What Is Ecological Validity? A Dimensional Analysis

Article *in* Infancy · October 2001

DOI: 10.1207/S15327078IN0204_02

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INFANCY, *2*(4), 419–436

THEMATIC COLLECTION

What Is Ecological Validity? A Dimensional Analysis

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Ecological validity has typically been taken to refer to whether or not one can generalize from observed behavior in the laboratory to natural behavior in the world. Although common in current discussions of research, the idea of ecological validity has a long history in psychological thought. A brief historical examination of this idea reveals that concerns with ecological validity are evident in multiple dimensions of experimental work, including the nature of the experimental setting, the stimuli under investigation, and the observer's response employed as the measure. One problem with this multidimensionality, however, is that no explicit criteria have been offered for applying this concept to an evaluation of research. One consequence of this problem is that concerns with ecological validity can be raised in most experimental situations. This article includes a discussion of some demands of ecological validity and the nature of these different dimensions, as well as a critical evaluation of research on the development of mobility with respect to these constraints.

The task of producing sound, innovative, and informative research is a formidable one. For psychologists, learning how to properly design and run experiments regardless of specialty, begins early in one's career, with the assumption that the ultimate utility of one's work depends on the extent to which this work adheres to such principles. One particularly important guide for conducting research involves the

This thematic collection is an outgrowth of a symposium organized by David J. Lewkowicz at the Biennial Meeting of the Society for Research in Child Development in Albuquerque, New Mexico, April 1999.

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criterion of ecological validity, with work that is ecologically valid (presumably) possessing a much desired characteristic.

In fact, ecological validity or the related idea of external validity (Campbell, 1957; Campbell & Stanley, 1967) has a long history in psychology, with the issues central to this idea frequently and continuously debated. One way to understand this concept is to look at it historically to see when and why the term originated and how and where it has been used in psychological thought; such an approach has proven instructive for understanding other concepts in psychology (e.g., Danziger, 1997; Danziger & Dzinas, 1997). Unfortunately, such an analysis is beyond the scope of this article and the conceptual skills of its author, given the pitfalls awaiting those who paint in broad historical strokes. As a first step toward this type of historical analysis, however, it is possible to look informally at what has been meant by ecological validity and how this concept relates to the demands of doing research.

DIMENSIONS OF ECOLOGICAL VALIDITY

To what, exactly, does ecological validity refer? Given that this concept has been debated over the years, it is surprising that there is no clear consensus on exactly what is meant by this phrase. In fact, though, this debate continues in part because ecological validity is itself " … rather a second-order or umbrella construct with several meanings" (Scheidt, 1981, p. 225); thus, what is meant by ecological validity and how it may be usefully applied to psychological thought is often the subject of the debate. As an informal starting point, ecological validity often refers to the relation between real-world phenomena and the investigation of these phenomena in experimental contexts. This is, however, only one view of this concept; Scheidt (1981, p. 225–226), for example, listed multiple possible definitions. Although varying in focus, some common themes underlie these views. To understand ecological validity better then, it is useful to look in detail at these themes or dimensions.

Nature of the Research Setting or Context

One of the first debates regarding ecological validity was an exchange between Brunswik (1943) and Lewin (1943), in which they discussed aspects of representative design as it related to psychology and the scientific method. A key issue in this debate involved the environmental context of the research and the impact the setting had on the study. Brunswik was concerned that psychology was headed toward studying "narrow-spanning problems of artificially isolated proximal or peripheral technicalities of mediation which are not representative of larger patterns of life" (p. 262). To avoid this fate, he suggested psychologists shift their unit of analysis from people to the situations of the investigation and replace proper sampling of participants with a representative sampling of situations or tasks. This issue thus highlights the first dimension of ecological validity—a concern with the setting or environment in which the research takes place.

Brunswik (1943) provided a fascinating example of the proper use of environmental setting in a study on size constancy in which he continuously queried a participant throughout the day regarding size estimates of objects at which she happened to be looking. By measuring the objects themselves and the distance between object and observer, Brunswik demonstrated that size estimates were more related to object measurements than retinal size and hence provided evidence for the phenomenon of size constancy. For Brunswik, this study possessed a real-world generality, or an ecological validity, that was absent from other experimental work.

Others have broached similar issues regarding the environmental context. A prominent example involves Bronfenbrenner's (1977, 1979) classic definition of ecological validity, in which "ecological validity refers to the extent to which the environment experienced by the subjects in a scientific investigation has the properties it is supposed or assumed to have by the experimenter" (Bronfenbrenner, 1977, p. 516). Along these lines, ecological validity involves maintaining the integrity of the real-life situation in the experimental context while remaining faithful to the larger social and cultural context. Of course, an important and unresolved issue involves determining of whom the environment should be representative. Whose real-life context should the experimental context simulate? Such a concern is particularly relevant when considering developmental research, with the environment of the child (participant) differing dramatically from that of the adult (observer).

Despite this caveat, a key issue regarding the ecological validity of the research setting is its representativeness and naturalness, with a primary consideration that the environment contain crucial features of naturalistic settings. Moreover, the relevance of the environment is also critical in that it must be functionally central in producing and observing the behavior in question; it must be a true environment in which actors behave on a regular basis.

Nature of the Stimuli

Another component of Brunswik's (1943) ecologically valid experiment is that the observer made size judgments of natural, everyday objects with which she came into contact. This highlights a second dimension of ecological validity—the stimuli under examination. A concern with the stimulus has been foremost in most discussions of ecological validity. For example, the ecological theory of the Gibsons (e.g., E. J. Gibson, 1984, 1991; J. J. Gibson, 1966, 1979; see Bruce & Green, 1985, or Lombardo, 1988) emphasized a shift in the view of the stimulus as a punctate occurrence at the sensory receptor that is uninformative as to its source in the world (J. J. Gibson, 1960) to a rich nested event involving objects, surfaces, and their relations (e.g., E. J. Gibson & Spelke, 1983; J. J. Gibson, 1979). Such events are "primary realities" (J. J. Gibson, 1979, p. 100) making up the "principal aspects of the world that require and receive the attention of animals" (E. J. Gibson & Spelke, 1983, p. 14), with perception involving the pickup of (often intermodal) information within a continuous spatiotemporal flow (E. J. Gibson, 1984, E. J. Gibson & Spelke, 1983; J. J. Gibson, 1950, 1966, 1979).

Similarly, Neisser (1976) vociferously reminded researchers that the artificial situations and stimuli used in experiments differ from the real world in critical ways, with the study of such artificial stimuli often irrelevant to understanding the phenomena in which one is interested. In his words, "contemporary studies of cognitive processes usually use stimulus material that is abstract, discontinuous, and only marginally real. It is almost as if ecological *in*validity were a deliberate feature of the experimental design" (Neisser, 1976, p. 34). Neisser stressed that ecologically valid stimuli consist of information that is temporally and spatially extended and often multimodal as well.

This concern with ecologically valid stimuli has been a pronounced factor in policy debates over the application of research results. One such example has been work on mental retardation in children (e.g., Brooks & Baumeister, 1977a, 1977b; Ellis, Harris, & Barker, 1983; Haywood, 1976; House, 1977), with some questioning if the materials and variables manipulated in laboratory research have any "demonstrated validity as meaningful constructs in the real-world behavior of retarded children" (Brooks & Baumeister, 1977b, p. 412). Similar arguments have arisen in investigations of the reliability of children as witnesses in court proceedings (e.g., Brainerd & Ornstein, 1991; Ceci, 1991; Loftus & Ceci, 1991; Yuille & Wells, 1991), with researchers debating the relevance of research findings on children's memory when the stimuli are more or less representative of the emotionally charged information characterizing real-world situations (Goodman, Quas, Batterman-Faunce, Riddlesberger, & Kuhn, 1994; see Qin, Quas, Redlich, & Goodman, 1997, or Schooler, 1994, for reviews).

In fact, a concern with the stimuli continues to be at the forefront of the debate over ecological validity. Witness, as evidence, the collection of articles in this special section of this issue of *Infancy*. One of its unifying themes is a discussion of the ecological validity of stimuli used in developmental research. Regardless of whether one is trying to define and further refine the validity of the stimuli (e.g., Lickliter & Bahrick, this issue; Walker-Andrews & Bahrick, this issue) or to justify the appropriateness of using what may be called *ecologically invalid stimuli* (Lewkowicz, this issue), the focus is on the nature of the stimuli and what it can tell us regarding infant development.

Generally, one sees the same concerns as with the research context. Thus, there is the issue of representativeness and naturalness. Are the stimuli actual, stable occurrences in the world that remain relevant when removed from their natural context? There is also the question of importance. Are these the critical stimuli for determining the behavior or percept? What is the importance of these stimuli in the population of possible stimuli?

Nature of the Task, Behavior, or Response

Another important aspect of Brunswik's (1943) size estimation study was that the participant made a straightforward judgment of relative object size, with Brunswik then deriving retinal size from these judgments. An alternative would have been to require the more unusual task of judging retinal size itself (e.g., Gogel, 1969; Rock & McDermott, 1959). The difference here underscores a third dimension of ecological validity—the nature of the task, behavior, or response required of the experimental participant—with this aspect identifiable in Bronfenbrenner's (1977, 1979) well-known criticism of developmental psychology as "the science of the strange behavior of children in strange situations with strange adults for the briefest possible periods of time" (Bronfenbrenner, 1977, p. 513).

This concern with the response raises the same issues as for the stimuli and settings. Is the response natural and representative, sampling the most appropriate behavior for the issue under investigation? Similarly, is the behavior an important part of the behavioral repertoire? Although many different behaviors are possible, if they occur only in constrained situations their importance in psychological functioning is debatable. Finally, is the observed behavior truly relevant to the psychological process being investigated? The recent debate over infant cognition illustrates this issue (e.g., Aslin, 2000; Baillargeon, 1993, 2000; Bogartz, Shinksey, & Schilling, 2000; Bogartz, Shinksey, & Speaker, 1997; Cashon & Cohen, 2000; Haith, 1998; Haith & Benson, 1998; Munakata, 2000; Rivera, Wakeley, & Langer, 1999; Schilling, 2000; Spelke, 1998), with some researchers questioning the relevance, or ecological validity, of simple discrimination measures (e.g., preferential looking) for understanding sophisticated cognitive competencies. Unfortunately, this is a particularly insidious problem for infancy researchers, who by definition investigate participants with a limited behavioral repertoire.

Dimensions of Ecological Validity: A Summary

That these three dimensions—the nature of the setting, stimuli, and response—have been recognized as important factors vis-á-vis ecological validity is evidenced by the previous quotes and examples as well as by the numerous debates and discussions regarding these issues. That these dimensions are interlinked has also been recognized and is shown by Bronfenbrenner's (1977) pointed critique of developmental psychology; if one were to add "in response to strange stimuli" to Bronfenbrenner's (1977, p. 513) quote, it would neatly summarize all three aspects. These dimensions are not exhaustive as to the factors involved in ecological validity, however. Other dimensions are possible, such as the validity of the underlying psychological process, and there are other aspects related to the validity of these dimensions. What these dimensions do offer, though, is a starting point in a discussion and definition of ecological validity.

This review also reveals some tensions regarding attempts to conduct ecologically valid research. One such problem is that although ecological validity involves multiple factors, little has been said of any criteria for adjudging ecological validity. Unfortunately, it is often just this concern that lies at the heart of these debates, with one researcher's ecologically valid stimuli demonstrably arbitrary, trivial, and ecologically invalid to a different investigator. A second tension arises when trying to maintain what is believed to be adequate scientific control at the same time as mimicking, as faithfully as possible, the critical components of the setting, stimuli, and responses characterizing the real-world situation. These two goals frequently conflict, causing either attempts to make research valid to be deficient in control or the addition of experimental constraints to produce hopelessly artificial situations.

One method for easing this second tension is to sacrifice validity in some dimensions while maintaining validity in other dimensions. Investigators, however, are often not explicit as to these trade-offs, nor is it clear why certain dimensions are favored over others. Thus, adding to a concern over the criteria for judging ecological validity is that there are no criteria for determining those dimensions that are primary. These trade-offs virtually ensure that all research is potentially invalid in some way. Unfortunately, if all studies can be so criticized, one can question the use of ecological validity as a discriminating attribute of research.

DEVELOPMENT OF MOBILITY AND ECOLOGICAL VALIDITY

Given these issues, it is useful to look at ecological validity with reference to a specific research program. To avoid picking on others who are not here to defend themselves, my own work on mobility development (e.g., E. J. Gibson & Schmuckler, 1989; Schmuckler, 1995) acts as the lightning rod. The goal of my work has been to explore children's integration of motor action and perceptual information, focusing on how this perception–action coupling varies with changing perceptual input, motor skill, and mobility experience. Research topics have involved the perception of surface rigidity (E. J. Gibson et al., 1987; E. J. Gibson & Schmuckler, 1989), depth perception (Schmuckler & Li, 1998; Schmuckler & Proffitt, 1994), intermodal perception (Schmuckler, 1996b; Schmuckler & Fairhall, 2001), balance control

(Schmuckler, 1997; Schmuckler & Gibson, 1989; Stoffregen, Schmuckler, & Gibson, 1987), visually guided locomotion (Kingsnorth & Schmuckler, in press; Schmuckler, 1996a), and spatial orientation (Jewell, 1999; Schmuckler & Tsang-Tong, 2000). In many ways this work is strongly ecologically valid, examining naturalistic behavior in natural settings and employing temporally and spatially rich stimuli. Nevertheless, a close look reveals aspects that raise disturbing threats to the ecological validity of the work.

Intermodal Recognition of Self-Movement

One line of research has investigated infants' intermodal recognition of their own movements. When one moves, there is typically visual information for this movement, along with kinesthetic, vestibular, and proprioceptive information for this movement. Adults easily integrate these varied inputs and thus intermodally perceive their own self-movement; the issue is whether or not infants are sensitive to these intermodal relations.

The paradigm I have used to investigate this question in my laboratory appears in Figure 1 and involves requiring young infants to perform hidden limb (i.e., arm or leg) movements, thereby producing proprioceptive but no direct visual information for movement. Visual information is provided via the use of a video camera focused on children's limbs, with this visual input projected to a monitor alongside a videotaped image of a different child. Thus, one of these images is contingently related to proprioceptive input whereas the other is not; the experimental question is whether or not infants detect this contingency.

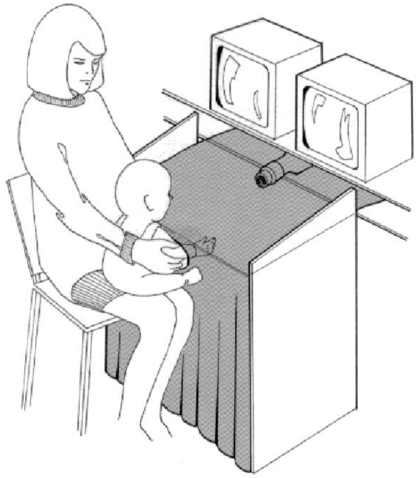

FIGURE 1 A schematic diagram of the experimental setup employed in the visual–proprioceptive intermodal perception studies of Schmuckler (1996b) and Schmuckler and Fairhall (2001).

Multiple researchers (Bahrick & Watson, 1985; Morgan & Rochat, 1997; Rochat & Morgan, 1995, 1998; Schmuckler, 1996b; Schmuckler & Fairhall, 2001) found that infants recognize this intermodal correspondence and demonstrate this recognition by preferentially fixating the display of the other child. My work has focused on the visual and proprioceptive information underlying this intermodal perception. Figure 2 shows the results from Schmuckler (1996b) and indicates that spatial contiguity is critical for this intermodal matching, with 5-month-old infants failing to recognize left–right reversed displays but successfully recognizing displays containing a novel orientation.

Schmuckler and Fairhall (2001) presented 5- and 7-month-old infants with point-light displays of leg movements as opposed to images of infants' legs. The goal of this work was to examine the role of familiar context and recognizable object perception in intermodal recognition. Figure 3 presents the results of studies manipulating orientation (upright vs. inverted) and point-light placement (on- vs. off-joint) information. These results indicate that as the displays became more abstract, both 5- and 7-month-old infants increasingly failed to coordinate the visual and proprioceptive information, thus highlighting the importance of coherent object perception for intermodal matching. Overall, these studies delimit the conditions under which infants can coordinate visual and proprioceptive inputs (i.e., the importance of spatial contiguity and object perception) and outline a developmental progression for this coordination. Even more globally this work has implications for our understanding of the growth of a central factor in development,

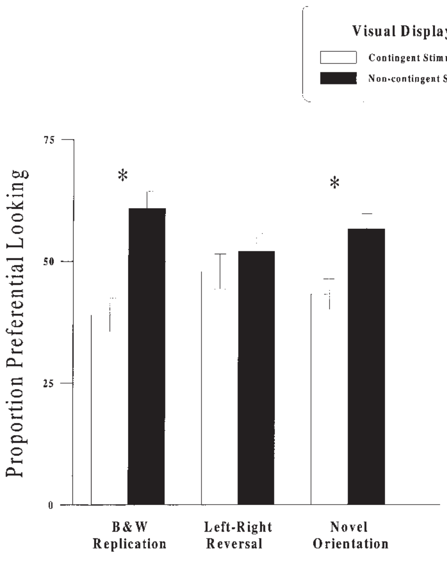

FIGURE 2 Preferential looking scores toward the contingent and noncontingent displays for Schmuckler (1996b). Significance relative to 50% (chance) is noted (* = $p < .05$).

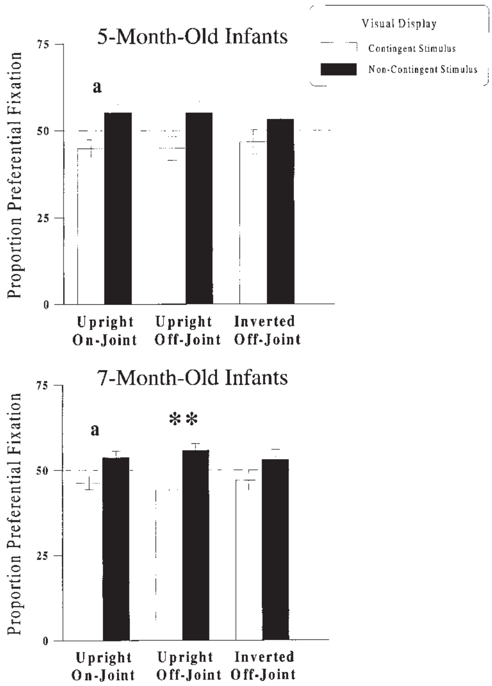

FIGURE 3 Preferential looking scores toward the contingent and noncontingent displays for Schmuckler and Fairhall (2001). Significance relative to 50% (chance) is noted (a = $p < .07$; ** = $p < .01$).

namely development of the self (Neisser, 1988, 1991, 1993, 1995; Rochat, 1995; Schmuckler, 1995, 1996b).

Why raise this work in a discussion of ecological validity? Although admirably ecologically valid in many respects, these studies present a number of threats to validity. Consider the visual displays. On one hand they are information rich, presenting spatially and temporally extended biological limb movements. On the other hand these displays could be considered artificial and nonrepresentative of the general issue. For example, although the orientation of the limbs was basically correct (e.g., an ego-based view), the limbs were unnatural in their size and distance from the torso and their angle from the body. In the point-light displays there was no image of the limbs at all but rather only abstract visual information for limb movement. At best, these displays represented disembodied limbs that moved in the same manner as the infants. Such factors raise concerns about whether these displays truly specify self-movement, which goes to the core of what these studies are investigating.

Similar issues can be voiced with the setting of the experiment and the response measure. Schmuckler (1996b) had infants manually explore an unseen and unremoveable toy, whereas Schmuckler and Fairhall (2001) placed infants' legs into a box with the legs moved by a parent. While their limbs were hidden, infants simultaneously watched two monitors presenting silent images. Clearly, neither the environment nor the task was natural for infants. In fact, one could question the entire research enterprise, wondering whether these findings would differ if intermodal recognition of a more familiar and socially significant stimulus such as the infant's face were investigated (e.g., Bahrick, Moss, & Fadil, 1996).

Given these concerns, why are these results accepted as relevant to intermodal perception and self-recognition? What are the critical features of this research that have satisfied ecological validity despite the drawbacks? Unfortunately, there is no obvious answer here because no clear mechanism for judging ecological validity has been set forth; nor are there any suggestions as to the nature of the critical factors for this judgment.

Balance Control in Young Children

The previous examples (Schmuckler, 1996b; Schmuckler & Fairhall, 2001) involved research on intermodal perception employing preverbal infants. It may be, however, that there are special costs to such a situation. Maybe intermodal perception is inherently problematic for ecological validity; the other articles in this section clearly attest to this possibility. Additionally, working with participants who cannot reply directly to experimental queries induces severe constraints, with such limitations generating issues that simply do not arise when there are more direct responses at one's disposal. Given these considerations, it is instructive to examine an alternative line of investigation, one involving different participants, contexts, stimuli, and responses. A prime candidate in this regard is work on the use of vision in balance control. One common paradigm for exploring this question is the moving room apparatus of Lee (Lee & Aronson, 1974; Lee & Lishman, 1975; Lishman & Lee, 1973). Movement of the room simulates the visual input produced via a loss of balance; observers situated in the room compensate for this perceived imbalance with postural sway. If the observer is young the postural response is dramatic, often consisting of a stagger or a fall (Bertenthal & Bai, 1989; Lee & Aronson, 1974; Schmuckler & Gibson, 1989; Stoffregen et al., 1987).

Other work has looked more closely at the frequency of sway in response to oscillating visual information. Numerous studies (e.g., Andersen & Braunstein, 1985; Andersen & Dyre, 1989; Delorme & Martin, 1986; Stoffregen, 1985, 1986) have demonstrated that postural sway is entrained by oscillating visual information, with observers swaying at frequencies comparable to the visual information. Some evidence suggests that this response is frequency specific in adults, with sway occurring only to slow oscillations (Stoffregen, 1986; van Asten, Gielen, & van der Gon, 1988); in contrast, work with infants has found no such frequency selectivity (Bai, 1991; Bertenthal, Rose, & Bai, 1997; Delorme, Frigon, & Lagace, 1989).

My research (Schmuckler, 1997) examined this developmental difference using 4- to 7-year-old children, a group of interest given the evidence suggesting that this is the time during which children begin to adopt adultlike postural control (e.g., Ashmead & McCarty, 1991; Riach & Hayes, 1987; Shumway-Cooke & Woollacott, 1985). In these studies, children received optical flow oscillating across a range of slow to fast frequencies, with postural sway quantified using a force platform. Examination of the frequency, amplitude, and timing of the postural responses induced by these visual oscillations revealed an intriguing developmental pattern. Specifically, children appeared adultlike in the amplitude and timing of their responses but nonadultlike in the frequency of their reactions, suggesting that these parameters are dissociable both empirically and developmentally. This mix of adultlike and nonadultlike responding may represent a transitional state in postural growth, one that is consistent with theoretical systems analyses (e.g., Thelen & Smith, 1994, 1998).

As with the intermodal perception research, this work on balance control has both pluses and minuses relative to ecological validity. On one hand this research employs the ecologically valid stimulus of global optical flow and looks at the natural response system of body sway. On the other hand the moving room produces an unnatural conflict between intermodal inputs, with vision specifying postural perturbation, whereas proprioception and kinesthesia specify postural stability. The visual movements themselves are also unnatural in that the world does not typically oscillate, certainly not at the speeds or with the amplitudes used in these studies. Yet these are the parameters manipulated in this work.

Ultimately, one faces the issues already described. How is it that these violations of ecological validity are acceptable? This work seems to adhere to certain criteria of ecological validity while violating other characteristics. Once again, there are the questions of the nature of the criteria for ecological validity and the manner in which judgments of validity are determined.

STATUS OF ECOLOGICAL VALIDITY

This look at research on mobility development vis-á-vis ecological validity raises some worrisome issues. Along with the concern that these studies may not ultimately answer the questions they set out to explore, the fact that a research program that intuitively seems ecologically valid can be so forcefully critiqued leads to questions as to the usefulness of this concept. A primary function of ecological validity is in its guidance in constructing, conducting, and interpreting research. If most experimental protocols are suspect in this regard, it is reasonable to wonder what is being gained by adhering to such strictures.

One attempt to address these concerns is to ask whether or not these violations are as damning as they appear. In fact, we are often overly pessimistic as to the consequences of potential violations of validity. In the earlier examples, there were both positive and negative aspects regarding ecological validity. That some concerns can be raised does not necessarily undermine either the conclusions or the generalizability of the work, nor does it mean that the results are unrepresentative of the psychological processes or underlying behavior. Although care must be taken when generalizing across persons, settings, and responses, this is common with any experimental protocol and simply reiterates the well-known importance of converging operations in research (Garner, Hake, & Erikson, 1956; Proffitt & Bertenthal, 1990).

Mook (1983) provided an especially strong statement in this vein by arguing that a preoccupation with generalizability between the laboratory and real world simply misses the point. Mook argued that many times the goal of laboratory work is to test predictions about events in the laboratory and not necessarily to make predictions about real-world situations. If some findings are applicable only in a laboratory setting, these results are nonetheless interesting because they show what is ultimately possible under certain circumstances. Thus, the laboratory itself can be considered a real-world environment, one that needs to be explained in any discussion of psychological processes. Interestingly, when direct comparisons of psychological processes operating in laboratory and naturalistic environments have been made, researchers have found strong correspondences between the constrained and natural settings (e.g., Anderson & Bushman, 1997; Anderson, Lindsay, & Bushman, 1999).

Essentially, one is left with determining whether or not the experimental situation captures the critical aspects of the real-world environment assumed to be important. In making this determination, it seems clear that not all violations of ecological validity are treated equally; some problems are more serious than others. What, then, determines this hierarchy of importance? The earlier review of mobility development research implied that such criteria are not obvious. One possibility emerges though a different aspect of the empirical enterprise—namely, the theoretical framework of the research. In fact, looked at closely, most discussions of ecological validity are in reality debates over the underlying theoretical rationale of the work. One's theoretical stance suggests that parameter *X* of the context is critical, with parameter *Y* of the stimuli important for producing behavior *Z*. As such, work not controlling, presenting, manipulating, or taking into account *X, Y,* or *Z* appears ecologically invalid in terms of its situation, stimulus parameters, or behavioral response.

Because ecological validity has been aligned with discussions of experimental design per se (e.g., Campbell, 1957; Campbell & Stanley, 1967) one may argue that there is, and should continue to be, a distinction between ecological validity and one's theoretical stance. Along these lines, ecological validity is a methodological concern that allows one to judge the reasonableness of experimental work; in this sense it is theory neutral. In contrast, one's theoretical stance brings with it ideas concerning the types of questions worthy of investigation and assumptions about the factors that may be important in such investigations. Although true in the abstract, the problem with this distinction is that defining the assumptions of one's theoretical stance and the questions under investigation implicitly endorses particular methods of experimentation that are most amenable for the study of these questions. Thus, no research procedures are truly theory neutral, nor is any theory agnostic concerning the best way(s) to investigate that theory. The relation between experimental methodology and aspects of theory and theoretical interpretation has been elegantly explored by Danziger (1990) and is (implicitly or explicitly) present in discussions of experimental design (e.g., Benjafield, 1994; Coombs, Raifa, & Thrall, 1954; McBurney, 1994). This relation must be recognized in discussions of ecological validity.

Examples of the reliance on theory for determining ecological validity are not hard to find; in fact, the articles in this section of this issue provide such examples. For instance, Lickliter and Bahrick (this issue) and Walker-Andrews and Bahrick (this issue), based on the ecological approach of the Gibsons (E. J. Gibson, 1984, 1992; J. J. Gibson, 1966, 1979), assume that the most appropriate experimental context (e.g., environment, stimuli, and response) makes use of dynamic, multimodal stimuli. These assumptions, then, define the criteria for judging ecological validity, with experiments failing to take such factors into account doing so at their own peril. In contrast, Lewkowicz (this issue), working within a more reductionistic framework, does not make similar assumptions regarding the nature of the stimuli; hence, based on this account the criteria for ecological validity are different. For the moment, the key issue is not whether ecological versus reductionistic approaches provide complementary or contradictory answers to the same questions (although this can be a critical point for ecological validity and one discussed by both Lickliter & Bahrick, this issue, and Lewkowicz, this issue) but rather, recognizing that the main bone of contention arises from differences in the underlying theoretical assumptions, with the methodological implications falling out of this more fundamental debate.

Ultimately, although the realization that theory defines ecological validity does suggest where one can find this needed hierarchy of criteria, it unfortunately does not provide a complete solution to these problems. It does not, for example, resolve any debate over the underlying theoretical assumptions, nor does it provide a guide for determining the seriousness of violations of the criteria for ecological validity. In addition, basing judgments of ecological validity on the underlying theory creates a circularity (also noted by Lewkowicz, this issue) in that it equates the criteria for determining the adequacy of experimental tests of a theory with the underlying assumptions of the theory itself. Unfortunately, this equating of theory and validity raises anew questions about the usefulness of this concept, although it is possible that a fuller distinction between the two simply awaits further refinement.

CONCLUSION

In many ways, too strong a concern with an abstract notion of ecological validity seems paralyzing in that it is difficult to find any general criteria for determining this validity. Instead, the issue involves identifying the critical theoretical parameters underlying the psychological processes in question and then determining whether these parameters occur in the empirical context. Accordingly, a concern with ecological validity is a judgment of the theoretical underpinnings of the work and the research operationalization of this theory.

This does not mean that there is no such thing as violating ecological validity. Assuming that the theoretical parameters of the work are explicit, it is possible that the context, stimuli, or responses have not captured the critical aspects of the phenomena in question. If the work is unconvincing in this fashion, then the experimental situation truly is not real for studying a given psychological process, regardless of its status in exemplifying the real world. Increased attention, then, to one's theoretical assumptions and statements of the critical components of the environment, stimuli, and contexts go a long way toward determining exactly what is meant by ecological validity.

ACKNOWLEDGMENTS

Portions of this work were presented at the Biennial Meetings of the Society for Research in Child Development, April 1999, Albuquerque, NM.

The preparation of this article and much of the research described in this article were supported by Grant OGP0089706 from the Natural Sciences and Engineering Research Council of Canada to Mark A. Schmuckler.

I thank Katalin Dzinas for her detailed and insightful comments on the ideas presented in this article; her contribution to this work has been invaluable.

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