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TOWARD THE PREDICTION AND INFLUENCE OF ENVIRONMENTALLY RELEVANT BEHAVIOR: SEEKING PRACTICAL UTILITY IN RESEARCH

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ABSTRACT: Despite several decades of effort, the field of psychology has largely failed to make any substantial gains in promoting widespread adoption of environmentally relevant behaviors (ERBs), regulations, or public policies. At the same time, huge impacts can be observed within other domains of science and engineering. The bulk of psychology's contributions on the topic come from two major schools of thought, social/ environmental psychology and behavior analysis. This paper reviews these contributions in terms of the strengths and weaknesses of each approach both practically and conceptually. Understanding the role of verbal behavior in influencing environmentally significant action is suggested as a means of guiding research efforts toward the discovery of practical solutions. Contemporary behavioral analysis of language is cited as an example of behavior-change technology that suggests pragmatic solutions and promising avenues for future investigation.
KEYWORDS: global warming, climate change, relational frame theory, psychological flexibility

Regardless of what might be suggested in some popular media sources, within the scientific community there is no question about the seriousness of global climate change. Figure 1, taken from the IPCC (2007) report, provides a visual depiction of the relationship between rising global temperature and collateral changes in global sea level and global snow cover. These data indicate a positive correlation between global temperature and sea level, as well as a negative correlation between global temperature and global snow cover.

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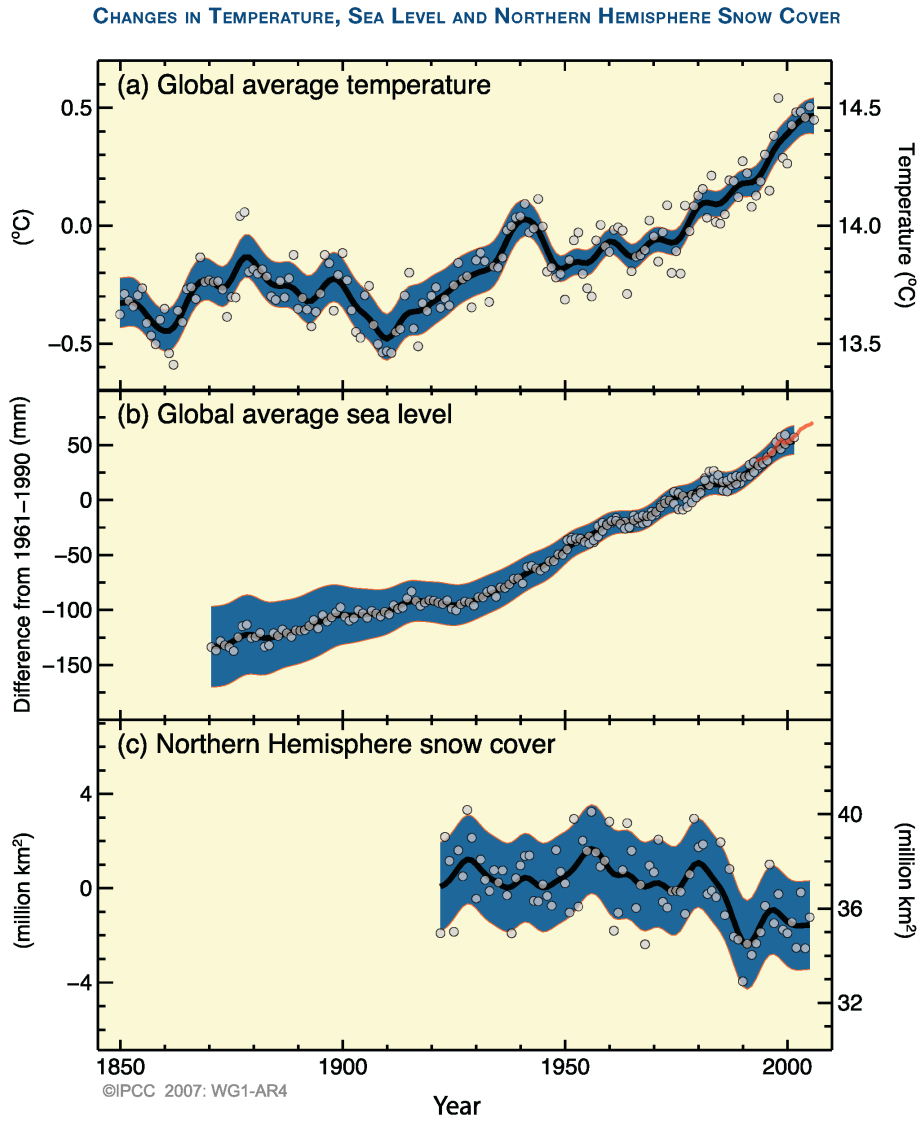
Figure 1. Changes in average global temperature are shown in Panel A. The rising average global sea level is indicated in Panel B. Panel C depicts the decreasing snow cover in the northern hemisphere.



Note. From IPCC, 2007: Summary for Policymakers. In: *Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* [Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M.Tignor and H.L. Miller (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA. Pg. 6, Figure SPM.3. Reprinted with permission.

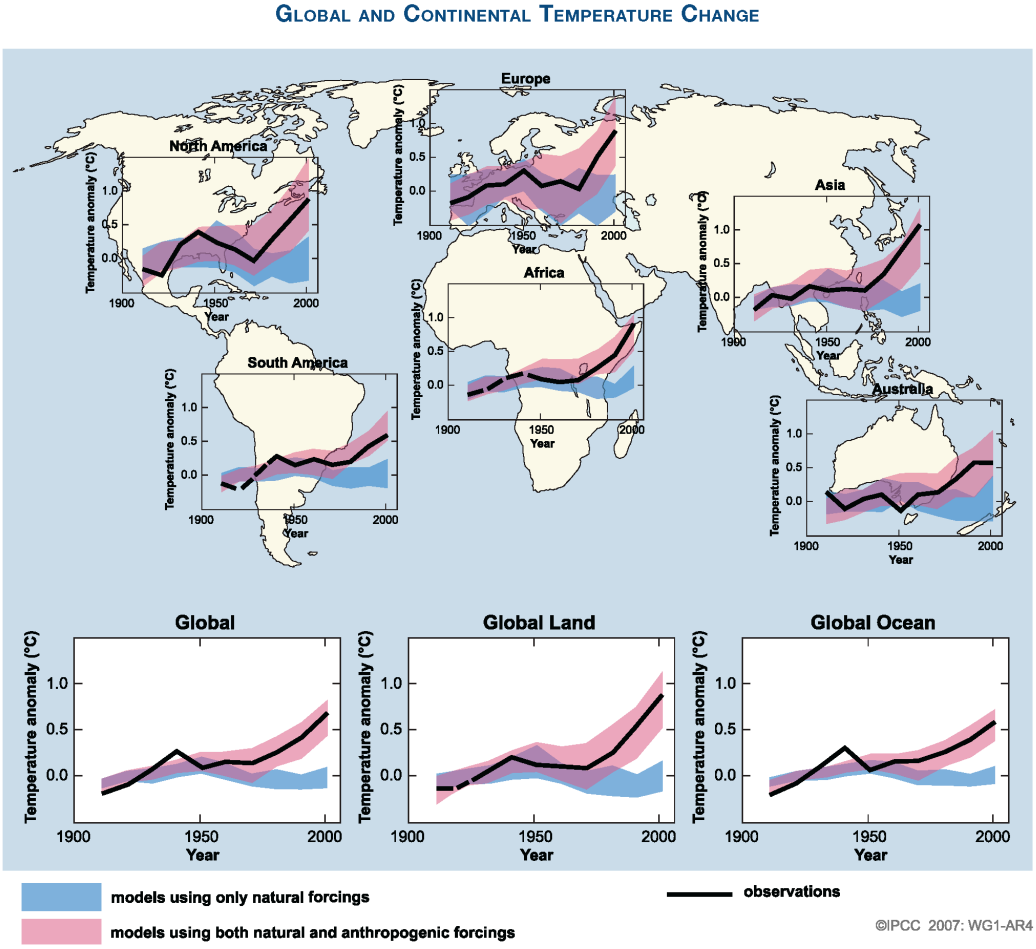
It has been suggested that these correlations may be best understood when the interdependent nature of these trends is appreciated. For example, while rising global temperature may be said to result in greater snowmelt, the reduction of highly reflective snowfields results in more of the Sun's radiant energy being absorbed by the Earth's surface thus, further accelerating the snowmelt and perpetuating the warming trend (Gore, 2009). The snowballing nature of this problem calls for swift action by the scientific community because it is not only getting worse; it is getting worse faster (Hansen & Sato, 2011).

The Environment and Human Behavior

The first challenge for scientists in solving almost any problem is to identify the constellation of factors contributing to changes toward unwanted outcomes. According to the best climate science has to offer, concluding that human behavior must be implicated in the warming global climate is unavoidable. Although many methods of study lead scientists to this same position, perhaps none provide greater clarity on the matter than careful analysis of the predictions cast by computerized global and continental temperature change models. According to these sets of climate modeling algorithms, observed increases in global temperature cannot be understood when only "non-human" causes of warming and cooling trends are considered. These data (see Figure 2, taken from IPCC, 2007) suggest climate models can only account for observed changes in temperature when they include the influence of human activities. More specifically, "human activities" refer to *behaviors* like overconsumption of resource-heavy commodities, polluting, and reproducing at unsustainable rates, among other things.

Continuation of these warming trends is predicted to change weather patterns, resulting in extreme changes in precipitation, wind patterns, droughts, floods, heat waves and increasingly catastrophic storms (IPCC, 2007). Substantial deterioration in global health due to weather-related famine, starvation, lack of fresh water and loss of critical infrastructure is sure to follow these dramatic changes in weather (Day, Hall, Yanez-Arancibia, Pimentel, Marti, & Mitsch, 2009). If left uncorrected, those who survive the fallout of political instability, civil unrest, and wars over dwindling resources will ultimately find themselves fighting for the survival of human kind. The United States military (USJFC, 2010) considers climate change to be among the top ten trends influencing planning for future action. Future military action encompasses a broad range of possibilities from combat to humanitarian relief during natural disasters. It is significant to note that military leaders accept the reality of global warming and include its dis-

Figure 2. Each of the charts in this figure shows three data streams: 1) Blue-shaded ranges depict the predictions of climate models including only "natural" sources of climate change, 2) red-shaded ranges depict predictions of climate models including both natural and anthropogenic variables and, 3) the solid black lines represent direct observation of trends in temperature. The charts in the upper portion of this figure indicate changes in average temperature for each of the six corresponding continents. The charts in the bottom portion represent the aggregate global, continental and ocean temperatures respectively.



Note. From IPCC, 2007: Summary for Policymakers. In: *Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* [Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M.Tignor and H.L. Miller (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA. Pg. 11, Figure SPM.4. Reprinted with permission.

ruptive effects on human cultures as having serious implications for global security.

Global Problem Solving

Once the source of the problem is identified, the next challenge for science is to understand how to manipulate it in ways perpetuating change toward desirable outcomes, and to influence public policy toward that end. In the case of the global warming crisis, professionals and volunteers from all realms of human activities (e.g., science, engineering, politics, the arts, etc.) have mobilized their efforts toward this end, and a wide variety of solutions have been suggested. Among them are political accords, such as the Kyoto protocol (UNFCCC, 1997), technologies for reducing future greenhouse gas production, technologies for sequestering the greenhouse gasses already produced, and even trends in fashion favorable to environmental stewardship. In the end, if a meaningful and measurable positive impact is to be made at all, it will undoubtedly require all of these advances, and more.

Although less commented upon in the popular media, and less impactful than the development of alternative energy vehicles or international climate summits, psychologists too have attempted to bring their expertise to bear on the issue of global warming. The psychological contributions on the topic have typically been analyses of the causal factors contributing to greater or lesser frequencies of environmentally relevant behaviors (ERBs), and related theories about those causal mechanisms. The explanatory constructs and techniques applied are not, however, always consistent across differing psychological perspectives.

The bulk of psychology's contributions come from two major schools of thought, social/environmental psychology and applied behavior analysis. These two lines of research primarily focus on environmental attitudes and management of ERB contingencies, respectively. A more detailed discussion of the characteristics of each approach is presented below, followed by a description of a new theoretical framework to allow environmental psychologists to capitalize on the strengths of both approaches.

Social/Environmental Perspective

The eclectic character of psychological approaches to environmental issues is well exemplified in Stern's (2000) review of common theories of environmentalism. Some of the examples provided suggest one's worldview predicts his/her probability of environmentalist behaviors and refer to causal factors such as "cultural bias" or "orienting disposition" (Dake, 1991; Douglas &

Wildavsky, 1982; Steg & Sievers, 2000); "emotional affinity toward nature" (Kals, Schumacher, & Montada, 1999); or "empathy with wild animals" (Schultz, Zelezny, & Dalrymple, 2000). Other theories suggest one's values guide ERBs, naming causal factors such as "religious values … that certain Judaeo-Christian beliefs predispose adherents to devalue the environment" (Schultz et al., 2000; White, 1967); "self-transcendent or altruistic values" (Dietz et al., 1998; Karp, 1996; Stern & Dietz, 1994; Stern, Dietz, Kalof, & Guagnano, 1995); or "prosocial value orientations" (Van Vugt & Samuelson, 1998). Finally, there is Stern's (2000) value-belief-norm (VBN) theory of environmentalism, which holds behavioral patterns as arising through a causal chain of five variables including, "personal altruistic values, new environmental paradigm, awareness of adverse consequences, ascription of responsibility to self about general conditions in the biophysical environment, and personal norms of pro-environmental action" (p 412).

Research based on these theories, which are largely focused on environmental *attitudes*, has flourished in recent decades (Lehman & Geller, 2004). The popularity of these views, encapsulated herein under the heading "social/environmental psychology," is owed at least in part to the familiarity of the constructs applied within this school of thought, such as attitudes, beliefs, values, etc. The appeal to these types of familiar conventions, which are common to all sorts of popular media and communication, makes these theories highly attractive and approachable to both laypersons and policy-makers. This type of familiarity and approachability is a clear strength of the social/environmental perspective. Societal acceptance is critical if psychological interventions are going to make their way into mainstream culture.

Despite the widespread proliferation of studies on the relationship between reported environmental attitudes and ERBs, this sub-field of environmental psychology has come nowhere close to influencing society toward meaningful mitigation of anthropogenic environmental problems (Lehman & Geller, 2004). This sad fact may be attributed to a research agenda too narrowly focused on understanding the correlations between what people say and what people do, which provides no insights about how to change either. If psychologists are to play a role in improving the environment, clear prescriptions for how to *change* ERBs are equally as important as the social validity that comes with the use of culturally popular constructs.

One reason these theories have fallen short of providing actionable recommendations is the limited scope of variables investigated, specifically the general exclusion of factors amenable to direct manipulation and the insistence upon casting attitudes as independent variables. Although the intrinsic attitudes

and characteristics of individuals are clearly important features of ERB patterns, their incorporeal nature precludes such factors from direct manipulation. As such, the practical utility of conceptualizing such factors as *causal* or *independent* may be called into question. An alternative conceptualization, expanded upon below, suggests the factors in these analyses deemed to be causal, such as dispositions, intentions, awareness and attitudes, be understood as participating in and with a much broader field of events. As such, they need not be identified a priori as either dependent or independent variables, but may assume either role as is appropriate to the analytical goals of the experimenter. Doing so opens the way for psychological theories to have greater practical utility so greater attention can be paid to the manipulable features of the environment. These may be cast as independent variables when practical to do so, standing in some functional relation to environmentally important dependent variables, such as what people say (attitudes and dispositions) and do (spend and consume resources) to impact their world.

Behavioral Perspective

Seated on a philosophical foundation of American Pragmatism qua William James, John Dewey and later B.F. Skinner, behavior analysis emphasizes the identification of functional relations between manipulable environmental variables and observable behaviors as the primary purpose of psychological investigation. Thus, based on the above criticisms of the social/environmental approach, this particular psychological perspective appears well positioned to inform practical solutions to the environmental problems driven by harmful human behaviors. And, indeed, behavioral interventions have seen great success in influencing litter control, recycling, domestic and industrial energy consumption, transportation decisions and consumer purchasing behavior (Lehman & Geller, 2004; Cone & Hayes, 1980; Geller, Winett & Everett, 1982). Yet, it is equally uncommon to see mainstream public policies or practices based on solid behavioral science as it is of any other psychological sub-discipline.

When this traditional behavioral interpretation of human activities is framed in terms of changing ERB patterns, it predicts the most successful interventions will be those establishing new contingencies by altering the consequences for those behaviors (Cone & Hayes, 1980; Geller, Winett & Everett, 1982). Abrahamse, Steg, Vlek and Rothengatter (2005), provide a review of 38 intervention studies aimed at household energy conservation. Although these studies are largely written by authors of the social/environmental perspective, this review provides an excellent opportunity to observe how active behavioral

components are still applied with relatively consistent, but less than perfect, success in environmental research.

In brief, the findings from their analysis indicate antecedent interventions, such as the provision of information about environmental impact, were not an effective strategy in isolation. However, the effectiveness of antecedent strategies was significantly increased when they were combined with other (consequence) strategies. Rewards, feedback, and other consequence manipulations, on the other hand, were reliably effective in changing behaviors, and decreasing energy consumption (note: this only pertains to those studies in which energy consumption was actually measured), with few exceptions. Finally, most studies showed that combinations of antecedent and consequence strategies were most effective. As an aside, feedback may not always be classified as a consequent strategy (Haas & Hayes, 2006) but is listed as such here for the sake of being consistent with its characterization in the Abrahamse et al. review.

These results appear to provide strong support for the traditional behavioral position. The most critical factors for making positive environmental impacts are changes made to relevant contingencies. In fact, across these 38 studies, positive outcomes in the absence of clear contingency manipulations were extremely scarce. Abrahamse et al. (2005) raise a criticism noting that when positive outcomes were achieved through the use of rewards contingent upon changes in behavior, those effects disappeared as soon as the intervention was withdrawn. On one hand, this is actually one of the strongest points of support for the behavioral account in that it demonstrates perfect experimental control of behavior by consequences (and other manipulable environmental variables). On the other hand, it is well taken as a point of criticism in that the commonly employed contrived consequences, such as reward systems for good environmental stewardship, are not always sustainable in practical settings due to costs, time, and other resource constraints.

Perhaps for these reasons, despite their apparent practical advantages at the conceptual level, behavioral solutions have faired no better than other approaches in being widely embraced by society. Furthermore, this general failure to penetrate the sphere of social influence, and thereby attain funding for further research, may reasonably be implicated in the decline in empirical studies from the behavioral perspective in recent decades (Dwyer et al., 1993; Lehman & Geller, 2004).

Despite observed declines in behavioral studies since the 1970s, there is some evidence that ERB research is re-emerging as point of interest for behaviorists. In 2010 a special section of *The Behavior Analyst* (Heward & Chance, 2010) featured a review of the evidence for climate change from world-renowned

paleoclimatologist Lonnie G. Thompson (2010), who also spoke to the behavior analytic community at an invited address to the Association of Behavior Analysis International annual convention in 2009 in Chicago, Illinois (Thompson, 2009). That special section also featured a series of short essays and reports by behavior analysts presenting ideas for how behavior science can be brought to bear upon the problems presented by Thompson. Proposed solutions targeted recycling (Keller, 1991, reprinted 2010), driving behavior (Pritchard, 2010), education (Twyman, 2010), and consumer behavior (Layng, 2010; Nevin, 2010), among other things.

A recent conceptual paper by Grant (2010) in *Behavior and Social Issues* represents yet another take on how the behavioral sciences can be applied to issues of sustainability. In short, Grant suggests that targeting "consumption skills" may improve citizens' abilities to meaningfully and repeatedly contact more resource-light, sustainable reinforcers. He recommends establishing resource-light reinforcers such as learning to appreciate art and leisure activities to align lifestyles with sustainable practices. It is worth noting that Grant's conceptualization of how behavioral principles may inform a transition to more sustainable societies calls into question the viability of many efficiency-oriented solutions now being pursued by behavior analysts which accept materialistic lifestyles but channel consumption towards improved goods and services. However, a growing diversity of views expressed among behavior analysts about how to combat issues of sustainability and global warming is indicative of a science that is taking these problems seriously.

The new-found conviction of behavior scientists in this area is further evidenced by the birth of Behavior Analysis for Sustainable Societies (BASS). This new special interest group under the ABAI banner held its first meeting in May, 2011. Alavosius & Mattaini (2011) describe the common ground shared by behavior scientists exploring cooperation, nonviolence, and other positive social behaviors in work converging on sustainable, resilient cultures. Focus on social responsibility as a facet of citizenship is likely to be a common thread as scientists engage with the human response to environmental degradation.

To summarize, strengths and weaknesses can be found in both the behavioral and social/environmental approaches. Although the behavioral approach has successfully revealed ways that ERBs can be predicted and influenced through the manipulation of environmental conditions, interventions informed by these methods are often costly, time consuming and unsustainable. On the other hand, the social/environmental approach offers a high degree of approachability for laypersons and policy makers through the use of familiar terminology, but has not yet yielded useful technologies for changing ERB.

An Evolving Conceptual Framework

We posit that a fruitful framework for ERB research will require the adoption of investigative constructs that are both approachable for non-psychologists and sufficiently operationalized to inform practical and sustainable interventions. A psychology of ERB successful in encouraging the sweeping societal changes needed to combat global warming will need to coherently incorporate characteristics of both of the above described approaches. The days in which various camps can be satisfied with studying narrowly defined aspects of human actions are over if focus turns to large-scale ERB change initiatives. After all, a good environmental steward has attitudes, values, dispositions *and* responds more effectively with respect to some direct-acting contingencies than others. The interrelated nature of all these aspects of human action must be appreciated if any individual aspect is to be understood, predicted, or influenced. In order to understand the interconnectedness of these features of the human repertoire researchers must adopt a conceptual perspective from which all human actions can be consistently viewed and described in common terms.

The framework suggested here merges the social/environmental and the behavioral traditions. The goal is to derive a single perspective from which the critical roles of verbal behavior and rule-governance can be understood in their proper relation to attitudes and contingencies of reinforcement. In the realm of ERB research there are, at present, no examples of investigative work fully aligning with these goals. Useful and well-operationalized ways of speaking about the role of verbal behavior have been developed in adjacent investigative sub-domains.

As mentioned above with respect to the shortcomings of research conducted from the social/environmental perspective, adherence with this new framework might be accomplished, in part, by seeing attitudes, values, etc., not only as sources of influence over behaviors, but also as behaviors in their own right which can be likewise influenced. Skinner (1957, 1974) provides a model for how these kinds of behaviors may be functionally classified; that model serves as a partial foundation for this conceptual framework. Per that model, the litany of postulated determinants suggested in the social/environmental perspective are broadly categorized within the current framework as *verbal behaviors*. The verbal behavior of making statements about one's attitudes or opinions about environmental issues may occur overtly (vocally) or covertly (as with "self-talk"). In many cases these types of responses fall into a specific sub-classification called *rule governed behavior*.

Behavior analysis has traditionally been reluctant to address highly complex behaviors such as attitudes, dispositions, emotions and valuing, which have

gained so much popularity in the social/environmental literature. Early behaviorists defended that position on the grounds of pragmatism, suggesting changes in those higher-order verbal behaviors come about as collateral effects of changes in the relevant contingencies of reinforcement, and therefore need not be addressed directly (Skinner, 1945/1972). That notion would slowly evolve toward a broader appreciation for the role of language in human behavior as behaviorism developed and the implications of how verbal responding, including attitudes and dispositions, impacts control by direct-acting contingencies became more clear. The publications of *Verbal Behavior* (Skinner, 1957) and *About Behaviorism* (Skinner, 1974) provide evidence of that progression.

Rules, according to Skinner, are "contingency specifying stimuli," or verbal statements that describe (fully or partially) a contingency relationship. A rule may be self-generated or provided by another person. *Rule-governed behavior* is often contrasted with *contingency shaped behavior.* Skinner (1974) noted that providing a rule changes a person's behavior in drastically different ways than contact with the contingencies described in the rule might. This characteristic of rule-governed behavior is often advantageous when consequences for behavior are potentially harmful and/or delayed. For example, one can learn safe pedestrian skills, such as 'looking both ways before crossing a street,' without ever needing to contact the dangerous consequences of not doing so. On the other hand, rules may be derived from direct contact with contingencies. For example, a pedestrian who crosses a road without looking first and is struck by a car may generate the rule, "always look both ways…"

In both examples above, the observation of rule-governed pedestrian behavior can be accounted for by appealing to specific events in the learning history of the pedestrian (i.e. contact with a rule, or contact with contingencies), which informs how those repertoires might be acquired or manipulated. This is advantageous over the position that the pedestrian "has a disposition toward self preservation," for example, because "dispositions" are often presumed to be immutable features of an individual and thus provide no way of accomplishing practical goals of prediction and influence. Once attitudes and dispositions are framed in this operationalist light, their interdependence with other variables, such as various overt responses to programmed contingency arrangements, can be understood more clearly.

To summarize, the framework suggested here is one which requires, as a means of accounting for the acquisition and maintenance of behavior when consequences are delayed, an account of verbal behavior as a variable that interacts with other variables/behaviors impacting the environment directly. In the pursuit of that goal, certain aspects of Skinner's system such as the distinction

between contingency-shaped and rule-governed behaviors are found useful for understanding ERB and will thus be incorporated into the current framework. Skinner's treatment of verbal behavior is not, however, wholly sufficient for our purposes of guiding the development of a practical understanding of ERB. We appeal as well to more contemporary accounts of human language, which build upon and complement the useful aspects of Skinner's classic understanding.

Contributions from Contemporary Behavior Science

Despite the efforts of Skinner and others to provide a comprehensive account of language from a behavioral perspective, the impact of these efforts on research and application in organizational/community behavior has been limited (Gross & Fox, 2009). This is especially true in the area of ERB research, where behavioral interventions have been described almost exclusively in terms of direct-acting contingencies (See Abrahamse et al., 2005, and Lehman & Geller, 2004, for examples).

Now, 35 years after the peak of behavioral studies focused on ERBs in 1976 (see Dwyer et al., 1993), advances in ongoing behavioral research in other areas of human concern inform a new assessment of the situation. Namely, it is insufficient to study either contingency-shaped, or rule-governed repertoires without consideration of their mutual influence and, further, special care should be given to conceptual coherence in the way that contingency arrangements are described and managed.

Weatherly and Malott (2009) point out that appeal to direct-acting contingencies, in which 'reinforcement' refers to a change in stimulus conditions presented contingently and immediately (within 60 seconds) after the target behavior and increases the likelihood of that class of behaviors under similar conditions, is often inappropriately applied to explain many "package" interventions. They reviewed behavioral interventions conducted in organizational settings and found the consequences for changing work performance were frequently described as reinforcers despite the fact that those consequences may have been delayed by hours, days, or weeks after the targeted behavior occurred. To describe interventions in this way does not match the traditional conceptualization of reinforcement, where immediacy is a defining feature. They called for greater precision in describing how human behavior can be affected through such delayed contingency arrangements, which they referred to as "indirect-acting" contingencies. Specifically, they suggest an account of rule-governance is required to explain how behavior can be maintained across long delays where the ultimate reinforcement for the target behavior (typically a

financial incentive in organizational settings) is not immediately forthcoming. A similar critique can be applied to behavioral reports of interventions upon ERBs, where the role of rule-governance in maintaining ERBs in the face of delayed consequences is commonly under-emphasized or entirely omitted.

This distinction between direct and indirect-acting contingencies complements the traditional division of contingency-shaped and rule-governed behavior. Within the current framework, understanding the influence of both direct and indirect-acting contingencies is critical to the pursuit of sustainable ERB interventions. Complex activities such as recycling, purchasing eco-friendly appliances, and using public transportation are seen as an amalgamation of behaviors from both contingency-shaped and rule-governed repertoires, and sensitive to both immediate and delayed consequences.

Several recent studies provide support for this notion of interdependence. Take, for example, Haas and Hayes (2006), who demonstrated that altering the function of certain verbal stimuli (rules/feedback), made subjects far less sensitive to changes in contingency arrangements. This demonstration of the capacity of verbal stimuli to functionally overshadow the effects of direct-acting contingencies has important implications for the design of an effective means of promoting ERB. Specifically, contingency management alone may not always be sufficient, and a comprehensive solution must consider the importance of rule-governance as well.

The outcome of the Haas and Hayes (2006) study is not, however, to be taken to suggest that verbal behavior plays a *determinant* role with respect to other sorts of behavior. A classic study by Harmon, Nelson and Hayes (1980), demonstrates a different sort of relation among these psychological events. They showed verbal behavior, reports of depressed mood, was influenced more by interventions aimed at increasing overt activities than by focusing on the verbal behavior directly. Unlike the Haas and Hayes (2006) study, this speaks to the control of verbal behavior by direct acting contingencies. Taken together, these studies highlight the bi-directionality of influence and interactive relationship between verbally regulated and direct-acting (contingency) sources of control over observed patterns of responding.

Particularly relevant to the current analysis is a recent study by Thibodeau and Boroditsky (2011), which demonstrated how subtle alterations in language have significant impact on how participants said they would address important social problems. In this study, groups of participants were provided with short paragraphs describing a crime problem in a city. Although the facts provided about the crime problem were the same for all participants, the figurative

language embedded in the paragraphs were systematically differentiated across groups.

When the embedded figurative language likened crime to a beast (e.g., crime is "preying on the city" or "lurking in every neighborhood") participants reported that solutions to the crime problem should involve enforcement, capture, punishment, etc. However, when the embedded figurative language likened crime to a virus (e.g., crime is "infecting the city" or "plaguing every neighborhood"), participants were more likely to suggest solutions involving diagnosing, treating and inoculating. Surely similar subtleties in language would be expected impact how people choose to respond to environmental problem, as well as informing decisions about whether any response is warranted at all.

Although a sufficient scientific account of this language-based phenomenon has long been lacking, the practice of taking advantage of its effects have not. Orwell's (1946/2009) essay, "Politics and the English Language," provides a string of potent examples of how it may be capitalized upon for unsavory ends. In each, indefensible acts are intentionally described in terms that do not occasion the same psychological function as contact with the event itself might, yet maintain a minimal degree of technical accuracy, such that political fallout may be avoided.

> Defenseless villages are bombarded from the air, the inhabitants driven out into the countryside, the cattle machine-gunned, the huts set on fire with incendiary bullets: this is called *pacification*. Millions of peasants are robbed of their farms and sent trudging along the roads with more than they can carry: this is called *transfer of population* or *rectification of frontiers*. People are imprisoned for years without trial, or shot in the back of the neck or sent to die of scurvy in Arctic lumber camps: this is called *elimination of unreliable elements*. Such phraseology is needed if one wants to name things without calling up mental pictures of them. (p. 17, emphasis in original).

The use of such disingenuous tactics by political figures is not reserved only for the sort of violent, inhumane actions in Orwell's examples. Today's politicians follow a similar pattern in attempting to color the response of their respective constituencies to scientific reports of anthropogenic global warming. Among the most famous modern acts of linguistic misdirection is Frank Luntz' memorandum to the Bush White House in 2003. The following are excerpts from that document (p 142):

> "*Climate change" is less frightening than "global warming*." As one focus group participant noticed, climate change "sounds like you're

> going from Pittsburg to Fort Lauderdale." While global warming has catastrophic connotations attached to it, climate change suggests a more controllable and less emotional challenge … *We should be "conservationists," not "preservationists" or "environmentalists*." The term "conservationist" has far more positive connotations that either of the other two terms. It conveys a moderate, reasoned, common sense position between replenishing the earth's natural resources and the human need to make use of those resources.

The need for a comprehensive, bottom-up analysis of language is serious, in light of evidence that very subtle, contextual changes in verbal stimuli can drastically alter their function. A complete set of analytic tools for this task have not yet been brought to bear upon the science of ERBs. However, bolstered by recent progress in related sub-domains of behavioral science, the goal of prediction and influence of these nuanced language phenomena may no longer be beyond the reach of ERB researchers. Skinner's distinctions among contingency-shaped and rule-governed behaviors, despite suffering a relative lack of productivity as a stand-alone account, provide an excellent starting point for the assembly of a well-operationalized, comprehensive account of language to inform sustainable ERB interventions. Further clarification regarding conceptual coherence in ways of speaking about the operation of direct and indirect-acting contingencies sheds light on the need for elaboration in the way ERBs can be accounted for through verbal processes. In service of that need, we turn now to contemporary behavioral accounts of language in search of complementary investigative constructs allowing further differentiation among behavior patterns fitting within Skinner's broad classificatory scheme.

Relational Frame Theory. A promising shift in behavioral psychology, Relational Frame Theory (RFT), brings the precision and practical utility of traditional behavior analysis to bear upon the complex verbal and cognitive processes commonly addressed in more mainstream approaches. It seeks to address these higher-level processes involved in language and cognition, and does so in a way that promotes practical utility by maintaining that the only variables of interest are those which are available to direct influence. We offer RFT simply as an example of an account of language that provides the sort of well operationalized investigative constructs required for a comprehensive understanding of ERB. Since no other conceptual perspective currently available achieves these goals, a brief introduction to RFT is warranted. A complete description is beyond the scope of this paper, but the reader is highly encouraged to see Hayes, Barnes-Holmes and Roche (2001) or Törneke (2010) for a thorough treatment.

Briefly, RFT suggests behaviors, which due to their destructive outcomes might otherwise be called irrational, are better understood as not under the exclusive control of direct-acting contingencies but influenced by verbally constructed rules as well. This approach investigates every-day behavior under the control of complex contexts and spawns development of technologies for behavior change. These technologies can inform concrete actions to be taken to modify complex human behaviors, such as environmental attitudes and values, even when direct-acting natural contingencies are too remote to be of practical use by ERB researchers.

Constructs such as *relational responding*, *flexibility*/*rigidity* and *values* have been developed and refined by the authors of RFT and its derivative technologies (e.g., Acceptance and Commitment Training [ACT]) as a means of further differentiating among patterns of behavior broadly categorized as verbal or rule governed. Evolution toward a more impactful science of ERB can be accomplished through thorough vetting of the workability of emergent constructs like these for solving environmental problems. Although the examples we provide will focus on constructs from the RFT/ACT tradition, the utility of constructs from other suitable theories of language could be assessed in similar fashion.

As with most applied strategies born of behavioral traditions, the RFT account of language has seen its greatest impact at the level of individual treatment via ACT. There have, however, been some notable applications of ACT constructs to workplace and community settings demonstrating their generalizability and promise for further extension to environmental issues (see Biglan, Hayes, & Pistorello, 2008). For example, Bond and Bunce (2003) found that RFT/ACT processes were predictive of both higher work performance and fewer health problems. Dahl el al. (2004) reported that interventions altering inflexible responding prevented pain-related worker disability and dramatically reduced absenteeism among employees. Similarly, Bond and Flaxman (2006) found greater psychological flexibility predicted worker job performance, mental health, and the ability to learn new skills at work.

As the Abrahamse et al. (2005) review suggests, the psychology of ERB lacks effective antecedent strategies, and struggles with the sustainability of effective consequence strategies. Given these accomplishments of language-based technologies in meaningful areas of human concern, and the goodness of fit of this approach with the operationalist framework of environmental behaviors described above, there is good reason to believe such technologies may aid design of long-needed effective antecedent interventions to increase the behavior-regulatory effect of direct acting contingencies—be they naturally occurring or explicitly programmed.

Relational responding. Relational responding is one way of describing how language functions in our everyday behavior to affect how we relate to events and contingencies. Each individual acquires language through an elaborate and extended learning process. Thus each individual may acquire unique accounts of the same event. Language colors our analyses of experiences and is an integral part of relating to the environment. This helps to account for the far ranging perspectives people report on relation to global warming. Some relate to scientific reports of climate change with alarm; others dismiss the same data. RFT suggests that analyses of the historical and current contextual events and contingencies that regulate verbal behavior are necessary to understand such vagaries in human action. Consideration of how language acts to frame events in the everyday world may inform the design of communications to reduce resistance and invite skeptics to consider interpretations of events that are currently rejected. How we describe circumstances and frame relations dramatically influence how people respond to a given set of ERB contingencies (Bond, Hayes, & Barnes-Holmes, 2006).

Humans have the unique capacity to derive relations among stimuli or events. These relations can be arbitrary with respect to the formal features of those stimuli. For example, we might say that a dime is larger than a nickel, despite the fact that it is physically smaller. Once acquired, this ability to derive relations is irreversible, and nearly obligatory to all verbally capable people. When stimuli are related with other stimuli, their functions are perpetually transformed as further relations are derived.

A person upon hearing that a scientist falsified data may reject all scientific findings as unreliable as that person frames science within concepts like fraud. Features of scientific reports (e.g., technical terms, data summaries, etc.) may combine in a broad stimulus class for such a person to occasion rejection and dismissal. Thereafter, perfectly reasonable and potentially fruitful courses of action may be avoided simply due to their psychological proximity to the ideas and terminology of science. In this hypothetical example, the dismissive response to ideas framed in scientific terms is occasioned through the same sort of relational responding implicated by participants in the Thibodeau and Boroditsky (2011) study who reported different responses to crime problems framed in terms of beasts and viruses.

The relational responding construct provides a parsimonious way of describing the result of conditioning processes through which the content of verbal behavior is generated, events are given meaning, and verbal relations come to dominate nearly all aspects of human life. The important implication is that the dominance of verbal relations often, but not always, entails the subordinance of putative contingencies and often results in less effective behavior with respect to

them. Once established, these verbal relations require little or no ongoing environmental support to be maintained, even when behavior with respect to them is ultimately harmful (Hayes et al., 1999; Skinner, 1957; Weatherly & Malott, 2009). In this sense, the same gift of language allowing for such a wide range of human activities can also serve to severely limit one's repertoire. Given the automaticity of this sort of relational responding, this theory suggests, unlike most psychological approaches, it is more practical to focus on altering the functions of verbal events than on their content. The ERB researcher need not look farther than the rhetoric of Orwell and Luntz to see the utility of investigative constructs permitting analyses of how words synonymous by definition attain measurably different behavioral functions.

Consideration of the verbal repertoires of community members (e.g., their statements of their values, goals and beliefs) may contribute to design of effective interventions at both individual and sociological levels, as measures of verbal behavior may help resolve problems with identifying the sources of control over ERB frequency. That is, understanding how individuals specify rules governing their behavior may aid in designing contingency arrangements that effectively sustain ERB's.

For example, feedback interventions are a well-tested technology for altering behavior. One might frame a feedback intervention to reduce household energy consumption as a way to protect the environment for members of the Sierra Club. That same intervention might be promoted as a cost-saving procedure for individuals struggling to live on a tight budget. Further, that same intervention might be described as a way to protect the country against over-dependence on foreign energy sources to individuals fearful of reliance on unfriendly neighbors.

When persistent patterns of relational responding are observed, feedback messages can be tailored to verbal repertoire of audience segments for maximum effect and minimal counter-control (see Haas & Hayes, 2006, for evidence that poorly chosen feedback messages can hinder task performance). As with any other construct considered for inclusion in an ERB research agenda, the ultimate utility of viewing language processes in terms of relational responding would be judged in light of the quality of outcome its application attains.

Psychological Flexibility. Psychological flexibility and its inverse, rigidity, are presented as a hypothesized measure of rule-governance (Wulfert, Greenway, Farkas, Hayes, Dougher, 1994), and speak to the interaction obtaining among behavior and its apparent sensitivity to contingencies of varying temporal proximity. The continuum from flexible to rigid offers a way to classify patterns of responding ranging from those most readily adaptable to present contingencies to those appearing completely insensitive to changes in contingencies as a

function of previous contact with rules. Various forms of covert verbal behavior (such as rules) may acquire functional control over behavior just as active contingencies might and, thereby, disrupt the control such contingencies would otherwise exert. The goal of RFT-based approaches (i.e., ACT) in addressing unwanted behaviors is to undermine these processes by supplanting them, when harmful, with more effective ones. The desired outcome of these new processes is a pattern of behavior broadly described as *psychologically flexible*.

Psychological flexibility interventions have primarily focused on mental health issues (Hayes & Strosahl, 2004) so flexibility has typically referred to the way troubled clients come to respond to their own covert verbal behaviors, such as painful thoughts and memories. Broadening this model to extend to citizens able to engage in effective actions in terms of ERBs is not a broad leap. Engaging in many ERBs will entail changing established behavioral patterns and responding differently whenever the context of present contingencies afford. Inflexible patterns of behavior are unresponsive to the present contingencies, and at least partly occasioned by his/her own verbal behavior. The citizen behaving rigidly is equally likely to miss opportunities to engage in beneficial ERBs irrespective of whether his or her motivation is environmental, political, or economic. To this point, it must be added that one's stated values are believed play a critical role in directing flexible responding. Values are elaborated upon in the section to follow.

The utility of the flexibility/rigidity construct for predicting and influencing the behavior of verbally capable humans as they engage, or not, in ERBs has yet to be studied. It is likely that a fuller understanding of why people do, or do not, demonstrate a sensitivity in responding to the direct acting contingencies arranged around ERBs would require an appeal to constructs of this sort, which can be seen as an extension of the contingency-shaped vs. rule-governed distinction constructed by Skinner (1974).

An excellent example of the utility of the flexibility construct in non-ERB research can be found in a study by Wulfert, Greenway, Farkas, Hayes, and Dougher (1994). In this study, the authors found that differing levels of rigidity/rule governance, as measured by the Personal Rigidity Scale (Rehfisch, 1958), were predictive of how the effects of task requirements and rules would interact differently across participants.

Those participants whose rigidity scale scores indicated lower levels of flexibility were more likely to persist in responding with respect to a rule given by the experimenters, even when the contingencies described by the rule were no longer active and extinction conditions were in effect. Those participants who scored on the more flexible end of the spectrum, on the other hand, were more likely to alter responding to match the present schedule requirements regardless of

whether those requirements were reflected in the provided rule. Application of the flexibility construct, in this example, provides actionable insight about how individuals might be expected to experience and respond to environmentally relevant direct-acting contingencies.

Note that some environmentally relevant outcomes of behavior may come about as a function of direct-acting contingencies, for example the taste of local organic produce may be more reinforcing than its industrially produced (often environmentally harmful) counterparts. However, the consequences for many ERBs such as improved health, cost savings and cleaner environmental conditions are delayed. Rigid rule governance (e.g., "buy the cheapest produce") maintains purchasing, via indirect-acting contingencies, of produce grown afar in environmentally harmful farms. Constructs like flexibility potentially offer utility in understanding these instances of everyday behavior that persist and ultimately create environmental degradation.

Values. Discussions of values are not unique to RFT/ACT research. Stating values and goal setting are antecedent interventions that have been frequently studied with respect to all sorts of meaningful behaviors, including environmentally relevant ones (Abrahamse et al., 2005; Lehman, & Geller, 2004). These interventions commit a person to course of action and as Lehman and Geller (2004) comment, "honoring the commitment may be seen as a case of rule-governed behavior" (p. 20). Studies show such interventions alter the verbal behavior of participants and indeed improve their responsiveness to consequence strategies such as feedback (see McCalley & Midden, 2002, for an example). However, the term *values*, like many terms belonging to common vernacular, suffers from eclectic usage and poor operationalization in research.

From an RFT/ACT perspective there are some important differences between values as compared to commitments and goals. Values are defined as verbal statements of chosen qualities of action that can be worked toward, but never achieved in a once-and-for-all sense (Hayes, Strosahl & Wilson, 1999). So values are distinguished from goals in that goals can often represent concrete ends, such as a 10% reduction in energy consumption, or the purchase of a hybrid car. Values, on the other hand, are stated as ongoing processes, such as being a good steward of the environment, sustaining ecosystems, or demonstrating fiscal responsibility through ongoing energy savings. Goals might still be part of a values-based intervention; the important difference is the goal-setting is informed by an overarching values system. Thus, an important process of interventions is to have individuals clarify values and specify their goals. In the proposed framework for effective ERB research, special caution must be taken with conventional terms

like *values* to ensure they are applied consistently and defined in terms of observable behavior, as in the RFT/ACT usage.

Chase (2010) demonstrated the additive benefit of values clarification to goal setting in promoting academic performance by university students. Both GPA and student retention improved when tutorials providing values clarification and goal generation were combined; lesser effects were noted when these interventions were provided separately. In the clinical ACT approach, values clarification and goal-setting exercises are only layers of a comprehensive approach to change behavior. In the OBM area, values clarification is an accepted approach and continuing refinement of these tools by OBM practitioners (e.g., McSween, 2003) parallels the work by therapists.

The language processes explored via RFT, indicate people come to respond to the description or thought of an event much the same way they would respond to the stimulus configuration of the event itself. The event and the language about the event share stimulus functions. Stimulus control is not easily revealed as the thoughts or rules governing behavior are private to the individual unless they are reported. Analysis of covert verbal stimuli enables examination of their behavior-regulatory power in the context of other non-verbal consequences. Imagine a person who has stated he/she values environmental stewardship. But, when given an opportunity to be part of a recycling program, this person thinks, "I am just one person, and my behavior doesn't really matter in the big picture." This thought may reduce or abolish the reinforcing effectiveness of conservation and the probability of recycling is low. But, if the designer of communications promoting the recycling program assesses the verbal behaviors that overshadow or block control by antecedents inviting participation, adjustments can be made to the inducements framing the program in ways to make the benefits more salient to the individual. If the stimuli inviting participation are customized to the individual's verbal repertoire, then behavior towards the valued direction may be more likely.

Consider the man who is in the market for a new vehicle and has the thought, "all my buddies drive trucks with V-8 engines. If I buy a hybrid, they will tease me." This thought is likely to give rise to the aversive sensations associated with social disapproval, and our potential hybrid owner, will avoid visiting the hybrid showroom. But the avoidance comes at a cost. It may be in his financial best interests to buy a hybrid. Buying something other than a hybrid might be a disservice to his environmentalist values. He may also be entirely miscalculating his friends' reactions. Nonetheless, his rigid avoidance of the topic makes it unlikely he would even have a conversation to validate his friends' feelings, or be willing to accept some degree of social disapproval in the service of his

environmental values. His repertoire of potential value-directed responses to the present direct-acting contingencies is artificially narrowed by his own thoughts.

Savvy marketing may alter such perceptions. Advertisements that feature a model much like our rugged weekend warrior afield with a dusty hybrid painted in desert camouflage, bedecked with mountain bike and kayak and coveted by lesser men may well lead our adventurist to purchase his very own hybrid. This phenomenon occurred with startling rapidity in the 1980's and 1990's when many consumers traded in sedans for SUV's. Clever marketing led civilians to purchase quasi-military vehicles outfitted in luxury appointments. These rugged vehicles initially designed for troop transport were used as commuter vehicles by status-conscious drivers. Initially designed for war, these vehicles perhaps find their most demanding use in the occasional excursion to the local nursery to transport potted plants back to home base.

Our thoughts, feelings, memories, and self-talk are classically and operantly conditioned responses that affect current and future behavior. Our words include value statements, objectives, rules, instructions, qualifiers, adjectives, labels, descriptions and more in seemingly infinite combinations. Language has been a feature of humans for 50,000 years (Day et al., 2009) and vital in the evolution of humans as fantastic problem solvers, but there is also a downside. Rule-governed problem-solving behaviors can over-generalize to situations in which they are not needed. Rule following can be inflexible behavior under the control of faulty or inadequate rules.

Excessive thinking about past and future events may result in the creation of "problems," which have no counterpart in the present environment. All sorts of verbal relations can come to dominate responding so as to reduce the degree to which one can behave effectively in the current context. Interventions targeting clear value statements may improve one's ability to deviate from habitual practices, engage in value-directed actions when the present environmental circumstances allow, and thereby contact more frequent reinforcement of doing so (Wilson, 2008).

Conclusions

Based on the low impact environmental psychology has had thus far, and the huge potential for advancement through the adoption of more pragmatic and consistent conceptual frameworks, research on language-based psychological intervention methods fitting of these frameworks is needed. The constructs outlined above serve as examples of the means by which the science of ERB might evolve toward this end. Each instantiates the focus upon common verbal phenomenon so embraced by the social/environmental perspective and so

appreciated by laypersons and policy-makers. Further, each holds to the doctrines of operationalism and pragmatism so honored in the behavioral tradition, thus making prescriptions for effective action with respect to them more clear. Finally, and perhaps most importantly, they inform potential ERB interventions that can rely upon the self-perpetuating nature of language to maintain conservation behaviors in the absence of costly contrived contingencies.

Of course, a dramatic overnight paradigm shift is improbable, but incremental testing of replicable assessment methods to gauge verbal repertoires and adjust interventions based on those assessments can improve the precision of a scientific account of ERB, and inform the selection of investigative constructs. Realistically, new ways of thinking and their associated technologies should be incorporated into the environmental research agenda systematically and the data will select successful innovations and ways of speaking.

A reasonable starting point for the vetting of these specific examples would be to incorporate the assessment protocols used by RFT/ACT researchers to evaluate the changing functions of verbal stimuli within different contexts that mediate ERBs. Coherent relations among stimuli influencing energy conservation identify potential interventions to promote generalization and maintenance of other ERB's. Likewise, the identification of contexts in which certain verbal stimuli occasion, through relational responding, inaction or counter-control by the audience can be avoided by consensus seeking policy-makers and educators.

Although the RFT/ACT model is designed to provide a means for altering the functions of human language and cognition as it is comprehensively understood by RFT, there is no reason why the components of the model could not be isolated and thoroughly vetted for their workability in the context of environmental interests. Some are more amenable to application now than others. Values-clarification appears to entail a replicable set of procedures that assess coherence of verbal statements with demonstrable action. Codifying these procedures, perhaps within web-based management systems, seems well within the reach of those developing internet-based treatments (Porritt et al., 2006; Glenn & Dallery, 2007; Raif & Dallery, 2010).

For example, researchers might begin by simply testing the impact of a values clarification exercise on citizens' responding to a more standard environmental intervention. Likewise, measures of psychological flexibility, such as the Acceptance and Action Questionnaire (AAQ-II: Bond, Hayes, Baer, Carpenter, Guenole, Orcutt, Waltz, Zettle, *in press*), might be utilized in the context of almost any type of intervention upon environmentally significant behavior to determine whether those measures are important mediators in individuals' responsiveness to a given intervention package.

In a sense, this is tantamount to the way "attitudes" have been studied in the social/environmental tradition described above. However, unlike the traditional approaches to attitudes-based research, the view of attitudes as interdependent variables whose behavior-regulatory power can be manipulated provides the researcher with a set of tools for improving flexibility and thereby potentially remediating those who are initially resistant to change through traditional contingency management strategies. The Hood River Conservation Project (Hirst, 1988), for example, demonstrated the potent effects of incentives for household energy retrofits coupled with effective marketing campaigns (word-of-mouth and local print media) for promoting community wide adoption of beneficial ERBs. That demonstration project offers interesting replication potential with the benefit of now incorporating social media technologies to better evaluate and manage the verbal processes involved in community action.

Currently, there are few options in the search for well-operationalized, comprehensive accounts of language. We therefore find ourselves borrowing from the neighboring sub-domain of clinical psychology. As such, community researchers should engage the clinical professionals' descriptions of therapy with caution and skepticism as such approaches are entrenched within practitioner boundaries and in some cases restricted by practitioner licensure. The RFT/ACT community is perhaps unique in opening access to their methods and welcoming other applications to continually promote alternative views and methods until the practical end of influencing societal practices at societal scale is accomplished.

Much is still unknown about the psychology of ERB. Scientists interested in this subject matter have much to discover. All that is currently "known" may eventually be found to be incorrect and replaced by new knowledge. The content of this paper is no exception. However, in acknowledging as much, openness to new ways forward will enable the day when environmental psychology makes it marks. Our environment has no patience for the dogmatism of scientists; the time to act is now.

This paper reviewed some of the history of psychological interventions aimed at ERB. Although research has shown them to be effective, contingency management strategies alone have made little impact on sustaining green behaviors to the extent needed to halt global warming. This is also the case for interventions aimed solely at environmental attitudes. This is not to say that such interventions are unimportant in the initiatives that lie ahead but available evidence suggests that alone these efforts are insufficient for the scale of behavior change needed to make a real difference. Thus, an evolving conceptual framework is recommended to better understand the interrelationship between rule-governed behavior/attitudes and responding to direct-acting contingencies.

The underlying notion is that an operationally-oriented understanding of these behavioral processes could lead to more effective interventions, and thereby increase the likelihood of broad societal and environmental impact. Relational Frame Theory and Acceptance and Commitment Training, are identified as a conceptual model and clinical application fitting this conceptual framework and are suggested as potential avenues for moving the psychology of environmental behavior forward.

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