twelve comparisons whereas correct rejections were preferred to misses for three comparisons. Reliability was found only for the former, however, and this was in three different instances, for two separate investigators.

Nevertheless, given that liking for misses over correct rejections has only been reported to be reliable three times and given that a trend in the opposite direction has been observed on several occasions, it would appear that while a preference for misses over correct rejections can occur such an observation may in fact be relatively rare. In summary, based on those mere-exposure effect studies to date that have coupled recognition with liking, while the predictions of both the perceptual fluency/misattribution and uncertainty reduction models were robustly born out for liking between hits and false alarms, it appears that their predictions for liking between misses and correct rejections has received relatively weak and inconsistent support.

As mentioned, these two models cannot be dissociated by looking at the pattern of preferences within recollective state. However, because of the contrasting predictions each makes for how recollective state shapes preference given objective familiarity, they can be dissociated by examining preferences within objective familiarity – that is, by comparing liking for hits to misses and false alarms to correct rejections.

### **How Recollective State Shapes Preference Given Objective Familiarity**

If the perceptual fluency/misattribution model is correct in assuming that people engage in a correction mechanism to reduce liking for an item to the extent that they recollect that they have seen the item before, and assuming people do this regardless of whether their recollection is in fact veridical, then within items that are actually old and new we should expect items believed to be new to be preferred to items believed to be old. That is, given that the items are objectively old, the pattern of preference should be: misses > hits; whereas given that the items are objectively new, the pattern of preference should be: correct rejections > false alarms.

If the uncertainty reduction model is correct in assuming that people prefer items that reduce uncertainty and if recollection of having seen an item before is one such factor that reduces uncertainty regarding an item, then within items that are actually old and new we should expect items believed to be old to be preferred to items believed to be new. That is, given that the items are objectively old, the pattern of preference should be: hits > misses; whereas given that the items are objectively new, the pattern of preference should be: false alarms > correct rejections.

Once again, to facilitate comparison of predictions between the two models, the results of the previously reviewed studies have been rearranged to show comparisons of hits to misses and false alarms to correct rejections. This is presented in Table 2. As before, where applicable a star is used to indicate that the difference was in fact reliable. Otherwise, any difference is only indicative of a trend.

Taking a look at liking for hits and misses, we can see that in every instance hits were rated more likeable than misses with the lone exception of Wilson (1979) Experiment 2. Additionally, the difference between hits and misses was confirmed to be

**Table 4.2:** Literature review comparing liking for items believed old to those believed new within objective familiarity.

Study	Objective Familiarity	
	Familiar	Unfamiliar
<b>Matlin (1971)</b>	hits > misses*	False alarms < correct rejections
<b>Wilson (1979)</b>		
<b>Experiment 1</b>	Hits (4.22) > misses (4.00)	False alarms (3.77) > correct rejections (3.04)
<b>Experiment 2</b>	Hits (3.51) < misses (3.85)	False alarms (3.03) > correct rejections (3.02)
<b>Obermiller (1985)</b>		
<b>For 1-3 Exposures</b>	Hits (12.8) > misses (12.3)*	False alarms (12.2) = correct rejections (12.2)
<b>For 6 Exposures</b>	Hits (13.2) > misses (12.0)*	False alarms (12.2) = correct rejections (12.2)
<b>Anand &amp; Sternthal (1991)</b>		
<b>Experiment 1</b>	Hits (5.26) > misses (3.95)	False alarms (4.73) > correct rejections (3.41)
<b>Experiment 2</b>	Hits (5.26) > misses (3.41)	False alarms (4.59) > correct rejections (3.22)
<b>Experiment 3</b>	Hits (5.32) > misses (3.40)	False alarms (5.15) > correct rejections (3.53)
<b>Lee (2001)</b>		
<b>Within "Sure"</b>	Hits (.65) > misses (.41)	False alarms (.36) < correct rejections (.46)
<b>Within "Half-Sure"</b>	Hits (.22) > misses (.08)	False alarms (-.09) > correct rejections (-.39)
<b>Wang &amp; Chang (2004)</b>		
<b>Experiment 1</b>		
<b>Within Remember</b>	Hits (3.51) > misses (2.68)*	False alarms (3.23) > correct rejections (2.64)*
<b>Within Know</b>	Hits (3.11) > misses (2.68)*	False alarms (2.92) > correct rejections (2.64)*
<b>Experiment 2</b>		
<b>Within Remember</b>	Hits (3.44) > misses (2.79)*	False alarms (3.25) > correct rejections (2.75)*
<b>Within Know</b>	Hits (3.26) > misses (2.79)*	False alarms (3.02) > correct rejections (2.75)*

Note: Items believed old = hits and false alarms. Items believed new = misses and correct rejections. Where reported, actual numbers are provided in brackets. A higher number indicates a higher preference rating. Where statistical analyses were performed, a star indicates statistical reliability.

reliable in seven different analyses across three different experimenters. Of the two remaining experimenters that did not report a statistical difference, it should be noted that Anand and Sternthal (1991) did not test for a difference between hits and misses. However, they did report that the comparison of hits to all other categories combined was significantly different. The results of these studies thus provide strong support for the uncertainty reduction view while providing almost no support for the perceptual fluency/misattribution view.

Taking a look at liking for false alarms and correct rejections, we can see that for ten of the fourteen comparisons false alarms were rated more likeable than correct



rejections. Of the remaining four, only Matlin (1971) and Lee (2001) found correct rejections to be rated more favorable than false alarms, although these differences were not reported to be reliable. However, despite the trend in favor of liking for false alarms over correct rejections, only Wang and Chang (2004) have reported this difference to in fact be reliable. Once again, it should be noted that although Anand and Sternthal (1991) did not test for a difference between false alarms and correct rejections, they reported that the difference between false alarms and misses in each of their experiments was significant. Since the spread between false alarms and correct rejections is on par with that of false alarms and misses, it appears that if they had tested they would have found the differences to be reliable. Nevertheless, the fact that false alarms were found to be liked more than misses is in complete contradiction to the perceptual fluency/misattribution prediction that misses, of all the items, should be the most well-liked. Although the results from these comparisons may not be as robust as for those of hits and misses, they do provide some support for the uncertainty reduction view while providing minimal support for the perceptual fluency/misattribution view.

In summary, given those mere-exposure effect studies to date that have coupled recognition with liking, the uncertainty reduction model's predictions are shown to be much more empirically verifiable than those of the perceptual fluency model. However, even though the uncertainty reduction model's prediction for liking between hits and misses has been robustly born out, there appears to be considerably less support for its prediction concerning liking between false alarms and correct rejections.

### **The Present Study**

Given the previous literature review, two observations emerge. First, the uncertainty reduction model appears to do a better job of accounting for the mere-exposure effect than does the perceptual fluency/misattribution model. Second, while some of the predictions of the uncertainty reduction model are well supported, other predictions, it would seem, are only rarely realized. Specifically, hits (items that participants should be most certain about) have been found to be preferred to false alarms and misses with almost perfect unanimity across studies, while false alarms and misses have been found to be preferred to correct rejections (items that participants should be least certain about) only occasionally. Given these observations, the present research was designed with the following goals in mind: 1) to provide yet another opportunity for comparing the veracity of the perceptual fluency/misattribution and uncertainty reduction models as explanations for the mere-exposure effect; 2) to extend the debate between these two models beyond the mere-exposure effect to two other preference effects that are also tied to the learning experiences of the perceiver – namely, to preferences for prototypicality and structural relation preferences; and 3) to investigate why the uncertainty reduction model's prediction that there should be a preference for false alarms and misses over correct rejections has only rarely been observed.

### **Experiment 1**

The mere-exposure effect is but one preference effect that has an historical basis. Another well researched preference effect tied to a perceiver's learning experiences is the preference for prototypicality. A prototype refers to the most typical member of a category. It is often thought of as representing an average or central tendency of all the members belonging to a category (Posner and Keele, 1968). Like the mere-exposure

effect, the preference for prototypes has proven robust. Despite no previous exposure to the prototypical member itself, the prototype has been found to be the most preferred member for such diverse categories as: color patches (Martindale & Moore, 1988); furniture (Whitfield & Slatter, 1979); paintings (Hekkert & Van Wieringen, 1990); birds, dogs, fish, watches, automobiles (Halberstadt and Rhodes, 2000; 2003); and human faces (Light, Hollander, & Kayra-Stuart, 1981; Rhodes and Tremewan, 1996; Rhodes, Yoshikawa, Clark, Lee, McKay & Akamatsu, 2002). There is also a smaller literature demonstrating preference effects for novel albeit structurally related members of previously learned categories. Adopting an implicit learning paradigm from Reber (1967), in which participants learn to classify novel members into a category even though they are unaware of any grammatical rule for category membership, Gordon and Holyoak (1983), for example, found that novel grammatical letter strings were liked more than novel ungrammatical ones. This finding was subsequently corroborated and extended to auditory stimuli by Sollberger and Reber (2004) who demonstrated a preference for novel structurally related tonal sequences over novel structurally unrelated tonal sequences. Unlike the mere-exposure effect, however, no consideration has been given to how our beliefs about the historical status of an item might influence preferences for previously unseen prototypical or structurally related members of familiar categories. This experiment was designed to rectify this situation.

### **Overview of Design**

To determine how recollective state interacts with objective familiarity to shape preference for the three aforementioned historical preference effects, a modified design based on Posner and Keele's (1968) category learning procedure was employed. The

basic procedure involved exposing participants to a category of dot patterns and then subsequently having them perform recognition and liking judgments on a number of test patterns. Regarding the test patterns, there were six in total, with three being considered objectively old patterns and three being considered objectively new patterns. The three objectively old test patterns corresponded to the three preference effects of interest: 1) a pattern that was actually seen – the mere exposure effect, 2) the prototype category pattern that was not actually seen but, being the prototype, is highly related to those patterns that were seen – preference for prototypicality, and 3) a generic category pattern that was not actually seen but that is still somewhat related to those patterns that were seen – structural relation preference. The three objectively new patterns were taken from a category that was not previously seen: two generic patterns and the prototype pattern. These latter patterns served as controls for assessing any gain in liking that might arise for the former patterns as a result of their being objectively old. More specifically, the mere exposure effect was assessed by comparing liking for old seen patterns to new generic patterns; the preference for prototypicality was assessed by comparing liking for old unseen prototype patterns to new prototype patterns; and the preference for structurally related stimuli was assessed by comparing liking for old unseen generic patterns to new generic patterns.

Of course, the goal was to *separately* examine for each of these three preference effects how recollective state interacts with objective familiarity to influence preference. As with previous mere-exposure effect studies, this can be accomplished easily enough by enumerating hits and misses for old seen patterns and false alarms and correct rejections for new generic pattern, and then calculating liking for each and making the

relevant comparisons. However, the situation becomes a bit trickier for the other two preference effects. Since the old unseen prototype patterns and old unseen generic patterns are never actually shown, it is not technically possible to have hits or misses for these patterns. This conundrum may be resolved, however, by simply designating unseen prototypes and unseen generic patterns as old by virtue of their similarity to patterns that have in fact been shown. That is, since these patterns are intimately related to previously presented categorical patterns, affirmative old responses for all of these patterns may be counted as hits while affirmative new responses may be counted as misses. Hence, in this sense, the term objective familiarity is not limited to items that have actually been seen before. Rather, the term objective familiarity now designates any item, even if not previously seen, that is highly related to items that have been seen previously.

To be clear, then, for the purposes of this experiment, hits, false alarms, misses and correct rejections were defined as follows: a hit was counted as any objectively old item (i.e., an old seen pattern; old unseen prototype pattern; or old unseen generic pattern) that was claimed to have been seen before; a false alarm was counted as any objectively new item (i.e., a new prototype pattern or new generic pattern) that was claimed to have been seen before; a miss was counted as any objectively old item that was claimed to have not been seen before; and a correct rejection was counted as any objectively new item that was claimed to have not been seen before.

Thus, for each of the three types of historical preference phenomena – the mere-exposure effect, preference for prototypicality and structural relation preferences – we can talk about hits, false alarms, misses and correct rejections, and, as such, for each of these historical preference effects we can *separately* compare: 1) liking for hits to false

alarms and misses to correct rejections to understand how objective familiarity influences liking given recollective state, and 2) liking for hits to misses and false alarms to correct rejections to understand how recollective state influences liking given objective familiarity. In this way, not only can we examine the tenability of the perceptual fluency/misattribution and uncertainty reduction models as explanations for the mere-exposure effect, but we can also examine the veracity of these models as explanations for two other historical preferences effects – the preference for prototypicality and structural relation preferences.

## **Method**

### **Participants**

Twenty students from the University of California, San Diego participated. In return for their participation, they received partial fulfillment of credit for their undergraduate psychology courses.

### **Stimuli and Apparatus**

Participants were tested in a private, well-lit 8' x 8' room. All stimuli and instructions were presented on a Dell OPTIPLEX GX270 computer with a 74.4 GB hard-drive and 512 MB of RAM and a 17-in ViewSonic monitor, using E-prime by Psychology Software Tools Inc. As previously mentioned, the stimuli consisted of dot patterns similar to those used by Posner and Keele (1968). Twenty distinct categories of dot patterns were created, with each category consisting of one prototype and fifteen distortions of that prototype. Each of the prototypes and distortions consisted of nine dots. The prototypes were randomly generated using Robert Goldstone's Concept Learning. The distortions were generated by randomly displacing the dots of the

prototype. A distortion level of 30 was chosen, which indicates the number of screen pixels by which each dot of the category's prototype was displaced. A screen pixel is equal to approximately 0.0437 centimeters.

### **Procedure**

For each participant, the experiment consisted of ten separate blocks presented in random order. Each block consisted of two phases – study and test. Participants were told prior to the study phase that they would be seeing a number of patterns on the screen one at a time and that they should do their best to focus on the patterns as they would subsequently be asked to make recognition and liking judgments on a number of test patterns. During the study phase, fourteen of the fifteen distortions from a category were presented in random order. Each distortion was presented in the center of the screen for 1000 ms with a 400 ms inter-stimulus interval. Each study list was preceded by a two second “READY?” prompt, cueing the subjects to focus their attention on that area.

During the test phase, each of the test patterns was presented for a duration of 1500 ms. After the stimulus disappeared, a prompt came on the screen indicating that the participant should make their judgment. Participants were required to perform a recognition judgment (“Was this pattern presented in the study list?”) followed by a liking judgment (“How much do you like this pattern?”) for each test pattern before moving on to the next one. Participants responded to these prompts by hitting the appropriate keys on a keyboard. For the recognition judgment, they hit a key labeled “O” for old and a key labeled “N” for new. For the liking judgment, they were informed that they were to indicate how much they liked the pattern on a scale from one to nine, with lower numbers indicating less liking and higher numbers indicating more liking. They

used the keys labeled one to nine on the keyboard to make their liking judgments. After completing their judgment on the six test patterns for a given block, they continued onto the next block where the procedure was repeated. Participants continued like this through ten blocks after which the experiment ended. Participants were then debriefed and dismissed.

As noted, twenty categories of patterns in total were constructed. However, as also noted, each participant was exposed to only ten of these categories. The three ‘old’ test patterns came from the categories that participants were exposed to while the three ‘new’ test patterns came from the other ten categories that they were not exposed to. For half of the participants ‘old’ test patterns were drawn from categories one to ten while ‘new’ test patterns were drawn from categories eleven to twenty. For the other half of the participants the situation was reversed. This counterbalanced design thus controlled for any potential differences in liking that might otherwise result from variation in intrinsic appeal between test patterns from different categories.

### **Results and Discussion**

Before reporting the results, it is first necessary to clarify how the data were analyzed. First, for some participants liking for a particular pattern was simply not available (e.g., when a participant called all old patterns “old” thus resulting in no misses for old patterns). In these instances that participant was removed from the relevant analysis (i.e., from comparing liking for hits to misses for old patterns). Second, the procedure of having participants first recognize a pattern and then provide a liking rating for that pattern introduces a significant demand characteristic, namely, that participants may consciously adopt, for example, an “if call old, then higher liking” heuristic for



making their preference judgments. To see how recollective state and objective familiarity more subtly influence preference, those participants whose liking ratings fell in the extreme outer 5% – and thus those most likely to be using some overt strategy for determining liking – were removed from each comparison. To accomplish this, the following procedure was used. A difference score for the relevant test patterns was obtained for each participant (i.e., the difference between liking for hits and misses for old patterns). Participants whose difference scores fell beyond 1.96 standard deviations from the mean of these difference scores were removed. This procedure was repeated using the resultant new mean until such time as all of the difference scores fell within 1.96 standard deviations of the mean of the difference scores. The participants that remained after this process served as the basis for the relevant comparison. This procedure was applied consistently to each comparison in both Experiments 1 and 2. Third, a two-tailed dependent samples t-test at an alpha of .05 was used for assessing the reliability of each comparison. In what follows, the results for each of the three preference effects are reported in two parts: 1) how objective familiarity influences liking given recollective state and 2) how recollective state influences liking given objective familiarity.

### **How Objective Familiarity Influences Liking given Recollective State**

For the mere-exposure effect, old items were only preferred to new items when participants believed the items to be old: hits ( $M = 6.22$ ,  $SD = 1.16$ ) were liked more than false alarms ( $M = 5.76$ ,  $SD = 1.09$ ),  $t(15) = 2.25$ ,  $p < .05$ . When participants believed the items to be new, there was no preference for old over new items: misses ( $M = 4.87$ ,  $SD = 1.43$ ) were liked no more than correct rejections ( $M = 4.77$ ,  $SD = 1.38$ ),  $t(11) = 1.47$ ,  $p >$

.10. For the preference for prototypicality, old items were likewise only preferred to new items when participants believed items to be old: hits ( $M = 5.96$ ,  $SD = 1.04$ ) were liked more than false alarms ( $M = 5.34$ ,  $SD = 1.14$ ),  $t(14) = 3.50$ ,  $p < .004$ . When participants believed items to be new, as for mere-exposed items, misses ( $M = 4.43$ ,  $SD = 1.55$ ) were liked no more than correct rejections ( $M = 4.60$ ,  $SD = 1.28$ ),  $t(18) = -1.33$ ,  $p > .10$ . Finally, for structural relation preferences, irrespective of whether participants believed items to be old or new, there was no preference shown for either old or new items: hits ( $M = 5.74$ ,  $SD = .94$ ) were liked as much as false alarms ( $M = 5.90$ ,  $SD = 1.02$ ),  $t(15) = -.67$ ,  $p > .50$ , and misses ( $M = 4.89$ ,  $SD = 1.18$ ) as much as correct rejections ( $M = 4.67$ ,  $SD = 1.39$ ),  $t(15) = 1.36$ ,  $p > .10$ .

The fact that the mere-exposure effect and preference for prototypicality were only obtained when participants believed items to be old suggests that actual historical status only influenced preference to the extent that it increased certainty as to whether the item had been seen before. As such, it seems pretty clear from these results that participants were using a feeling of familiarity as a basis for their liking judgments – the more certain they were that an item was in fact old, the higher the liking rating. If true, then it appears that participants could be no more certain about having seen structurally related items over their novel controls as the former were not deemed any more likeable than the latter. The link between certainty of recognition and liking will be more fully addressed after the results of the next experiment.

### **How Recollective State Influences Liking given Objective Familiarity**

For all three preference effects, irrespective of whether items were actually old or new, items believed to be old were always preferred to items believed to be new: for

mere-exposed items, hits ( $M = 6.29$ ,  $SD = .75$ ) were liked more than misses ( $M = 5.12$ ,  $SD = 1.17$ ),  $t(15) = 4.66$ ,  $p < .0002$ , and false alarms ( $M = 5.67$ ,  $SD = 1.06$ ) more than correct rejections ( $M = 4.72$ ;  $SD = 0.72$ ),  $t(14) = 4.57$ ,  $p < .0005$ ; for prototypical items, hits ( $M = 5.94$ ,  $SD = .95$ ) were liked more than misses ( $M = 4.46$ ,  $SD = 1.49$ ),  $t(18) = 4.38$ ,  $p < .0004$ , and false alarms ( $M = 5.32$ ,  $SD = 1.23$ ) more than correct rejections ( $M = 4.81$ ,  $SD = .99$ ),  $t(13) = 1.97$ ,  $p < .08$  (note: though only marginally significant here, this result is replicated and found to be reliable in the next experiment); and for structurally related items, hits ( $M = 5.73$ ,  $SD = .95$ ) were liked more than misses ( $M = 4.81$ ,  $SD = 1.22$ ),  $t(17) = 4.15$ ,  $p < .0007$ , and false alarms ( $M = 5.76$ ,  $SD = .88$ ) more than correct rejections ( $M = 4.89$ ,  $SD = .95$ ),  $t(11) = 5.93$ ,  $p < .0001$ .

Since these results confirm the predictions of the uncertainty reduction model while disconfirming those of the perceptual fluency/misattribution model, they not only reaffirm the veracity of the uncertainty reduction model as an explanation for the mere-exposure effect, but they also extend it to the preference for prototypicality. However, as structural relation preferences were not actually observed, we cannot properly apply the uncertainty reduction model to explaining them. Nevertheless, these results do allow us to make a broader generalization: when the sole concern is with identifying the familiar, at least where boredom and/or stimulus satiation is not an issue, irrespective of the actual historical status of an item, items believed to be old will be preferred to items believed to be new.

## **Experiment 2**

Though the uncertainty reduction model provides us with a better explanation for historical preference effects than the perceptual fluency/misattribution model, the

uncertainty reduction model still has difficulty explaining why misses and false alarms are often not found to be reliably preferred to correct rejections. Each of these comparisons is considered in turn.

### **Why Misses are Often Not Reliably Preferred to Correct Rejections**

Based on the previous experiment, it appears quite clear that when participants are faced with a recognition decision that they are focused on identifying old items – that is, they ask themselves, “Is this an item I have seen before?” They then use the resultant feeling of familiarity as a basis for their liking judgment. This readily explains why hits are consistently preferred over false alarms and misses – because on average the former feel more familiar than either of the latter. However, this does not explain why correct rejections are not consistently *disliked* more than misses – given that on average the former should feel less familiar than the latter. This apparent anomaly, however, may be explained away easily enough if we accept the reasonable assumption that participants usually only rely on their feeling of familiarity for evaluating items they believe to be old (i.e., hits and false alarms); for items they believe to be new (i.e., misses and correct rejections), they simply rate them lower, without regard for how familiar they feel.

### **Why False Alarms are Often Not Reliably Preferred to Correct Rejections**

If participants rely solely on a feeling of familiarity as the basis for their evaluative judgments, even if they only use this feeling for items they believe to be old, we should still expect false alarms to be consistently and reliably preferred to correct rejections. The fact that only one other study (Wang and Chang, 2004) besides the present one has reported the difference between false alarms and correct rejections to be reliable suggests participants must be using some other basis besides their feeling of

familiarity for making their liking judgments. Echoing sentiments first expressed by Obermiller (1985), I suggest that this other basis may be a feeling of accuracy.

Although when faced with a recognition decision I believe that the decision maker rarely, if ever, solely focuses on identifying new items, I suggest that he or she may sometimes be concerned with separating out the old from the new. In such instances, once an item has been identified as old or new, the concern may become one of accuracy – “Am I certain that this item is in fact old or new?” Given that the uncertainty reduction model is correct in assuming a positive relationship between certainty and affect, then for any given recognition decision positive affect should accrue to the extent that the decision maker is certain the correct decision has been made (i.e., that the item under consideration is in fact old or new). Hence, in so far as participants make use of this feeling of accuracy as a basis for their evaluative judgment, we should expect correct rejections (items that participants should be very certain are new) to be preferred to false alarms (items that participants should be less certain are old). Unfortunately, since a reliable preference for correct rejections over false alarms has never been reported, it appears that participants never *exclusively* use the feeling of accuracy as a basis for liking. However, if we assume that participants may at times use both a feeling of familiarity *and* a feeling of accuracy, we can readily account for why participants often exhibit no preference for false alarms over correct rejections. That is, sometimes using a feeling of familiarity as the basis for preference would lead to higher liking ratings for false alarms over correct rejections while sometimes using a feeling of accuracy as a basis for preference would lead to higher liking ratings for correct rejections over false alarms. With these two strategies opposing one another, either within the same

participant or between different participants within the same study, preference for false alarms and correct rejections would even out. Hence the null result so frequently observed between false alarms and correct rejections.

Evidence for the concurrent use of both a feeling of familiarity and a feeling of accuracy as a basis for determining preference has to some extent already been obtained. Specifically, Obermiller (1985) found that despite greater confidence associated with correct rejections (greater certainty that new items were in fact new) than false alarms (lower certainty that new items were in fact old), participants showed no preference for one item over the other. Since preference did not parallel confidence, participants could not be basing preference solely on a feeling of accuracy. However, they could not be basing preference solely on a feeling of familiarity either since false alarms (items that should feel more familiar) were not preferred to correct rejections (items that should feel less familiar). Yet, if we assume both strategies were being used, this null result may readily be explained.

Further support for the concurrent use of both these feelings for evaluative purposes comes from a study by Lee (2001). While she found subjectively old items (more familiar items) to be preferred to subjectively new items (less familiar items), she also found that participants rated those items more favorably that they could more confidently judge as old or new. Interestingly, a close examination of her results reveals that at a level of confidence where participants were “half-sure” about items being old or new, correct rejections (less familiar items) were liked less than false alarms and misses (more familiar items). However, at a level of confidence where participants were “sure” about items being old or new, correct rejections (items associated with more certainty)

were liked more than false alarms and misses (items associated with less certainty). This suggests that while a feeling of familiarity may have been an important determinant of liking when participants were “half-sure” about the item in question, a feeling of accuracy became an important determinant of liking when participants became “sure” about the item in question.

### **The Present Experiment**

The purpose of this experiment was to empirically demonstrate that participants may concurrently rely on both a feeling of familiarity and a feeling of accuracy for determining preference. To induce participants to rely on a feeling of accuracy as a basis for making their liking judgments, a simple instructional manipulation was employed. As noted earlier, it seems that when participants are faced with a recognition decision that by default they focus on identifying old items – that is, they ask themselves, “Is this an item I have seen before?” Approaching the recognition task with this goal in mind likely engenders some measure of familiarity for the item that is then used as a basis for the liking judgment. Given that false alarms (more familiar items) were robustly preferred to correct rejections (less familiar items) in experiment 1, it seems as if participants in this experiment were relying solely on a feeling of familiarity for determining preference. To get them as concerned about new items as old items, participants in this second experiment were asked to try to identify items that they had *not* in fact seen before. The hope was that this simple instructional manipulation concerning the recognition decision would have participants, at least some of the time, asking themselves, “Is this really an item I have *not* seen before?” Approaching the task with this goal in mind should engender some sense of accuracy concerning the actual novelty of the item in question.

In so far as they then use this feeling of accuracy as a basis for their liking judgment, we should observe liking for correct rejections (items that participants should be very certain are new) to increase relative to false alarms (items that participants should be less certain are old). That is, if the null result between correct rejections and false alarms that is frequently observed in studies of this kind is really attributable to the concurrent use of both a feeling of familiarity and a feeling of accuracy, then biasing participants towards using this dual strategy should eliminate the preference for false alarms over correct rejections that was observed in experiment 1.

## **Method**

### **Participants**

Twenty students from the University of California, San Diego participated. In return for their participation, they received partial fulfillment of credit for their undergraduate psychology courses.

### **Procedure**

Other than the subtle change in the instructions (as detailed above) given to participants concerning the recognition task, this experiment was exactly the same in every way to experiment 1.

## **Results and Discussion**

Using the same procedure as the previous experiment, those participants whose liking ratings fell in the outer 5% were removed from each comparison. Once again, the results for each of the three preference effects are reported in two parts: 1) how objective familiarity influences liking given recollective state and 2) how recollective state influences liking given objective familiarity.



### How Objective Familiarity Influences Liking given Recollective State

The results of the first experiment were replicated and extended. The mere-exposure effect was once again observed for those items believed to have been seen before: hits ( $M = 5.78$ ,  $SD = .95$ ) were liked more than false alarms ( $M = 5.08$ ,  $SD = .96$ ),  $t(17) = 3.36$ ,  $p < .004$ . The same was true for the preference for prototypicality: hits ( $M = 5.78$ ,  $SD = 1.44$ ) were liked more than false alarms ( $M = 5.02$ ,  $SD = 1.42$ ),  $t(17) = 3.31$ ,  $p < .005$ . However, this time, unlike in the previous experiment, participants also exhibited structural relation preferences: hits ( $M = 5.60$ ,  $SD = 1.44$ ) were liked more than false alarms ( $M = 5.18$ ,  $SD = 1.48$ ),  $t(17) = 2.43$ ,  $p < .03$ . Importantly, for the mere-exposure effect, when participants believed items to be new, items that were actually new were preferred to items that were actually old: correct rejections ( $M = 5.14$ ,  $SD = 1.26$ ) were liked more than misses ( $M = 4.53$ ,  $SD = 1.13$ ),  $t(16) = 5.81$ ,  $p < .00003$ . This was not observed for the preference for prototypicality: correct rejections ( $M = 4.93$ ,  $SD = 1.16$ ) were liked no more than misses ( $M = 5.02$ ,  $SD = 1.33$ ),  $t(15) = -.56$ ,  $p > .50$ . It was also not observed for structural relation preferences: correct rejections ( $M = 5.05$ ,  $SD = 1.30$ ) were liked no more than misses ( $M = 4.79$ ,  $SD = 1.19$ ),  $t(17) = .90$ ,  $p > .30$ .

These results thus further bolster the uncertainty reduction explanation for the mere-exposure effect and preference for prototypicality while also extending it to structural relation preferences. Importantly, for the mere-exposure effect, the observation that truly new items were preferred to truly old items when they believed those items to be new suggests participants were in fact using a feeling of accuracy to determine preference: since participants could be more certain that correct rejections were new than they could be about misses, it appears that the more certain they were that an item was

new, the higher the liking rating they gave it. The reason why this result was not observed for the preference for prototypicality and structural relation preferences is likely due to the fact that for these items participants could have been as certain about misses being new as correct rejections: in these instances, misses were actually correct rejections in the sense that they had not really been seen before; they were only considered “old” and therefore misses in these experiments by virtue of their close structural relationship to the category that was shown.

### **How Recollective State Influences Liking given Objective Familiarity**

Like the previous experiment, for all three preference effects, for those items that were actually old, items believed to be old were always preferred to items believed to be new: for the mere exposure effect, hits ( $M = 5.62$ ,  $SD = 1.04$ ) were liked more than misses ( $M = 4.86$ ,  $SD = .99$ ),  $t(12) = 9.55$ ,  $p < .0000006$ ; for the preference for prototypicality, hits ( $M = 5.94$ ,  $SD = 1.46$ ) were liked more than misses ( $M = 5.08$ ,  $SD = 1.32$ ),  $t(19) = 2.10$ ,  $p < .05$ ; and for structural relation preferences, hits ( $M = 5.63$ ,  $SD = 1.14$ ) were liked more than misses ( $M = 4.78$ ,  $SD = 1.20$ ),  $t(15) = 3.50$ ,  $p < .004$ . However, unlike the previous experiment, for all three preference effects, for those items that were actually new, items believed to be old were not preferred to those believed to be new: for the mere-exposure effect, false alarms ( $M = 5.16$ ,  $SD = .94$ ) were liked no more than correct rejections ( $M = 5.18$ ,  $SD = 1.30$ ),  $t(14) = -.11$ ,  $p > .90$ ; for the preference for prototypicality, false alarms ( $M = 4.99$ ,  $SD = 1.13$ ) were liked no more than correct rejections ( $M = 5.05$ ,  $SD = 1.04$ ),  $t(15) = -.26$ ,  $p > .80$ ; and for structural relation preferences, false alarms ( $M = 5.05$ ,  $SD = 1.24$ ) were liked no more than correct rejections ( $M = 5.19$ ,  $SD = 1.28$ ),  $t(10) = -1.74$ ,  $p > .10$ .

Since biasing participants towards using both a feeling of familiarity and a feeling of accuracy for inferring liking eliminated the preference for false alarms over correct rejections that was observed in Experiment 1, it is quite possible that the null result between false alarms and correct rejections so often reported in the literature is in fact due to the simultaneous use of these two goal-based strategies for determining preference. As such, as long as we consider that liking might result from the reduction of uncertainty with respect to some goal (i.e., identify old or new), the uncertainty reduction model still holds as an explanation for historical preference effects. In regards to the observation made in the last section that for the mere-exposure effect correct rejections were reliably preferred to misses, a result that has not been reported before, this may be somewhat of an anomaly; given the strong demand characteristics of the instructional manipulation (i.e., the unusually high stress that was placed on identifying new items), participants might have used a feeling of accuracy to infer liking to a greater extent here than ordinarily would be the case in studies of this kind. Nevertheless, this latter result speaks to the importance that our goals play in the development of our preferences: when we believe items are new, we can prefer objective novelty to objective familiarity as long as our goal is to find something that is in fact new, different or otherwise out-of-the-ordinary.

### **Additional Analyses**

To more closely examine the link between certainty of recognition and liking, proportion of old claims and reaction times for hits versus false alarms and misses versus correction rejections were informally examined for both experiments. These results are presented in Table 3. Regarding these analyses, two points must be made clear. First, the

proportion of old claims and reaction times were only calculated for those participants that were included in the original liking analyses. As such, because the participants used for the hits versus false alarms analysis differed somewhat from those used for the misses versus correct rejections analysis, the proportion of old items claimed old and new (i.e., hits and misses) and the proportion of new items claimed old and new (i.e., false alarms and correct rejections) will not sum to 1 as they ordinarily would. Second, given the aforementioned comparisons, it should be apparent that the data as presented in Table 3 is in regards to how objective familiarity influences liking given recollective state. In what follows, I examine this data and explain how it supports: 1) the use of both a feeling of familiarity and a feeling of accuracy for determining liking in Experiment 2, and 2) the link between certainty of recognition (i.e., how certain one is that one has correctly classified an item as old or new) and liking. Please refer to Table 3 for the following discussion.

**Table 4.3:** Proportion of items claimed old (for hits and false alarms) and new (for misses and correct rejections) and reaction time (in milliseconds) to make the decision.

Preference Effect	Believe Old		Believe New	
	Hits	False Alarms	Misses	Correct Rejections
<b>Experiment 1</b>				
Mere Exposure	0.64 (1086)	0.29 (1813)	0.41 (1620)	0.81 (1051)
Prototypicality	0.64 (1152)	0.29 (1429)	0.36 (1237)	0.77 (1134)
Structural Relation	0.47 (1087)	0.24 (1331)	0.57 (1325)	0.76 (953)
<b>Experiment 2</b>				
Mere Exposure	0.63 (1523)	0.37 (1772)	0.35 (2057)	0.62 (1629)
Prototypicality	0.63 (1255)	0.36 (1424)	0.34 (1697)	0.63 (1426)
Structural Relation	0.62 (1389)	0.39 (1504)	0.42 (1652)	0.59 (1564)

Note: the unbracketed number in each cell indicates proportion claimed old or new while the bracketed number in each cell indicates reaction time.

### Support for the use of both a Feeling of Familiarity and Accuracy for Evaluation

Overall the reaction times for classifying patterns as old and new were higher for Experiment 2 than for Experiment 1. This increase in reaction times may be accounted for if we assume that participants in Experiment 2 had the dual concern of correctly identifying both old and new items as opposed to Experiment 1 where the concern was solely with correctly identifying old items. This extra concern in Experiment 2 with correctly identifying new items is supported by the observation that the proportion of new claims for correct rejections was markedly reduced in Experiment 2 from Experiment 1, an observation which suggests that participants became much more discriminating for new items. Indeed, the fact that the proportion of new claims for correct rejections was on par with the proportion of old claims for hits in Experiment 2 strongly argues that participants became as concerned with correctly identifying new items as old items. Given these observations and the finding that liking for correct rejections increased in Experiment 2 from Experiment 1, it seems pretty clear that in Experiment 2, in addition to using a feeling of familiarity for determining liking for old items as they did in Experiment 1, participants also adopted a feeling of accuracy for determining liking for new items.

### **Support for the Link between Certainty of Recognition and Liking**

For both experiments there is clearly a close relationship between ease of recognition and liking: 1) truly old items (hits) were always classified as old more quickly than truly new items (false alarms) and 2) truly new items (correct rejections) were always classified as new more quickly than truly old items (misses). However, we should not conclude from this that there is a simple relationship between ease of

recognition and liking. Rather, as the following observations will show, the relationship between ease of recognition and liking is probably somewhat more complex.

For the mere-exposure effect, despite correct rejections being classified as new more quickly than misses in both Experiment 1 and 2, correct rejections were only reliably preferred to misses in Experiment 2. However, though there was no change in relative classification times across the two experiments (with correct rejections always being classified more quickly than misses), what did change is that participants became more discriminating for what they would call new in Experiment 2; that is, instead of simply being concerned with identifying new items, they became more concerned in Experiment 2 with *correctly* having done so (as exemplified by the reduction in proportion of correct rejections). These observations thus suggest that ease of recognition in-and-of-itself is insufficient to engender a hedonic response. Rather, in order for a hedonic response to accrue from an act of recognition, it appears that the perceiver must view their act of recognition as being somewhat of an accomplishment (i.e., not simply that one has identified a new item, but rather that one has *correctly* done so).

For structural relation preferences, despite hits being classified more quickly than false alarms in both Experiment 1 and 2, hits were only reliably preferred to false alarms in Experiment 2. However, you'll notice that unlike in Experiment 1 where the proportion of hits for structural relation preferences was markedly lower than the proportion of hits for either the mere-exposure effect or the preference for prototypicality, in Experiment 2 the proportion of hits for structural relation preferences was comparable to the proportion of hits for the other two preference effects. Though one might be

tempted to conclude that the reliable difference in liking between hits and false alarms in Experiment 2 is being driven by the increase in claims of old for hits, it should be emphasized that for structural relation preferences while liking for hits was comparable in the two experiments liking for false alarms was markedly reduced in Experiment 2 as compared to Experiment 1. Since false alarms are actually new items, perhaps focusing on identifying novelty in Experiment 2 ultimately made participants less certain about their decision to call new items old (i.e., less certain about false alarms). If so, then the reliable difference in liking between hits and false alarms for structural relation preferences that was observed in the second experiment may be more the result of a reduction in certainty for false alarms than of an increase in certainty for hits. In any case, though this result is difficult to interpret in terms of ease of recognition alone, it becomes readily explicable if we consider that liking is being driven by certainty of recognition – how certain one is that one has *correctly* classified a pattern as old or new.

Taken together, these observations suggest that there is no simple relationship between ease of recognition and liking. Rather, they suggest that reaction times for recognition should only be taken as a proxy for certainty; and that it is certainty of recognition, as opposed to ease of recognition per se, that importantly determines one's preference for old and new items.

### **General Discussion**

The three goals for this study that were established at the outset were addressed by the results of the two mere-exposure experiments reported here. First, the veracity of the uncertainty reduction model as an explanation for the mere-exposure effect garnered further support (Experiments 1 and 2). Second, the explanatory power of the uncertainty

reduction model was extended to two other historical preference effects – the preference for prototypicality (Experiments 1 and 2) and structural relation preferences (Experiment 2). Third, some results reported in the literature that might otherwise be considered anomalous for an uncertainty reduction explanation (i.e., the null result between false alarms and correct rejections) were accounted for as resulting from the simultaneous use of two goal-based strategies – the feeling of familiarity and the feeling of accuracy – to infer liking (Experiment 2). In what follows, I address the repercussions of these findings for: 1) the role that recognition plays in bringing about the mere-exposure effect, and 2) the relationship between recognition and preference formation in general.

### **Recognition and the Mere-Exposure Effect – Preferences Need Inferences**

Based on the studies reviewed here and the results of the present experiments, it seems quite clear that recognition increases liking and does not, as the perceptual fluency/attribution model suggests, decrease liking. In other words, I believe we can say with some confidence that if there is any sense on a participant's part that an item has been seen before that the participant will more often than not be biased towards giving the item a higher liking rating. Of course, proponents of an unconscious and noninferential view maintain that recognition is not necessary for the mere-exposure effect – that no inferences are required. They frequently cite the results of subliminal mere-exposure experiments as support for their claim: if participants cannot tell what they have seen before but prefer old items to new items, then recognition cannot be driving the mere-exposure effect. However, as mentioned earlier, Bonnano and Stillings (1986) demonstrated that participants could reliably discriminate between old and new items in a subliminal paradigm when they were asked to do so using a feeling of



familiarity (i.e., based on their *sense* that an item was old or new). As such, given that participants can in fact reliably discriminate between old and new items using a feeling of familiarity and given that participants tend to give more familiar items higher liking ratings, the assumption simply cannot be made in subliminal paradigms, or in any other mere-exposure paradigm for that matter, that an inference is not involved – that participants are not using a feeling of familiarity to infer preference.

It's also important to clarify what discrediting the perceptual fluency/attribution model means and what it does not mean. It means that preference formation is *not* impaired when highly fluent processing is attributed to familiarity; it does not mean that participants are unable to use perceptual fluency per se, apart from any resultant feelings of familiarity, as a basis for their preference judgments. But if participants can use fluency per se to determine liking, then doesn't this imply an unconscious and noninferential mechanism – that preferences do not in fact need inferences? No it doesn't. How so? When Jacoby and Dallas (1981) initially coined the term 'processing fluency' to describe the ease of the perceptual operations performed on a stimulus, they described highly fluent processing as a kind of 'pop-out' effect whereby the stimulus literally seems to jump out at the perceiver. If this is accurate, then the use of fluency per se to determine preference would still mean that the underlying mechanism is: 1) conscious – because the highly fluent stimulus is perceived differently relative to other similar stimuli, and 2) inferential – because participants are using this change in their conscious experience to determine liking for the items under consideration.

### **On Recognition in Preference Formation – A Closer Look at a Hedonic Syndrome**

By identifying recognition as the fundamental basis for historical preference effects, a number of issues concerning the nature of the relationship between processes of recognition and liking are immediately raised: 1) whether more affirmative acts of recognition always lead to greater liking, 2) whether liking for recognized items may simply be viewed as an instance of goal-related reward and 3) whether recognition enhances liking simply via cold, cognitive heuristic processes. In what follows, I offer preliminary answers to each of these issues and in so doing suggest fruitful avenues for future research.

### **Does more affirmative recognition always lead to greater liking?**

Given the pattern of preferences that has robustly been observed not only in this study but also across all those studies that have coupled recognition with liking (hits > false alarms > misses  $\geq$  correct rejections), it would appear that the more affirmative the act of recognition the stronger the preference that is formed. However, in accordance with the uncertainty reduction model of the mere-exposure effect, the derivation of pleasure from the reduction of uncertainty presupposes that there was some uncertainty that could be reduced to begin with. Hence, while the former statement may for the most part be true, I believe that the following qualification is in order: an act of recognition will be pleasurable to the extent that it is associated with some measure of uncertainty. Indeed, this helps to explain why the mere-exposure effect is enhanced by such factors as heterogeneous (as opposed to homogenous) exposure sequences, a small number of exposures (10-20), longer delays between exposure to the stimuli and ratings of the stimuli (Bornstein, 1989) and subliminal (vs. supraliminal) exposures; each of these factors increases the uncertainty associated with recognizing stimuli from the exposure

phase. But how exactly might greater uncertainty increase the pleasure that accompanies recognition?

First, with greater uncertainty as to whether a previously seen item will be reencountered, participants are more likely to perceive the act of recognition as a challenge and thus as more of an achievement when positive identification finally occurs. Indeed, perceiving the task as a kind of challenge may in fact be a prerequisite for those mere-exposure studies where the connection between the exposure and rating phases is obvious. Take, for example, Bornstein, Kale and Cornell's (1990) study on how boredom affects mere-exposure. In one experiment, they found that while bored participants stopped exhibiting the mere-exposure effect for highly repeated items, interested participants continued to do so. This suggests that bored participants did not see it as any special challenge to pick out highly repeated items and, as such, did not experience any pleasure for doing so. On the other hand, since interested participants' liking ratings for repeated items continued to increase even through fifty exposures, they seemed to have adopted an "if more certain old, then higher liking" heuristic for evaluative purposes, which is a strategy that would have readily been taken up by anyone that perceived the task in terms of a challenge (i.e., where the goal was to achieve affirmative recognition).

Second, with greater uncertainty as to whether a previously seen item will be reencountered, participants are more likely to be surprised by their act of recognition and, as such, more stimulated and thus biased towards providing a higher liking rating for the item under consideration. Indeed, as George Mandler (1980) illustrated in his butcher-on-the-bus scenario, we all know how stimulating it can be to run into a friend or

acquaintance outside of the usual context in which we ordinarily find them. Could this dramatic reduction in uncertainty – encountering the highly familiar in a highly unfamiliar context – engender ever more positive affect and even greater liking? It remains to be seen.

### **Does greater liking for recognized items simply reflect goal-related reward?**

Traditionally, the mere-exposure effect has been used to elevate ‘the familiar’ and to relegate ‘the novel’ amongst preference phenomena. However, the results of Experiment 2 in the present paper suggest such a conclusion may be premature; specifically, novel items (items with which participants had no prior experience) were made more appealing simply by establishing a goal to identify novelty. In a similar fashion, our preference for the familiar might result from achieving success with respect to the (default) goal of identifying old items. Nevertheless, even in Experiment 2 when there was a (concurrent) goal to identify new items, correctly identified old items still garnered higher liking ratings than correctly identified new items (i.e., hits > correct rejections). This observation, however, does not require us to assume that familiarity per se is responsible for old items being preferred to new ones. Rather, because confirming evidence is available for old items (as one can readily conjure up an image of an item that has been seen before), more certain decisions concerning their historical status can be made. Since this confirming evidence is not available when a decision must be made for new items (as one cannot conjure up an image of an item that one has not seen before), it is to be expected that less certainty would be associated with identifying novelty (i.e., the absence of a stimulus) than with identifying familiarity (i.e., the presence of a stimulus). As such, given a positive correlation between certainty and affect, old items should of

course be expected to be liked more than new items. Ultimately, however, whether we become partial to ‘the familiar’ or ‘the novel’ may very much depend upon our mental set: the extent to which we are looking for the ‘run-of-the-mill’ or something ‘just-a-little-bit-different’.

**Does recognition enhance liking simply via cold, cognitive heuristic processes?**

By suggesting that people use the feeling of familiarity to determine preference, I do not mean to imply that they do so simply in a cold, cognitive heuristic manner, “If more certain old, then higher liking.” Rather, I think it is important to realize that recognition is a hedonic syndrome that reflects changes occurring across multiple levels: at the neurological level there is a suppression of neural responsiveness within the visual cortex (e.g., Desimone, 1996) and the subsequent activation of prefrontal cortical regions associated with assessing reward (e.g., Elliot and Dollan, 1998; Elliot, Dollan and Frith, 2000); at the physiological level there is an increase in arousal (as indicated by higher GSR’s and greater deceleration in heart rate) (e.g., Bitterman and Marcuse, 1945; Stormark, 2004); at the behavioral level there is the initiation of movements (as indicated by our tendency to choose repeated over novel items) and the activation of muscles (as indicated by greater zygomaticus activity) associated with approach tendencies (e.g., Harmon-Jones and Allen, 2001); at the cognitive level there is a rise in fluency of processing (as measured by lower latencies for identification) and the spontaneous generation of inferential thoughts like, “This seems familiar” (as indicated by greater false alarms and feelings of knowing for unexpectedly fluent items) (e.g., Whittlesea and Williams, 2001a & b; Whittlesea, 2002; Willems, Linden and Bastin, 2007); and, finally, at the experiential level the item seems to ‘pop-out’ and grab one’s attention (as indicated

by Mander's butcher-on-the-bus scenario) (Mandler, 1980; Jacoby and Dallas, 1981).

The extent to which we can isolate and point to any single component of this syndrome as being the cause of historical preference formation is, at this point, anyone's guess. And to do so may be to miss the point: that in ordinary individuals it is the synergistic functioning of all of these components that is important for the pleasure that is experienced upon achieving recognition. Instead, I think it's important to understand the conditions under which the various components of this syndrome are initiated and the extent to which they may be the same/different from those components initiated by the successful achievement of any goal-directed behavior, in particular, as discussed in the previous section, as might occur with the successful identification of novelty.

In conclusion, by pinpointing recognition as being the fundamental basis for historical preference effects, several questions arise, each of which suggests a fruitful avenue for future research. First, how exactly does uncertainty influence the pleasure that accompanies an act of recognition? In particular, what roles do 'a sense of achievement' and 'surprise' play in engendering an affective response? Second, to what extent does the pleasure that accompanies an act of recognition simply reflect goal-based reward? How might our goals modify our preferences for 'the familiar' and 'the novel'? Third, what exactly are the affective components (neurological, physiological, behavioral, cognitive and experiential) that underlie an act of recognition? How are they the same/different from those affective components that underlie the successful achievement of any goal-related behavior?

### **Concluding Remarks**

The literature reviewed herein and the results of the present experiments strongly argue that when it comes to forming preferences for previously encountered items recognition and liking are inextricably linked. Despite the apparent obviousness of this conclusion, however, research into the mere-exposure effect over the last few decades has been utterly dominated by efforts to show how preferences might be formed in the absence of inferences. Indeed, since the obvious does not sell very well in academic psychology, this state of affairs is hardly surprising. Unfortunately, this has meant that there has been an almost total ignorance of, and therefore lack of research into, the hedonics of recognition. Perhaps the present paper may play some small role in rectifying this situation.

Chapter 4 is currently being prepared for submission for publication. Chenier, Troy. “How recollective state interacts with objective familiarity to shape preference.” The dissertation author was the primary investigator and author of these materials.

## CHAPTER 5

The Striving for and the Acquisition of Meaning: On the Origins of Aesthetic Pleasure



### Abstract

This paper theoretically and empirically examines the notion that the pleasure of the aesthetic experience may be traced, at least in part, to a psychological process that involves ‘the striving for and the acquisition of meaning’, namely, that greater struggle after meaning results in greater pleasure when that meaning is acquired. This idea was tested using a procedure in which participants were first given an impoverished passage or picture to make sense of before being given the full passage or picture to evaluate. The results showed that the more impoverished the passage or picture became (the more participants had to strive after meaning), the more favorably the full passage or picture was evaluated: the more enjoyable the passage was to read (studies 1a-d) and the better drawn the picture was deemed to be (studies 2a-d). The repercussions of these findings for our understanding of a number of preference effects are discussed.

### The Striving for and the Acquisition of Meaning: On the Origins of Aesthetic Pleasure

Consider the thrill experienced by the listeners at a symphony, the delight of the ornithologist upon glimpsing their favorite species of bird, the ebullience of the sports fan at a hockey game, and the palpable buzz that radiates from the audience taking in an action movie. Superficially, each of these situations appears to be completely different, with the items of interest to the viewers seemingly having little in common. If we look beyond the superficial elements, however, and instead focus on the processing experiences of the perceivers, we may discover that the pleasure aroused in each instance, at least in part, derives from one-and-the-same psychological process. What psychological process exactly? A great place to start searching for the answer to this question is in the rather voluminous literature that has amassed on the aesthetic experience. Unfortunately, as anyone who has even taken a cursory glance at these writings can attest, they are filled with vastly different and often contradictory accounts. However, in reading through them, if one remains focused on the similarities while eschewing the differences, a certain reoccurring theme does seem to emerge: that the pleasure that accompanies the aesthetic experience may be traced, at least in part, to the act of striving after meaning itself. I begin by briefly detailing how some prominent aesthetic thinkers have given voice to this theme in their writings and in-so-doing theoretically set the stage for the empirical investigations that follow.

#### **On the Origins of Aesthetic Pleasure – Theoretical Explications**

In what is arguably the most comprehensive psychological description of the aesthetic experience, Kate Hevner (1937) traces the pleasure of the experience to the struggle on the part of the perceiver to achieve mastery over the perceptual and

conceptual aspects of some stimulus scene, be it a painting, a piece of music or a dancer's movements; it is the consciousness of difficulty overcome, the felt want realized, she emphasizes, that imbues the experience with its satisfaction, its pleasure. Rudolph Arnheim (1957), one of the most influential figures in the world of art criticism and scholarship, also acknowledges the importance of making sense of the stimulus scene. In particular, he places emphasis on the superordinate Gestalt principle of *pragnanz*: that ill-structured stimulus environments engender a palpable tension in the perceiver and that this tension motivates the perceiver to seek relief via the realization of ever better, more clear-cut perceptual configurations. This, according to Arnheim, explains why we tend to makeover irregular and unusual stimuli – why, for example, we remember an asymmetrical figure as being symmetrical or an incomplete figure as being complete; it must to some degree be relieving and, therefore, pleasurable to do so. Ernst Gombrich (1967), another monumental figure in the world of art criticism and scholarship, agrees with this line of thinking but is careful to emphasize that the order that is apprehended in the course of sense-making only really grabs our attention when it is contrasted with some disorder. Hence the reason why, he explains, our attention is so strikingly arrested when we stumble upon a fairy ring (a circular arrangement of mushrooms) in the woodlands; it is precisely the contrast between the geometric order of the fairy ring and the random medley of nature that grabs our attention and perks us up. Ramachandran and Hirstein (1999), in forwarding a neurological theory of art, reaffirm the sentiments of the former theorists and in-so-doing go on to postulate a potential neurological source for the pleasure of this sense-making process; namely, that in the process of abstracting out meaning from some stimulus scene – in finding correlations, demarcating figure from

ground and identifying objects – reinforcement is provided by the limbic system at each step along the way. This not only motivates continued exploration and discovery, they suggest, but also ensures that the sense-making process, ultimately, is a pleasurable one.

These musings by these aesthetic theorists, then, all seem to suggest that whether an individual listens to a symphony, searches for their favorite species of bird within some foliage, watches a hockey game or takes in a scene from an action movie, that the source of the pleasure that accompanies the experience may be traced, at least in part, to a psychological process that involves ‘the striving for and the acquisition of meaning’: to the *struggle* by the musical patron to integrate the notes that comprise a symphony so as to achieve their concordance and therefore the perception of some harmony; to the *endeavor* on the part of the ornithologist to successfully demarcate the markings of a bird from that of the surrounding foliage so that a clear, unobstructed view becomes possible; to the *straining* by the hockey fan to overcome the chaos that characterizes the play so that some seemingly improbable organization may be brought to fruition, such as a neat, intricate passing play that ends with the puck deposited in the opposing teams net; and to the *grappling* on the part of the action movie buff to arrange the disparate aspects of some sequence – the visual images, accompanying sound effects and musical score – in such a way that it acquires some discernable rhythm or lawful ebb and flow. The implication, then, is clear: if we want to understand the nature of the pleasure that attends the aesthetic experience, we would do well to focus on how the struggle to acquire meaning might affect the pleasure of its eventual acquisition. I next turn to those empirical investigations that have in one way or another done just that.

### **The Striving for and the Acquisition of Meaning – Empirical Investigations**

Harter, Shultz and Bloom (1974), focusing on the gratification children derive from cognitive challenge and mastery, were among the first researchers to directly examine the hedonics of 'the striving for and acquisition of meaning'. In their study, they had fifth and sixth-graders solve anagrams that varied in difficulty and assessed how much they enjoyed the process and how much smiling they exhibited upon completion of each. Not surprisingly, they found higher enjoyment ratings and greater smiling for correctly over incorrectly solved anagrams. Interestingly, however, when they looked only at those anagrams solved correctly, they observed a positive linear relationship between smiling and difficulty level, thus suggesting that the more effort the children had to expend to find the solution to an anagram the more gratified they were when they actually found it. Consistent with this conclusion, they found a decrease in smiling when they had the children re-solve already correctly solved anagrams. And these objective observations linking greater challenge with more enjoyment were reinforced by the children's own subjective reports: they indicated that while little enjoyment was derived from solving the easy anagrams, maximum gratification came from solving those that were the most difficult.

Just like finding the solution to a puzzle, comprehending humor also requires a reordering of otherwise disjoint elements to find new meaning. It therefore stands to reason that just as more challenging puzzles engender greater satisfaction when solved, more challenging humor should produce greater mirth when comprehended. Zigler, Levine and Gould (1966) found evidence for just this in their study of humor in children. Specifically, they presented a number of cartoons to children in the second through the fifth-grade and measured their comprehension and mirth responses. They observed that

even though comprehension scores for the cartoons continued to rise for children through the second to fifth-grade, the mirth responses for fifth-graders went down from that of the fourth-graders. They surmised that the reduction in mirth responses for fifth-graders may have occurred because they found the cartoons to be too simple, too easy to comprehend. To test their hypothesis, Zigler, Levine and Gould (1967) replicated their previous study except this time they manipulated the difficulty of the cartoons that they presented to the children. They found that moderately difficult cartoons received both the strongest mirth responses and the highest preference ratings, thus providing support for the idea that the magnitude of our mirth response depends, at least to some extent, on how cognitively demanding we find the humor stimulus to be.

Interestingly, despite the apparent ubiquity of the idea amongst art theorists, ‘the striving for and acquisition of meaning’ has received little empirical attention in experimental aesthetics. This may be changing, however. In particular, Millis (2001) studied the relationship between an ‘effort after meaning’ and the aesthetic experience. Specifically, he solicited comprehension and aesthetic ratings from participants for illustrations and photographs that were accompanied either by elaborative titles (that only implied the subject of the accompanying piece), descriptive titles (that accurately described the subject of the accompanying piece) or no titles (that provided no information about the subject of the accompanying piece). He found that illustrations and photographs accompanied by elaborative titles garnered higher aesthetic ratings than those accompanied by descriptive or no titles. However, as he found no difference in comprehension between the elaborative and descriptive title conditions, the result cannot be explained in terms of differences in comprehension produced by the titles. Also, as he

found that this result only held when the elaborative titles bore some relation to the content of the accompanying illustration or photograph, it cannot be attributed to the mere presence of the elaborative titles either. Instead, taken together, these results argue that the greater aesthetic responsiveness for the elaborative title condition came from the successful integration of the meaning implied by the elaborative title with the content of the accompanying illustration or picture to form a coherent representation.

Leder, Carbon and Ripsas (2006) subsequently adopted Millis's (2001) procedure and applied it to the study of how an 'effort after meaning' might affect the aesthetic appeal of representational and abstract paintings. Specifically, in their first experiment, they had participants give comprehension and aesthetic ratings for a set of paintings that were untitled and then had them rate a matching set of paintings accompanied by no titles, descriptive titles and elaborative titles. Though they observed no differences in comprehension ratings for representational paintings across title conditions, they did find an increase in comprehension ratings over the three title conditions for the abstract paintings: no titles < descriptive titles < elaborative titles. Despite this increase in comprehension over the three title conditions, however, they did not find a corresponding increase in aesthetic ratings. In their second experiment, they had participants give understanding and liking ratings for abstract paintings accompanied by descriptive and elaborative titles under presentation times of either 1s or 10s. Though understanding was highest for the descriptive titled paintings presented for 1s and the elaborative titled paintings presented for 10s, they once again failed to observe a corresponding pattern in the liking ratings.

Why did Leder, Carbon and Ripsas (2006) fail to observe a relationship between an ‘an effort after meaning’ and aesthetic appreciation? There are a number of potential reasons. First, it should be noted that while they observed an increase in understanding ratings across the three title conditions for abstract paintings, comprehension remained quite low, with the highest ratings reaching 3.17 out of 6 for the elaborative title condition. Perhaps the small increase in understanding across the title conditions was simply not substantial enough to affect pleasure. Second, after rating understanding but before rating liking, participants were asked for each painting to assess how personally meaningful the painting was to them. If the greater understanding engendered by the elaborative titles did increase pleasure, it’s quite possible that this hedonic response was blunted by the intervening request to assess how personally meaningful the painting was. Third, except for the understanding ratings, all ratings across the three title conditions exhibited a decrease from that of the first phase. This may reflect the fact that boredom was setting in. If so, just as boredom has been shown to abolish other preference effects (e.g., Bornstein, Kale and Cornell, 1990), it’s possible that boredom here may have blunted any pleasure that otherwise would have accrued from greater understanding afforded by the elaborative titles.

Still, none of the aforementioned reasons explains why Leder, Carbon and Ripsas (2006) failed to observe a relationship between an ‘effort after meaning’ and aesthetic appreciation in their second experiment where understanding ratings were high, participants were only asked to rate the paintings on understanding and liking, and boredom was not a factor. Interestingly, however, though not statistically significant, their results from this experiment do show a trend towards higher liking ratings for



elaborative over descriptive titles, and this was true even in the 1s condition where descriptive titles produced significantly greater comprehension than elaborative titles. The latter observation is particularly interesting because it suggests that the greater aesthetic ratings for elaborative titles does not simply stem from an increase in comprehension. So how else might they increase aesthetic appeal? Being that elaborative titles only hint at the subject of the accompanying artwork, they require the perceiver to in effect solve a puzzle, that is, to successfully make the connection between the meaning implied by the title and the content of the accompanying piece. It may very well be that the greater aesthetic pleasure observed for elaborative titles stems from this puzzle solving process. Indeed, this would explain why Millis (2001) was able to find significantly greater pleasure for elaborative over descriptive titles whereas Leder, Carbon and Ripsas (2006) were not: whereas Millis (2001) used *representational* illustrations and photographs that would have allowed for a satisfying solution between title and content to be achieved, Leder, Carbon and Ripsas (2006) used *abstract* paintings that would have made the achievement of such a satisfying solution next to impossible.

Leder, Carbon and Ripsas (2006) are not the only ones, however, to have failed to observe a relationship between comprehension and liking for abstract works of art; although only using descriptive titles to manipulate meaning, Russell and Milne (1997) had previously also failed to find it for abstract and semi-abstract paintings. Russell (2003) subsequently reasoned that the lack of a correspondence between comprehension and liking in his earlier study may have stemmed from the fact that the descriptive titles did not increase comprehension enough to affect aesthetic responsiveness. To test this idea, he presented abstract and semi-abstract paintings either with no information, titles

or with titles and brief descriptions, and had separate groups of participants rate them for meaningfulness and pleasantness. Although he only found a marginal increase in meaningfulness as a function of the amount of information that accompanied the paintings (no information < title < title and description), he did find that this increase was significant for four of the paintings. However, this increase in meaningfulness was not mirrored by an increase in pleasantness; not only was there no overall effect of amount of information on pleasantness, but the four paintings that showed an information effect for meaningfulness failed to show a corresponding effect for pleasantness. Russell (2003) surmised that he may not have found an effect of amount of information on hedonic ratings in his first experiment because the between-subjects design he used was just not sensitive enough to pick it up. In his second experiment, therefore, he employed a within-subjects design. Specifically, he first had participants rate the paintings with no information and then had them rate the paintings again either with no information or with a title and description. This time he found an effect of amount of information on pleasantness: only the paintings that were subsequently accompanied by a title and a description showed an increase in pleasantness from the first to second ratings.

So what do these studies on entitling art tell us about how an ‘effort after meaning’ might affect aesthetic pleasure? Though not the explicit intent of these studies, they appear to throw emphasis on the importance of ‘the effort’ for engendering aesthetic pleasure. After all, making comprehension of the artwork easy by providing clear information did nothing to improve evaluations (e.g., Leder, Carbon and Ripsas, 2006; Russell and Milne, 1997; between-subjects design of Russell, 2003). Instead, evaluations were only improved when the perceiver was forced to grapple with what the meaning of

the artwork might be before actually obtaining that meaning: in the Millis (2001) study participants first had to integrate elaborative title with representational content before acquiring meaning, while in the Russell (2003) within-subjects design participants first had to ponder the artwork on its own before they were subsequently given a description that clarified its meaning. The results of these studies therefore coincide nicely with those done on puzzle-solving and humor: they suggest that the subjective experience of acquiring meaning is pleasurable, and that the potency of the experience, and therefore the pleasure that attends it, may be heightened by increasing the striving that precedes it.

### **The Present Studies**

The purpose of the present studies was to examine the hedonics of ‘the striving for and the acquisition of meaning’. The basic strategy for doing so was to manipulate the striving that precedes the acquisition of meaning and to assess the repercussions of this manipulation for various evaluative judgments in both written (Study 1) and pictorial (Study 2) materials.

#### **Study 1 – Hedonics of Striving for and Acquiring Meaning in Written Materials**

To examine the hedonics of ‘the striving for and the acquisition of meaning’ in written materials, the degree to which participants had to struggle to make sense of an impoverished passage before evaluating a full version of that passage was manipulated. If striving for meaning affects the pleasure of acquiring that meaning, then how positively the full passage is evaluated should vary as a function of the struggle that went into making sense of the impoverished passage that preceded it.

#### **Pre-Study Baseline Ratings for Written Passage**

After screening several written passages, the following passage describing a wolf hunt received the most moderate reading enjoyment ratings.

*Like arrows loosed from a bow, the three wolves shot forward. In an effort to unsteady its foe, the first grabbed hold of the Elk's ankle. Caught by surprise, the unwitting victim reacted instinctively by violently kicking against the impedance. Any hope of escape, however, was quickly dashed as moments later the second wolf smashed into its side, the force of which sent it careening to the ground. Dazed and in shock, the poor soul reacted in the only way that it could: by letting out a mighty, vacuous bellow. But that moment of seeming defiance would be its last; before it could bellow a second time, the third wolf moved in, grasped it by the throat and cut off the flow of air. By the time the other wolves arrived, the brute was dead. Tonight every member of the pack would leave the feast with a full belly.*

Since of all the passages tested participants tended to find this passage moderately enjoyable to read, this passage seemed to afford the best opportunity for testing manipulations that might increase or decrease reading enjoyment without the fear of achieving problematic basement or ceiling effects. This passage was subsequently given to forty participants to read and rate for reading enjoyment. The passage received a mean rating of exactly 4 (enjoyable) on a scale from 1 (not enjoyable) to 7 (very enjoyable). This passage served as the focal stimulus for all studies in this series.

### **Study 1a**

In this first study, 'the striving for and the acquisition of meaning' was manipulated by varying how much of the passage participants were given prior to reading and rating a full version of it. To this end, two preparation conditions were established: a

low preparation condition, in which the preparation passage was impoverished, and a high preparation condition, in which the preparation passage was complete. Each of these two conditions and the rationale behind the manipulations is detailed below.

In the low preparation condition, prior to rating how enjoyable it was to read the passage, participants first read a version of the passage in which large sections were left out. The idea was that this would heighten the striving for meaning because in reading through the impoverished version of the passage participants would have to struggle somewhat to put the disparate pieces together to pull out meaning. Of course, with so many details missing, at best, they would only be able to arrive at the gist of the passage. This would, however, subsequently heighten their experience of acquiring meaning upon reading the final, clear version because only at this point would the missing details be filled-in and the full meaning of the passage manifest.

In the high preparation condition, prior to rating how enjoyable it was to read the passage, participants first read the passage twice through. The idea was that this would diminish the striving for meaning because, unlike the previous condition where participants had to piece together the passage to pull out meaning, here participants need only read through each passage and take in meaning as it unfolds. This would, however, subsequently diminish their experience of acquiring meaning upon reading the passage for the third and final time because at this point, with no details to be filled-in or ambiguities to be cleared-up, they would simply be recapitulating the same information.

To the extent that ‘the striving for and the acquisition of meaning’ has hedonic merit, then, the following predictions for each of these conditions should be realized. In the low preparation condition, the greater struggle associated with making sense of the

preceding passage (the greater striving for meaning) combined with the subsequent resolution that is achieved upon reading the final, clear passage (the sense that meaning was acquired) should push reading enjoyment ratings *above* baseline (where such processes, it might reasonably be assumed, would have been operating to a lesser extent). In the high preparation condition, however, the lesser struggle associated with making sense of the preceding passages (the reduced striving for meaning) combined with the mere recapitulation of information upon reading the final, clear passage (the sense that nothing meaningful was acquired) should push reading enjoyment ratings *below* baseline (where such processes, it might reasonably be assumed, would have been operating to a greater extent).

## Method

### Participants

Eighty participants (forty per preparation condition) from the University of California, San Diego participated. In return for their participation, they received partial fulfillment of credit for their undergraduate psychology courses.

### Materials

For the low preparation condition, the following passage served as the preparation passage.

<i>Like arrows loosed from a bow,</i>	<i>. In an effort to</i>
<i>unsteady its foe,</i>	<i>. Caught by surprise, the</i>
<i>unwitting victim reacted</i>	<i>. Any</i>
<i>hope of escape, however,</i>	<i>later the second wolf smashed</i>
<i>into its side,</i>	<i>. Dazed and in shock,</i>

: *by letting out a mighty, vacuous bellow.*

*But that moment of seeming defiance would be its last;*

*, the third wolf moved in, . By the  
time the other wolves arrived, . Tonight every member of the pack*

Of course, for the high preparation condition, the full, clear wolf passage served as the preparation passage.

### **Procedure**

Participants were seated in a small, private room and given a booklet to make their way through. For those in the low preparation condition, the booklet consisted of seven pages: the instructions page, a blank page, the passage with large parts missing, a blank page, the full passage, a blank page, and a question and answer page. For those in the high preparation condition, the booklet consisted of nine pages: the instructions page, a blank page, the passage, a blank page, the passage, a blank page, the passage, a blank page, and a question and answer page. The instructions told participants to make their way through the booklet one page at a time. They were told not to look ahead and that once they advanced a page that they were not to go back. The instructions informed participants that they would be reading through versions of a passage and that they were to read each of those passages in whatever form they appeared from beginning to end once through. On the final page, they were simply asked to rate how much they enjoyed reading the LAST passage on a scale from 1 to 7, with 1 being not enjoyable, 4 enjoyable, and 7 very enjoyable.

### **Results and Discussion**

Consistent with expectations derived from the concept of ‘the striving for and the acquisition of meaning’, reading enjoyment ratings were highest for the low preparation condition ( $M = 4.50$ ,  $SD = 1.47$ ) and lowest for the high preparation condition ( $M = 3.55$ ,  $SD = 1.22$ ), with baseline ratings falling in between ( $M = 4.00$ ,  $SD = 1.63$ ). However, reading enjoyment ratings were only found to be statistically different for the low and high preparation conditions  $t(78) = 3.15$ ,  $p < .002$ ; reading enjoyment ratings for the low preparation and the high preparation conditions did not differ from baseline,  $t(78) = 1.44$ ,  $p > .10$  and  $t(78) = -1.40$ ,  $p > .10$ , respectively. These results thus provide empirical support for the theoretical notion that the pleasure of an episode of information processing may be heightened when there is ‘the striving for and the acquisition of meaning’: in the high preparation condition, where there was little striving for meaning (where meaning simply unfolded in reading through two full versions) and where there was little sense that meaning was acquired (where the final version was simply a recapitulation of the previous versions), reading enjoyment was minimized; in the low preparation condition, however, where there was striving for meaning (where participants had to work to extract out meaning from an impoverished version) and where there was the acquisition of meaning (where the final version contained the details that were previously omitted), reading enjoyment was maximized. Nevertheless, as reading enjoyment ratings in the low preparation condition were not found to be statistically higher than those of baseline, this result provides only tentative support for the idea that the pleasure of acquiring meaning may be heightened by increasing the striving that precedes it.

### **Study 1b**



Perhaps in the previous study no statistical difference between the low preparation condition and baseline was found because the striving that preceded the acquisition of meaning in the low preparation condition was inadequate. That is, perhaps in piecing together the disparate bits of the passage to arrive at its overall meaning, participants simply did not have to work hard enough; even with a glance at each fragment, despite the missing details, participants could come by the gist of the passage fairly easily. The goal of this second study, therefore, was to try to make it more of a struggle for participants to extract out meaning from the preparation passage before reading and rating the clear wolf passage.

To make the extraction of meaning from the preparation passage more of a struggle, the wolf passage was “jumbled” in the following way. If a word began with a consonant, the consonant was replaced with a different consonant, whereas if a word began with a vowel, a consonant was added to the beginning of the word. Participants were required to read through two such passages en route to reading and rating the clear wolf passage. In the first of these passages, every word was altered, whereas in the second, only every other word was changed. Pretests on these “jumbled” passages revealed that while participants could easily read through them, their meaning for the most part was obscured; though they knew the passage involved predators taking down their prey, they could not report on many of the details (e.g., how many wolves there were, the identity of the prey, etc). With participants being left to wonder about many of the details, just as in the low preparation condition of the previous study, they would be in a position to experience ‘the acquisition of meaning’ upon reading through the clear version. Importantly, however, unlike in the low preparation condition of the previous

study where participants could come by meaning relatively easily by simply reading through the various fragments, in order to extract out meaning here they would have to expend some effort to decode (at least some of) the “words” en route to obtaining that meaning. Thus, if in fact greater striving for meaning increases the pleasure of its acquisition, then the greater struggle for meaning in this instance should translate into a more favorable evaluation of the clear wolf passage.

Even if the greater struggle associated with extracting out meaning in this case were to increase the pleasure of reading the clear wolf passage, we would still not be able to say that it was ‘the striving for and the acquisition of meaning’ that produced the result. Instead, we could only conclude that striving for meaning increases the subsequent pleasure of reading anything. In other words, the result could simply be attributed to a contrast in reading difficulty, namely, that reading the jumbled passages prior to reading the clear passage increased reading enjoyment because of how much easier it was to read the clear passage in contrast to how difficult it was to read the preceding jumbled passages. For this reason, a second condition was run in which participants first read jumbled passages that were *unrelated* to the clear wolf passage. In the latter case, though participants have to struggle to extract out meaning, unlike those reading the jumbled versions of the wolf passage, they will not have a sense upon reading the clear wolf passage of having acquired the meaning that they had been previously striving for. As such, with the contrast in reading difficulty between the jumbled passages and the clear wolf passage being comparable in the two conditions, any gain in reading enjoyment that is observed for the jumbled-related condition may be taken as having its source in the ‘the striving for and the acquisition of meaning’.

## Method

### Participants

Eighty participants (forty in the jumbled-related and forty in the jumbled-unrelated condition) from the University of California, San Diego participated. In return for their participation, they received partial fulfillment of credit for their undergraduate psychology courses.

### Materials

For the jumbled-related condition, participants read the following two “jumbled” versions of the wolf passage before being given the clear wolf passage.

*Sike narrows roosed grom a low, the gree nolves zot norward. In an leffort to lunsteady its loe, the tirst trabbed fold of the nelk’s mankle. Haught by nurprise, the cunwitting nictim meacted tinstinctively by piolently ficking against the limpedance. Many sope of tescape, however, was quickly fashed as poment s gater the lecond nolf mashed into its kide, the porce of which hent it pareening to the bround. Nazed and in hock, the loor zoul neacted in the only hay that it sould: by jetting out a nighty, zacuous nellow. But that soment of leeming refiance nould be its nast; before it could nellow a zecond zime, the fird nolf noved in, crasped it by the droat and lut off the glow of mair. By the zime the fother nolves garrived, the trute was tead. Fonight mevery hember of the zack hould seave the seast with a mull helly.*

*Like narrows loosed grom a low, the gree wolves zot forward. In an effort to lunsteady its loe, the tirst grabbed fold of the nelk’s mankle. Caught by surprise, the unwitting nictim reacted tinstinctively by piolently kicking against the limpedance. Any sope of tescape, however, was quickly fashed as poment s later the second nolf smashed*

*into its kide, the porce of which sent it careening to the bround. Dazed and in hock, the loor soul neacted in the only hay that it should: by letting out a nighty, vacuous nellow. But that moment of seeming refiance would be its nast; before it could nellow a zecnd time, the third nolf moved in, grasped it by the throat and cut off the glow of mair. By the time the other nolves arrived, the brute was dead. Fonight every hember of the pack hould leave the feast with a mull belly.*

For the jumbled-unrelated condition, participants read the following two “jumbled” versions of a passage about running a marathon before being given the clear wolf passage.

*It das mate and he was greeling sired. It nad, naffer all, leen a serry zong hay. Shinking of excuses was geasy: loo lired, hegs were till shore, it nas faining. He gretched his larms out to the fide, ruffed out his kest and fawned. He hen food up, dook his negs and gretched. Lowly his tulse licked up team and his gruscles degan to goosen up. The farathon was inly two seeks toway and foday’s sun was sarticularly dritical, heing the mast hong tun defore the gig hace. Multhough foday’s gun rould be glow, it gould be a mong son – hirty giles. But if he sould ho tis hen he tew the tarathon in two seeks hould be a giece of nake. He nad hever lun a garathon kefore and nis toal for this gace was to timply jake it to the linish fine as lomfortable as rossible.*

*It das late and he was feeling sired. It nad, after all, been a very zong day. Shinking of excuses was geasy: too lired, legs were still shore, it nas raining. He stretched his arms out to the side, ruffed out his chest and yawned. He then food up, dook his negs and gretched. Slowly his pulse licked up team and his muscles degan to goosen up. The marathon was only two weeks toway and foday’s run was particularly*

*critical, being the last long run before the big race. Although today's run would be slow, it would be a long one – thirty miles. But if he could do this then he knew the marathon in two weeks would be a piece of cake. He had never run a marathon before and his goal for this race was to simply make it to the finish line as comfortable as possible.*

## **Procedure**

Everything about the procedure was the same as the first study. The notable difference being that the booklet for both conditions consisted of seven pages: the instructions page, a blank page, the first jumbled passage, a blank page, the second jumbled passage, a blank page, the clear wolf passage, a blank page, and a question and answer page.

## **Results and Discussion**

Making it more of a struggle for participants to extract out meaning from the wolf passage subsequently increased reading enjoyment of the clear wolf passage: reading enjoyment ratings for the jumbled-related condition ( $M = 5.05$ ,  $SD = 1.48$ ) were higher than baseline ( $M = 4.00$ ,  $SD = 1.63$ ),  $t(78) = 3.01$ ,  $p < .004$ . And this result cannot simply be attributed to the contrast in reading difficulty between the jumbled passages and the clear wolf passage as reading enjoyment was only selectively increased for those that read jumbled versions of the wolf passage: reading enjoyment ratings for the jumbled-related condition were higher than reading enjoyment ratings for the jumbled-unrelated condition ( $M = 4.175$ ,  $SD = 1.65$ ),  $t(78) = 2.50$ ,  $p < .02$ , with ratings for the latter condition not differing from baseline,  $t(78) = 2.69$ ,  $p > .60$ . These results thus provide

empirical support for the theoretical notion that greater striving after meaning produces greater pleasure upon its acquisition.

### **Study 1c**

In the related-jumbled condition of the previous study, in the process of making it more of a struggle to extract out meaning from the preparation passages, overall comprehension was impaired. In an effort to facilitate comparison with the high preparation condition of the first study, whereby participants read through and comprehended two preparation passages before reading and rating the final, clear wolf passage, the goal here was to leave comprehension intact while making it more of a struggle to read through the two preparation passages. To accomplish this, the first and last letters of each word of the preparation passages were unaltered whereas the intervening letters were rearranged. Rayner, White, Johnson and Liversedge (2006) have previously demonstrated that while comprehension of such jumbled sentences is comparable to their clear versions, extracting out meaning requires considerably more effort; in their study, compared to the clear sentences, the jumbled sentences took longer to read, with each word being fixated more often and for a longer duration. The idea, then, was that though participants would be able to experience the narrative as it unfolds, as they would need to unscramble each word to do so, the overall effort expended to make it through the preparation passages would be considerably greater than that of the high preparation condition of the first study. Unlike the latter, however, where the final passage simply recapitulated the information given in the preparation passages, here participants would still be in a position to experience ‘the acquisition of meaning’: though it is the case that the final, clear wolf passage simply recapitulates the information

previously given, that meaning is now instantiated in its proper orthographic form, which is what participants have been struggling to realize all along. This sense of finally achieving a fit between the orthographic and semantic aspects of each word, then, might prove particularly satisfying, yielding relatively high reading enjoyment ratings. The veracity of this explanation, of course, requires a control condition to make sure that any gain in reading enjoyment isn't simply due to the contrast in reading difficulty between the preparation passages and the final, clear wolf passage. Like the previous study, therefore, a second condition was run in which the jumbled preparation passages were unrelated to the clear wolf passage.

## **Method**

### **Participants**

Eighty participants (forty in the jumbled-related and forty in the jumbled-unrelated condition) from the University of California, San Diego participated. In return for their participation, they received partial fulfillment of credit for their undergraduate psychology courses.

### **Materials**

For the jumbled-related condition, participants read the following two passages before being given the final, clear wolf passage.

*Lkie aworrs lesood form a bow, the terhe wevlos soht frawrod. In an erofft to udaetsny its foe, the fsrit gebbard hlod of the Ekl's alkne. Chguat by ssirprue, the unittiwng vitcim retcaed ilevitcnitsy by vltneoy knikcig asniagt the icnadepme. Any hpoe of epacse, hevewor, was qlkciuy dehsad as mnemots letar the snoced wlof sehsamd itno its sdie, the fcroe of wcihh snet it cnineerag to the gnuord. Dezad and in scohk, the poor*

*suol retcaed in the olny way that it cluod: by lnitteg out a mthgiy, vuoucas bollew. But that mnemot of snimeeg dcaniafee wluod be its lsat; rofee it cluod bollew a snoced tmie, the trihd wlof mevod in, gepsard it by the taorht and cut off the folw of air. By the tmie the oehtr wevlos aevirrd, the btire was daed. Thginot erevy mebmer of the pcak wluod lvae the fsaet wtih a flul blley.*

*Like aworrs loosed form a bow, the terhe wolves soht forward. In an erofft to udaetsny its foe, the fsrit grabbed hlod of the Elk's alkne. Caught by surprise, the unwitting vitcim reacted ilevitcnitsy by vltneloiy kicking asniagt the icnadepme. Any hpoe of epacse, however, was qlkcuiy dashed as moments letar the snoced wolf sehsamd into its side, the force of which snet it cnineerag to the ground. Dezad and in shock, the poor suol reacted in the olny way taht it cluod: by lnitteg out a mighty, vuoucas bellow. But that mnemot of snimeeg defiance wluod be its last; brofee it cluod bellow a second tmie, the trihd wolf mevod in, gepsard it by the taorht and cut off the flow of air. By the tmie the oehtr wolves aevirrd, the btire was daed. Tonight every mebmer of the pack wluod leave the feast wtih a flul belly.*

For the jumbled-unrelated condition, participants read the following two passages before being given the final, clear wolf passage.

*It was ltae and he was eetsauhxed. It had, aetfr all, been an elemertxy lnog day. Tnikinhg of eesucxs was esay: too terid, lges wree slitl sroe, it was rninaig. He sehctertd his lbmis out to the sdie, peffud out his cseht and yenwad. He then sootd up, soohk his lges and sehctertd. Slwoly his pslue pekcid up saetm and his melcsus bagen to lesoon up. The mohtaran was olny tow wkees aawy and tyado's tniniarg soissen was plralucitray cacitirl, bnieg the lsat lnog run brofee the big rcae. Aguohth tyado's run wluod be solw,*



*it wluod be a lnog one – ttrihy melis. But if he cluod do this tehn he kenw the mohtaran in two wkees wluod be a pceie of ckae. He had nveer run a motharan brofee and his gaol for this race was slpmiy to mkae it to the fsinih lnie as clbatrofmoie as plbissoe.*

*It was late and he was eetsauhxed. It had, after all, been an elemertxy lnog day. Tnikinhg of eesucxs was esay: too terid, legs were slitl sore, it was rniniag. He sehctertd his limbs out to the side, peffud out his chest and yenwad. He then stood up, shook his legs and sehctertd. Slowly his pulse pekcid up saetm and his melcsus began to lesoon up. The marathon was only tow weeks aawy and tyado’s trianing soissen was plralucitray critical, bnieg the last long run before the big rcae. Although tyado’s run wluod be solw, it wluod be a lnog one – ttrihy miles. But if he could do this tehn he kenw the mohtaran in two weeks wluod be a piece of cake. He had nveer run a marathon brofee and his goal for this race was slpmiy to mkae it to the fsinih line as comfortable as possible.*

## **Procedure**

The procedure was exactly the same as study 1b.

## **Results and Discussion**

Once again, forcing participants to struggle to comprehend the wolf passage subsequently increased reading enjoyment of the clear wolf passage: reading enjoyment ratings for the jumbled-related condition ( $M = 5.40$ ,  $SD = 1.35$ ) were higher than baseline ( $M = 4.00$ ,  $SD = 1.63$ ),  $t(78) = 417$ ,  $p < .00008$ . And, like the previous study, this result cannot simply be attributed to the contrast in reading difficulty between the jumbled passages and the clear wolf passage as reading enjoyment was only selectively increased for those that read jumbled versions of the wolf passage: reading enjoyment ratings for

the jumbled-related condition were higher than reading enjoyment ratings for the jumbled-unrelated condition ( $M = 4.05$ ,  $SD = 1.66$ ),  $t(78) = 3.98$ ,  $p < .0002$ , with ratings for the latter not differing from baseline,  $t(78) = .14$ ,  $p > .90$ . As for comparing the results of this study with those of the high preparation condition of the first study, it is of more than passing interest that even though semantic processing of the three passages could be equated between the two studies, while the former produced reading enjoyment ratings that fell below baseline the latter produced ratings that fell significantly above baseline. This observation would appear, therefore, to speak to the importance that ‘the striving for and the acquisition of meaning’ plays in maintaining interest in any given stimulus scene: that it is precisely the *challenge* associated with finding meaning in a scene that sustains interest and that enables the perceiver to continue to derive pleasure from it over time.

### **Study 1d**

If in fact the increase in reading enjoyment observed in the preceding study may be traced to the hedonics of ‘the striving for and the acquisition of meaning’, then by disrupting this process we should be able to affect a reduction in the reading enjoyment ratings for the final, clear wolf passage. To disrupt the process, participants were required to read the clear wolf passage prior to the jumbled passages. The idea was that this would reduce: 1) the extent to which participants struggle to acquire meaning while reading the jumbled passages (because they are simply reading jumbled versions of the passage they’ve just read), and 2) the extent to which they have a sense of acquiring meaning upon reading the final, clear wolf passage (because it simply recapitulates information they’ve already been given). As such, with ‘the striving for and the

acquisition of meaning' compromised in this way, reading enjoyment of the final, clear wolf passage should be attenuated. To test for this, it was only necessary to make a slight modification to the basic design of study 2c: two jumbled-related conditions were run, with one of those conditions, here called the clear-jumbled-related condition, being preceded by the clear the wolf passage.

## **Method**

### **Participants**

Eighty participants (forty in the clear-jumbled-related and forty in the jumbled-related condition) from the University of California, San Diego participated. In return for their participation, they received partial fulfillment of credit for their undergraduate psychology courses.

### **Materials**

Both conditions employed the same jumbled passages as in study 2c, with the only difference being that in the clear-jumbled-related condition the jumbled passages were preceded by a full, clear version of the wolf passage.

### **Procedure**

Everything about the procedure was the same as the last two studies. The only notable difference being that the booklet for the clear-jumbled-related condition consisted of ten pages: the instructions page, a blank page, the clear wolf passage, a blank page, the first jumbled passage, a blank page, the second jumbled passage, a blank page, the clear wolf passage, a blank page, and a question and answer page.

## **Results and Discussion**

Though preceding the jumbled passages with a clear version of the wolf passage reduced reading enjoyment of the final, clear wolf passage, the result failed to reach statistical significance: participants in the clear-jumbled-related condition ( $M = 4.85$ ,  $SD = 1.53$ ) gave comparable reading enjoyment ratings to those in the jumbled-related condition ( $M = 5.35$ ,  $SD = 1.25$ ),  $t(78) = 1.60$ ,  $p > .10$ . Nevertheless, comparing both conditions to baseline showed that the effect was stronger for the jumbled-related condition,  $t(78) = 4.15$ ,  $p < .00008$ , Cohen's  $d = .93$ , than for the clear-jumbled-related condition,  $t(78) = 2.41$ ,  $p < .02$ , Cohen's  $d = .54$ . This result thus provides some support for the idea that to the extent that the subjective experience of 'the striving for and the acquisition of meaning' is compromised, so too will the pleasure that attends that processing experience.

### **Overall Summary and Conclusions for Study 1**

This first set of experiments examined the hedonics of 'the striving for and the acquisition of meaning' in written materials and found the following. First, removing 'the striving for and the acquisition of meaning' by preceding the written passage with two identical preparation passages caused reading enjoyment ratings to fall below baseline (high preparation condition of experiment 1a). Second, increasing the striving for meaning led to more favorable evaluations of that meaning once it was acquired: reading enjoyment of the written passage became more favorable when it was preceded by an impoverished preparation passage (low preparation condition of experiment 1a), an easy to read yet difficult to understand jumbled preparation passage (experiment 1b), and a difficult to read but nevertheless comprehensible jumbled preparation passage (experiment 1c). Third, compromising 'the striving for and the acquisition of meaning'

by preceding the jumbled preparation passages with a clear one attenuated subsequent reading enjoyment of the written passage (experiment 1d). These results thus provide empirical support for the hedonic properties of ‘the striving for and the acquisition of meaning’ within written materials.

### **Study 2 – Hedonics of Striving for and Acquiring Meaning in Pictorial Materials**

To examine the hedonics of ‘the striving for and the acquisition of meaning’ in pictorial materials, the struggle associated with processing meaning related to a sketch prior to evaluating the sketch was manipulated. If striving for meaning affects the pleasure of acquiring that meaning, then how positively the sketch is evaluated should vary as a function of the struggle that went into previously processing meaning related to that sketch.

#### **Study 2a**

To examine how the struggle associated with processing meaning related to a sketch subsequently affects the evaluation of that sketch, two conditions were created: a low struggle and a high struggle condition. In the low struggle condition, prior to evaluating the sketch, participants read the words “a camel”. In the high struggle condition, prior to evaluating the sketch, participants read the words “humps and live in the desert”. The idea was that the latter condition would create greater striving for meaning than the former: only in the latter would participants experience some uncertainty upon reading the description, perhaps even going so far as to generate the word “camel” for themselves. Regardless, whereas in the low struggle condition participants should experience some acquisition of meaning (“Yes it’s a camel alright.”), for participants in the high struggle condition, because of the struggle that preceded it,

this acquisition of meaning should be that much more potent (“Of course! Camels have humps and live in the desert!” or “I knew it was a camel!”).

## **Method**

### **Participants**

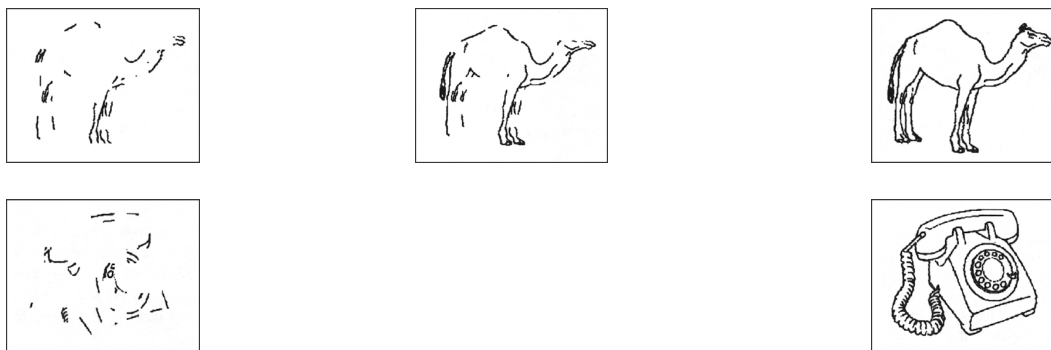
Eighty participants (forty in each of the low and high struggle conditions) from the University of California, San Diego participated. In return for their participation, they received partial fulfillment of credit for their undergraduate psychology courses.

### **Materials**

The sketches used in all studies in this series are displayed below in Figure 1. The sketch used as the focal stimulus for all studies in this series, and therefore the sketch used for evaluative purposes here, was that of the full camel (found in the upper right hand panel of Figure 1).

### **Procedure**

Participants were seated in a small, private room and given a booklet to make their way through. The booklet for both conditions consisted of five pages: an instructions page, a blank page, a page with either the words “a camel” (low struggle condition) or “humps and live in the desert” (high struggle condition) printed on it, a blank page, and the sketch of the camel. The instructions told participants to make their way through the booklet one page at a time, read whatever was printed on each page and then to advance the page after doing so. They were told not to look ahead and that once they advanced a page that they were not to go back. On the fifth page, which contained the sketch of the camel, participants were asked to indicate how well drawn they thought the sketch was on a scale from 1 to 7, with 1 being poorly drawn, 4 well drawn, and 7



**Figure 5.1.** Camel and phone sketches used in studies 2a-2d. All sketches were taken from Snodgrass and Feenan (1990).

very well drawn.

### Results and Discussion

Consistent with the idea that the striving for meaning may increase the pleasure of its acquisition, the sketch of the camel was viewed as a better drawing in the high struggle condition ( $M = 5.83$ ,  $SD = 1.13$ ) than in the low struggle condition ( $M = 5.20$ ,  $SD = 1.22$ ),  $t(78) = 2.37$ ,  $p < .03$ .

#### Study 2b

A conceptual replication of the previous result was attempted. In fact, everything in this study was the same as the previous study except that in the high struggle condition the metaphor “ships of the desert” was used as the descriptor. This slight alteration might be expected to produce a comparable but nevertheless unique processing experience: whereas in the previous study upon seeing the picture of the camel participants might have been expected to have their suspicions simply resolved (i.e., animals that have humps and live in the desert are indeed camels), here upon seeing the picture of the camel participants might be expected to additionally experience an epiphany as to how camels are like ships (i.e., camels are like ships in that they transport people across otherwise

intractable expanses of terrain). Though it's unclear whether we should expect even more favorable evaluations from this process of linking superficially disparate concepts to discover how they are similar, the fact that the achievement requires some struggle to achieve means that at the very least the results of the previous study should be replicated.

## **Method**

### **Participants**

Eighty participants (forty in each of the low and high struggle conditions) from the University of California, San Diego participated. In return for their participation, they received partial fulfillment of credit for their undergraduate psychology courses.

### **Materials**

The sketch used for evaluative purposes was the same as that used in study 2a.

### **Procedure**

Everything about the procedure was the same as the previous study. The only notable difference being that the metaphor "ships of the desert" was used in the high struggle condition.

## **Results and Discussion**

Once again, consistent with the idea that the striving for meaning may increase the pleasure of its acquisition, the sketch of the camel was viewed as a better drawing in the high struggle condition ( $M = 5.43$ ,  $SD = 1.13$ ) than in the low struggle condition ( $M = 4.83$ ,  $SD = 1.22$ ),  $t(78) = 2.28$ ,  $p < .03$ . The use of a metaphor for the descriptor, however, did not alter the strength of the effect: the effect size for the high struggle to low struggle comparison of study 2b was comparable to that of study 2a, with Cohen's  $d$  being .51 and .53, respectively.



## Study 2c

Though the two previous studies provide support for the idea that striving for meaning increases the pleasure of its acquisition, they do not tell us if there is a systematic relationship between the *amount* of striving engaged in to acquire meaning and the amount of pleasure engendered upon the acquisition of that meaning. This was examined directly in this study in the following way. Participants were presented with the camel sketch twice in a row. The first time they saw the sketch, they were asked simply to identify it. The challenge associated with identifying the sketch was manipulated by varying how degraded the sketch was. Based on degree of degradation, three challenge conditions were created: low, medium and high. In the low challenge condition, the sketch was not degraded at all; in the medium challenge condition, the sketch was only slightly degraded; and in the high challenge condition, the sketch was highly degraded. The second time they saw the sketch (which was the same full camel sketch in all three conditions), they were asked to rate how well drawn the sketch was. If there is a systematic relationship between the amount of striving engaged in to acquire meaning and the pleasure engendered upon the acquisition of that meaning, then ratings for how well drawn the camel sketch is should vary as a function of the challenge required to guess its identity: high challenge > medium challenge > low challenge.

## Method

### Participants

Ninety participants (thirty in each of the low, medium and high challenge conditions) from the University of California, San Diego participated. In return for their

participation, they received partial fulfillment of credit for their undergraduate psychology courses.

### **Materials**

The sketches to be identified for the three conditions are presented in Figure 1: high challenge condition (upper left degraded sketch), medium challenge condition (upper middle degraded sketch) and low challenge condition (upper right full sketch). The sketch to be evaluated was the same as the previous two studies (upper right full sketch).

### **Procedure**

The procedure was the same as the previous two studies except that the third page of the booklet contained either a degraded (medium and high challenge conditions) or a full (low challenge condition) sketch of a camel with accompanying instructions to write down the identity of the figure in the sketch before proceeding.

### **Results and Discussion**

Ratings for how well-drawn the sketch was systematically varied as a function of how challenging it was to previously identify the sketch: ratings for the high challenge condition ( $M = 6.3$ ,  $SD = 1.02$ ) were significantly higher than those of the medium challenge condition ( $M = 5.7$ ,  $SD = 1.06$ ),  $t(58) = 2.24$ ,  $p < .03$ , and ratings for the medium challenge condition were significantly higher than those of the low challenge condition ( $M = 4.93$ ,  $SD = 1.45$ ),  $t(58) = 2.36$ ,  $p < .03$ .

### **Study 2d**

Though the results of the previous study provide support for the idea that there is a systematic relationship between the striving engaged in and the pleasure engendered

upon the acquisition of meaning, perhaps the increase in ratings across challenge conditions for how well drawn the sketch was simply resulted from the striving for meaning itself (simply trying to guess the identity of the degraded figure) without any pleasure being derived from the acquisition of that meaning (from verifying that the figure in the degraded sketch was indeed that of a camel). If so, then the same pattern of results should be observed when the sketch to be identified is different from the sketch that is being evaluated (so that no verification can take place). To test this, the low and the high challenge conditions were repeated from the previous study, the only difference this time being that the sketch to be identified differed from the sketch that was subsequently evaluated.

## **Method**

### **Participants**

Sixty participants (thirty in each of the low and high challenge conditions) from the University of California, San Diego participated. In return for their participation, they received partial fulfillment of credit for their undergraduate psychology courses.

### **Materials**

The sketches to be identified for the two conditions are presented in Figure 1: high challenge condition (lower left degraded sketch) and low challenge condition (lower right full sketch). The sketch to be evaluated was the same as the previous two studies (upper right full sketch).

### **Procedure**

Everything about the procedure was the same as the previous study. The only notable difference being that the sketch to be identified in both conditions was that of a telephone instead of a camel.

### **Results and Discussion**

Ratings for how well drawn the sketch was did not vary as a function of how challenging it was to identify the preceding sketch: ratings for the high challenge condition ( $M = 5.53, SD = 1.33$ ) did not differ significantly from those of the low challenge condition ( $M = 5.37, SD = 1.27$ ),  $t(58) = .50, p > .60$ . This suggests that the pattern of results in the previous study did not simply result from the striving for meaning (trying to guess the identity of the degraded sketch). Rather, this suggests that those results were a consequence of the pleasure derived from acquiring meaning after striving to obtain it: that the challenge associated with trying to make sense of the sketch (figuring out its identity) heightened the pleasure of subsequently making sense of it (verifying its identity from the full sketch).

### **Overall Summary and Conclusions for Study 2**

This second set of experiments examined the hedonics of ‘the striving for and the acquisition of meaning’ in pictorial materials and found the following. First, increasing the striving for meaning by preceding the sketch with a less descriptive (as opposed to a more descriptive) phrase led participants to rate the sketch more favorably (Experiments 2a and 2b). Second, systematically manipulating the striving for meaning by first having participants guess the identity of an ever more impoverished version of a sketch led participants to subsequently rate the sketch ever more favorably (Experiments 2c and 2d).

These results thus provide empirical support for the hedonic properties of ‘the striving for and the acquisition of meaning’ within pictorial materials.

### **General Discussion**

The studies presented here provide empirical support for the theoretical notion that the pleasure of the aesthetic experience may be traced, at least in part, to a psychological process involving ‘the striving for and the acquisition of meaning’: increasing the striving that preceded the acquisition of meaning produced more favorable evaluations in both written (study 1) and pictorial (study2) materials. In what follows, I take a closer look at: 1) the repercussions these findings have for our understanding of learning-based preference effects, 2) how these findings might contribute to our understanding of classical preference effects, 3) the phenomenology of this psychological process, and 4) some limitations and caveats of these findings.

#### **‘The Striving for and the Acquisition of Meaning’ in Learning-Based Preferences**

Preference development in psychology has focused on how a prior experience with a domain may influence the subsequent appeal of the same or related items from that domain. These learning-based preference effects come in many forms: the mere-exposure effect – the finding that repeated, unreinforced exposure to a stimulus is sufficient for the development of a preference for that stimulus (e.g., Zajonc, 1968; Bornstein, 1989); the preference for prototypicality – the finding that more typical or averaged members of familiar categories are preferred over less typical or less averaged members (e.g., Martindale & Moore, 1988; Rhodes & Tremewan, 1996; Halberstadt & Rhodes, 2000; 2003); structural relation preferences – the finding that novel items that are structurally related to previously learned categories are preferred to novel items that

bear little structural relationship to these categories (e.g., Gordon and Holyoak, 1983; Sollberger and Reber, 2004); and priming-based preferences – the finding that briefly preceding a stimulus with a perceptually or conceptually related one increases preference for that stimulus (e.g., Reber, Winkielman and Schwartz, 1998).

Though diverse mechanisms have been postulated to explain how these learning-based preferences may come about, the hedonic fluency model of Winkielman, Schwartz, Fazendeiro and Reber (2003) represents the one attempt to provide a parsimonious explanation for all of them: that a prior experience with a stimulus makes subsequent processing of the stimulus easier which, in turn, engenders a positive affective response and a more favorable evaluation. The present studies, however, suggest an equally parsimonious alternative account: that a prior experience with a stimulus affords the opportunity to subsequently experience ‘the acquisition of meaning’ for that stimulus. This may come about either via the discovery of correlations between the stimulus being evaluated and one that was previously presented (“That’s one I’ve seen before!”), or via the clearing up of ambiguities for a stimulus that wasn’t deeply processed the first time around (“That briefly presented apple-like item actually was an apple!”). In either case, the sense of having acquired meaning that would be engendered for old or primed items would, as the results of the present studies suggest, make them preferable to new or not primed items.

If the latter account is correct, just as in the present studies where the acquisition of meaning was made more pleasurable by increasing the striving that preceded it, we should observe stronger learning-based preference effects when the experimental paradigm is such that it makes discovering correlations and clearing up ambiguities more

challenging. This is indeed what one finds when one examines the literature on the mere-exposure effect: factors that might be expected to increase the challenge of making connections between items at exposure and evaluation, such as shorter exposure durations, heterogeneous exposure sequences, fewer exposures, and longer delays between exposure to and ratings of stimuli, all tend to increase the strength of the mere-exposure effect (Bornstein, 1989). These observations coupled with the presents findings thus suggest that ‘the striving for and the acquisition of meaning’ may play an important role in bringing about learning-based preference effects.

### **‘The Striving for and the Acquisition of Meaning’ in Classical Preferences**

One persistent theme in the history of aesthetics is the notion that beauty may be traced to ‘uniformity in variety’. This notion garners empirical support from studies that have found complexity to be related to preference via an inverted U-shaped function (see Berlyne 1970; 1971). What might account for this preference for intermediate levels of complexity? On the one hand, since the hedonic fluency model discussed previously posits that easier processing should produce a more favorable response, the finding that more complex patterns (and therefore presumably more difficult processing) are preferred to less complex patterns (and therefore easier processing) poses a problem. On the other hand, this finding is exactly what would be expected if we assume hedonic responses are being driven by a psychological process that involves ‘the striving for and the acquisition of meaning’: unlike low levels of complexity where pattern is easily grasped and high levels of complexity where pattern is all but indiscernible, intermediate levels of complexity provide affordances for the perceiver to struggle somewhat before apprehending pattern.

Conceptualizing the preference for intermediate complexity as resulting from ‘the striving for and the acquisition of meaning’ may also provide us with insights into some other closely related findings. Take, for example, Bornstein’s (1989) meta-analytic finding that mere-exposure effects are stronger for complex than simple stimuli. Though this may in part represent a contrast effect between complex and simple stimuli when they are used in the same study, Bornstein, Kale and Cornell (1990) subsequently showed that this result still holds when complex and simple stimuli are rated separately. So how else might we account for stronger mere-exposure effects for complex stimuli? The answer may lie with the greater curiosity that is created by the brief presentation of a complex stimulus. Ertel (1974), for example, found that when participants were briefly presented with a pair of stimuli and asked to choose one for further viewing that they chose the more complex stimulus of the pair. Perhaps, then, as in the present studies where acquired meaning was evaluated more favorably the greater the striving that preceded it, the subsequent satisfaction of this greater curiosity for complex stimuli is what is responsible, at least in part, for the stronger mere-exposure effects we see for complex over simple stimuli.

### **The Subjective Experience of ‘The Striving for and the Acquisition of Meaning’**

Though the studies reported here have demonstrated the favorable evaluative repercussions of ‘the striving for and the acquisition of meaning’, they are mute with respect to the phenomenology of the process itself. Since further theoretical elaboration and future empirical examination of this idea will require more precise construct specification, I speculate here as to what the subjective qualities of this psychological process might be.



A complete characterization of the phenomenology of ‘the striving for and the acquisition of meaning’ requires that both aspects of the process be considered, that is, both ‘the striving for’ as well as ‘the acquisition of’ meaning. Since the hallmark of ‘the striving for meaning’ is inefficiency, whereby processing proceeds slowly, frequently fails and often requires a different course to be initiated, the individual engaged in this type of processing is likely to experience *difficulty* (because of the struggle to integrate otherwise disparate elements into a meaningful whole) and *uncertainty* (because it’s not clear how the disparate elements may be made to come together to form a meaningful whole). Since the hallmark of ‘the acquisition of meaning’ is efficiency, whereby processing proceeds rapidly and without failure, the individual engaged in this type of processing is likely to experience *ease* (because the many disparate elements have now been reduced to a single meaningful whole) and *certainty* (because it’s clear how the otherwise disparate elements fit together to form a meaningful whole). So we may say that ‘the striving for and the acquisition of meaning’ involves a *shift* from inefficient processing, subjectively experienced as difficulty and uncertainty, to efficient processing, subjectively experienced as ease and certainty. But how might the *shift* itself from ‘the striving for’ to ‘the ‘acquisition of’ meaning be experienced subjectively? First, there is likely to be *relief* as the difficulty and uncertainty associated with the ‘the striving for meaning’ abates, with the amount of relief being to some extent commensurate with the difficulty and uncertainty that preceded it. Second, there is likely to be some *joy* garnered from ‘the acquisition of meaning’, with the amount of joy being to some extent commensurate with the challenge that was overcome in successfully acquiring that meaning.

‘The striving for and the acquisition of meaning’, then, lends itself to the following phenomenological characterization: it is the sense of relief and the feeling of joy that one experiences as one moves from a processing state marked by difficulty and uncertainty to a processing state marked by ease and certainty.

### **Limitations and Caveats**

The finding here that a psychological process involving ‘the striving for and the acquisition of meaning’ may account, at least in part, for the pleasure that accompanies our otherwise disparate aesthetic experiences requires a couple of caveats. First, it is important to emphasize that these findings pertain to the seeking of meaning for purely intrinsic reasons and should not be generalized to situations where meaning is being sought for extrinsic reasons. For example, though a child may experience great delight after expending much time painstakingly putting together a complex jigsaw puzzle to uncover the picture that lies therein, they are likely to grow more and more upset the longer their algebra homework delays their getting to see their friends. In the latter situation, where meaning is only being sought for some extrinsic reason (so they can go out and play), less striving (less effort expended on math) will likely result in a more favorable response (that math isn’t so bad after all). Second, even when meaning is being sought for its own sake there are likely to be individual differences in terms of the amount of striving people are willing to engage in for the affective payoff that comes with acquiring meaning. For example, among those turning to literature in their leisure time, while some may prefer something easy, such as might be had by reading Robert Frost’s poem “Stopping by Woods on a Snowy Evening,” others might prefer a greater challenge, as might be obtained from reading James Joyce’s epic novel “Ulysses”. In

addition, this preference for degree of challenge is likely to be moderated by a number of other variables, such as expertise in a domain, with experts preferring greater challenges than novices, and state of arousal, with well-rested, alert individuals preferring to expend more effort than their tired, inattentive counterparts. Nevertheless, as found in the present experiments with both written and pictorial materials, the claim here is that within certain individual and domain specific limits relatively more effort after meaning will produce relatively more pleasure once that meaning is acquired.

### **Concluding Statement**

The approach taken here towards studying the aesthetic experience and its attendant pleasure has been by design a nomothetic one, specifically being concerned with a general psychological process that might explain the pleasure that attends our otherwise disparate aesthetic experiences. For likeminded theorists and researchers, I would just like to end off by emphasizing that as we tip-toe towards a general model of the aesthetic experience we would do well to keep our prejudices in check, being careful not to relegate the experience to only a certain class of activities. Instead, we must keep in mind that with proper study and training, wherever we are able to throw off the shackles of extrinsic constraint and allow intrinsic interest to pull us along, any activity, no matter how outwardly boorish, can be made sublime. Take a prize fight. Where the amateur spectator only sees two brutes flailing wildly, merely a cacophony of repugnant violence, the erudite fan observes a coordinated phantasmagoria of physicality waged somewhere at the upper limits of human performance. The latter keenly follows each movement of the boxers, simulating the footwork, the feints, each bob and weave, each blow. He grimaces when a boxer bobs when he should have weaved; cheers when a

boxer's feint draws the intended reaction from his opponent thus allowing him to score his blow; is amazed when a fighter rattles off a blinding three punch combination that thumps his opponent both body and head; and expresses a kind of resigned joy when the combination that he'd been screaming for a fighter to throw is at long last brought to fruition. This fight fan is every bit the connoisseur as the art critic, the wine taster, the conversationalist, the patron of music. Though the latter may turn up their noses and look down on the former, the only thing that differs between them are the materials, the objects of inquiry; the psychological processes that arouse and satisfy their curiosity, and the pleasures that ensue, these are one-and-the-same.

Chapter 5 is currently being prepared for submission for publication. Chenier, Troy. "The striving for and the acquisition of meaning: On the origins of aesthetic pleasure." The dissertation author was the primary investigator and author of these materials.

## GENERAL CONCLUSION

The purpose of this thesis was with characterizing the cognitive mechanism that underlies aesthetic pleasure: what set of psychological processes might lead someone to proclaim that some segment of their experience is satisfying or pleasant and that some focal stimulus is preferable or likeable? This problem was attacked from two directions: from the bottom-up and from the top-down. The bottom-up approach started with a set of empirically well-defined preference effects – historical preference effects – and from there tried to elucidate mechanism, whereas the top-down approach started with a well-defined theoretical mechanism – ‘the striving for and the acquisition of meaning’ – and from there tried to obtain empirical support for it. The main findings and conclusions from each of these two approaches are detailed below.

### **The Bottom-Up Approach – Key Findings**

The first concern of the bottom-up approach was to determine whether historical preference effects may best be understood in terms of unconscious and noninferential or conscious and inferential processes. The following empirical and theoretical findings spoke to this issue. First, regarding the empirical finding, it was found that although mere-exposure effects were intact in interested participants, they were completely abolished in bored participants. Given that boredom has been shown to impair memory and reduce motivation, such a result argues that bored participants were either not able or they were not willing to use those properties that might result from prior exposure (i.e., perceptual fluency or feelings of familiarity) to determine preference, and, as such, that the mechanism driving the preference effects for interested participants was in fact a conscious and inferential one (Chapter 1). Second, regarding the theoretical finding, a critical review of research often cited in support of an unconscious and noninferential

mechanism revealed that in most cases inferences could be shown to be driving the observed preference effects; and even where it was not clear that an inference definitely was involved, it could not be reasonably ruled out either (Chapter 2). These findings thus argue that historical preference effects are best conceptualized as stemming from conscious and inferential processes, that is, from the strategic use of either processing fluency, feelings of familiarity or explicit recognition to determine preference.

The second concern of the bottom-up approach was to determine the role that recognition plays in bringing about historical preference effects: are these preference effects based solely on processing fluency, as suggested by the perceptual fluency/misattribution model, or may they also stem from the resultant feeling of familiarity, as suggested by the uncertainty reduction model? The following two empirical findings spoke to this issue. First, a key piece of evidence often cited in support of the perceptual fluency/misattribution model failed to replicate, namely, that a belief the items are all new should selectively increase liking for items that are actually old. Instead, the opposite was observed: beliefs about prior exposure had no effect on liking for old items, but liking for new items was enhanced by a belief the items were all old (Chapter 3). Second, an extensive review of all those studies that have coupled recognition with liking judgments found, in contrast to the predictions of the perceptual fluency/misattribution model but in accord with the predictions of the uncertainty reduction model, that recognition enhances mere-exposure effects. This conclusion was reaffirmed in two mere-exposure experiments that also extended the explanatory power of the uncertainty reduction model to two other historical preference effects – the preference for prototypicality and structural-relation preferences (Chapter 4). These

findings thus argue that historical preference effects may, in addition to stemming from perceptual fluency, readily stem from feelings of familiarity or explicit recognition and, therefore, that they are best explained by the uncertainty reduction model.

### **The Top-Down Approach – Key Findings**

The concern of the top-down approach was to examine the hedonics of a psychological process involving the ‘striving for and the acquisition of meaning’, that is, that greater struggle after meaning results in greater pleasure when that meaning is acquired. Using a paradigm in which participants were first given an impoverished or clear passage or picture to make sense of before being given the final, clear passage or picture to evaluate, the following observations were made. First, removing ‘the striving for and the acquisition of meaning’ by recapitulating the same information reduced aesthetic pleasure: preceding a written passage with two identical preparation passages caused reading enjoyment ratings to fall below baseline (high preparation condition of Experiment 1a). Second, increasing the striving for meaning before its acquisition engendered more aesthetic pleasure: a written passage became more enjoyable to read when it was preceded by an impoverished version (low preparation condition of Experiment 1a), an easy to read yet difficult to understand version (Experiment 1b), and a difficult to read but readily comprehensible version (Experiment 1c). Third, compromising ‘the striving for and the acquisition of meaning’ attenuated aesthetic pleasure: preceding a difficult to read but readily comprehensible passage with a clear version reduced how enjoyable it was to subsequently read through the clear version (Experiment 1d). Fourth, ever greater striving for meaning produced ever more pleasure upon its acquisition: the more challenging it became to identify a sketch the better drawn



the sketch was subsequently deemed to be (Experiments 2c and 2d). These findings thus argue that a psychological process involving ‘the striving for and the acquisition of meaning’ may be an important locus for the pleasure that attends our otherwise disparate aesthetic experiences.

### **Characterizing the Cognitive Mechanism for Aesthetic Pleasure – A Synthesis**

Based on the present theoretical and empirical findings, the pleasure of the aesthetic experience may be said to arise when the perceiver is successful in the ‘making of meaning’, that is, when they are successful in abstracting out pattern and structure from, and thereby reducing the uncertainty associated with, an otherwise nonsensical stimulus environment. In the present studies, this occurred when correlations between the stimulus being evaluated and one that was previously presented were discovered (bottom-up approach), and when the ambiguities of a stimulus that wasn’t satisfyingly processed the first time around were subsequently cleared-up (top-down approach). The cognitive mechanism that underlies aesthetic pleasure may therefore be succinctly characterized as follows: it consists of a meaning making process in which difficult and uncertain processing (as one strives for meaning) gives way to easy and certain processing (when one acquires meaning) to produce feelings of relief (because one’s exertions have abated) and joy (because of the challenge that was successfully overcome in acquiring meaning).

In what follows, I show how this conceptualization of aesthetic pleasure may: 1) enrich our understanding of historical preference formation, 2) provide us with an explanation for one of the most debated topics in the history of aesthetics, namely, the idea that beauty may be traced to ‘uniformity in variety’, 3) be contextualized within a

psycho-biological/evolutionary framework, and 4) suggest that the mind is driven towards, and ultimately prefers, processing the rather improbable – the difficult to come by, the unusual, the unique.

### **On the Pleasures of Making Meaning in Historical Preference Formation**

Research into aesthetic phenomena within cognitive and social psychology has largely focused on how the learning experiences of the perceiver shape his or her preferences. While interesting and informative, these efforts have persisted in almost total isolation from wider philosophical and literary aesthetic traditions. Given that the theoretical formulation for aesthetic pleasure was arrived at here in part from ideas originated in the latter, it only seems appropriate to revisit the literature on historical preferences to see what insights might be gleaned from applying this fresh perspective.

Findings from the bottom-up approach led to the conclusion that historical preference formation may be traced to an uncertainty reduction mechanism in which participants use a feeling of familiarity or even explicit recognition to determine liking. Conceptualizing historical preference formation as arising from an effort on the part of participants to find meaning in the situation leads to one-and-the-same conclusion: that the sense of having acquired meaning, either via the discovery of correlations between the stimulus being evaluated and one that was previously presented (“That’s one I’ve seen before!”), or via the clearing up of ambiguities for a stimulus that wasn’t deeply processed the first time around (“That briefly presented apple-like item actually was an apple!”), should lead to old items being evaluated more favorably than new ones. As detailed below, however, findings from the top-down approach suggest that a couple of qualifications to this basic conceptualization may be in order.

First, just as in the present studies on ‘the striving for and the acquisition of meaning’ where the mere recapitulation of information did nothing to enhance evaluative ratings, the mere sense in historical preference studies that an item has been seen before might likewise be expected to be insufficient to enhance liking. That is, historical preference effects might only be expected to emerge under conditions in which it is unclear whether the items being evaluated have been repeated or not. This would ensure that when an act of recognition does take place that it is accompanied by a sense that something has been achieved, namely, that meaning has been abstracted out from an otherwise meaningless situation. A recent study by Dechene, Stahl, Hansen and Wanke (2009) suggests that this sense of having acquired meaning may in fact be a necessary condition for the mere-exposure effect. Specifically, after a typical exposure phase, they had participants rate items either in a mixed list (where half the items were old and half were new), a repeated list (where all the items were old), or in an unrepeated list (where all the items were new). They found that the mere-exposure effect only emerged when the items being rated consisted of a mixture of old and new items: whereas old items were rated more favorably than new items in the mixed list, old items from the repeated list were not rated more favorably than new items from the unrepeated list.

Second, just as in the present studies on ‘the striving for and the acquisition of meaning’ where the acquisition of meaning was made more pleasurable by increasing the striving that preceded it, historical preference effects might similarly be expected to be stronger when the experimental paradigm is such that it makes discovering correlations and clearing up ambiguities more challenging. Turning once again to the literature on the mere-exposure effect, this is in fact what one finds: factors that might be expected to

increase the challenge of making connections between items at exposure and evaluation, such as shorter exposure durations, heterogeneous exposure sequences, fewer exposures, and longer delays between exposure to and ratings of stimuli, all tend to increase the strength of the mere-exposure effect (Bornstein, 1989).

These observations thus argue that although historical preference effects may be based on feelings of familiarity or even explicit recognition, such acts of recognition will only engender pleasure and a more favorable response to the extent that they are accompanied by a sense that meaning has been abstracted out from the situation. And just to clarify what ‘meaning’ refers to in this context, consider the following analogy between perceptual and memorial processes. Suppose while visiting a garden an individual comes across a plot of roses. Suppose further that the plot consists of all white roses. Given their perceptual similarity, none of the roses stands out as being particularly special. However, suppose during a subsequent visit that the plot consists of mostly red roses, with only a few being white. Now those white roses stand apart and become particularly salient to the individual. Likewise, when an individual has a sense in a mere-exposure study that every item being rated has been seen previously, then no particular act of recognition stands out as noteworthy. However, when an individual has not experienced any of the items as familiar, when they finally do come across one that feels familiar, their act of recognition, as well as the item under consideration, will take on an air of significance: their sense will be that they have managed to find meaning in an otherwise meaningless situation.

**On the Pleasures of Making Meaning when faced with ‘Uniformity in Variety’**

Down through the ages scholars have debated the relative merits of various properties for invoking a sense of beauty. At one extreme there are those that have espoused the virtues of simplicity, order and uniformity, while at the other are those that have stressed the importance of complexity, disorder and variety. Often when there is a debate like this between two extreme positions a resolution comes about through a synthesis. This appears to be what philosopher Gottfried Leibnitz (1714) achieved in his definition of perfection: “to obtain as much variety as possible with the greatest order that one can”. Whether or not this was the seminal source, this merging of the two extremes subsequently found expression in the writings of a number of aesthetic thinkers. Francis Hutcheson (1725), for example, would go on to articulate the view that beauty could be traced to “uniformity amidst variety,” while Moses Mendelssohn (1757) would argue that “uniformity in multiplicity is a quality of beautiful objects”. Even Gustav Theodore Fechner (1876), the father of experimental aesthetics, would explain beauty in terms of a principle involving “the unitary connection of the manifold” (quotes taken from Tatarkiewicz, 1970).

Despite these prognostications, however, there have been relatively few studies that have tackled the issue directly. Instead, the best evidence we seem to have for the hedonic consequences of perceiving ‘uniformity in variety’ comes from studies that have found complexity to be related to preference via an inverted U-shaped function. What might account for this preference for intermediate complexity? It may readily be accounted for if we assume that aesthetic pleasure derives from a cognitive process that involves ‘the making of meaning’. Specifically, just as in the present studies on ‘the striving for and the acquisition of meaning’ where the acquisition of meaning was made

more pleasurable by increasing the striving that preceded it, unlike low levels of complexity where pattern is easily grasped and high levels of complexity where pattern is all but indiscernible, intermediate levels of complexity provide affordances for the perceiver to struggle somewhat before apprehending pattern. The merit of this explanation for the appeal of ‘uniformity in variety’, however, requires more than simply demonstrating a preference for intermediate complexity; rather, it requires that this preference be specifically tied to the process of abstracting out pattern itself. I next turn to a couple of studies that have in one way or another done just that.

Daniel Berlyne is one of the few investigators to have directly tackled the hedonics of ‘uniformity in variety’ (Berlyne and Boudewijns, 1971). To do this, he employed a paradigm in which he presented two patterns in succession that were either identical to one another, had some properties in common, or that were completely different from one another, and then had participants evaluate the sequence on a number of dimensions. The results provided support for the hedonic nature of ‘uniformity in variety’: whereas the lowest pleasingness/liking ratings were reserved for sequences of patterns that were completely identical or completely different from one another, the highest pleasingness/liking ratings were given to sequences of patterns that contained some similarities among some differences. Berlyne went on to note the similarities between this finding and the rather robust preference that has been shown for intermediate complexity and then interpreted the results within an arousal model of aesthetic pleasure: that intermediate levels of complexity are preferable because they maintain arousal levels within some optimal range. Regarding this interpretation, Joachim Wohlwill (1980) subsequently lamented how theoreticians were content to

simply invoke some “happy medium” principle when explaining such observations. He suggested that by doing so they were neglecting analyses of pattern perception, chunking and the detection of relationships among a complex configuration. In this regard, the present conceptualization of Berlyne’s results serves as the perfect remedy: that little reward is garnered from perceiving successive patterns that are completely identical because there is no challenge for picking out correlations between them, and little reward is garnered from perceiving patterns that are completely different because no correlations may be found; rather, it is only when there are some similarities scattered amongst the differences that the perceiver finds it challenging to pick out correlations and, as such, is rewarded for successfully doing so.

Dorner and Vehrs (1975) subsequently examined preference formation in pattern construction by using a rather unique procedure. Instead of having participants passively judge pre-made patterns, they had participants construct patterns for themselves: one that they might consider aesthetically satisfying and one that they might consider aesthetically unsatisfying. The investigators then took these satisfying and unsatisfying patterns and identified the extent to which each contained evidence of hierarchical organization: first-order organization was identified with a single dimension of elements (e.g., a single row of colors), second-order with two dimensions of elements (e.g., a cross made of alternating colors), and third-order with multiple dimensions of many different elements (e.g., a complex pattern made up of alternating colors). They found that whereas aesthetically unsatisfying patterns were either very simple or very complex, being almost entirely comprised of either first-order organization or having no organization whatsoever, aesthetically satisfying patterns tended to fall somewhere in between, being

especially rich in signs of second and third-order organization. This connection between hierarchical organization and preference for intermediate complexity thus provides support for the idea that the pleasure derived from ‘uniformity in variety’ does in fact stem from a process involving the making of meaning: that scenes of intermediate complexity are preferred to scenes of lower and higher complexity because of the greater challenges associated with (such as when intermediate complexity is preferred over low complexity) or just possible affordances for (such as when intermediate complexity is preferred over high complexity) abstracting out patterns from those scenes.

Finally, before leaving this topic, it’s worth emphasizing the remarkable similarities between historical preference effects, ‘the striving for and the acquisition of meaning’ and ‘uniformity in variety’. In each case, it has been shown that the mere recapitulation of information does little to enhance preference; rather, preferences only seem to readily emerge when the conditions are such that they provide affordances for the making of meaning: when items are rated in mixed lists for the mere-exposure effect (Dechene, Stahl, Hansen and Wanke, 2009); when a full passage or picture is preceded by an impoverished one for ‘the striving for and the acquisition of meaning’ (Chapter 5); and when successively presented patterns contain both similarities and differences for ‘uniformity in variety’ (Berlyne, 1971). Envisioning preference formation in terms of a meaning making process, therefore, would seem to hold promise for providing us with a parsimonious explanation for a wide range of preference effects: from those originating in the social and cognitive sciences – the mere-exposure effect, preferences for prototypes and structurally related stimuli, and priming-based preferences – to those more



commonly associated with theoretical and empirical aesthetics – intermediate complexity and ‘uniformity in variety’.

### **The Pleasures of Making Meaning in a Psycho-Biological/Evolutionary Framework**

Christian Theodosius Dobzhansky (1964) once remarked that “nothing in biology makes sense except in the light of evolution”. Given the widespread acceptance of this dictum, it seems only appropriate that some effort should be made here to ensconce the pleasures of making meaning within an evolutionary framework. Daniel Berlyne (1971), in his book *Aesthetics and Psycho-biology*, took a step towards doing this when he conceptualized the human mind as being fundamentally driven towards exploration of the unknown in the service of expanding the boundaries of territorial certainty. This drive to confront disorder so as to achieve a higher level of orderliness is adaptive because it pushes us to maximally exploit the resources and therefore thrive within a select environment. Of course, given the dangers associated with exploration, when we do capture meaning, it’s important that we are rewarded for doing so; otherwise, without such reinforcement, the motivation to sustain exploration might wane in face of its potential pitfalls. The suggestion, then, is that when we turn to leisure pursuits we co-opt this meaning making process in an effort to exploit its hedonic properties: we purposefully place ourselves in nonsensical environments, albeit relatively safe and benign ones, just so we may experience the pleasure that comes from making them sensical.

### **On the Nature of Mind in the Making of Meaning - Towards the Improbable?**

The present work has brought to light the importance ‘the struggle’ plays in eliciting the aesthetic response, in particular, that aesthetic pleasure does not readily

accrue from the mere recapitulation of information, but instead only seems to be engendered when accompanied by a sense that some measure of uncertainty has been overcome in realizing a perceptual or conceptual configuration. The implication of this is that the mind is not particularly oriented towards capturing the probable, but rather is driven towards capturing the *improbable*. This latter point fits in perfectly with the evolutionary framework discussed previously because it ensures that we do not waste our time on the rather maladaptive exercise of recapitulating the same old generic forms; rather, it ensures that we spend most of our time engaged in the more adaptive activity of innovation, that is, of realizing ever more distinctive and intricate perceptual and conceptual configurations.

The notion that the mind is driven towards capturing the improbable, however, runs contrary to the prevailing zeitgeist in psychology, which boasts a number of literatures that show preferences for the probable: mere-exposures effects (the preference for the familiar), prototype effects (the preference for the average) and fluency and accessibility effects (the preference for the easy to process). Scrutinized more closely, however, I believe these literatures may actually show that we do in fact have a marked tendency to seek out and prefer the improbable. Each is considered in turn.

### **Mere-Exposure Effects**

The mere-exposure effect is a robust preference effect that clearly indicates a bias towards preferring the familiar (Bornstein, 1989 for review). We need to be careful, however, in assuming from this that the mind is oriented towards the familiar *by default*. Instead, it is quite likely that the contingencies associated with your typical mere-exposure study are such that they slant participants in this direction. Consider that in

such studies investigators go to great lengths to hide from participants what items have been presented to them at exposure. It's hard to imagine under such circumstances participants not being somewhat curious as to what they previously "saw" and, as such, becoming oriented towards trying to spot those items at evaluation. And successfully doing so, or at least having the subjective experience of doing so, would no doubt prove highly rewarding. It's no wonder, then, that within this context of considerable uncertainty about what has or has not been seen before that old items are preferred to new items. Indeed, the latter observation neatly explains several otherwise difficult to reconcile mere-exposure findings: why Dechene, Stahl, Hansen and Wanke (2009) only found a mere-exposure effect when repeated items were evaluated amongst unrepeated ones; why the so-called 'believe new' conditions of Bornstein and D'Agostino (1994), Lee (1994) and the Experiment of Chapter 3 produced the strongest mere-exposure effects; and why factors that make the connection between the exposure and rating phase *less* obvious tend to increase the strength of the mere-exposure effect (Bornstein, 1989): because each of these situations introduces considerable uncertainty as to what has been seen before and, as such, makes it quite rewarding to identify (even if vaguely) items that have been seen previously.

Such observations suggest, then, that we do not necessarily have a default preference for the familiar; instead, what they seem to show is that we have a tendency to respond ever more favorably to old items as the prevailing conditions under which we encounter them become ever more uncertain. Interestingly, this notion resonates nicely with findings from the memory literature, where a number of studies have shown that it is 'surprising' fluency (i.e., the extent to which an item 'pops out' at participants) rather

than fluency per se (i.e., simply how easily the item is processed) that underlies the feeling of familiarity (e.g., Whittlesea and Williams, 2001a and b). And even given these considerations, contrary to any so-called familiarity bias, as was shown in Experiment 2 of Chapter 4, when participants are explicitly oriented in a mere-exposure paradigm towards recognizing what they have *not* seen before, they can readily be induced to develop a preference for the objectively unfamiliar (correct rejections) over the objectively familiar (misses). Ultimately, whether our orientation is towards the familiar or the unfamiliar may very well depend on context: when things become too familiar we seek novelty whereas when things become too novel we seek familiarity. If this rather intuitive notion is validated empirically, then regardless of whether we seek the familiar or the novel, one thing remains constant: the mind is always oriented towards capturing the improbable.

### **Prototype Effects**

There is a considerable literature showing that the average member of a category, or the member that best approximates the ‘central tendency’ of the category, is also the most preferred member: people show it for nonliving categories – color patches (Martindale & Moore, 1988), furniture (Whitfield & Slatter, 1979), wristwatches and automobiles (Halberstadt & Rhodes, 2000; 2003), as well as for living categories – human faces (Rhodes & Tremewan, 1996; Rhodes, Yoshikawa, Clark, Lee, McKay & Akamatsu, 2001), fish, dogs and birds (Halberstadt & Rhodes, 2000; 2003). Despite the apparent robustness of this literature, however, these findings do not necessarily show a preference for the probable; it’s possible the pleasure that is engendered upon the realization of such configurations may be traced to our sense that considerable odds had

to be overcome to achieve them: though we've encountered a thousand variations of some species of bird, encountering an exemplar that is a near faultless blend of all the birds we have ever encountered would be rather remarkable, and though we've seen numerous Caucasian and African American faces, coming across a face that possessed a rare combination of features from each, such as blue eyes set against dark skin, would likewise prove exceptional. Indeed, concerning the latter, Lewis (2010) recently reported that mixed-race faces were rated as more attractive than non-mixed race faces among a random sample of 1205 such faces taken from Facebook communities, with mixed-race faces dominating the highest attractiveness ratings. Though this provides further support for the idea that attractive faces are average, it also supports the idea that we prefer the improbable; as only around three percent of the British population are of mixed-race, non-mixed race faces are likely what people encounter the majority of the time, so that an encounter with a mixed-race face is a rather rare event.

Putting aside the relationship between prototypicality and probability, there is still some question as to whether average forms, at least when it comes to faces, are really what we find most attractive. Perrett (1994), for example, found that though a composite of sixty faces was deemed more attractive than the individual faces that made it up, it was deemed *less* attractive than a smaller composite of the fifteen most attractive faces. More importantly, he found that caricaturing the shape of each composite (e.g., narrowing the face and reducing the size of the jaw line) produced faces that were less average but more attractive than either composite. These results seem to suggest that while prototypicality may to some degree determine attractiveness, what we find *most* attractive is that which is just a little bit different from what we're used to.

One way to directly test whether it's averageness *per se* that determines attractiveness would be to start with that which is attractive and make it even more average. If the averageness hypothesis is correct, the result should be something even more attractive. However, if making it more average decreases its attractiveness, this would suggest that there is something about its uniqueness that is responsible for its appeal. This is precisely what DeBrune, Jones, Unger, Little and Feinberg (2007) did in a visual adaptation experiment on human facial attractiveness (Experiment 5). Specifically, they first had participants rate the normality and attractiveness of an unattractive and an attractive composite. They then had them passively view either 20 generic unattractive or 20 generic attractive faces. Finally, they had participants rate the unattractive and attractive composites again. For the unattractive composite, they found both normality and attractiveness increased following exposure to the unattractive generic faces. Interestingly, however, for the attractive composite, though normality increased following exposure to attractive generic faces, they found its attractiveness *decreased*. This result thus suggests that there may be no simple relationship between attractiveness and averageness *per se*, and that perhaps the reason why so many prior studies have found such a relationship is because they started with the relatively unattractive and derived their composite from there. Regardless, what this finding does tell us is that even if an item is highly average it will only come to be viewed as highly attractive to the extent that it is perceived to be rather improbable – uncommon, rare, or unique.

### **Processing Fluency and Accessibility Effects**

There are literally hundreds of studies documenting a link between easier information processing and more favorable reactions. From the literature on processing

fluency, researchers have reported that the easier it is to perceptual or conceptually process a stimulus the more likely we are to say it is familiar (e.g., Jacoby and Dallas, 1981; Whittlesea, Jacoby, and Girard, 1990), clearer (Whittlesea, Jacoby, and Girard, 1990), likeable or pretty (e.g., Bornstein and D'Agostino, 1994; Reber, Winkielman, & Schwartz, 1998), and, if a statement, true (Reber and Schwartz, 1999; McGlone and Tofiqbakhsh, 2000). From the literature on accessibility, researchers have reported similar findings: we believe we are more assertive when we are easily able to bring to mind instances of past assertive behavior (Schwartz, Bless, Strack, Klumpp, Rittenauer-Schatka, & Simons, 1991); we judge we have a better memory when we are readily able to generate childhood events (Winkielman, Schwartz and Belli, 1998); we claim someone is more likeable when we are effortlessly able to come up with favorable thoughts about that person (Haddock, 2002); and we view dining out in a more favorable light when we can easily bring to mind past instances of positive dining experiences (Raghubir and Menon, 2005).

These findings would seem to indicate that there is an intimate association between how easy it is to process information about something and, ultimately, how positive our evaluation of that thing is. This could easily be construed to mean that we do indeed covet the probable – the easy to come by, the usual, the run-of-the-mill. It must be remembered, however, that the meaning of our fluency and accessibility experiences is determined by the naïve theory that is invoked to explain them (e.g., Schwartz, 2004). The reason why, therefore, the aforementioned paradigms likely found an association between ease of information processing and more favorable judgments is because their experimental contingencies were such that they invoked naïve theories that favored the

positive evaluation of easy processing. In fact, as will be seen in the studies reviewed below, when the experimental setup is such that its contingencies invoke a naïve theory that favors the positive evaluation of difficult processing, it can readily be shown that what we really covet the most is in fact the improbable – the difficult to come by, the unusual, the unique.

Kruger, Wirtz, Van Boven and Altermatt (2004) were among the first to directly examine the notion that people might rely on an effort heuristic when judging quality. Specifically, they found that participants rated a poem (Experiment 1), painting (Experiment 2) and a suit of armor (Experiment 3) as being of higher quality, of better value and more preferable the more time and effort they thought it took to produce. Extending these findings to include an individual's own processing experience (as opposed to their perception of what someone else went through), Labroo and Kim (2009) suggested that people may rely on an instrumentality heuristic when assessing the usefulness of an item for accomplishing a self-relevant goal; the idea being, as greater effort is associated with more successful outcomes, more effortful processing of an item should lead to the item being deemed more useful for achieving the self-relevant goal and, as such, should make the item more appealing. This is indeed what they found: participants primed with a goal to 'maximize pleasure' subsequently rated chocolate in an advertisement more favorably when it was accompanied by a more difficult than easier to read description (Experiment 1); and participants primed with a goal to 'be a kinder person' subsequently offered to give more to charity when the description of the charitable organization was more difficult than easier to read (Experiment 2). In both cases, however, participants primed with a goal that was irrelevant to the item being



evaluated showed the usual fluency effects: the chocolate was evaluated more favorably and more was offered to the charitable organization the easier it was to process the information given. These observations thus suggest that when we have a self-relevant goal in mind that we do indeed associate more successful outcomes with more effortful means.

Pocheptsova, Labroo and Dhar (2010) subsequently reasoned that while previous research has shown that easier processing leads to more favorable evaluations of common, everyday products, the opposite might be true when it comes to special occasion products; where consumers value quality, difficult processing might make these kinds of products more appealing by making them appear special or unique. Their suspicions were confirmed across a number of experiments: while cheese described as ‘all American’ was evaluated more favorably when the accompanying description was easy to read, the same cheese described as ‘a decadent delight for special occasions’ was evaluated more favorably when the accompanying description was difficult to read (Experiment 1); while people were willing to pay more for a meal at a ‘casual Thai restaurant’ when they only had to give one reason (as opposed to five) for eating there, they were willing to pay more for a meal at an ‘upscale French restaurant’ when they had to give five reasons (as opposed to just one) for why they would eat there (Experiment 2); and while participants primed with ‘everyday’ and ‘ordinary’ evaluated chocolate in an ad more favorably the easier the accompanying description was to read, those primed with ‘special’ and ‘unique’ evaluated the chocolate in the ad more favorably the more difficult it was to read (Experiment 4). These findings thus establish a clear link between effortful processing and the appreciation we have for high-end products: the more effort

we must invest in making sense of them, the more unique and, therefore, better and more valuable we assume them to be.

Labroo, Lambotte and Zang (2010) further extended these findings to include the importance we attach to various media reports. In particular, they reasoned that because people typically allocate effort to processing information that they believe is important, more effortful processing should make a reported finding seem more important whereas less effortful processing should make it seem less important. This is indeed what they found: regardless of whether participants were evaluating jury decisions (Experiment 1), economic principles (Experiment 1), math theorems (Experiment 1), psychological effects (Experiment 2) or findings from medical research (Experiment 3), the reported findings were regarded as more important when they were more difficult than easier to process.

Finally, to this small but ever growing body of research, we can add the present findings; specifically, from Chapter 5 on the hedonics of ‘the striving for and the acquisition of meaning’, it was shown that when the goal is to acquire meaning for meaning’s sake, then the more effort that goes into doing so the more pleasure that is engendered when that meaning is eventually acquired: a written passage became more enjoyable to read as a preceding version of it became more impoverished (Experiment 1a-d); and a picture was rated as a better drawing as a preceding version of it became more degraded (Experiment 2a-d). Contrary to what so many previous fluency and accessibility studies might lead us to believe, then, this literature shows that we do not in fact covet the probable – the easy to come by, the usual, the run-of-the-mill. Instead, it shows that when it comes to what we truly prefer, cherish and hold in highest esteem,

what we actually covet is the improbable – the difficult to come by, the unusual, the unique.

In conclusion, in spite of the fact that mere-exposure, prototypicality, and fluency and accessibility researchers have seemingly been focused on demonstrating our inclination for the probable, it may just be that what they have succeeded in showing is the fondness we have for the improbable. The latter conceptualization, however, may serendipitously prove quite valuable; not only does it establish a framework that parsimoniously explains a number of disparate preference phenomena, but it also connects the rather mundane preferences people exhibit inside the laboratory to the more profound aesthetic experiences they have outside of it. To illustrate, consider the following examples: why a young Muhammad Ali's dazzling display of hand and foot speed against the hard-hitting Cleveland Williams on the night of November 14<sup>th</sup>, 1966 left so many wide-eyed and mouth-agape; why Bollywood actress Aishwarya Rai with her peculiar blue-green eyes is cited by so many as the most beautiful woman in the world; and why St Peter's Basilica and the Taj Mahal with their highly wrought and intricately decorated environs receive hundreds of thousands of visitors each year. If we conceive of the mind as being driven towards realizing the ever more improbable, just as we've been able to explain mere-exposure effects, preferences for prototypicality, and various fluency and accessibility effects, we may likewise be able to trace the *potency* of each of these experiences to our sense of having captured the highly improbable: though having sat through a thousand prize fights, its only on the rarest of occasions that we get to witness the exceedingly rhythmic pugilistic patterns – the fluid footwork and precise combination punching – of a fighter like Muhammad Ali; though encountering

innumerable pairs of generic brown, blue and even green eyes, it is a most uncommon occurrence to encounter eyes with the blue-green hue of an Aishwarya Rai; and though on a daily basis we process countless isolated forms and a myriad of discrete patterns, it is an extraordinary set of circumstances that leads us to the extreme articulation of form and hierarchical arrangement of pattern that characterizes such places as St. Peter's Basilica and the Taj Mahal.

Perhaps, then, it's time to forgo the study of the *so-called* attraction we have to the probable; instead, given the observations made here, maybe it's time to turn our attention to the evident proclivity that we show for processing the improbable. Indeed, given the relative paucity of research into the latter, it would certainly appear as if there is much to be gleaned from doing so.

### **Concluding Remarks**

Prefiguring the work of the present thesis, Joachim Wohlwill (1980) some thirty years ago gave the following prescription for studying aesthetic pleasure: "To emphasize *changes* over the course of exposure in the character of aesthetic perception, and the viewer's *effort*, given sufficient time, to achieve a more highly structured percept". To a large extent the present work has been a realization of this prescription. Still, it can only be considered a humble beginning, merely pointing the way towards future theoretical and empirical inquiry, where much work still needs to be done. In this regard, besides exploring several of the topics I've tried to bring to the reader's attention throughout, what would prove most helpful is a more comprehensive description of aesthetic pleasure, one that conceptualizes the 'making of meaning' in terms of a hedonic syndrome that involves changes occurring across multiple levels of analysis, including

the neural, physiological, behavioral, cognitive and experiential. By assessing variations in these components as the perceiver moves from initial acquaintance to gist to complete understanding, we could potentially build-up a comprehensive and dynamic model of aesthetic pleasure, one that not only indexes aesthetic responsiveness across multiple levels, but that also documents how the various components interrelate and affect one another in the act of making meaning.

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