

The Neglect of the Environment by Cognitive Psychology

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Abstract

In 1955, Egon Brunswik presented a paper in which he argued that neglect of the environment and over emphasis of the organism was the major downfall of cognitive psychology. His critiques have largely been ignored and research is discussed that demonstrates the same organismic-asymmetry Brunswik detailed in 1955. This research is discussed in attribution terms since experimental psychologists make behavioral attributions. This organismic-asymmetry has resulted in a body of research that is guilty of the fundamental attribution error. Brunswik's theory of representative design, proposed to address organismic-asymmetry, is discussed and contrasted with calls for ecological validity. Although calls for ecological validity are well intentioned, they lack any systematic theory of the environment and fall significantly short of Brunswik's ideal.

In 1955, Kenneth Hammond presented Brunswik's paper, "Scope and aspects of the cognitive problem," at one of the first ever conferences on cognition. Hammond (2001) writes that "in this paper he [Brunswik] made a strong effort to make the whole of his life's work intelligible to his peers" (p. 298). The theme of this paper, if not the language, is simple; psychology has neglected the environment. Brunswik (1957/2001) writes "if there is anything that still ails psychology in general, and the psychology of cognition specifically, it is the neglect of the investigation of environmental or ecological texture in favor of that of the texture of organismic structures and processes." Brunswik's argument still carries weight today and psychology in general, and cognitive psychology specifically, has still not dealt with the criticisms levied against it by Brunswik 50 years ago.

Brunswik began that 1955 paper with the following sentences, "One of the broadest and most universally accepted definitions of psychology conceives of psychology as being concerned with the interrelationships between organism and environment. In this definition both organism and environment appear as equal partners" (p. 300, 1957/

2001). At face value, there seems little to object to in this definition. However, a look at the definition of psychology in most introductory textbooks will reveal that the environment is not mentioned. A review of most of the major standard-format introductory textbooks (modular style texts not included) revealed that of 36 textbooks, the environment was only mentioned in the definition of psychology in one of them while “mental”, “mind”, “cognitive”, or “experience” was mentioned in 34 of the 36 definitions. At face value we can take this as support that psychology today is still more focused on “organismic structures and processes” than on the environment in which behavior takes place.

For Brunswik, this asymmetric focus of psychology on the organism was the central problem of experimental psychology. Brunswik strongly advocated that the organism-environment interaction should be the central focus of psychology and that a cumulative science would only be had with this systemic focus. Both Hammond (2001) and Brunswik (1957/2001) point out that while theories of organismic behavior abound in psychology, there have only been two explicit theories of the environment, those of Brunswik and Gibson. Without explicit theories of the environment, organismic attributions of behavior will change with experimental paradigms without a clear linkage between contexts. Linkages between the organism, behavior, and environment will be post-hoc and remain limited to haphazard changes in experimental paradigms so long as psychology maintains this asymmetric focus on the organism.

Research in cognitive psychology, including social cognition, typically demonstrates this asymmetric-organismic focus. Sternberg (2003), in his textbook on cognitive psychology, defines cognitive psychology as “the study of how people perceive, learn, remember, and think about information” (p. 529). The environment is not mentioned in this definition and there are almost no theories linking cognition to the environment in an explicit a-priori way (exceptions include Gibsonian and Brunswikian inspired theories).

While Brunswik explicitly emphasized the achievement of the organism within an environment, much of cognitive psychology has instead focused on errors in cognition with the assumption that learning about these malfunctions can teach us about how normal cognition operates. Terms like “bounded rationality” and “biases” are often used to describe these limits. In the abstract, the paradigm is to construct an experiment that demonstrates these flawed cognitive processes at work and attribute them to limits in our information processing abilities. Little attention is initially given to the effects of the experimental context on behavior since it is implicitly assumed that we are learning about cognition, which resides within the organism. Later, when a different experimental procedure yields different results, theories of cognition

are modified. What is missing from the start is the systemic focus on organism-environment achievement that Brunswik advocated 50 years ago.

Since experimental psychologists are in the business of making attributions about the causes of behavior, perhaps this asymmetric-organismic focus can be better understood through the lens of behavioral attributions. The fundamental attribution error (FAE), or correspondence bias, refers to the tendency for people to make dispositional attributions over situational attributions when establishing the cause of another person's behavior. Gilbert (1995) and Gilbert, Pelham, and Krull (1988) developed a two-stage model of attribution that describes the possible mechanism that produces this causal attribution bias. The theory posits that when we first observe a behavior, we make an automatic personal attribution (the person is the cause of the behavior). This personal attribution is automatic, triggered by an observed behavior, requiring minimal cognitive resources, and runs until completion. The second stage however is not automatic. Rather, it is an effortful contextual adjustment (taking the power of the situation into account when making an attribution). For example, you may be more patient when dealing with a friend or loved one if you know they are experiencing an unusually high load of personal stress. Consideration of how the context may have caused the behavior requires conscious effort according to this theory of behavioral attribution. Since the contextual attribution requires attentional resources, one can make the prediction that if people are cognitively taxed, they will not have the resources available to make the effortful contextual adjustment. Instead, they will over-attribute the cause of an observed behavior to factors residing in the person.

An example will help make the phenomenon more concrete. In one study participants were asked to watch:

seven silent clips from a videotape of a female target having a discussion with a stranger. In five of the seven clips, the target appeared extremely anxious. Half the subjects learned that in these five clips the target had been discussing anxiety-inducing topics (e.g., her sexual fantasies). The remaining subjects learned that in all seven clips the target had been discussing relaxation-inducing topics (e.g., world travel). Half of the subjects in each of these conditions were required to perform a cognitive rehearsal task (i.e., remembering the discussion topics in their proper sequence) while viewing the tape, and the remaining subjects were not. After viewing the tape, subjects rated the target's trait anxiety, predicted the target's future state anxiety, and attempted to recall the discussion topics. (Gilbert et al., 1988, p. 734)

Gilbert et al. hypothesized that the added cognitive load of memorizing the discussion topics would inhibit this group from making the effortful contextual adjustment. Ironically, they predicted that those subjects who were memorizing the contextual variables were less likely to use the contextual variables when making a causal attribution. This is precisely what they found. On average, the target discussing the relaxing topics was judged as less trait-anxious by participants who had the memory task than those without the memory task. Likewise, the target discussing the anxious topics was judged to be more trait-anxious by participants who had the memory task than those without the memory task. This finding is ironic because it shows that participants who memorize the contextual variables are less likely to use those same variables in subsequent judgments!

Cognitive psychologists, like the participants in Gilbert et al.'s study, are in the business of making causal attributions about behavior. Cognitive psychologists may also have a tendency to attribute behaviors to personal factors rather than situational factors. This, in and of itself, is nothing shocking because it simply suggests that researchers fall prey to some of the same biases that other people do. However, this becomes more surprising when you consider that the researchers create the situations, usually with the intent of showing the behavior. When the behavior is observed, it is attributed to some biased mechanism of the cognitive system, and the situation that was designed to show the behavior is under-weighted. Consider how similar the preceding argument is to the participants in Gilbert et al.'s study who, upon memorizing all the situational variables, attributed the cause of the behavior to dispositional factors.

Below I discuss examples of organismic-asymmetry in psychology and argue that the conclusions are examples of misattribution. Specific examples of how changes in the experimental situations moderate the observed effects are discussed. All of the examples demonstrate a lack of systemic organism-environment focus as advocated by Brunswik. It is important to note that I am not arguing against any of the findings. Rather my goal is to show that Brunswik's central critique of cognitive psychology 50 years ago has still not been heeded and that a more explicit organism-environment focus would advance the science of psychology. In short, our bias toward personal attributions limits our understanding of situational factors, and ultimately, human behavior. These examples represent a convenience sample who's basis for inclusion was the initial personal attribution made by psychologists that later had to be reconsidered when the experimental context was altered. No claim is made as to the representativeness of this sample. Rather, they should be viewed as hand-picked examples for the purpose of making a point.

The Negative Effects of Introspection on Judgment

Wilson and colleagues have several studies showing the detrimental effects of introspection on decision making (Hodges & Wilson, 1993; Wilson, Kraft, & Dunn, 1989; Wilson & LaFleur, 1995; Wilson & Schooler, 1991). The title of one paper, "Thinking too much: Introspection can reduce the quality of preferences and decisions" (Wilson & Schooler, 1991), accurately describes some of their findings.

Wilson, Dunn, Bybee, Hyman, and Rotondo (1984) asked some participants to "list all the reasons you can think of why your relationship with your dating partner is going the way it is" (p. 11). Half the participants were asked to perform this reasons analysis task while the other half were not. Both participants were then asked to fill out a dyadic adjustment scale assessing their relationship. Participants were then contacted 32-41 weeks later and asked if they were still with their romantic partner. Participants who had performed reasons analysis prior to making their relationship satisfaction judgment showed a significantly lower correlation (0.08) between their responses and the state of their relationship several weeks later than participants who had not performed reason analysis (0.56). Introspecting on the reasons why they felt the way they did toward their partner resulted in a less accurate judgment about the relationship.

The judgment tasks chosen by Wilson and colleagues are typically preference judgments (Hodges & Wilson, 1993; Wilson et al., 1989; Wilson & LaFleur, 1995; Wilson & Schooler, 1991). Preference judgments are ill-defined and ambiguous and therefore not likely to benefit from a rational analysis (Hammond, 1996). So perhaps it is not as bad as 'Introspection reduces the quality of decisions' but more like 'Specific types of introspection mixed with specific types of judgment tasks can reduce the quality of decisions.' This last view paints the findings in a more positive light while still acknowledging the effect. This last view is the approach that was taken by Millar and Tesser to explain such findings.

Millar and Tesser (1986, 1989, 1992) have developed a mismatch model to explain the low attitude-behavior relationships found after reasons analysis by Wilson and colleagues. Millar and Tesser's theory assumes that attitudes have both an affective and cognitive component. When asking people to analyze the reasons *why* they do something, the cognitive component of the attitude is made salient. When asking people to focus on *how* they feel about something, the affective component of the attitude is made salient. Attitude-behavior consistency will be strong when the attitude component made salient (cognitive versus affective) matches the primary drive of behavior. Consumatory behaviors, those done for their own purpose, are considered to be affectively based. Instrumental behaviors, those done to aid in goal attainment, are considered to be cognitively based. Any given behavior can con-

ceivably be performed for instrumental or consumatory purposes. The mismatch model predicts that when reasons analysis is performed prior to making a global evaluation, the cognitive component is activated. Since preference judgments are affectively based, the low attitude-behavior relation found in the work of Wilson and colleagues should be expected.

This example demonstrates that introspection does not necessitate poor judgment. Such a statement is an attribution bias in that it fails to consider the wider context of the introspection instructions. Poor judgment following introspection is a result of a multitude of factors that include the context that induces the introspection. The effects of introspection on judgment are not limited to factors residing in the person (lack of introspective access) but include situational factors set up by the researchers including the type of introspection induced and the type of judgment task selected.

The Effects of Affect

Many researchers have found that negative moods (sadness, anxiety) increase self-focused attention and happy moods decrease self-focus (Wood, Saltzberg, & Goldsamt, 1990; Carver & Scheier, 1986). Such a view emphasizes how negative moods can lead to increased self-focus, rumination, and consequently depression. In short, this work often views negatively valenced moods as having negative consequences. This conclusion is also an attribution bias as little attention is given to the environmental context.

Green and Sedikides (1999) argue that “affect orientation [self or environment] exerts effects on self-focused attention that are above and beyond those exerted by affect valence.” They argue that emotions often serve to prepare an organism for action or inaction and are adaptive responses to basic environmental demands like mate selection, food gathering, and fighting predators. Based on this psychoevolutionary perspective, Green and Sedikides hypothesized that self-focus would be a function of the orientation of the affect rather than the valence. They induced either sad or content emotions in participants and found equal levels of self-focus even though these states are oppositely valenced. Similarly, they found no difference between thrilled and angry affective states in terms of self-focus. However, the thrilled and angry participants were significantly less self-focused than the sad and content participants. These results require an explicit consideration of the situation and show that a predominantly personal attribution is insufficient to explain the relationship between self-focus and affect.

Negative emotions provide feedback that may indicate goal-fulfillment (watching a sad movie may be the goal) and goal-progress (no pain, no gain). In short, moods, whether positive or negative, provide

feedback about the environment (and our reaction to the environment) that aid in adaptive functioning (Martin, 1999). The simple view that negative moods lead to rumination and depression is a FAE because personal attributions are insufficient in that they do not account for the situational factors that are necessary to understand the effects of affect.

The Irrational Processor

There are many examples of irrational processing in social cognition, cognitive psychology, and the joint literature on judgment and decision making. One popular example of the irrational processor is the phenomenon of base rate neglect. In studies of base rate neglect, people are given specific information about a case, plus information about the population distribution from which the case was drawn (or base rate information) and asked to make a judgment about the likelihood of the case. Participants often underweight the base rate information when judging the likelihood of the event. For example, the following is a commonly used base rate problem (Bar-Hillel, 1980; Kahneman & Tversky, 1972; Tversky & Kahneman, 1980):

A cab was involved in a hit and run accident at night. Two cab companies, the Green and the Blue, operate in the city. You are given the following data: 85% of the cabs in the city are Green and 15% are Blue. A witness identified the cab as Blue. The court tested the reliability of the witness under the same circumstances that existed on the night of the accident and concluded that the witness correctly identified each one of the two colors 80% of the time and failed 20% of the time. What is the probability that the cab involved in the accident was Blue rather than Green? (Tversky & Kahneman, 1982, p. 157)

Bayes' Theorem is the normative rule usually used to obtain the correct answer. Using the odds form of Bayes' the cab is more likely to be Green (.59) than Blue (.41). Despite this fact, "the median and modal answer is typically .80, a value which coincides with the credibility of the witness and is apparently unaffected by the relative frequency of blue and green cabs" (Tversky & Kahneman, 1982, p. 157). There are many other examples in the literature of participants ignoring or under-weighting base rates (see Kahneman, Slovic, & Tversky, 1982; Koehler, 1996). The finding is so common that Bar-Hillel (1980) stated, "The genuineness, the robustness, and the generality of the base-rate fallacy are matters of established fact" (p. 215). Similarly, Kahneman and Tversky (1972) stated, "man is apparently not a conservative Bayesian: he is not Bayesian at all" (p. 450).

Such work on base rate neglect implies that we are inherently doomed to be irrational processors of information. Our irrational processing is attributed to limitations in our information processing systems (Gigerenzer & Hoffrage, 1995; Lichtenstein, Fischhoff, & Phillips, 1982). Research by Gigerenzer and Hoffrage (1995) demonstrates that such a simple personal attribution is an error.

Gigerenzer and Hoffrage (1995) argue that the representation format used in classic base rate neglect studies may not be in line with how our cognitive systems have evolved. Classic base rate studies present information as percentages. Such a format is a recent development and not necessarily the format our cognitive systems are tuned for. Gigerenzer and Hoffrage demonstrate that by changing a standard base rate problem from a percentage to a frequency format, which they argue is more natural, the proportion of participants who use a Bayesian algorithm and get the correct answer jumps from 16% to 46%. Arguing that base rate neglect is inherent to our information processing system is a misattribution if changes to the surface characteristics of the task drastically increase Bayesian reasoning.

The most natural format to present base rate information is to let participants experience base rates in a series of unique events rather than as summary statistics (Gigerenzer & Hoffrage, 1995). Under such condition of direct experience Dunwoody, Goodie and Mahan (2005) found that participants differentially utilize base rates as a function of their environmental predictiveness. Participants used base rate information more when it was consistent than when it was inconsistent. In addition, when participants had a choice between information that was consistent but less useful versus an inconsistent but more useful alternative, they choose the more useful piece of information regardless of whether it was the base rate information. This finding was particularly surprising considering that the predictiveness of the information varied by a mere 10%. Base rate usage was found to be a function of the statistical characteristics of the environment and not a fixed bias inherent in the participants.

Return of the FAE

The last example of asymmetric-organismic focus is of the FAE itself. While the work on the FAE initially received strong empirical support, it has come under criticism. Krull (1993) has since reversed the effect with an ironic twist. Krull reasoned that the experimenters (Gilbert et al., 1988) imparted implicit goals to the subjects when they directed participants to make a judgment of how nervous the target person was in their daily life. This instruction directs the participant to focus on personal characteristics. Krull replicated the earlier experiment but reversed the instructions for half the participants and asked them to make a judgment about how anxiety provoking the situation

was. He followed this up with an identical cognitive load manipulation and his results showed a bias in the opposite direction of the original research (toward the situation) for the participants that were asked to make a judgment about how anxiety provoking the situation was. On average, participants with increased cognitive load reported that the situation was more anxiety provoking than participants without the cognitive load. Krull concluded that individuals' implicit goals are a key factor in their attribution processes. Ironically, the implicit goals of the researchers seem to be just as important in hypothesis selection. It appears that the FAE is itself, a fundamental attribution error. More recent work by Choi, Nisbett, and Norenzayan (1999) has also demonstrated that the FAE is less prominent in collectivistic-eastern cultures which emphasize the power of the situation than in individualistic-western cultures.

Exploring the Reasons for Organismic-Asymmetry

The examples above demonstrate how our implicit goals as researchers influence our attribution process. In each case the observed behavior was initially attributed to some mechanism residing within the participants. In each case later research showed that the experimental context was a key moderator of the observed behavior. These studies provide evidence that organismic-assymetry is still a problem in modern cognitive psychology. Why has Brunswik's critique gone unanswered for so long? Ironically, perhaps the FAE offers part of the answer. Perhaps our individualistic-western culture predisposes us to seek out personal causes of behavior. Cognitive psychologists may be particularly vulnerable to the FAE since the discipline is defined as a search for personal attributions of behavior.

Disciplinary momentum is another obstacle for Brunswik's call for change. The science of psychology began with a focus on consciousness by the Structuralists and the Functionalists. Little if any attention was paid to the environment. Once Behaviorism established itself as the dominant school, consciousness was outlawed in favor of the basic principles of learning. Even here though, the environment was stripped down to the minimum so that basic laws of learning could be established. The environment in this tradition is so impoverished that it bears little resemblance to the complex ecology for which we evolved. Brunswik (1957/2001) argued that "the adjustment of the organism to a complex environment" was "the core question of psychology" (p. 312). Once Cognitivism supplanted Behaviorism as the dominant school, information-processing in the black-box became the focus and again there was no systematic treatment of the environment.

More recently cognitive psychology has demonstrated an increasing concern over issues of ecological validity. A recent search of the phrase "ecological validity" in PsycINFO (conducted 5/16/2006) yielded 693

records as a keyword phrase and 133 records as a title phrase. The phrase is generally interpreted as “the degree to which particular findings in one context may be considered relevant outside of that context” (Sternberg, 2003, p. 21) and at face value appears to address the organismic-asymmetry argument of Brunswik. However, a closer look at this term and its application show that this is not the case.

The degree of ecological validity in a study or studies is not assessed in any systematic manner but rather based solely on appeals of face-validity. There is no theory of ecological validity offered in this literature but rather a vague appeal that research be conducted outside of the laboratory or that the laboratory conditions mimic the real-world in some unspecified manner. To be fair, this is a good start. We ought to be concerned about “the degree to which particular findings in one context may be considered relevant outside of that context” as Sternberg says. However, this body of literature falls short of offering any systematic treatment of what qualifies as ecologically valid. Brunswik did offer a detailed theory of ecological validity, which he referred to as representative design, as early as 1943 (1943/2001) and further explicated in later works (1944/2001; 1951/2001; 1952; 1956). Brunswik actually coined the term ecological validity and defined it precisely. However, his usage of the term differed significantly from how many psychologists are using the term today (see Hammond, 1998, for a discussion of this issue).

For Brunswik, the problem of organismic-asymmetry in psychology could be largely fixed by the use of representative designs. He developed a detailed theory of what constituted a representative design based largely on sampling theory. His logic was simple: Just as we strive to create representative samples of participants so that our findings may generalize to an explicit population, we must create representative samples of stimuli using similar sampling procedures so that our findings may generalize to an explicit population of environments. Although the logic is simple, the application is not. Obtaining representative samples of stimuli presents many challenges. However, there is now a substantial body of research in this tradition that has met these challenges (for examples see Part III of Hammond & Stewart, 2001).

Another important aspect of Brunswik’s representative design was the relationship among stimuli. It was not enough to have a representative sample of a stimulus that was to be manipulated. Brunswik argued that organisms evolved to respond to the texture of the environment. The texture referred to the richness of environmental cues available and their potential for inter-substitution. For example, when making a judgment about the trustworthiness of another person there are a large number of potential cues one can utilize. Reliance on any one cue may be deceiving and better judgments will likely be obtained by relying on

a variety of cues. Many of these cues are likely to be intercorrelated with each other allowing for a judge to vicariously utilize different cues as they are available. This vicarious functioning, as Brunswik termed it, is part of the systemic focus that Brunswik advocated was the proper focus of psychology.

Vicarious functioning in the organism was matched by vicarious mediation in the environment. Vicarious mediation refers to the environmental structure of scattering distal states into a variety of cues. For example, we predict the likelihood of a tornado, volcano, or any other natural event based on a variety of fallible indicators that taken together, allow us to make predictions about when these events will occur. The full scope of the cognitive problem for Brunswik was not just vicarious functioning on the part of the organism, but also vicarious mediation on the part of the environment. Understanding both vicarious mediation and vicarious functioning maintains the symmetry and equality of roles that each plays in shaping behavior.

Compare these aspects of representative design with the studies described above as examples of organismic-asymmetry. These examples are typical of modern experimental design in that they hold all variables constant except for one or two which are orthogonally manipulated. Little attempt is made to assure that the independent variable being manipulated is representative of a population. Often, when there are two levels of the independent variable, only two stimuli are selected (one for each level of the independent variable). This selection of stimuli is analogous to only having two participants in the subject sample. The orthogonal relationship among the independent variables strips the environment of all texture and vicarious mediation. This last point is especially important because Brunswik argued that organisms evolved to respond to an array of cues since any one cue may be fallible. Achievement, and ultimately evolutionary success, will be best served by acting as an intuitive statistician and integrating a variety of cues. From this perspective, the typical experimental design lacks any systematic treatment of the environment and therefore cannot speak to the generalizability of the behavioral effects to other situations. Although the current calls for ecological validity are well intentioned, they fail to provide a systematic treatment of the organism-environment relationship.

Seeking Balance

Are there theories in cognitive psychology that place the environment and organism on equal footing, with systematic treatment of each and treatment of the whole as an inseparable system? Yes. Hammond, Hamm, Grassia, and Pearson, (1987) introduced Cognitive Continuum Theory (CCT) with the explicit goal of providing a broad theory of cognition that focuses on the organism-environment interaction. While

it is beyond the scope of this paper to address the specifics of this theory (see Hammond, 1996 and Dunwoody, Haarbauer, Mahan, Marino & Tang, 2000 for further explication of the theory) there are a number of important points that are relevant to the present discussion.

CCT explicitly focuses on the interaction between cognition, which is viewed as oscillating on a continuum between intuition and analysis, and the environment. It is an explicit theory of the environment and the types of cognition that different environments are likely to induce. By specifying characteristics of the environment that induce different types of cognition, CCT offers an explicit theory of cognition-environment interaction. With the relevant features of the environment specified in a theory, representative design is possible because the important characteristics of the environment that need to be sampled are identified. While there are many details of the theory that need further testing and development, it is perhaps the only cognitive theory that explicitly addresses Brunswik's main criticisms of the field of cognitive psychology.

Summary

Fifty years ago Brunswik argued that the single largest shortcoming of cognitive psychology was neglect of the environment. The field of cognitive psychology then, and now, appears to be guilty of the FAE. A small convenience sample of findings was presented as evidence that Brunswik's critique is still applicable today. A summation of key components of Brunswik's representative design indicates that current standard experimental procedures fail to meet his recommendation to view the organism and environment as complex and interacting systems. Theories such as CCT, while still much in need of empirical assessment, offer a systems level treatment of organism-environment interaction that will be needed if psychology is to become a cumulative science and minimize future attribution errors.

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