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Authors

Groom, CJ
Sherman, JW
Conrey, FR

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COMMENTARIES

What Immersive Virtual Environment Technology Can Offer to Social Cognition

Carla J. Groom, Jeffrey W. Sherman, and Frederica R. Conrey
Department of Psychology
Northwestern University

Immersive virtual environment technology (IVET) offers exciting potential for social cognition research. Yet the reasons for our enthusiasm differ from those of Blascovich et al. (this issue, target article). We have reservations about the plausibility and even the value of boosting mundane realism, replicability, and external validity through IVET. However, IVET does offer valuable ways to enhance internal, construct, and statistical conclusion validity. So that social cognition researchers can capitalize on these strengths, we discuss the need for theoretical understanding of psychology in the virtual environment, increased practical feasibility of IVET, and creativity on the part of researchers.

The Problems of Mundane Realism, Replicability, and External Validity

We contend that IVET may have a quite limited ability to enhance mundane realism. It seems instead to be a novel kind of artificiality. Participants are still metacognitively aware that they are in an experiment, despite the perceptually compelling nature of the environment. Laden with tracking equipment, the participant realizes that her every movement is under scrutiny. The problem of finding nonreactive measures is, therefore, as important in an IVET experiment as it is in a conventional study. Blascovich et al. (this issue) rightly point out that the type of response system under observation is critical. Participants are also likely to be aware that this is an environment designed for a particular research purpose and are likely to be trying to figure out what is special about it rather than simply reacting as they would in a nonexperimental setting. Furthermore, the trade-off between realism and control may be an issue of psychology rather than procedure and design. If IVET increases realism by giving the participant greater autonomy and freedom to explore, this also means greater freedom for the participant to control sensory input. The conventional researcher and one using IVET may confront exactly the same choice between (a) restricting autonomy and increasing uniformity of experiences across participants and (b) boosting subjective agency and tolerating the accompanying data noise.

Similarly, we are unsure that IVET represents a major advance in replicability arising from the ease with which experimental environments can be transmitted and reconstructed for use in new experiments. In our view, most conventional social psychological materials are fairly easy to transmit and reconstruct (e.g., questionnaires, computer programs, visual stimuli, procedural scripts). Moreover, IVET offers no way to transmit those more influential aspects of "lab lore," such as the enthusiasm of the experimenter who trains the participant in equipment use, the ad lib aspects of instructions, and the atmosphere and expectations generated by the particular school setting. Those features that are more easily reproduced via IVET, such as the shape and color of the lab environment, are probably the least important sources of cross-experiment variability.

The problem of external validity also seems essentially unchanged by IVET, despite Blascovich et al.'s (this issue) suggestion that the increased availability of IVET technology will allow diverse populations to participate in experiments via the Internet. We argue that the pros and cons of Web-based experimentation are generally orthogonal to those of IVET. Self-selection and lack of experimental control remain major stumbling blocks to the former, although IVET may provide a limited amount of environmental standardization over and above a conventional computerized task.

An Alternative View of the Role of IVET

If the primary purpose of IVET is to replicate existing findings in more real settings with broader populations,

few researchers are likely to conclude that the technology is worth an investment of $20,000 or more. However, we suggest that IVET may serve other purposes that do justify the expense.

Most social cognition experiments are concerned with causal explanation rather than causal description. As such, the demonstration of an outcome (e.g., social judgments rely disproportionately on stereotypic vs. individuating information) is typically only the first stage in the research process. Subsequent studies will be designed to determine when, why, and how that effect is obtained. To this end, models are built, and the purpose of experiments is to test their predictions. According to this view, external validity in the sense of stability of effects across participant populations and settings is not the highest priority issue for social psychology. More important is the fleshing out of the causal explanation for an effect through the identification of mediators (including specific cognitive processes), moderators, and critical aspects of independent and dependent variables (Banaji & Crowder, 1989; Mook, 1983). Indeed, a good causal explanation can go further than a haphazard series of replication studies in enabling extrapolation to unstudied populations and settings. By pinning down causal mechanisms, situations can be identified in which that causal relation is likely to be present or absent. For example, in our research we are not seeking to replicate the finding that stereotypes influence judgments. Rather, we are testing a model of stereotype function that proposes when, why, and how stereotypes influence perception, focusing particularly on the ways in which stereotypes direct encoding and retrieval efforts (e.g., Sherman, Lee, Bessenoff, & Frost, 1998).

Much of Blascovich et al.'s (this issue) argument centers on IVET's ability to improve causal description via more realistic stimuli, settings, and varied populations. In contrast, we believe the greatest strength of IVET is its ability to improve causal explanation, and this arises from the unique properties of a virtual environment. The very artificiality of the virtual world allows the experimenter to decouple what is inextricably confounded in the real world, improving the ability to draw causal inferences and, thereby, enhancing internal validity. It also allows researchers to enhance construct validity in two ways. First, existing empirical effects can be more accurately described through the use of IVET to decompose the independent variable into aspects that are and are not necessary for an effect to hold. Second, constructs can be better empirically represented because the control afforded by IVET over the independent variable also allows a broader range of variations of a particular manipulation to be measured. Finally, statistical conclusion validity can be improved by reducing noise via increased experimental control and by offering potentially more sensitive dependent measures. In the following section, we elaborate with practical suggestions for ways in which IVET could benefit the social cognition researcher.

Capitalizing on the Difference Between Virtual Environments and Real Lab or Field Settings

If we were marketing IVET to social cognition researchers, we would emphasize not its ability to approximate a field experiment but rather the fact that the laws of the natural world do not bind its virtual counterpart. This opens up an exciting array of possibilities. For example, we are keen to try Blascovich et al.'s (this issue) suggestion of randomly assigning participant variables such as minority race and other stigmas. We could then see whether race-related effects such as stereotype threat still hold. If a White participant assigned to a Black identity performs more poorly on a test purported to assess intelligence, we would know that growing up with a Black identity is not a necessary part of the independent variable. If the effect disappeared, we would know that skin color alone is not the issue. Minimal group paradigms have so far been the only alternative to correlational studies of group differences and social identity; IVET offers a range of possible intermediate designs. IVET also allows greater control over the perceived properties of artificially created groups. For example, perceived similarity and entitativity can be manipulated with the visual features and spatial positioning that distinguish one group from another.

Other forms of manipulation may also be more effectively operationalized with IVET. For example, subtle contextual primes can be conventionally introduced in an "unrelated" prior phase of a study. Yet if the deception fails, we know that the exact opposite of the intended effect can result because the participant tries to correct for the influence of the prime (Schwarz & Bless, 1992). In a rich virtual environment, primes could be unobtrusive and more convincingly incidental. For example, mood could be primed by the color of the walls or atmospheric music. A rifle hanging on a virtual wall could prime aggression. Sex could be primed via sex-stereotypic paraphernalia such as make-up or a tie lying on a virtual table. Such objects would look suspicious in a psychologist's lab; the very unfamiliarity of the virtual environment has its advantages in reducing the strength of expectancies that a participant has and, thereby, increasing their credulity. Studies of eyewitness testimony can similarly benefit.

Finally, the sophistication of the tracking equipment provides for richer outcome measures, especially of attentional processes, and helps identify mediating processes. Knowing how long participants attended to

various stimuli has a number of uses. Attention can be used as a covariate or manipulation check in studies that depend on participants attending to prime or study materials (e.g., recognition memory experiments). Second, it can be used to directly test hypotheses that propose attentional biases as a mediator of other effects (e.g., stereotyping).

Blascovich et al. (this issue) ask for ideas about how IVET can best be put to social psychological use. The preliminary studies they describe (concerning proxemics, conformity, etc.) represent an intuitive answer to this question but not necessarily the most revolutionary. The studies essentially mimicked precisely those past experiments that used confederates or rich and realistic stimuli and were thus most easily translated into a virtual environment. Social cognition at first appears a poor candidate to use IVET because the procedures that have been used so far to test social cognitive hypotheses have usually involved very minimal stimuli and artificial responses (e.g., making lexical decisions in a stereotype-priming study). It is not obvious how these procedures can be meaningfully copied in a richer and more realistic virtual environment setting. It would not be progress to have participants seat themselves in a virtual cubicle in a virtual lab to have words flashed at them, even if the participants would pay a little bit more attention than they do in a conventional scenario. Yet the points we have outlined previously show that we believe IVET has several properties that social cognition researchers would value. Indeed, the technology could represent a particularly radical step forward in the social cognitive subfield. In contrast, IVET does not necessarily offer more behavior-oriented lines of work the opportunity to address new questions, but it is simply a more controllable and (possibly) more convenient arena for a field-type study with agent–avatars replacing confederates.

As conventional lab researchers in social cognition, we have become accustomed to asking questions that can be answered with our current methodologies. The challenge that IVET presents is to break those habits of thought and come up with creative ways to test hypotheses with the properties of IVET.

The Psychology of Virtual Experiences

The differences between IVET and conventional studies require that we try to understand how people respond differently in the two situations. We need theories of the special psychological properties of the virtual environment, just as we needed theories of the special statistical properties of meta-analysis when this was introduced as a methodological leap forward. What are the implications of the psychological tension between metacognitive awareness that the environment is artificial and the compelling nature of the perceptual input? How do the differences in visual representation between the real and virtual environments affect cognitive, affective, and behavioral responses? The threshold model of social influence that Blascovich et al. (this issue) present is a useful contribution in this respect. It is part of a theory about the psychological aspects of virtual environments. Such theories allow researchers to know what assumptions they can make when they use IVET to test hypotheses about people's behavior in the real world and, of course, are useful to researchers interested in IVET experiences in their own right, for example, as training devices. However, we are less convinced that such theories apply to everyday social psychology. Yet, we argue that this need not be their purpose.

Practical Limitations

Although in principle IVET is an exciting tool that every social cognition researcher may want in her lab, in practice there are major practical obstacles to the widespread adoption of the technology. First, the cost of purchasing and maintaining even a handful of machines of reasonable quality is still prohibitive without specially earmarked grant money. Second, the time to learn the programming and then actually create programs will deter many without the funds to hire a programmer. Prepackaged software will probably be necessary if IVET is to become widespread. Even if IVET becomes cheaper and easier, there remains a paradox until IVET becomes equally as cheap and easy as conventional methods. Researchers will be reluctant to invest in an IVET experiment until conventional pilot studies give them confidence that there is indeed an effect to study, even though it is IVET that is intended to be more sensitive and less noisy! This reinforces the point that justification for IVET must derive from an ability to test novel hypotheses, not to test existing hypotheses in novel ways.

Conclusion

We believe that Blascovich et al. (this issue) are right to champion IVET as a radical methodological advance, although the strengths of IVET that we recognize are different from those that they choose to highlight. However, we would certainly not describe IVET as a theoretical paradigm shift. Rather, it is a promising tool. This new tool is unlikely to replace conventional lab and field experiments; the practical and methodological limitations are too great. However, we do not think that this should be the goal. Rather, we would hope to see the most creative methodologists combining conventional and virtual methodologies to ex-

pand our ideas of what is testable, advance theory and do so entirely within the current paradigm of social psychology.

Note

Carla J. Groom is now at the University of Texas at Austin. Correspondence should be addressed to Jeffrey Sherman, Department of Psychology, 2029 Sheridan Road #102, Evanston, IL 60208-2710. E-mail: sherm@northwestern.edu

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Virtually Interactive: A New Paradigm for the Analysis of Stigma

Michelle R. Hebl
Department of Psychology
Rice University

Robert. E. Kleck
Department of Psychological and Brain Sciences
Dartmouth College

> If we really want to know how persons think about persons, we may have to introduce our participants to some. (Gilbert & Hixon, 1991, p. 516)

Blascovich et al. (this issue) propose in their target article that one way in which social psychologists might introduce research participants to other individuals is through a virtual reality technology ingeniously devised to make them appear both real and contingently engaged. Because Blascovich et al. have thoughtfully reminded us that when first introduced to a hammer we may be tempted to pound everything in sight, we will confine our comments concerning the feasibility and promise of immersive virtual environment technology (IVET) to a few issues within stigma research, an area of inquiry that has caught the attention of an increasing number of psychologists over the last several decades. Although the concept of stigma has been defined in various ways, the notion advanced by Crocker, Major, and Steele (1998) currently has high consensus among social psychologists, that is, "a person who is stigmatized is a person whose social identity, or membership in some social category, calls into question his or her full humanity—the person is devalued, spoiled, or flawed in the eyes of others" (p. 504).

In the third edition of the *Handbook of Social Psychology,* Archer (1985) identified what he considered to be a paradigmatic shift in our conception of stigma or social deviance. In his view, several scholars writing in the early 1960s "drew attention to the central ideas that deviance was socially constructed and that the reactions of nondeviants were a major force in the emergence of deviance and the qualities it assumes" (p. 744). Archer argued that this conception quickly drew the attention of social psychologists because it viewed stigma as an emergent quality or product of social interaction. If one wished to understand stigma, one had to move away from an ideographic focus on the deviant individual to an analysis of the factors that contaminate and "spoil" interactions between "normal" individuals and those considered deviant or stigmatized (Goffman, 1963).

Although such a conception implies the use of research paradigms involving face-to-face interaction, much of the subsequent empirical work has been focused on attitudinal and self-report measures with little of it involving actual social exchanges between the stigmatizer and the stigmatized (for some exceptions, see Hebl, Foster, Mannix, & Dovidio, 2000; Ickes, 1984; Kleck, Ono & Hastorf, 1966; Kleck & Strenta, 1980). The result is that we know a great deal about the self-reported cognitions of stigmatizers but relatively little about the affective reactions and behaviors that they exhibit in social interactions with the individuals supposedly stigmatized by these reactions and behaviors (for recent reviews, see Crocker et al., 1998; Fiske, 1998; Heatherton, Kleck, Hebl, & Hull, 2000). Further, because the bulk of this research has tended to focus on the stigmatizer, we know relatively little about the cognitions and behaviors of the stigmatized individual