Affective and Cognitive Consequences of Visual Fluency:

When Seeing is Easy on the Mind.

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The question of what makes visual stimuli persuasive has a long tradition in theories of aesthetics. At least since Plato and Aristotle, theoreticians pondered what makes for evocative sculpture, good architecture, and appealing design. As the Greek philosophers noted, some images influence perceivers via their symbolic meaning, such as themes of transcendence, intimacy, heroism, conflict or struggle. Other images affect perceivers via their formal aspects, such as harmony, balance, symmetry, proportion, and simplicity. The Greek philosophers also suggested that some images speak through the head while others speak through the heart, or to use more modern terms, convey a message or create an experience.

The present paper addresses some of these classic questions from the perspective of recent psychological research that explored the interplay of declarative and experiential information in human judgment. Traditionally, models of human judgment have assumed that our evaluations of a given object are based on accessible declarative information bearing on the object. Challenging this assumption, a growing body of research demonstrated that one's affective experiences, like one's mood at the time of judgment, one's physical arousal and bodily sensations, or one's cognitive experiences, like ease of recall or fluency of perception, can serve as a source of information in their own right (for a comprehensive review see Schwarz & Clore, 1996). Here, we address one specific type of experiential information, namely the subjective experience of ease of processing. The first section introduces the concept of visual fluency. Next, we review research that explores the role of fluency experiences in judgments pertaining to physical characteristics of visual stimuli and the truth value of visually presented statements. Subsequently, we address the influence of fluency experiences on judgments of liking

and preference and highlight the affective consequences of visual fluency. In this context, we contrast objectivist models of beauty with an experiential theory that traces the appealing nature of certain characteristics of visual stimuli (like symmetry, brightness contrast and related variables) to their facilitative effect on ease of processing. We conclude with some caveats and a discussion of the limitations of the available evidence.

Visual Fluency

The concept of visual fluency is based on the simple observation that the processing of any visual stimulus requires cognitive work. The amount of cognitive work needed is reflected in the speed and accuracy of visual processing as well as in the subjective experience of ease or difficulty (Jacoby, Kelley & Dywan, 1989). A large number of variables can influence the ease with which a stimulus can be processed. Some of these variables, like figure-ground contrast, clarity, presentation duration or previous exposure to the stimulus facilitate processing through low-level perceptual processes and hence increase perceptual fluency (e.g., Jacoby et al., 1989). Other variables, like exposure to semantically related concepts, facilitate processing through high-level interpretation processes and hence increase conceptual fluency (e.g., Whittlesea, 1993). Because perceptual and conceptual fluency have similar effects on the ease with which a visual stimulus can be processed, and show parallel influences on subsequent judgments, we subsume both under the summary term visual fluency. The subjective experience of fluency usually corresponds to objective fluency (as assessed by speed and accuracy), although there may be dissociations between the two, for example under the influence of

alcohol where the subjective feeling of fluency may exceed the objective speed of processing.

A growing body of research indicates that the subjective experience of processing fluency can influence a variety of judgments, ranging from judgments of perceptual characteristics to assessments of the truth of statement or one's liking of an object.

Cognitive Consequences of Visual Fluency

Judgments of Perceptual Characteristics and "Memory Illusions"

It is usually easier to perceive stimuli that are presented for a long rather than a short duration or with high rather than low clarity. Moreover, it is also easier to perceive stimuli one has seen before rather than novel stimuli. Because we have only one window on our subjective experiences, however, we may misread the fluency of processing resulting from one of these sources as being due to a different source.

On the one hand, several studies demonstrated that the perceptual fluency resulting from previous exposure or an increased number of stimulus repetitions can be misattributed to the duration or clarity of the stimulus presentation (e.g., Witherspoon & Allan, 1985; Whittlesea at al., 1990). Thus, people who have seen a given stimulus before, and hence find it easier to process, infer that the current presentation lasted longer, or had higher clarity, than people who had not previously seen this stimulus. The same effect can be obtained with manipulations of conceptual fluency, under conditions that do not require a previous visual experience with the stimulus. For example, Masson and Cladwell (1998) asked participants to rate the clarity and duration with which a target word (e.g., "arrow") was presented to them. As expected, participants inferred

longer presentation durations and higher visual clarity when a preceding semantic task (e.g., complete the sentence, "an archer shoots a bow and a____") had rendered the target word highly accessible. Again, the processing fluency resulting from a preceding task was misattributed to characteristics of the visual stimulus itself.

Conversely, the fluency resulting from visual characteristics of the stimulus may be misattributed to previous exposure, thus leading to "memory illusions" (Jacoby & Whitehouse, 1989). For example, Whittlesea, Jacoby, and Girard (1990) exposed participants to a rapidly presented list of words. Following this exposure, participants were shown target words and asked whether they had appeared on the previous list or not. The perceptual fluency of the target words was unobtrusively manipulated by visual masks of different clarity. As expected, the words shown with more clarity were more likely to be "recognized" as having appeared on the previous list. Participants presumably misattributed the higher perceptual fluency resulting from the clarity of the presentation to previous exposure. Consistent with this interpretation, this "memory illusion" disappeared when participants were aware that the clarity of the visual presentation was being manipulated.

Recently, we have demonstrated that such "memory illusions" extend to manipulations of conceptual fluency and to judgments of pictures (Fazendeiro & Luo, 1999). First, participants saw a study list that included pictures and words. Next, the participants saw a test list and indicated which items had appeared previously. Some items on this list were "old", in that they were presented on the study list, whereas other items were "new." Importantly, some of the "new" items were associatively related to the stimuli from the study list and were always presented in a different modality. For

example, if the word "snow" appeared on the study list, the test stimulus was a picture of a "shovel". As expected, the "new", associatively related pictures were more likely to be "recognized" as having appeared on the previous list, presumably because participants misattributed the fluency with which they could process these pictures to previous exposure. Consistent with this interpretation, the observed memory illusion was eliminated when participants were told that their feeling of familiarity could be influenced by music playing in the background, thus undermining the diagnostic value of the feeling (Winkielman & Fazendeiro, 2000).

In sum, variables that increase perceptual fluency (like previous exposure, presentation duration or clarity) as well as variables that increase conceptual fluency (like thinking about associatively related concepts) can influence the subjectively experienced ease with which a stimulus can be processed. Because people are typically unaware of the specific source of this experience, they may misattribute it to any plausible factor that is brought to their attention. Thus, fluency due to high presentation clarity may lead one to infer that one must have seen the stimulus before, much as fluency due to previous exposure may lead one to infer that the stimulus is currently shown with high clarity.

Judgments of Truth

When the objective truth of a statement is difficult to evaluate, people often draw on social consensus information to arrive at a judgment (Festinger, 1954): When many others believe it, it is probably true. Thus, we may distrust some information when we hear it for the first time, but when we hear it repeatedly from different sources, we may eventually accept it. In fact, Allport and Lapkin (1945) observed in a classic study of rumor transmission that the strongest predictor of belief in wartime rumors was simple

repetition. Consistent with this logic, numerous studies demonstrated that a given statement is more likely to be judged "true" the more often it is repeated. This "illusion of truth" effect (Begg, Anas, & Farinacci, 1992) has been obtained with trivia statements or words from a foreign language (e.g., Hasher, Goldstein, & Toppino, 1977; Arkes, Hackett, & Boehm, 1989; Gilbert, Krull, & Malone, 1991) as well as advertising materials (e.g., Hawkins & Hoch, 1992).

Bringing the preceding discussion of perceptual fluency to bear on judgments of truth, we may conjecture that statements that are easy to process are more likely to be judged "true" than statements that are difficult to process. As reviewed above, people are the more likely to infer that they have seen a stimulus before the easier the stimulus is to process, e.g., because it is presented with high clarity or for a long duration. If so, the clarity of presentation may result in an "illusion of familiarity," which in turn may influence the likelihood that a statement is accepted as true. In an empirical test of this conjecture, Reber and Schwarz (1999) presented participants with statements like "Osorno is a city in Chile" and asked them to decide, as fast as possible, whether each statement is true or false. To manipulate perceptual fluency, the statements were shown in colors that made them easy (e.g., dark blue) or difficult (e.g., light blue) to read against a color background. As expected, a given statement was more likely to be judged "true" when it was easy rather than difficult to read. Thus, the ease of visual processing resulted in an illusion of truth, presumably because perceptual fluency elicited a feeling of familiarity.

In combination with the findings reviewed in the preceding section, these results highlight that people are typically unaware why a given stimulus is easy to process.

Accordingly, the experience of processing fluency can be attributed to a wide range of different variables, with different implications for subsequent judgments. Quite obviously, nobody would infer that a given statement is likely to be true because it is easy to read. Yet, when the subjective experience of fluency is misread as an indication of the apparent familiarity of the statement, the statement is accepted as true. Future research may fruitfully explore if variables that facilitate the fluent processing of more complex persuasive communications enhance their persuasive appeal. Theoretically, this is most likely to be the case under conditions known to give rise to heuristic processing (Chaiken & Trope, 1999; Petty & Cacioppo, 1986), an issue to which we return later.

Affective Consequences of Visual Fluency:

Judgments of Liking and Preference

The fluency effect that is probably of most interest to consumer researchers is the observation that the ease with which a stimulus can be processed influences people's liking of the stimulus. The best known example of this phenomenon is the "mere-exposure" effect identified by Zajonc (1968). As numerous studies demonstrated, repeated exposure to a stimulus, without any reinforcement, leads to gradual increase in liking (see Bornstein, 1989 for a review and limiting conditions). One interpretation of these findings traces the phenomenon to the increased fluency that results from previous exposures (for other interpretations see Zajonc, 1998). Fluency, in turn, may influence liking in one of two ways. On the one hand, fluency itself may be experienced as affectively positive and this experience may be misread as resulting from the pleasing features of the stimulus. On the other hand, fluency may suggest that the stimulus is

familiar (consistent with the findings reviewed above), and familiar stimuli may be preferred over novel ones, as initially suggested by Zajonc (1968). In either case, the assumption that fluency is at the heart of the mere exposure effect entails that the frequency of exposure per se is not the crucial variable. Instead, any variable that increases the fluency with which a stimulus can be processed should be sufficient to increase perceivers' liking of the stimulus.

The Influence of Perceptual Fluency

Several studies are consistent with this conjecture (Reber, Winkielman & Schwarz, 1998; Winkielman, Berntson & Cacioppo, 2000; Winkielman & Fazendeiro, 2000). The logic of these studies is rather straightforward. Participants are asked to indicate their liking for a variety of pictures. In most of our studies, these pictures are standardized drawings of everyday objects, such as a car or a lamp, and common animals, such as a dog or a bird (Snodgrass & Vandervart, 1980). In some studies, we have also used abstract objects such as patterns of dots, circles, or geometrical shapes. While participants view the pictures, the fluency with which the pictures can be processed is unobtrusively manipulated through various methods. In some studies, a target picture was preceded by a subliminally presented visual contour that either matched or mismatched the target picture, thus facilitating or impeding its perceptual processing. In other experiments, fluency was manipulated by subtle variations of the presentation duration, figure-ground contrast, or symmetry. Independent of the specific stimuli and manipulations used, the results of all studies converge on a simple conclusion: Participants like the easy-to-process stimuli more. From this perspective, the classic mere exposure effect is just one instantiation of a more general class of phenomena. In

the case of the mere exposure effect, perceptual fluency is the result of repeated exposure, yet any other variable that increases perceptual fluency has the same positive influence on perceivers' preferences.

Moreover, this positive influence of perceptual fluency is not limited to perceivers' explicit judgments but can also be observed with physiological measures that assess perceivers' immediate affective responses. Using facial electromyography to assess affective change, we observed that easy-to-process pictures generated stronger responses over the cheek region than hard-to-process ones (Winkielman, Berntson, & Cacioppo, in press). Similarly, Harmon-Jones and Allen (1996) observed that enhancement of fluency via repeated exposure also leads to stronger electromyographic responses over the cheek region. In combination, these findings demonstrate that increased fluency of processing elicits more positive affective responses, either because fluency itself is experienced as positive or because apparently more familiar stimuli elicit more positive affect, an issue to which we return below.

Finally, our findings on the influence of visual priming, figure-ground contrast, presentation duration, and symmetry dovetail with other research that shows that the liking for pictures can be enhanced by manipulations of image prototypicality and complexity (Langlois & Roggman, 1990; Martindale and Moore, 1988; Cox & Cox, 1988). From our perspective, all of these manipulations represent different ways of increasing the ease of perceptual processing, which in turn increases liking of the perceived stimulus (see also Shapiro, 1999).

The Influence of Conceptual Fluency

In our discussion of judgments of perceptual characteristics and "memory illusions" we highlighted the functional equivalence of visual and semantic priming. This equivalence holds as well for judgments of liking. Specifically, in the "memory illusions" section of this paper we reviewed an experiment by Winkielman and Fazendeiro (2000) that manipulated fluency with which a picture (e.g., of a shovel) could be perceived by exposing participants to an associatively related word (e.g. "snow"). This experiment also included a condition in which participants were asked to make liking judgments. As expected, participants preferred pictures that were associatively related to words from an earlier memory task. The shovel, for example, was rated as mor appealing when preceded by "snow" than when preceded by an associatively unrelated word. This finding demonstrates that perceivers' preference for visual stimuli is not only a function of visual features that facilitate processing. Instead, preceding semantic tasks that facilitate processing have a similar positive influence.

This experiment also addressed the underlying mechanisms. As noted earlier, one account suggests that easy-to-process stimuli are experienced as more familiar and that familiar stimuli, in turn, are preferred over less familiar ones (e.g., Klinger & Greenwald, 1994). An alternative account suggests that fluency generates positive affect directly, perhaps as a result of feedback to the limbic system (e.g., Winkielman, Berntson & Cacioppo, in press; Ramachandran & Hirnstein, 1999; Vallacher & Nowak, 1999). We tested these competing explanations by informing participants that some of their experiences may be uninformative for the judgment at hand. Specifically, participants were either told that an external source (music playing in a background) my bias their feelings of familiarity or may bias their affective response. Interestingly, attributing

familiarity to the music did not eliminate the effect of fluency on liking, contrary to the predictions of the familiarity account. In contrast, attributing one's affective response to the music did eliminate the positive influence of fluency on liking. In combination with the electromyographic findings reviewed above, this pattern of results suggests that fluency is immediately experienced as positive and that its influence on liking is not mediated by feelings of familiarity.

These findings are especially important because they highlight differences in the mechanisms underlying the influence of fluency on cognitive and affective judgments. Recall that attributing one's feelings of familiarity (but not one's affective feelings) to background music eliminated the "memory illusion" discussed earlier. In contrast, attributing one's affective response (but not one's feelings of familiarity) to background music eliminated the influence of fluency on liking.

Beauty Resides in the Processing Experience of the Perceiver

Most theories of aesthetics assume that beauty resides in the object of appreciation. This perspective gave rise to numerous attempts to identify objective features of beauty. Among the more prominent of these features are simplicity (e.g., Birkhoff, 1933), symmetry (e.g., Arnheim, 1974; Birkhoff, 1933; Gombrich, 1984), balance (e.g., Arnheim, 1974; Gombrich, 1995), certain proportions, such as the golden section (Fechner, 1876), clarity (Gombrich, 1995; St. Thomas of Aquinas, see Maritain, 1966) and brightness contrast (Gombrich, 1984; Solso, 1997), as well as the prototypicality of the form (e.g., Martindale, 1984). Note that all of these characteristics of the object of appreciation share one important feature: They are likely to facilitate the fluent processing of the stimulus. If so, we may conjecture that these well-known

characteristics render an object beautiful because they enable the perceiver to experience

visual fluency (see Reber & Schwarz, 2000, for a more fully developed argument). From

this perspective, beauty does not reside in the object of appreciation but in the processing

experience of the perceiver.

Such an experiential approach to aesthetic judgment provides a unified and

parsimonious account for the influence of numerous, otherwise unrelated, variables. On

the one hand, it plausibly accounts for the known influence of objective characteristics of

"beautiful objects," as the above list illustrates. On the other hand, it accounts for the

reviewed visual and conceptual priming effects, such as the otherwise counterintuitive

observation that thinking about "snow" increases one's appreciation of a shovel.

Findings of this type fall outside the range of objectivist approaches to aesthetic

judgment. In addition, an experiential approach to aesthetic judgment can accommodate

individual, situational, and cultural differences without requiring differential assumptions

about the underlying processes. As illustrated by the influence of previous exposure and

conceptual priming, what can be fluently processed depends on an individual's previous

experience and knowledge, which is culturally contextualized. Moreover, temporary

influences like the cognitive and motivational resources available at a given time may

influence fluency experiences, resulting in systematic intraindividual variation. Finally,

"fluency-like" experiences may be generated by a variety of context-specific operations

within the visual system, such as component extraction, image segmentation, grouping,

and meaning analysis (see Ramachandran & Hirnstein, 1999). As a result, aesthetic

judgments are likely to be influenced by numerous variables that are unrelated to the

object of appreciation. Yet, the influence of these variables may be fruitfully traced to

the perceiver's experience of visual fluency, potentially providing a unifying framework

for the psychological analysis of aesthetic experience.

Conclusions

The reviewed research highlights the crucial role of subjective experiences in human

judgment. One of these experiences is the ease with which a stimulus can be processed.

The experienced processing fluency is a function of objective characteristics of the

stimulus, like figure-ground contrast or presentation duration, as well as the perceiver's

previous experiences, like earlier exposures or thoughts about associatively related

material. Because perceivers are typically unaware of the specific source of visual

fluency, they may attribute the experience to any plausible candidate that comes to mind.

Thus, they may erroneously infer from fluency that is due to previous exposure that the

stimulus is presented for a long duration, or may infer from fluency due to duration that

they have seen the stimulus before. This "free floating" nature of the experience explains

the broad range of substantive judgments -- most notably judgments of truth, beauty, and

liking -- for which this experience can serve as a source of information. As is the case

for other types of experiential information, people do only draw on their fluency

experiences when the informational value of the experience for the judgment at hand is

not called into question. When people are aware that their experience may be due to a

source that is unrelated to the object of judgment, the otherwise observed influence is

eliminated.

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