THE EXPERIENCE SAMPLING METHOD, APPLE IPHONES, AND INVESTIGATING THE RELATIONSHIP BETWEEN VALUES, SUBJECTIVE WELL-BEING AND PRO-ENVIRONMENTAL BEHAVIOR

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ABSTRACT

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Recent research shows that humans' private-sphere behavior, or the purchase, use, and disposal of personal and household products, is responsible for exacerbating climate change, bio-diversity loss and environmental degradation. Some believe that these rates of change, loss and degradation are unsustainable. As a result a great deal of effort has been spent in attempting to identify the determinants of such behavior. While some researchers focus on attitudes and intentions as potential determinants, others focus on worldviews, social- and personal-norms, and values. Most, if not all, of this research relies on single-administration surveys, interviews and focus groups to generate its data. These methods are often subject to recall error and socially desirable responding (SDR) bias, as well as typically rely on self-reporting. The current study, as its first primary objective, tests the joint use of a new method and instrument in pro-environmental behavior research: the Experience Sampling Method (ESM) and the Apple iPhone, respectively. In four one-week periods, the study uses ESM and the Apple iPhone to examine seventy-one university sophomores' values, their subjective well-being, contributions of certain phenomena to their well-being, and finally their private-sphere pro-environmental behavior. In adopting this specific method and instrument the study also attempts to ameliorate the errors and biases mentioned above. The study tests a theoretical framework that suggests significant associations between certain value orientations and pro-environmental behavior performance.

PREFACE

This study introduces the reader to pro-environmental behavior theory and more specifically to recent research on the association between certain value orientations, individuals' subjective well-being and pro-environmental behavior. In doing so it also argues that additional attention and research are necessary, both to advance such theory and to provide an increased array of tools to those who hope to mitigate the possibly catastrophic effects of climate change, bio-diversity loss, and environmental degradation. This study's contribution to such urgent efforts is the adoption of both a new technology and a relatively novel method, neither of which has been utilized within the field of socio-environmental research to date. The former is the Apple iPhone (Apple Incorporated, Cupertino, California), a multi-use multimedia broadband mobile phone and web-interface device. The latter is the Experience Sampling Method (ESM), a multiple-administration survey method—as opposed to single-administration, that attempts to capture the "subjective experience of persons interacting in natural environments in a way that ensures ecological validity" (Csikszentmihalyi & Larson, 1987: 526).

While both technology and method complement each other well in carrying out tasks such as measuring behavior and examining perceptions, beliefs and feelings, as will be seen below, it is perhaps the possibilities that their conjoint use create beyond these initial warrants that is most exciting.

This thesis will apply both method and instrument in an investigation of the relationship between values, pro-environmental behavior and subjective well-being. Such a relationship as presented is inherently socio-psychological, and many of the efforts used to examine it buck the recent trend of adding or applying external or contextual variables to models that previously depicted the internal workings of the human mind. The most obvious examples of this and the

primary theoretical framework utilized in this study come from Shalom H. Schwartz (1992, 1994, 2000) and Tim Kasser (2010, 2011, in press). ESM however, as will be shown, is often used to examine both the internal and external coordinates of experience. How the two—the body of research and the method—work jointly will be of primary interest.

The concluding chapter presents results from research conducted at Michigan State University in the winter of 2011 where the Experience Sampling Method (ESM) and the Apple iPhone were used to investigate seventy-one university sophomores' pro-environmental attitudes, behavior and values. With support from the Sustainable Michigan Endowed Project (SMEP), this research also aimed at identifying associations between students' well-being and their pro-environmental behavior performance.

* * * * *

This thesis is structured around three chapters. The first chapter is an introduction to pro-environmental behavior theory in general and a specific look at Schwartz (1994) and Kasser's (2010, 2011, in press) research on values, well-being and pro-environmental behavior. It ends with Brown and Kasser's (2005) call for additional research into values and pro-environmental behavior, research that they argue needs to specifically address recall error and socially desirable responding (SDR). The second chapter introduces ESM and the benefits of incorporating Apple iPhones into ESM *and* socio-environmental research. The final chapter presents the current study and discusses the implications of its results, while also suggesting avenues for future research using ESM and broadband mobile phones.

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Chapter One:
Examining The Determinants of Pro-Environmental Behavior

1.0. Fifty Years of Pro-Environmental Behavior Research

A great deal of research exists today suggesting human beings' day-to-day activities have a deleterious effect on the earth's ecosystems, climate and natural resources. Despite the prevalence of such studies and their discussion in the media, however, individuals continue to behave and often believe in a manner that sustains or even accentuates environmental decline. The distinction between behavior and belief is and always has been an important one for researchers, as are the distinctions between attitudes, values, preferences, beliefs and intentions.

For over a century behavioral scientists and social psychologists, along with behavioral economists and sociologists, have investigated the determinants of human behavior, not only theoretically but also empirically, often through the building of and reinterpretation of mathematical models. The concepts listed above, e.g. attitudes, values and beliefs, are all possible culprits. Until the 1960s and 70s however, most of these researchers' efforts existed outside the realm of socio-environmental study.

This was so because for most of the 20th century human beings were primarily portrayed as egocentric gain-maximizers, or utility-maximizers. Their behaviors purportedly consisted only of consuming resources with little or no concern for efficiency, passing waste and costs on to others, and forming small groups that excluded and neglected the interest of others (de Young, 2000). Appropriate behaviors were those behaviors that were considered most expedient for the individual decision-maker. Externalities—or consequences either favorable or adverse for those not involved in the decision-making—were lumped into a residual category and for the most part were considered either forgotten or only peripherally acknowledged by individuals (Heberlein,

1972). Leopold (1948) argued that land was still property and the land relationship was strictly economic; it entailed only privileges, not obligations.

White (1967) argues however that in the 1960s and early 70s individuals' attitudes and beliefs began to change; suddenly, human beings were no longer seen as separate from or superior to the natural world. A new awareness of the consequences of human actions was growing. And decisions that were supposedly once solely based on economic efficiency and yet had deleterious consequences for the environment were now being questioned in the public forum. Heberlein (1972: 79) argues that such investigations were due in part to the "general moral turbulence of the sixties," and in part to a new ethical standard based on preserving the "integrity, community and beauty of the biotic community" (Leopold, as quoted in Dunlap & Van Liere, 1977: 204). Dunlap and Van Liere (1977) saw the situation differently. They argued that it was traditional ethics with its focus on moral and interpersonal norms that was to blame. People were not so interested in preserving the natural environment, as they were concerned for their fellow human beings.

Regardless of the cause, socio-environmental researchers had three new phenomena to examine: (1) in what manner one interprets the effect of his or her behavior on the environment; (2) the process in which one reaches that interpretation; and (3) how one's behavior depends on that interpretation. Deciphering each of these three phenomena, it was believed, would ultimately lead researchers to be able to (4) predict whether or not certain individuals would—and do—behave more environmentally consciously.

Regrettably, the links between what individuals believe, why they believe it, and how those beliefs—and values—affect their behavior is not so obvious. Fifty years have passed and

socio-environmental researchers still do not yet know definitively what directs what, and why. As such, divisions have arisen both in the theory and the literature.

1.0.1. Current Trends in Pro-Environmental Behavior Theory and Methodology

Before examining that division or the theory, methods and models of pro-environmental behavior specifically, it is first important to understand exactly what comprises "pro-environmental behavior." Stern (2000: 408) defines environmental behavior by its impact: "the extent to which [that behavior] changes the availability of materials or energy from the environment or alters the structure and dynamics of ecosystems or the biosphere itself." That behavior can have a direct or indirect effect; clearing forest or polluting causes direct environmental change, while behaviors like international development policy or tax policy impact the environment indirectly (yet perhaps much more significantly than the former). Stern adds that humans' environmental impact has primarily been a by-product of our desire for "physical comfort, mobility, relief from labor, enjoyment, power, status, personal security, maintenance of tradition and family" (ibid: 408). Yet, as was discussed previously, only after what Heberlein (1972) and Dunlap and Van Liere (1977) argue was the acknowledgment of an environmental ethic (or norm), did environmental protection become an important consideration in human decision-making.

It was at that point that environmental behavior began also to be defined by the intent of the actor, i.e. one's intention to change the environment. This resulted in both highlighting environmental intent as an independent cause of behavior and the possibility that positive environmental intent, or what is referred to in this thesis as "pro-environmental attitudes" and "pro-environmental behaviors," may actually fail to result in positive environmental impacts

(Stern, 2000). Yet regardless of this seemingly glaring incongruity, socio-environmental researchers have continued to focus on investigating individuals' pro-environmental intentions—or more appropriately the lack thereof. Ecologists, climatologists, and engineers investigate the impact of human behaviors. Sociologists, psychologists and economists examine that impact's effect, or how that effect is translated—or fails to translate—into social norms, as well as how to predict or alter those human behaviors.

These disciplinary divisions aside, at this point two schools of thought exist in explaining, predicting, and altering individuals' pro-environmental behavior (Guagnano et al., 1995). The first is that of the social and cognitive psychologists who study behavior as a "function of processes internal to the individual" (ibid: 700). The second is that of the economists and sociologists who focus on external and contextual forces. There exists another division and that is between the rational-choice theorists like Fishbein (1967) and Ajzen (1991; Ajzen & Fishbein, 1980), as well as Tversky and Kahneman (1981), and the pro-social, personal-norm and value-orientation theorists like Schwartz (1972), Kasser (2010, 2011), Stern, Dietz and Guagnano (Stern et al., 1995), and Geller (1995).

The methods upon which each respective school relies to investigate beliefs, attitudes, values and behaviors vary as well. Obviously the socio-psychologists and the rational-choice modelers typically focus on the internal processes of the individual, while the economists and sociologists generally focus on the external context, or the structural, institutional, and socio-economic constraints each individual face. Regardless of which side of the mirror one investigates, two methods typically dictate. The first is socio-environmental surveys, often single-administration surveys, which evince individuals' stated preferences, or individuals' self-reported beliefs, attitudes, values and behaviors. The second method, often referred to as the

revealed preference method, relies on direct observation or monitoring the choices individuals make through their participation in the marketplace. Each method has both advantages and disadvantages, as will be discussed below.

The last two decades however have seen each of the two schools begin to integrate. Behavioral economists, as well as neuroeconomists who study brain imagery during decision-making (e.g. Weber et al., 2007), are striving to reintroduce psychology into their work (Shogren & Taylor, 2008). And the rational-choice theorists like Izek Ajzen (1991) are offering reinterpretations of their earlier models, i.e. the Theory of Planned Behavior, that take into account both internal and external constraints. This dedication to examining individuals' context and constraints in socio-environmental research is for the most part an attempt to close the "value-action gap," or the empirical reality that attitudes and beliefs fail to predict behavior (Blake, 1999).

Such attempts more than ever require the melding of methodologies. To understand the determinants of pro-environmental behavior, one cannot simply monitor an individual's market behavior, or ask him or her questions regarding his beliefs or values about climate change. Often one must do both, either working simultaneously, which can sometimes be difficult—if not impossible, or else rely on multiple population samples, which generate validity and financial concerns. Thus, in order to successfully close the value-action gap, new methods and new technologies may be necessary. Paper surveys, telephone interviews, and willingness-to-pay (WTP) or accept (WTA) studies, while still very important, may now be complemented—if not replaced entirely in some cases—by studies that rely on mobile technology and real-time monitoring of individuals' behavior, beliefs and values.

Certainly technology is moving at a faster speed than that which our core disciplines can maintain. Peer-review and the replication requirement guide much of our research, and studies that rely on or introduce new technologies and methods may find themselves without a rudder in bodies of literature that are decades old. This is of course a necessary process, one that mitigates the scientific and normative power of one-time and one-off studies that utilize unknown, un-replicable or unclear methods. At the same time, scientists must be careful not to rely too heavily on only proven methods and technologies, as they may, in avoiding or resisting evolution of their craft, miss the proverbial boat.

1.1. Four Models of Pro-Environmental Behavior

Predicting, and altering, human behavior is not easy. The number of determinants one must consider is high. Those determinants can be internal, or specific to human beings in general, such as one's beliefs, attitudes, intentions and perceptions. Or, they can be external, i.e. dependent upon individuals' context, such as knowledge, income, opportunities to act, appreciation of norms, or level of self-control. The number of theories and models used to describe the process of human behavior is equally high. However three models and theories in particular have come to inform much of today's research in the socio-environmental arena, and an introductory examination of each will situate the reader well to understand the theoretical framework that was ultimately chosen for this thesis and the current project. Any investigation of pro-environmental attitude and behavioral theory would also be incomplete without a brief summary of the work's history.

While each of the following models primarily investigates the internal socio-psychological determinants of behavior, each does so from a unique perspective. The first

focuses on attitudes and intentions; the second focuses on personal and social norms, and the third focuses on worldviews (each of these terms will be defined below). While each involves the examination of individuals' values, none does so as explicitly as the fourth model, which investigates individuals' specific value orientations and searches for associations between those orientations and the individuals' pro-environmental behavior. It was this theoretical model (Schwartz, 1994; Brown & Kasser, 2005; Kasser, 2010) that was ultimately chosen to inform this thesis and the current study. A more in-depth examination of this theoretical construct begins in Section 1.1.4.

1.1.1. Rational-Choice Theories of Behavior

The first models this thesis examines are that of the social and cognitive psychologists or rational-choice theorists who examine behavior especially as a "function of processes internal to the individual" (Guagnano et al., 1995: 700). These theorists, or at least those authors engaged in socio-environmental research, typically date their models' origins back to Fishbein and Ajzen's Theory of Reasoned Action (Fishbein, 1967; Ajzen & Fishbein, 1980). This socio-psychological model was based on both the presumption that individuals are rational and make systematic use of the information around them in their decision-making, and that a person's intention was the immediate determinants of one's action. Intentions were defined as the motivational factors that influence a behavior, i.e. how hard people are willing to try, or how much effort they are willing to exert. The greater the intention, the greater should be that individual's performance (Ajzen, 1991).

Intentions, then, are the functions of two determinants themselves: one's attitude toward the behavior, and one's subjective norm. An attitude is the degree to which an individual favors

or disfavors the behavior in question, and the subjective norm is a social factor that refers to the implied or perceived social pressure to (or not to) perform the behavior. By determining the relationship between attitudes and norms an investigator begins to understand and becomes able to predict individuals' behaviors (Ajzen & Fishbein, 1980). It is important to note that Fishbein and Ajzen believed that external factors, while certainly influential, were internalized as affecting an individual's beliefs—which then determine his or her attitudes; i.e. "an external variable will have effect on behavior only to the extent that it influences the determinants of that behavior" (ibid: 9)

The belief amongst rational-choice theorists that external variables influence only an individual's determinants of behavior has held for decades. Even Ajzen's (1991) reinterpretation of the Theory of Reasoned Action maintains such a distinction, arguing that as a general rule the stronger a person's intention to engage in a behavior, the more likely should be that behavior's performance. Yet, he added, that intention can only find expression if the behavior in question is under volitional control, i.e. "if the person can decide at will to perform or not perform the behavior" (ibid: 182). The performance of most behaviors depends to some degree on non-motivational factors like the availability of requisite opportunities and resources, e.g. time, money, skills, cooperation, or climate. It is these factors that represent an individual's actual control over the behavior (ibid). Intentions then would be expected to influence performance only to the extent that the person has behavioral control.

Ajzen's Theory of Planned Behavior thus has in addition to (1) *attitudes toward the behavior* and (2) *subjective norms,* (3) *perceived behavioral control (PBC)* as a central tenet. This differs from actual behavior control, which as stated above would be determined by the availability of necessary opportunities and resources. Instead, *PBC* is one's perception of the

ease or difficulty of performing the behavior of interest (ibid). This is very close to Bandura's (1977; 1982) notion of self-efficacy, or "an individual's confidence that he or she can perform a particular behavior*" (*quoted in Bagozzi, 1992: 180*).*

Studies of *PBC* show that people's confidence in their abilities to perform specific behaviors strongly influences their choice of activities, preparation for an activity, the effort expended during that activity, as well as thought patterns and emotional reactions (Bandura et al., 1977; Bandura et al., 1980).

1.1.2. Personal Norm Theories and Pro-Social Behavior

The second model widely used by socio-environmental researchers is that of Schwartz's (1977) Norm-Activation Theory of Altruism. Many pro-environmental behaviors are characterized as altruistically motivated behaviors or pro-social behaviors. Altruism is defined as feeling or acting on behalf of the welfare of others in cases where self-interest could not be involved (Jencks, 1990). According to Schwartz (1977) it is especially in regards to these scenarios that "personal norms" become key (ibid: 222). Such altruistic or helping behaviors are initiated by exposure to the need of another, and Schwartz offers three explanations for the process that connects that perception of need to the helping intention: (1) arousal of emotion, (2) activation of social expectations, or (3) activation of self-expectations. It is only this last that is codified as a personal norm.

To link back to Fishbein and Ajzen's theories of reasoned action and planned behavior (see above), it may help to think of (1) and (2) as being attitudinal (or intentional) and social-normative, respectively. Or, as Schwartz states, the arousal of emotion may even be less its own distinct variable and instead collapsible within (3). If (1) is a manifestation of empathy, then it

may be the need to relieve one's *own* distress. Conversely, the greater one envisions the perceived need of the other the more likely he may activate his own personal norms (ibid).

The *activation* of social expectations on the other hand is unique from their *arousal*. Activation means a cognitively driven "directing of attention to expectations sufficient to bring them in to the stream of information processing" (ibid: 225). These social expectations are learned in the normal course of socialization and are activated by explicit or subtle communications from others. They are also implicitly backed by socially mediated sanctions, which despite being mild, remote or even improbable, are the ultimate reason why expectations motivate behavior (Blake & Davis, 1964). It is not unfounded to suggest that the urge to meet these social expectations may also ultimately collapse into self-expectations (Schwartz, 1977). And self-expectations are instead experienced as feelings of moral obligations. Behavior then is motivated by the "desire to act in ways consistent with one's values so as to enhance or preserve one's sense of self-worth and avoid self-concept distress (ibid: 225).

To clarify, Schwartz's theory is based on three basic propositions: an obligation proposition, an activation proposition, and a defense proposition. They are listed below:

1. Altruistic behavior is influenced by the intensity of moral (personal) obligation, which an individual feels to take specific helping actions.
2. Feelings of moral obligation are generated in particular situations by the activation of the individual's cognitive structure of norms and values.
3. Feelings of moral obligation may be neutralized prior to overt action by defenses against the relevance or appropriateness of the obligation.

(Schwartz: 1977: 227)

These propositions suggest three corollaries from which testable hypotheses can be derived:

1. Individual differences in feelings of moral obligation to perform particular actions lead to individual differences in overt behavior.
2. The impact of feelings of moral obligation on behavior is a function of conditions, which influence the initial activation of the individual's cognitive structure of norms and values.
3. The impact of feelings of moral obligation on behavior is also a function of conditions which influence defense against the relevance or appropriateness of the activated obligation.

(ibid: 227)

The activation proposition and its corollary suggest that the impact of feelings of moral obligation on behavior is a function of factors, the most notable two being the awareness of consequences of one's behavior for others or the environment (AC) and the extent to which one ascribes responsibility to him or herself for changing the offending condition (AR) (ibid; Stern et al., 1993). Schwartz argues that AR should be relabeled RD, or responsibility denial; as opposed to a spontaneous tendency, it is instead generally a tendency to accept rationales for denying responsibility (1977).

Because Schwartz stresses *norms* and *values*, as opposed to Ajzen and Fishbein's *beliefs, attitudes* and *intentions*, a proper definition of each is necessary. *Norms* are "what should or should not be done by particular types of actors in given circumstances," while *values* are "standards of desirability that are more nearly independent of specific situations" (Williams, 1968: 284). Kasser (2010) describes values a bit differently; this will be discussed below.

However for clarification, equality is a *value*, while feeling that all high school graduates should have equal opportunities to go to university is a *norm*. Norms are either pre-existing based on past circumstances from which individuals draw their current self-expectations (Pruitt, 1972), or constructed by reference to general norms and values they have internalized in the past (Schwartz, 1977). This process is experienced as feelings, as opposed to intellectual judgments of right and wrong (ibid: 234).

Schwartz (ibid) presumes that the norm construction process can be instigated simply by asking people how they feel they ought to behave, i.e., "under circumstances X, would you feel a moral (personal) obligation to do Y?" *Obligation* is the term used because it refers to action, and so is particularly beneficial in attempting to predict behavior. It is also a relatively neutral term and so avoids positive or negative self-evaluations that may instead emphasize guilt-avoidance as the primary motive for conforming to internal obligations (Fenichel, 1945).

Below is an adapted outline of Schwartz's procedural model.

I. Activation steps: perception of need and responsibility
   a. Awareness of a person, object or condition in a state of need
   b. Perception that there are actions which could relieve the need
   c. Recognition of own ability to provide relief
   d. Apprehension of some responsibility to become involved

II. Obligation step: norm construction and generation of feelings of moral obligation
   a. Activation of preexisting or situationally constructed personal norms

III. Defense steps: assessment, evaluation, and reassessment of potential responses
   a. Assessment of costs and evaluation of probable outcomes

IV. Response step

a. Action or inaction response

(Schwartz, 1977: 241)

One should immediately note the similarities between Schwartz's model and Fishbein and Ajzen's model. They both attempt to internalize within the model what can be considered and are considered by many today to be external constraints and effects. As opposed to measuring an individual's ability to recycle in the distance between her residence and the recycling facility, or her availability of transportation, both the Theory of Planned Behavior (Ajzen, 1991) and Norm-Activation Theory (Schwartz, 1977) can internalize that ability and availability as *perceived behavioral control* and the "recognition of [one's] own ability to provide relief" and "assessment of costs," respectively (see Schwartz's model above). Ajzen (1991) does acknowledge of course, as mentioned previously, that these same conditions can also be considered non-motivational factors and will typically attenuate the intention-behavior relationship.

1.1.3. The New Environmental Paradigm

The third development in attitude-behavior research, as opposed to the two discussed previously, was specific to the socio-environmental arena. In 1978, Riley Dunlap and Kent Van Liere introduced a new concept, or worldview, of environmental concern, entitled the "New Environmental Paradigm" (1978). They argued that many of the U.S.'s ecological problems stemmed from its traditional values, attitudes and beliefs, namely, belief in abundance and progress, devotion to growth and prosperity, faith in science and technology, a commitment to laissez-faire economy, limited governmental planning and private property rights (ibid: 10). These combined to form a "dominant social paradigm" (DSP) or worldview, i.e. a "way in which

individuals interpret the meaning of the external world…[and] a mental image of social reality that guides expectations in a society" (Pirages & Ehrlich, 1974: 43-4).

As opposed to Heberlein (1972), who argued for an earlier shift in the way individuals saw the natural world, one inspired by an environmental or land ethic, Dunlap and Van Liere (1978) argued that new ideas like the inevitability of "limits to growth" and the necessity of achieving a "steady-state" economy, in addition to the rejection of the "anthropocentric notion that nature exists solely for human use" inspired a challenge to the DSP (e.g. Daly, 1973; Meadows et al., 1972). Such a challenge they entitled the "New Environmental Paradigm" (NEP). They then created a 12-item scale that attempted to measure individuals' acceptance of the NEP, eventually arguing that the scale created was both an internally consistent and valid instrument of measurement.

Today the NEP scale is one of the most widely used social-psychological measures of environmentalism (Stern et al., 1999). Yet it is often treated as a measure of endorsement of a fundamental paradigm or worldview, as well as of environmental attitudes, beliefs, and even values, according to Stern et al. (1995). This "ambiguity is a result both of the inherent ambiguity in measuring these phenomena as well as Dunlap and Van Liere's failure to ground NEP in social-psychological theories of attitude structure" (Dunlap et al., 2000: 427). It is lauded as a folk ecological theory from which beliefs about the adverse consequences of ecological change can be easily deduced (Stern et al., 1995), while also being recognized as dealing only with very general attitudes that very often fail to predict congruent behaviors (e.g. Schuman & Johnson, 1976). According to Dunlap et al. (2000), it is reasonable to argue that NEP taps "primitive beliefs" about the nature of earth and our relationship to it—Rokeach (1968:

6) defines primitive beliefs as forming the inner core of a person's belief system and representing "his basic truths about physical reality, social reality and the nature of the self."

Dunlap et al. (2000) revised their NEP scale in the year 2000, making it more comprehensive and alleviating a lack of balance in the original scale's item direction, also calling it the "New Ecological Paradigm."

1.1.4. Value orientations and Pro-Environmental Behavior

The preceding introductions provide the reader with both a background and a foundation for examining this thesis and the current study's theoretical framework regarding pro-environmental behaviors. Fishbein and Ajzen (Fishbein, 1967; Ajzen, 1991) focused on attitudes and intentions; Schwartz (1977) focused on personal norms; and Dunlap and Van Liere (Dunlap et al., 2000) focus on global worldviews. To be sure there are a great many more determinants and theories, such as those theories focused on affective influences (e.g. sympathy: Allen & Ferrand, 1999; emotional affinity: Kals et al., 1999; empathy: Schultz, 2000). Yet within each, an individual's values play a key role, either in informing the proto-determinants of behavior, such as Fishbein and Ajzen (Fishbein, 1967; Ajzen, 1991) and Dunlap and Van Liere's (2000) "primitive beliefs," or in constructing the norms that become activated in Schwartz's (1977) theory of altruism. None of the three focuses specifically however on the importance of individuals' values in determining their pro-environmental attitudes and behavior. Nevertheless, recent work by Kasser (2010), amongst others (e.g. Dietz et al., 1998: Stern et al., 1995) has found that general theories of values, Schwartz's (1994) in particular, can be extremely useful in identifying individuals' likelihood and willingness to engage in pro-environmental behavior (Stern, 2000).

Furthermore, Kasser also places individuals' subjective well-being, or happiness, within the domain of behavioral determinants, in particular those affecting pro-environmental behavior (Brown & Kasser, 2005). Despite the small number of studies, there are research findings that suggest that satisfying our desires, i.e. pursuing our subjective well-being—which also happens to often be value-specific—is both compatible with and may even lead to increased pro-environmental behavior (DeYoung, 1996, 2000; Eigner, 2001; Sohr, 2001).

As a result, the current study—while also examining the joint application of ESM as a method and the Apple iPhone as an instrument in socio-environmental research (as will be discussed in Chapter Two)—examined the interaction of values and subjective well-being with individuals' pro-environmental behavior. The next four sections present Schwartz's (1994) structure and content of values, which inform Kasser's (2010) research and ultimately that of the current study.

1.2. Schwartz's Structure and Content of Values

Schwartz acknowledges that the commonly accepted definition of a value, as opposed to an attitude, is that it is a "belief pertaining to desirable end states or modes of conduct that transcend specific situations, guides selection or evaluation of behavior, people and events, and is ordered by importance relative to other values to form a system of value priorities" (Schwartz, 1994: 20, 1992; Schwartz & Bilsky, 1987, 1990). While helpful, this definition both presumes there to be an infinite number of specific values and does not tell anything about what different *types* of values there are (Schwartz, 1994). In order to move past simply comparing individual values, which tells us little, Schwartz redefined values as "desirable trans-situational goals, varying in importance, that serve as guiding principles in the life of a person or other social

entity: (ibid: 21). He then argued that these values speak to three "universal requirements," i.e. the "needs of individuals as biological organisms, requisites of coordinated social interaction, and requirements for the smooth functioning and survival of groups" (ibid: 21). In meeting these requirements ten types of values materialize: power, achievement, hedonism, stimulation, self-direction, universalism, benevolence, tradition, conformity, and security. Schwartz (ibid) adds an eleventh value, spirituality; however he acknowledges that this last value does not speak to one of the three universal requirements and thus may not be existent across all cultures.

Schwartz then, in attempting to structuralize the value-types, argued that, "actions taken in the pursuit of each type of values have psychological, practical, and social consequences that may conflict or may be compatible with the pursuit of other value types" (ibid: 23). For instance, striving for power in general precludes one from seeking benevolence, whereas pursuing hedonism is generally compatible with the seeking of stimulation. The value-types then, according to Schwartz, could be classified more generally into four groups: (1) self-transcendence (universalism and benevolence); (2) conservation (security, conformity and tradition); (3) self-enhancement (achievement and power); and (4) openness to change (stimulation and self-direction, and to some extent hedonism) (ibid: 24). Self-transcendence is in opposition to self-enhancement, and openness to change is, quite logically, in opposition to conservation. These oppositions are of particular importance in socio-environmental research (Kasser, 2010).

1.2.1. Self-Enhancement Values and Pro-Environmental Behavior

Kasser (2010) argues that one set of values in particular, those of Schwartz's (1994) self-enhancement group, i.e. power and achievement, is responsible for much of the ecological crisis

humans face. He further states that this value group also aligns with an "extrinsic" or "materialistic" cluster consisting of three types of goals: (1) financial success, or the desire for money and possessions; (2) image, or the desire to have an appealing appearance; and (3) status, or the desire to be popular and admired by others (Kasser, 2010: 90).

Studies abound documenting the association of self-enhancing values and extrinsic goals with individuals caring less and doing less about environmental protection and stewardship. Kasser (2010) lists a number: (1) Saunders and Munro (2000) and Good (2007) identified that materialistic values are associated with lower biophilia, or the belief that there is an instinctive bond between humans and other living beings; (2) Schwartz (1992, 2006) showed that self-enhancing values are associated with individuals caring less about protecting the environment and attaining unity with nature; and (3) Schultz et al. (2005) identified that across nations high achievement and power values were associated with worse environmental attitudes.

More importantly perhaps is that high self-enhancement values have been identified as being negatively associated with pro-environmental behavior and positively with ecologically destructive behavior. Richins and Dawson (1992), Brown and Kasser (2005) and Gatersleben et al. (2008) all demonstrated results that support the former association, while Dechesne et al. (2003), Kasser and Sheldon (2000), and Sheldon and McGregor (2000) all demonstrated results that support the latter (see Kasser, 2010). Futhermore, nations that exhibit high self-enhancement value numbers, or more specifically, *mastery values*, i.e. manipulating the world to serve one's own interest, have higher ecological footprints than those nations with lower mastery value figures (Kasser, 2010, in press)

1.2.2. The Causes of Self-enhancement Values

Kasser et al. (2004) argue that the research (e.g. Ahuvia & Wong, 2002; Banerjee & Dittmar, 2008; Kasser et al., 1995) suggests two primary pathways lead to high materialistic, or extrinsic, values: social modeling and felt threats, or insecurity. Investigating these pathways is important, as will be seen below. The first, social modeling, occurs when "individuals are exposed to people or messages in their environment suggesting that money, power, possessions, achievement, image and status are important aims to strive for in life" (Kasser, 2010: 92). As opposed to Schwartz's (1977) altruistically motivated behavior and pro-social norms, these aims almost exclusively involve activating individuals' self-interest. The second, insecurity, as demonstrated in the literature, leads individuals to orient toward materialistic aims. Kasser (2010: 93) gives the example of children's self-enhancement values being higher when they experience poverty or a "cold, controlling mother" (e.g. Cohen & Cohen, 1996; Kasser et al, 1995; Rindfleisch et al., 1997; Williams et al., 2000).

Even considering insecurity, such as economic hardship, poor interpersonal relationships, hunger, personal self-doubt, social exclusion, or fearing one's own death, increases the priority that individuals place on materialistic aims or ecologically destructive behavior and attitudes (see Kasser, 2010: 93 for a complete list of studies).

1.2.3. Self-transcendent Values and Pro-Environmental Behavior

Kasser (2010) and Schwartz (1994) argue that certain values and goals necessarily lie in opposition to one another. Self-enhancement values, like power and achievement, or extrinsic goals, like image or status, are psychologically, socially and actively opposed by two self-transcendent values: benevolence and universalism, and the intrinsic goals of self-acceptance,

affiliation and community feeling. Empirical research demonstrates that these oppositional values and goals are positively associated with pro-environmental attitudes and behavior. Schultz et al. (2005) demonstrated that self-transcendent values were positive predictors of individuals having engaged in a set of 12 environmentally helpful behaviors, and Gatersleben et al. (2008) and Kasser (2005) found that generosity, which Kasser (2010) argues is akin to universalism and community feeling, predicted more pro-environmental attitudes. Finally, nations that report high *harmony* values, again akin to the value and goal of universalism and community feeling respectively, have significantly lower CO_2 emissions than those countries who rate materialistic goals as important (Kasser, 2010, in press).

1.3. Subjective Well-Being and Pro-Environmental Behavior

Just as an introduction to value orientation theory was necessary to locate the current study, an introduction to the role subjective well-being (SWB) has played in pro-environmental behavior research is also needed, as the current study examines both.

DeYoung (2000) argues that the two most popular motivations used to induce individuals to act pro-environmentally are financial, or material, incentives and focusing on altruism, ala Schwartz's (1977) Norm-Activation theory. DeYoung (2000: 510) identifies that such "single-determination theories" remain popular, despite centuries of evidence demonstrating that there are likely multiple determinations. There are problems with both motivations. Incentivizing, while often able to initiate pro-environmental behavior, seems unable to produce durable behavioral change (e.g. Dwyer et al., 1993; Katzev & Johnson, 1987) and can sometimes discourage behavior as seen in the Israeli Day-Care experiment (Gneezy & Rustichini, 2000).

Even if the incentivizing continues indefinitely, which is rare, participation rates ultimately begin to drop (Katzev & Johnson, 1987).

Reactance—the phenomena of participants doing the opposite of what is asked of them (Brehm, 1966)—is often to blame in cases involving altruistic motivations (Schwartz & Howard, 1981). Reactance in these cases can be caused by individuals' suspiciousness following a high-pressure appeal, psychological reactance, or over-justification. Similar to Gneezy & Rustichini's (2000) results, "external pressures to provide aid [may] undermine the internalized motivation to perform altruistic actions" (Schwartz & Howard, 1981, quoted in DeYoung, 2000: 512).

Focusing on individuals' self-interest, however, as opposed to altruistic or financial motivations, may be a potential solution to the problem of pro-environmental behavior, notes DeYoung (ibid). In a study of individuals' multiple motives for volunteering, it was discovered that those who participate because of self-oriented motives do so longer than those who volunteer for social issues, or because of community-based concerns (Omoto & Snyder, 1995). It is important to note that they also volunteer longer than those who do so because of "value-based reasons" (ibid, quoted in DeYoung, 2000: 515).

Borden and Francis (1978, as noted in Lehmann, 1999: 34) hypothesized some time ago that people who have "satisfied their personal needs are more likely to act ecologically because they have more resources to care about bigger, less personal social and pro-environmental issues." And Geller (1995) proposed that environmentally friendly behavior can only be motivated by individuals actively caring (Allen & Ferrand, 1999), i.e. individuals must focus beyond themselves and be concerned about others in a larger community before they will actively care or act on behalf of the environment. Yet this focus only occurs when an individual's need for self-esteem, belonging, personal control, self-efficacy, and optimism have

been satisfied. This last part is key and separates Geller's (1995) model of active caring from earlier models of norm-activation (e.g. Schwartz, 1977) by acknowledging that the needs of the individual may mediate social norms.

As mentioned previously, De Young (2000) argues that a prominent approach to facilitating pro-environmental behavior has been to focus only on altruism as the crucial motive. Kaplan (2000: 491), however, acknowledges that this focus results in several "inadvertent consequences, including contributing to helplessness and stressing sacrifice rather than quality-of-life-enhancing solutions." He suggests an alternative approach, a product called the Reasonable Person Model. This model stresses three goals: (1) providing a durable source of motivation, (2) reducing the sense of helplessness, and (3) generating innovative solutions that people do not see as threatening (ibid).

Altruism as defined in section 1.1.2 entails sacrifice, since there cannot be a compensating benefit to the self. Kaplan suggests that such a 'negative pay-off' creates serious motivational issues that bring into question the "strategic usefulness of the concept" (ibid: 494). Encouraging altruism communicates a powerful message that adopting pro-environmental behaviors reduces one's quality of life by acknowledging, perhaps inadvertently, the positive relationship between resource use and happiness, and that materialism and waste are more fun. As a result incentivizing altruistic behavioral change is particularly problematic. An example is Schwartz and Howard's (1981) study mentioned above that reported situations in which there was a significant presence of those factors most conducive to activating norms favoring helping, and yet decreased rates of helping behavior.

Are there then only two positions to adopt, that of the altruist who must put aside the "issue of gain, of self-interest, in human behavior" and the "economic man" who argues that gain

is all that matters" (Kaplan, 2000: 496)? If so, then neither position is satisfying, Kaplan argues. Instead, he suggests, we should focus on four aspects of human cognition, or information processing, each of which likely has strong behavioral and motivational implications (Kaplan & Kaplan, 1989):

- people are motivated to know, to understand what is going on; they hate being confused or disoriented
- people are motivated to learn, to discover, to explore; they prefer acquiring information at their own pace and in answer to their own questions
- people want to participate, to play a role, in what is going on around them; they hate being incompetent or helpless
- people avoid contexts that they consider conducive to helplessness

(Kaplan, 2000: 498)

The last motivation is key; Levin (1993) reported that more information often leads not only to greater concern but also to a greater sense of helplessness. Allen and Ferrand (1999) in their test of Geller's theory of active caring found that personal control, or the "opposite of helplessness" in Kaplan's words (2000: 499) was the only significant predictor variable associated with pro-environmental behavior.

Thus it seems it is not selfishness, but self-interest that is the motivator, i.e. not an individual "selfishly consuming resources or creating waste without concern for others," but instead an individual "taking care of [oneself] and maintaining [one's] ability to function effectively in a challenging and frequently chaotic world" (DeYoung, 2000: 515). Furthermore, happiness need not be inherently or necessarily selfish. Although it is experienced personally, it can be derived from "such things as enhancing the well-being of another person or the

sustainability of an ecosystem" (ibid: 515). Wallach and Wallach (1983: 201) argue that "we are satisfied or pleased if we attain what we (really) want; we are made happy if something that we (really) wish for comes to pass." Thus happiness, and in turn our subjective well-being is not necessarily egoistic, but instead intrinsic. Kasser (2002) reviews a substantial body of research that suggests individuals who are intrinsically oriented, as opposed to those who report being extrinsic or materialistically oriented, report greater personal well-being (see Kasser, 2002). And Richins and Dawson (1992) report that extrinsic individuals also have lower subjective well-being and engage in fewer pro-environmental behaviors.

1.3.1. Value orientations, Subjective Well-Being and Pro-Environmental Behavior

Brown and Kasser (2005) in their study of psychological and ecological well-being examined the relationship between individuals' subjective well-being and their pro-environmental behavior (or ERB—ecologically responsible behavior), as well as the relationship between their value orientation, i.e. intrinsic or extrinsic, and their mindfulness, and their pro-environmental behavior. They discovered that both, SWB & ERB, and intrinsic value orientations and ERB, along with mindfulness, were positively correlated. Furthermore, they were able through their analysis to find support for their propositions, stating quite emphatically that, "happy people live in more ecologically responsible ways because such individuals hold intrinsically oriented values and are more mindful of their experience and behavior" (ibid: 360).

The two offered hypotheses regarding the reasons behind these connections, suggesting that:

> "Intrinsic values are, by their very nature, not dependent on material goods for their fulfillment; thus, energy invested in intrinsic pursuits may mean less

> energy devoted to some of the consumption-based activities reflected in the ecological footprint analysis and certain of the environmentally friendly behaviors assessed here. For example, people holding more intrinsic values are unlikely to be very interested in large ‘‘trophy’’ homes or gas-guzzling vehicles that often reflect ostentatious displays of wealth or image enhancement. Further, the focus on community that is a component of an intrinsic value orientation (Kasser & Ryan, 1996) might lead individuals to try to decrease the ecological impacts of their behavior so as to benefit future human generations as well as other species."
>
> (Brown & Kasser, 2005: 361)

1.4. The Need for Expanded Studies and Methodology

1.4.1 Socially Desirable Responding (SDR)

Brown and Kasser (2005) acknowledge that social desirability responding (SDR) may have had a part to play in their study on SWB, mindfulness and pro-environmental behavior. Edwards (1957: vi) defines SDR as "the tendency of subjects to attribute to themselves in self description, personality statements with socially desirable scale values, and to reject those with socially undesirable scale values." Paulhus (2002: 49) defines the SDR *bias* as the "systematic tendency to answer questionnaire items" with "overly positive self-descriptions," and breaks SDR into two components: self-deception and impression management (ibid: 56). Self-deception takes the form of either enhancement, i.e. promoting positive qualities, or denial, or the disavowing of negative qualities (Paulhus & Reid, 1991). Impression management involves consciously or deliberatively distorting self-descriptions to fool an audience (Sackeim & Gur,

1978), or else the habitual presentation of a specific positive public impression (that could be construed as an aspect of personality) (Paulhus, 2002).

A great deal has been made of SDR outside socio-environmental research and a number of operationalizations exist (e.g. Edwards, 1957, 1970; Wiggins, 1959; Eysenck & Eysenck, 1964; Crowne & Marlowe, 1964; Paulhus, 1984). Paulhus (2002) argues that because of the large number of alternate constructs it is easy for skeptics to discount SDR as empirically invalid. Yet despite such skepticism, there exist theoretical grounds for and particular instances in which one might expect distorted reporting (Goffman, 1959; Schlenker & Weigold, 1989). One of those instances is in the answering of socio-environmental survey questions.

Previous socio-environmental researchers have admitted the limitations in relying on self-reported measures of environmental attitudes, intentions and pro-environmental behavior (Stern & Oskamp, 1987; Tarrant & Cordell, 1997). Tarrant and Cordell (ibid) argue that what people report on a survey is often inconsistent with their real actions (e.g. Bickman, 1972; Heberlein, 1981; Weigel, 1983), and greater attitude-behavior correspondence occurs when actual versus self-reported behavior is measured (Hines et al., 1987). Yet Milfont (2009) points out that Stern and Oskamp (1987) and Tarrant and Cordell (1997), the two papers most often referenced to support SDR in socio-environmental surveys, do not argue for SDR specifically as one of those limitations. Furthermore Milfont (ibid) argues that there are very few studies that test for SDR directly in socio-environmental research and those that have examined it indirectly have found the effect of SDR to be low or non-existent (Kaiser et al., 1999; Hartig et al., 2001; Schahn, 2002; Wiseman & Bogner, 2003; Mayer & Frantz, 2004; Pato et al., 2004).

To get a sense of a few of these studies, a brief summary follows. Kaiser et al. (1999) used an SDR scale (Amelang & Bartussek, 1970) consisting of 32 items (e.g. "I never claim to

know more than I actually do") and found all five of their measures, environmental knowledge, environmental values, ecological behavioral intentions, responsibility factor and general ecological behavior, were marginally influenced by SDR. Hartig et al. (2001) used the Marlowe-Crowne SDR scale (Crowne & Marlowe, 1960) and found that perceptions of restorative quality and reports of ecological behavior were weakly but significantly correlated with SDR item responses. Mayer and Frantz's (2004) investigation of their "connectedness-to-nature" scale (CNS) found both measures of the CNS and new ecological paradigm (NEP) independent from SDR measures. Milfont's own study, which claims boldly that both environmental attitudes and ecological behavior are completely free from social desirability effects (2008: 266), in reality only examines the relationship between Paulhus's (2002) *measure* for impression management and the NEP and Milfont and Duckitt's (2004) ecological behavior scale. This approach of determining individuals' likeliness to distort answers by asking them questions about past behaviors appears to be the only one available to socio-environmental researchers.

Based on these studies and measures, Schahn and Bohner (2002) offer an interesting interpretation of SDR and why it is less problematic than it may appear initially. They argue that most socio-environmental research is conducted to evaluate interventions and not to assess representative population statistics. Since few researchers focus on the absolute values of relevant variables, SDR's effect is mitigated. Yet many socio-environmental researchers *are* trying to determine empirically what is being bandied about theoretically in the literature, namely are general attitudes regarding nature shifting, i.e. are individuals adopting a New Ecological Paradigm or pro-social ethic? An important distinction exists that were one to adopt Schahn and Bohner's (ibid) interpretation one may miss outright; i.e. are those attitudes shifting, or is merely the impetus to commit SDR increasing? Such questions demand attempts to determine a

representative statistic, particularly as climate change and resource depletion become more pronounced both within the public consciousness and as environmental realities.

Schahn and Bohner also argue that in studies of self-reported pro-environmental behavior, conscious distortions of individuals' past behavior "do not appear plausible, since respondents are typically not motivated to distort responses in the context of a research study" (ibid: 24). This tautological argument may seem unsatisfying, particularly to those researchers attempting to determine if respondents distort responses. Instead, Schahn and Bohner (ibid: 24) argue that because of "the necessary effort and the lacking availability of appropriate formulation," those special cases where concern about response distortion is high are often abandoned. Admittedly the effort to examine SDR is substantial, and in certain arenas is perhaps not seen as a valuable pursuit.

Yet this thesis argues the opposite. All of the studies above offer valuable insight into the world of impression management, SDR, and pro-environmental attitudes and behavior, yet such attempts to measure an individual's likeliness to distort his answers by asking him how often he distorts his answers may prove precarious. It is this wariness that motivates the current study, which was an attempt to avoid SDR entirely by both couching the research as a consumer-behavior study and avoiding any reference to the research's true socio-environmental aims. This also aligns with Kasser's (2011) assertion that by simply acknowledging certain value orientations, individuals' behavioral inclinations—and thus their self-reports—can shift.

Brown and Kasser (2005) acknowledge that though SDR may have played a part in their study, they did not consider SDR a serious concern. They report that this was in part because of Kaiser's (1998) research that showed, using Amelang and Bartussek's (1970) social desirability scale, that self-reported environmental behavior is not susceptible to social desirability.

Nevertheless, they list SDR as one of the study's limitations and argue that future studies should pay attention to SDR.

1.4.2. Recall Error and Bias

Brown and Kasser (2005) also relied solely on self-report methods and argued that methods not based on self-reporting are difficult to implement in this type of research. Nevertheless, the authors call for future studies that "request reports over a limited time frame (e.g. the past week), or use diary-based reports of ecological behavior and well-being to help circumvent biases due to retrospective reporting" (ibid: 364). These biases due to retrospective reporting are often termed recall errors or recall *biases*. A brief examination of the most common recall errors and biases and how and why they occur follows.

When comprehending questions, individuals must retrieve from memory whatever information is necessary to construct their answer. And according to cognitive psychologists, they rely on two major memory systems: long term memory and working memory—Yarmey (1979) argues for three: sensory, short-term and long-term. Long-term memory encompasses semantic and episodic (or autobiographical) memory and procedural knowledge like how to ride a bike (Tourangeau & Bradburn, 2010: 320). Working memory is the information we are consciously aware of and that information from long-term memory that is currently being used by some ongoing cognitive process, like the comprehension of language. In order to retrieve the information necessary to answer a question, an individual must move information from the long-term memory, which has limitless capacity but is accessed slowly, to working memory, which is limited in capacity but rapidly accessed. This process is called "remembering" (ibid: 321). Surveyors often use retrieval cues to activate or direct this process.

Tourangeau, Rips and Rasinki (2000) argue that when answering survey questions individuals do one of four things: directly retrieve an existing answer; retrieve general information from which they construct or infer an answer; retrieve specific memories from which they derive an answer, or retrieve an impression. Most survey questions do not ask for existing answers, but require the inference or derivation of an answer from an individual's general or specific knowledge. It is during this process of inference or derivation where many recall errors occur. For one, and of particular relevance to environmental attitude judgments, survey respondents may be influenced by that information which has already been transferred from their long-term memory to their working memory based on previous questions (Schwarz & Bless, 1992). Schwarz et al. (1991) call these "part-whole effects," or the effect that previously answering a specific question may have on answering a general question. If an individual is asked about his marriage, and then asked about his general life-satisfaction, his answer may vary, either positively or negatively, based on the increased accessibility of the information about his marriage. Because individuals are unlikely to retrieve all information that may bear on a judgment, they will naturally truncate the process as soon as enough information has come to mind to form a judgment with sufficient subjective certainty (Bodenhausen & Wyer, 1987).

Part-whole effects are of particular concern when investigating individuals' attitudes; however, there are other sources of recall error that have relevance for both investigating attitudes *and* monitoring behavior. Tourengeau and Bradburn (2010) identify three: (i) information gets harder to retrieve over time; (ii) retrieval fails to come up with the information, even though the information exists; and as previously mentioned (iii) attempts to infer what happened or fill in missing details introduce error. The first is fairly obvious; it is harder to

remember something the more time that has elapsed since it occurred. The second requires an explanation.

Yarmey (1979) and Bartlett (1932) argue that we do not remember events by constructing an exact replication or reproduction, but instead remember general features of experience. In Bartlett's words, we start with some schematized representation of what we wish to remember—which has important implications when considered alongside social desirability response bias. These schemas reflect our "individual understanding of phenomena and are based upon our own personalities, values, attitudes, and general plans of thought" (Yarmey, 1979: 63). Johnson et al. (1993: 14) argue that, "reality is not given directly in perceptual and memory representations but is a product of judgment processes." In undergoing these processes we often incorporate cues that are guesses about what actually happened. Sometimes we incorporate fiction as fact, we believe a self-generated product was of the moment when in fact it was generated or perceived much earlier, and we incorporate misleading suggestions into our accounts of actual events (ibid: 11-13). Time-loss and truth-loss become one, as the retrieving of our 'guesses' becomes more difficult when the event happened a long time ago or we encoded the information poorly.

Not only can we forget and recount fictional events or behaviors, but we can also remember too many events. Neter and Wajsberg (1964) call this "telescoping." Telescoping occurs when we are asked questions about our behavior within a bounded time period, and we report behavior that took place before the period in question. "Constant wave responding" is another strategy that we employ when our memory is poor and we are asked to reconstruct events (Tourangeau & Bradburn, 2010). Since we typically have the best recall for the most recent period, we may reconstruct earlier periods by extrapolating backward from the most

recent period. For example, if asked how often we recycle, we may think only about how often we recycled this week, or even today, and then report that figure as if it were a constant. This is of particular interest in efforts to monitor pro-environmental behavior as most of these pro-social acts do not take much time or effort and are easy to forget. Thus a strategy of anchoring our self-reports on our most recent behavior is an attractive one, and may even result in underreporting.

The implications of recall error are profound. Regardless of whether self-reports of individuals' past pro-environmental behaviors are socially biased, they are likely skewed from the very instance of encoding, which may have taken place long ago. There are two possible solutions to this faulty encoding that Brown and Kasser (2005) argue in favor of and that the current study hoped to incorporate. The first is direct monitoring (of behavior), and the second is decreasing the time between the event (or behavior) and the act of the survey question. A study that uses ESM and the Apple iPhone as method and instrument respectively—as will be discussed in the next chapter—may even in some cases be able to reduce the recall time to the point that the event may still be retained in an individual's working memory.

1.4.3. ESM and the Apple iPhone: In Response

Kasser and his colleagues' (e.g. Kasser, 2010, in press; Brown & Kasser, 2005) work examining Schwartz's (1994) value orientations, subjective well-being (SWB) measures and pro-environmental behavior demands additional attention, not only because of its theoretical value and the empirical evidence in support, but also because of the urgency of many of the environmental dilemmas humans face. Nevertheless, this thesis and the current study are not attempts solely to validate or invalidate that work. Instead this project attempts primarily to accomplish three objectives, only two of which are specifically complementary to Kasser's

(2010) work.

First and foremost, the current study is an application of the joint use of ESM and the Apple iPhone as a socio-environmental survey method, the implications of which may be profound. Next, the study uses that application to examine Kasser (2010, 2011) and Schwartz's (1994) theoretical framework regarding value orientations, SWB and pro-environmental behavior. And third, in doing so, both the method and the instrument are presented as an ameliorating response to the two errors and biases listed in Section 1.4, i.e. socially desirable responding (SDR) and recall error. Each of these objectives, especially the first, will be discussed in the following chapter, and the current study will then be presented in Chapter Three.

Chapter Two:
The Experience Sampling Method and the Apple iPhone

2.0. Introduction

Chapter One concluded with Brown and Kasser's (2005) call for additional research into values, well-being and pro-environmental behavior. It also claimed that ESM, along with the Apple iPhone, was a complementary method that may be able to ameliorate the effects of socially desirable responding (SDR) and recall error. This chapter introduces ESM and its advantages and disadvantages, and examines how researchers might use ESM, along with the Apple iPhone, to investigate the three variables listed above.

2.0.1. Introduction to ESM

It is generally considered that Mihaly Csikszentmihalyi and Reed Larson created the Experience Sampling Method at the University of Chicago in 1975. At the time it was both an effort to satisfy a need and a useful adoption of the latest technology. The need derived from what Csikszentmihalyi and Larson (1987: 526) identify as a "large body of research demonstrating the inability of people to provide accurate retrospective information on their daily behavior and experience" (e.g. Yarmey, 1979). It was also an attempt at *systematic phenomenology*, which, inspired by the German philosopher Edmund Husserl's (1962) pure phenomenology, attempted to reliably measure the events that occurred in individuals' stream of consciousness over time (Hektner et al., 2007). As opposed to the behaviorists who only measure overt actions and consign all mental processes to a "black box," phenomenologists on the other hand examine *only* the mental processes (ibid). Yet systematizing a method in which to

do so would be difficult—Csikszentmihalyi has spent the last thirty years attempting to do so (Csikszentmihalyi, 2000).

Perhaps surprisingly, beepers were the technology that allowed for this type of investigation. Beepers allowed researchers to alert respondents and elicit self-report data at randomized points in time (Csikszentmihalyi & Larson, 1987). Respondents would receive a page and then enter their answer to the proposed question in a journal or research booklet. As opposed to the diary method, which was in wide use before the initial ESM studies and provided "dry and generalized" results "without much discrimination" and "according to predictable scripts," ESM typically generates rich and unique data (Hektner et al., 2007: 34). Beepers were eventually replaced by mobile-phones, but only as signaling devices, and PDAs (personal digital assistants, e.g., Palm Pilots), often only as recording devices.

Not only did ESM both meet a need *and* need a new technology, but it was also purported to meet that need *while* addressing others in socio-psychological research. ESM is a "means for collecting information about both the context and content of the daily life of individuals," a way "to capture daily life as it is directly perceived from one moment to the next, affording an opportunity to examine fluctuations in the stream of consciousness and the links between the external context and the contents of the mind" (Hektner et al., 2007: 6). Its more general purpose is to study subjective experience and ensure ecological validity, capture respondents in various life situations and record their psychological reactions (Csikszentmihalyi & Larson, 1987). It attempts to identify regularities in the stream of consciousness and then relate these regularities to characteristics of the person (e.g. age, aptitude, physiological arousal, well-being), of the situation (e.g. challenges of a job, being a university student), or of the

interaction between the person and the situation (e.g. the dynamics of one's personal relationships) (ibid).

ESM also addresses a number of the shortcomings found in alternate methods aimed at capturing similar phenomena. Csikszentmihalyi & Larson (ibid: 527) list a few. First, scientists engaging in laboratory studies that ask individuals to evoke feelings, behavior and imagery often receive responses that are not typical of experience encountered in real-life situations. Second, in quality-of-life studies, complex phenomena that are often temporally or spatially contingent can only be presented as global assessments. Third, the data is often gathered in retrospect, and outside the context of the life-situation, and thus permits distortions and rationalizations to become important. Finally, studies of time-budgeting often present unclear links between behavior and psychological states.

In attempting to address these shortcomings, Scollon et al. (2003) argue that ESM has over the decades begun to excel in five areas especially. First, ESM allows researchers to better understand the contingencies of behavior. Second, ESM removes the respondent from the lab and places her back into real-life situations. Third, ESM allows for the investigation of "within-person processes" (ibid: 8). Fourth, ESM avoids memory and recall bias and the use of heuristics. And finally, ESM alleviates the need for multiple methods to study psychological phenomena.

This thesis and the current study suggest that ESM is able to go beyond merely the study of social-psychological phenomena and assist in economic and socio-environmental research as well. The rest of this chapter will continue to examine tenets of ESM and discuss the advantages that the adoption of current broadband mobile-phone technology, such as the Apple iPhone, affords future researchers.

2.1. Types of Experience Sampling

Three distinct types of experience sampling exist (Scollon et al., 2003). The first is called interval-contingent sampling and refers to the type of data collection in which participants complete self-reports after a designated interval for a pre-set amount of time (e.g. Nowlis & Cohen, 1968). Event-contingent sampling occurs when participants complete self-reports when a pre-designated event occurs (e.g. reporting after a physical activity, sport, or social interaction, Cote & Moskowitz, 1998). The last, and what will be the primary focus of this thesis and the current study, is signal-contingent sampling, which requires participants to complete self-reports when prompted by a randomly-timed signal.

Scollon et al. (2003) also acknowledge that there are three other similar types of study that are distinguishable from ESM based on the type of data generated. The first is called thought-sampling, and was developed by Hurlburt (1997) and independently by Klinger (1978-1979). Thought-sampling focuses on recording one's inner thoughts and generally dispenses with external events. Hurlburt (1997) distinguishes descriptive-experience sampling; this sampling is used only for gathering qualitative data and typically forgoes any of the psychometric scaling that is commonly found in ESM studies. Stone et al. (1999) distinguish ESM from ecological momentary assessment, or EMA. EMA measures both the "participant's momentary subjective experience" and "the elements of the environment related to the momentary experience" (Scollon et al., 2003: 8). This last distinction is likely the most tenuous, as many ESM studies are EMA studies.

2.2. Resource Requirements of ESM

ESM has for most of its history required a great deal of resources, i.e. time, money and human capital. As opposed to single administration surveys, ESM studies require researchers to engage, sometimes continuously, with their respondents for days and weeks, if not months or years. This engagement is often in the form of signaling, which as stated above relies on an electronic instrument that emits stimulus signals according to a random schedule. For most of ESM's history, beepers or pagers have been responsible for this signaling. However more recently ESM has relied on mobile phones as signaling devices and PDAs (personal digital assistants) as recording devices. For the current study the Apple iPhone, a broadband web-ready mobile-phone, was used, both as a signaling device and a recording device. The advantages of such a device that can serve as both a signaling and recording device will be discussed in later sections.

Due to this high level of resources and commitment, it has been argued that ESM studies are not appropriate for all types of investigation. ESM is designed to capture individuals' representation of experience as it occurs, within the context of daily life, and thus is best suited to measure dimensions of experiences that are contingent on context, i.e. time, place, space and activity (Hektner et al., 2007). Thus global and retrospective questions are not generally considered useful or cost-effective. However as mobile technology becomes more popular and more advanced, the costs of conducting such a study are decreasing, making examinations that were once thought appropriate for single-administration surveys suitable for ESM-investigation (e.g. Killingsworth & Gilbert, 2010).

Kahneman and Krueger (2006) provide a summary of the typical ESM experience from the viewpoint of the respondent. In this example the participant is using a handheld computer or PDA (ibid: 9):

> "Participants in experience sampling studies carry a handheld computer that prompts them several times during the course of the day (or days) to answer a set of questions immediately. Participants are shown several menus, on which they indicate their physical location, the activities in which they were engaged just before they were prompted and the people with whom they were interacting. They also report their current subjective experience by indicating the extent to which they feel the presence or absence of various feelings, such as feeling angry, happy, tired and impatient."

The above description is derived from research that Kahneman and Krueger (2006) and Kahneman et al. (2004) conducted in which they attempted to supplant ESM with an alternate version entitled the Day Reconstruction Method, or DRM. DRM relies on a combination of experience-sampling and time diaries and was "designed specifically to facilitate accurate emotional recall" (Kahneman & Krueger, 2006: 10). Kahneman (ibid) and others argue that DRM, because it is cheaper and easier than ESM and provides similarly accurate data, is the preferred method. Hektner et al. (2007: 277) however argue that DRM is subject to the same biases that more standard diary-reliant methods are, and that DRM very well "might provide information that distorts reality."

What is perhaps lost in such an argument over DRM and ESM is that technology such as the Apple iPhone is capable of reducing the cost of ESM studies to a point that make Kahneman

and Krueger's (2006) concerns unnecessary (e.g. Killingsworth & Gilbert, 2010). And the adoption of broadband mobile-phones not only decreases *financial* costs. Previous ESM studies required researchers to provide significant amounts of instruction to respondents regarding the signaling device and the ESM form, or the booklet in which the respondents were to record their answers. While respondents surely still require an introduction to the study, its intentions, and instructions on how to respond to signals, using mobile-phones as both signaling and recording devices reduces the amount of instruction required by a considerable degree—presuming the respondent is already knowledgeable about using certain features of her phone. There are other advantages to reducing the necessary introduction and instruction, namely, reducing the impact of the study on the respondents' day-to-day activities. The benefits of such a move will be discussed later.

2.3. Reliability of ESM

2.3.1. Internal Validity

Two fundamental questions must be addressed by any research study. Are confounding variables controlled so that the conclusions are warranted? And can generalizations be made beyond the individuals and moments sampled? (Hektner et al., 2007: 104). These are questions of internal and external validity, respectively.

ESM, because it focuses on everyday life, emphasizes external or ecological validity over internal validity (ibid). That does not mean that ESM studies lack internal validity. Internal validity is defined as the correlation between a measure and the true value of the attribute, taken on a set of individuals (Groves, 1987). It is "whether a difference exists at all in any given comparison…whether or not an apparent difference can be explained away as some

measurement artifact" (Webb et al., 1966: 10-11, quoted in Bailey, 1994). Evidence suggests that ESM studies are more internally valid than single-administration surveys (SAS); however Csikszentmihalyi & Larson (1987: 531) admit that because the measure is designed to measure the effects of life situations on psychological states, "perfect reliability would in fact defeat [ESM]'s purpose."

ESM studies benefit from, as Zuzanek (1999) and Kubey et al. (1996) argue, the immediacy of the questions being asked, which reduces recall error and bias, along with the tendency to answer questions using socially desirable responding (SDR) (see Section 1.4.1) for an explanation of SDR and SDR *bias*). Recall error is of particular concern to psychologists, who argue that monitoring individuals in situ is necessary versus asking a participant to recall an event a week or more after the fact (Hicks et al., 2010). These errors can be caused by the emotional state of the participant, the length of time the participant is asked to recall, or simply by the foreign environment in which the participant is located (ibid). Furthermore, these errors have been shown to be systematic (Shiffman et al., 1997). For a more in-depth analysis of recall error see Section 1.4.2.

The randomness of ESM signals also reduces reflexivity bias, or attempts of the respondents to discern the purpose of the research and tailor their responses accordingly (also reducing SDR). Hektner et al. (2007) also argues that because of the large number of signals received, the respondents often habituate to the recording of their personal behavior, and thus forget to some extent that they are being monitored or engaging in a research project. Over-reporting and underreporting are also more likely in SAS (e.g. Lee, 2005), and events and behaviors deemed less important by respondents are often ignored, like idling—or doing nothing

at all, which accounts for a greater amount of time than perhaps thought previously (Csikszentmihalyi & Larson, 1987).

With a method that some might infer as intrusive, there are of course concerns over reactivity, or the phenomenon of respondents answering questions accurately, but changing their behavior because of their participation in the method. Hektner et al. (2007) present evidence suggesting that these concerns are unfounded. Csikszentmihalyi and Larson (1987) found that the vast majority of respondents reported having a normal week and that ESM "captured their week well" (Hektner et al., 2007: 106). Hormuth (1986) found that among German adults only 14 percent considered the signals a bother; however 22 percent said ESM disrupted their daily routine. Larson and Richards (1994) found that over half of the families they surveyed responded, "not at all" to the question, "Do you think the family's week was different because of the study?" And Hufford et al. (2002) found that undergraduate problem drinkers maintained the same level of drinking before, during and after their ESM study period.

Using Apple iPhones as both a signaling and recording device in ESM studies likely has a mitigating effect on each of the errors and concerns introduced above. Simply merging the two devices, signaling and recording, quickens the participants' ability to respond and reduces the amount of hardware, as well as the cognitive load, of participating in the study. While this increase in efficiency may have negligible effects on recall error—as compared to other ESM studies, it surely aids in decreasing reactivity bias. Moving from beepers and research booklets, to PDAs, and finally to mobile-phones certainly decreases the real and perceived intrusion of ESM studies on respondents' daily activities and impressions of normalcy. And because most individuals carry their mobile-phones on their persons at all times, concerns over delayed responses or missed signals should be mitigated as well.

2.3.2 External Validity

Webb et al. (1966: 10-11, quoted in Bailey, 1994) argue that, "external validity is the problem of interpreting the difference [in any given comparison], the problem of generalization. To what other populations, occasions, stimulus objects, and measures may the obtained results be applied?" Hektner et al. (2007: 107) identify that, unique to ESM, the "population" that Webb is speaking about can be thought of in two senses: "as a collection of people or of moments of experience." While all researchers and their projects must consider how well their sample represents the sampled population, ESM researchers must also consider how well their questions represent the population of lived experiences (ibid). Often this is done through comparing ESM and non-ESM studies. Diaries can be compared, as Csikszentmihalyi and Graef (1980) and Robinson (1985) have done. Hoover (1983) compared ESM reports and the readings from heart-rate and activity monitors.

Often situational validity is used instead of standard external validity measurements. Situational validity is derived from examining the internal logic of a reported situation, the convergence of time, context, and activity (Hektner et al., 2007). For example, personal grooming times are likely to be reported at predictable times of day, and participants report talking when they are known not to be alone (ibid). When it comes to measuring internal states of mind, which was of course ESM's original intention, it must be noted that phenomenologically speaking only the individual can truly know whether her response is an accurate representation. However, again, situational validity is often used. People are expected to report internal states that make sense when compared to the activities reported. Hektner et al. (2007: 113) argue that because most ESM studies do report situationally valid results (e.g. Csikszentmihalyi & Larson, 1984; ibid, 1987; Csikszentmihalyi & Schneider, 2000; Wells,

1985), such as being relaxed while watching television, this easily recognized "normal" or "obvious" representation of the world speaks to ESM's validity.

Hektner et al. (2007) also argue that a common use of ESM instruments is to validate non-ESM measures of aggregated person-level characteristics or traits. Such use of ESM was the primary motivation for the current study, which examined value orientations, pro-environmental behavior, and individuals' subjective well-being. All were hypothesized to be time and context-dependent, as well as subject to recall error and faulty generalization by respondents in single-administration surveys.

Admittedly, while mobile-phones and iPhones in particular have a great deal to contribute regarding internal validity concerns, they have less impact on the external—and situational—validity of ESM studies. This is because the questions asked would likely remain unchanged regardless of the specific technology being used—though not necessarily. One area in which iPhones can assist is in the linking of time and context to the internal state or behavior that is the subject of inquiry. This can be done primarily through the use of the mobile-phone's camera. Taking pictures, while increasing the amount of data analysis and perhaps the amount of coding required by the researcher and her assistants, does help to erase doubts or the vagaries found in individuals' self-reports.

For example, Hektner et al. (2007) provide an example of two individuals giving conflicting reports about their being with their partner. A husband reported to be alone, while the wife reported being with her husband. While taking a picture would certainly increase the burden and the invasiveness of any ESM study, it is possible that having the husband and wife take a picture of any persons in their space may have provided a unique answer from that which was previously reported. While the husband and wife may continue to consider their purported

state of aloneness differently, one's picture of the other would give the researcher an objective picture of the situation.

2.3.3. Ecological Validity

Ecological validity, while similar to external validity, varies in important ways. Ecological validity is the extent to which findings can be generalized to the naturally occurring situations in which the phenomenon that is investigated takes place (Brunswik, 1949). This generalization is not only spatial, but also temporal and experiential. ESM allows for the researcher to be able to investigate the various situational contingencies of any psychological phenomenon; in doing so ESM allows her to ecologically validate her theoretical concepts and empirical findings in real life settings (Scollow et al., 2003). It may be easier to think of ecological validity as external validity reversed. If ensuring external validity is ensuring that specific results can be generalized, ensuring ecological validity is ensuring that generalized results hold up in specific situations and contexts, *in situ*. For example, if Csikszentmihalyi's (1988) theories of flow and optimal experience are right, then at certain points of each day and during specific activities, most humans are more cognitively engaged and more highly motivated then at other points. Thus the time, location and specific act of being surveyed would have a considerable effect on an individual's responses to questions regarding his mood.

The ecological moment in which an individual finds himself does not only affect his mood. It may also have a significant effect on his beliefs, values and reported behaviors, especially environmental attitudes and pro-environmental behavior. For example, single-administration research instruments can only measure individuals' concerns regarding pollution, reductions in green-space, or climate change in the context of the survey-act. This type of

engagement necessarily generalizes the individual's response, and leaves out the emotional components of past experience (Hektner et al., 2007: 23). If asked about her level of concern regarding pollution, the individual must remove herself from the social, cultural or even biological context in which that concern more typically materializes. For example, if she is in a laboratory or participating in an online survey, she is likely not able to consider all of the variables and constraints that contribute to her level of concern. On a scale of 1-7, with 1 being "not concerned at all" and 7 being "extremely concerned," she may answer "6." However were she to answer while sitting in a boat on a sunny day in a lake that is isolated from other people she may answer "4." Were she sitting in traffic on a hot, humid day in southern California, she may answer "7." None of these responses is inaccurate or wrong. Instead they capture the natural oscillations that occur in each of our daily lives. Yet single-administration surveys miss these oscillations. ESM on the other hand allows us to examine the context as well as the content of our attitudes and behaviors.

As regards phenomena like personal well-being, ESM allows researchers to examine not only the accuracy but also the robustness of individuals' stated measures of well-being. Instead of asking an individual to generalize his current level of satisfaction (as regards his daily life), one can ask him to report his level of satisfaction at multiple times and places and during different activities during the week. The researcher can then investigate whether or not these levels, which are affected by any number of contexts and constraints, predict the individual's general level of satisfaction. Furthermore one can investigate what exactly those contexts and constraints are, as well as what the specific contributors to that level of satisfaction are, as was done in this study. In this way researchers can get a better picture of not only how individuals behave, but also why individuals behave and believe the way they do.

2.3.4. A Focus on Intra-Personal Variation

Hektner et al. (2007: 9) admit that scientists are "justifiably leery of putting too much credence in what people say about themselves, especially when they describe their thoughts and feelings." They also argue however that subjective experience is the most objective datum we have access to and "trying to reduce it to a more objective standard only decreases its objectivity" (ibid: 10). They argue that if somebody reports that she is happy, then she *is* happy. But what exactly "happy" means to that individual is difficult to determine without examining *intra*personal, as opposed to *inter*personal, comparisons. Scollon et al. (2003) agree that psychologists—amongst others—have called for more idiographic research, i.e. intrapersonal research, over nomothetic, i.e. interpersonal research, since the 1990s (e.g. Lamiell, 1997; McAdams, 1995; Pelham, 1993), yet the latter has formed the mainstay of research. ESM however allows researchers to investigate within-person patterns that may mask patterns that are not visible at mean levels (Scollon et al., 2003: 9).

For example an individual might report that she is happy both while driving a car and while watching television. This may not tell researchers much of anything. However were she to report on a scale of 1-7 with 7 being "extremely happy" and 1 being "completely miserable" that while driving a car she was a "4" and while watching television she was a "6," then researchers would know a great deal more about her definition of happiness, or at least what experiences are representative of her happiness. At a within-person level, researchers are primarily interested in what states go together at any given moment, and not only between emotions, such as guilt and happiness as Scollon et al. (ibid) suggest, but also between activities and emotions, and activities and attitudes. In the previous example, our subject is obviously happier watching television than she is happy driving. Knowing this allows researchers to then

construct a "Z-score" or a mean score on a particular variable and judge how she deviates from the mean in different circumstances (Hektner et al., 2007: 11).

An interesting example of the benefits of ESM intrapersonal investigation is a study done by Oishi et al. (2002) in which the researchers found that across cultures, being with friends increased pleasant mood and decreased negative mood. Other global affective traits existed among samples, but the degree to which situations exerted an influence on the absolute level of affective experience varied across cultures. The benefit of being with others was qualified by culture and gender such that people in some cultures, as well as men in general, received a greater boost from being with friends.

ESM has also been used to investigate the role of resources in subjective well-being examinations (e.g. Diener & Fujita, 1995), something the current study does in its investigation of the effect of well-being and values on pro-environmental behavior and attitudes.

2.4. Critiques of ESM

ESM is obviously not without its disadvantages, as discussed by Kahneman and Krueger (2006) and others above. Hormuth (1986) argues that ESM studies may place too great a responsibility on participants to accurately report the objective features of each moment. They may lack the ability or become ignorant to such features over the duration of the experiment. There are also concerns over reactivity. While reactivity, a methodological "confound that occurs when respondents report accurately but change their behavior or internal experiences as a direct result of their participation in a method" (Hektner et al., 2007: 106), is a concern, the use of broadband mobile-phone technology, as suggested above (in Section 2.2) should work to mitigate such concerns.

The sharpest critique of ESM is the rate of data loss through refusal, non-response or attrition. As stated above, gaining a sample that is large enough to be representative and generalizable is difficult because of the intrusive and burdensome nature of some ESM studies. Lawton (1999) argues that high volunteer rates and signal response rates are difficult to attain and the self-selection bias of those who do volunteer needs to be considered. For example, studies have shown that those individuals who volunteer for ESM have higher grades than those who do not (Mulligan et al., 2000) and college students who volunteered were less anxious, less likely to employ pathological defensive styles, and more well-adjusted than those who refused to participate (Waite et al., 1998).

Scollon et al. (2003: 14) identify self-selection bias as one of the most difficult hurdles facing ESM studies, arguing that ESM studies are indeed onerous and the alarms may "disrupt one's activities, conversations, and work, and may not only annoy oneself but surrounding others as well, such as in church, classrooms, or meetings." They add that filling out the forms may also take over the course of an entire study one hour or more. They inquire as to who would volunteer for such a study, arguing that ESM studies may over-represent participants that may show greater motivation, conscientiousness and agreeableness, participants who have more time (e.g. unemployed people or college students), and participants who are familiar with and physically able to respond to signal technology.

While these are all legitimate concerns, the introduction of broadband technology may alleviate a large number of them. As will be presented in Chapter Three, data-loss and refusal attrition rates were low to non-existent in the current study. Furthermore, using participants' own mobile phones makes the survey process much less invasive and reduces the probability that participants will stop carrying the research instrument at all times—as opposed to studies which

use PDAs or research journals. And while monetary incentives may certainly improve volunteer rates (e.g. Lynn, 2001), one of the focuses of the current study was to intentionally present the examination as novel, enjoyable and minimally invasive. This was hoped to entice individuals who may have forgone a typical ESM-style project. Additional research is necessary in order to confirm that ESM studies using broadband mobile-phones entice less motivated or less willing participants.

2.5. ESM Embracing Technology

For the past two decades ESM has relied primarily on signaling technology, or alerting participants via pagers or telephone calls. Participants would then answer by writing their open- or closed-end answers in a journal or research booklet. Over time, written answers have been exchanged for computerized responses as is demonstrated in Kahneman and Krueger's (2006) portrayal above, and a few social scientists have moved from using personal data assistants (PDAs) to using mobile phones (e.g. Hicks et al., 2010; Killingsworth & Gilbert, 2010). Such advances have allowed researchers to gather data about the specific time and place respondents receive signals, drive triggers and sensors, i.e. ask questions at specific times and places (Hicks et al., 2010), and have participants respond to signals more easily and accurately.

To this point however, there have only been a few forays into using broadband mobile-phones themselves, such as the Apple iPhone, to study socio-psychological phenomena. Killingsworth and Gilbert (2010) used ESM and the iPhone to study mind-wandering and its deleterious effects on individuals' happiness, and Karapanos et al. (2010) used the Day-Reconstruction Method, an alternate form of ESM that asks participants to keep a diary of their day's activities, to examine individuals' user-experiences with iPhones—this study combined

DRM and iPhones, but did not use iPhones as the survey instrument. Just last year Hicks et al. (2010) developed a Droid-powered personal data collection system called AndWellness. This system has yet to be deployed.

Most of the literature regarding the use of mobile phones in socio-psychological research does not reside in socio-psychological or methodological journals, but instead resides in computer science, information systems, and consumer research journals. As a result the focus remains on the development of the mobile technology and the purported advantages such technology will afford social scientists. Little empirical evidence or supposition however exists regarding the second-order advantages, or the advantages *of* these advantages.

2.5.1. Larger Sample Sizes

The most immediate advantage of using broadband mobile-phones in ESM study is the ability to acquire much more data at a significantly reduced cost. This is not to imply that cost-savings is the key advantage, but instead what that cost-savings allows.

Killingsworth and Gilbert (2010) acknowledge that laboratory experiments have revealed a great deal about the cognitive and neural bases of mind wandering, the aim of their latest ESM study; however, little has been discovered about its emotional consequences as they affect individuals in their normal day-to-day activities. "The most reliable method for investigating real-world emotion is experience sampling," they admit; however, "unfortunately, collecting real-time reports from large numbers of people as they go about their lives is so cumbersome and expensive that experience sampling has rarely been used to investigate mind wandering" (ibid: 932). And any investigations that have occurred have been limited to very small samples.

Instead of using a different method however, one that lacked both the high internal and external validity of ESM, the authors developed a Web application for the Apple iPhone. They then used this app to create a large database of real-time reports on thoughts, feelings and actions. The database at publication contained nearly a quarter of a million samples from about 5000 people from 83 different countries ranging in age from 18 to 88 and who, collectively, represent 86 major occupational categories (ibid: 932). This is a staggering amount of data, but even more so for an ESM study, which when relying upon PDAs or research journals, often samples between 50 and a few hundred individuals.

Again, it is not simply the amount of data this Web application provided that is intriguing, but also the new arenas of research that it suggests are available for ESM-style study. ESM need no longer simply be a tool for verifying non-ESM data, but instead, because of the reduced costs that mobile-phone technology provides, can be a cost-effective alternative to non-ESM studies altogether.

The current study, while not nearly as expansive or exhaustive as Killingsworth and Gilbert's (2010) study, suggests that ESM may be a cheaper and easier method to examine pro-environmental attitudes and behavior than administering an SAS.

2.5.2. Flexible Survey Instruments

Another advantage to incorporating technology into ESM studies is *real-time* data collection and analysis. The Killingsworth and Gilbert (2010) study collected—and continues to collect—data in *real-time*; however, they did not analyze it at that time in order to adjust the instrument. The advantages of such immediacy cannot be overstated. Because ESM is necessarily longitudinal in format, instantaneous data collection and analysis allows for the

creation of a *flexible* research-instrument. Researchers cannot only monitor participants as if they were typing their answers into a computer in a laboratory, but they can also alter the composition of the survey instrument so as to personalize it to each respondent or time period—analysis concerns of course must be considered. While computer programming allows for such on-the-fly composition, because SAS examinations typically "exist" for only a few minutes or hours, adjustments generally cannot take into account contextual variables like time or social or cultural events, especially those that are unpredictable.

Using mobile phones as both the signaling and recording device allows for such incorporation. In studies such as the current one, researchers are able to ask questions regarding pro-environmental attitudes and behaviors and well-being while at the same time incorporating difficult-to-predict weather-events like blizzards or heat-waves and social-events like the Japanese tsunami and nuclear near-catastrophe (in 2011). For example, researchers could ask individuals about their beliefs regarding climate change during a heat wave in March or during a random cold-spell in July, and these events would likely have a considerable effect on the resulting data (see Section 2.3.3 on Ecological Validity). Yet coordinating the study so that the specific "hot" day of the week or even the "cold" week of the year coincides perfectly with the actual weather event would be impossible for non-ESM or DRM studies. Having control over the survey instrument provides researchers with the ability not only to guess better, but also to investigate multiple events in single research periods and sample populations. This results in ESM researchers not only being able to examine the reliability of non-ESM studies, but also to study social and environmental events and individuals' reactions to each in the same way that ESM researchers previously examined the effect of different physical or behavioral states on individuals' internal or psychological states.

Such a marriage of ESM and broadband mobile telephones creates a great deal of low-hanging fruit for not only socio-psychological researchers, but also for those researchers who have relied primarily on other methods and technologies.

2.5.3. ESM as a Hybrid Technology: Stated and Revealed Preferences

Using mobile technology such as Apple iPhones to implement ESM studies increases the number and variety of arenas appropriate for experiential research. Such devices also allow for ESM and ESM-style approaches to move beyond personal experience and psychological and phenomenological investigation. The current study is an example of an investigation that, in line with previous studies, examines both the content and context of individuals' psychological states, e.g. their well-being, and hybridizes the repeated-interaction approach of ESM to investigate individuals' behavior and values.

In economics terms, ESM and mobile phones allow for investigations of both stated and revealed preferences, and may provide greater detail and accuracy by accounting for the ecological context of both. Research abounds that relies upon one or the other or, much more common recently, the combination of both stated preference (SP) and revealed preference (RP) models. Both types of experiments have been the subject of considerable criticism. SP data has been critiqued because it is thought consumers react differently to hypothetical experiments than they would were they facing the same alternatives in a real market (Brownstone et al., 2000); also, actual behavior is not observed (Adamowicz et al., 1994). Another issue is that some attributes for new products might be too novel for consumers to completely understand them, and socially desirable options, a particular problem in socio-environmental research, may cause respondents to misrepresent their choices (Brownstone et al., 2000).

RP methods, or indirect methods (SP methods are considered direct methods), are not free from critique either. They often suffer from high co-linearity and limited variation among attributes in real markets (ibid), and cannot be used to examine non-use values (Adamowicz et al., 1994). Combining RP and SP is a way to avoid many of these concerns; Adamowicz's et al. study of recreation sites used RP to determine the respondents' market behavior, and then an SP model to explain the choice of one alternative over the other as a function of the attributes, e.g. travel distance. Brownstone et al. (2000) in their study examined both SP responses and RP behavior in two waves, with the SP data preceding the RP observations by 15 months. Both waves of data were gathered via survey, either telephone or mail.

Certainly these joint-model studies provide data that offer advantages over SP or RP studies alone. Yet in doing joint-model studies, researchers face higher costs and higher resource requirements. Many of these types of studies are longitudinal or require the use of multiple samples. The validity concerns regarding the use of multiple samples are known and require considerable effort on the part of the researcher to mitigate. ESM when combined with iPhones or other broadband mobile technologies offer a low-cost alternative or at least can supplement many joint-model studies. No longer do all researchers need to rely on conducting separate investigations—admittedly many researchers still do and would not benefit from ESM-style studies. However, for many ESM surveys allow for simultaneous investigations, both surveying to acquire stated preferences and monitoring market behavior to acquire revealed preferences.

Such investigations also allow the researcher to leave the laboratory behind. Regarding contingent valuation studies, surely the context of both the question within the survey and the context of the individual within his daily activities have significance. ESM and mobile phones used jointly have two advantages over single-administration surveys. They resist part-whole

effects by isolating the questions asked from each other and can, through the use of geographic and temporal triggers, potentially isolate and align the individuals' experiences purposely with specific questions (Hicks et al., 2010). Instead of asking individuals to recall their purchases from three days prior, or think back to how often they recycle in a week, or imagine how much they would be willing to pay for mass-transit, researchers using ESM and mobile phones can ask participants to describe or photograph their purchases in real-time, text each time they recycle an item over the period of a week, or relate willingness-to-pay (WTP) for mass-transit during a rush-hour commute (remember that texting while driving is illegal in Michigan!)

2.6. ESM and Technology: Expanding Beyond Previous Studies

Hektner et al. (2007: 125) argue that ESM research centers on "the contexts of daily life, the experiential content of life, and the links between context and content." They add that a third dimension is the specific characteristics of the sample of participants. This is obvious in the decades of ESM studies Hektner et al. describe in their text. Each study ranges from monitoring a specific behavior, like sleeping (Stickgold et al., 2001), climbing mountains (Delle Fave & Massimini, 2003), or listening to music (Sloboda et al., 2001) to monitoring a specific population, like widows aged 69 or older (Hnatiuk, 1991), teenagers (Csikszentmihalyi & Larson, 1984) or college students with concealable stigmas (Frable et al., 1998).

No other group has been studied more with ESM than adolescents and teenagers (Hektner et al., 2007: 133). Csikszentmihalyi & Larson (1984) examined adolescents internal and external worlds, measuring what they were doing, how often they were doing it, where, whom with, and the effect that their behavior had on their internal states of mind. Their findings showed that teenagers follow "astonishingly similar patterns," and those patterns vary little based on age, sex,

and social class (ibid: 78). Futhermore, certain activities, such as sports, games, hobbies and conversations merged high motivation with opportunities for learning cognitive discipline (ibid).

Only ESM is able to monitor these psychic peaks and valleys that occur throughout individuals' days. And Csikszentmihalyi has used decades of these studies to develop what he calls the theory of "flow experience," or "intrinsically motivated states of consciousness," which often lead to discoveries of new ideas, artifacts and technologies (1992: 29). Csikszentmihalyi argues that these optimal states allow for the "evolution of consciousness…the evolution of culture…and ultimately the evolution of the human species," all of which hinges on our "capacity to invest psychic energy in goals that are not modeled exclusively on the teleonomy of genes or culture" (ibid: 29). Teleonomy means simply "that the person identifies his or her goals with the genetic instructions programmed in his or her organism" (ibid: 24).

While these flow, or optimal experience, studies are obviously outside the purview of this thesis, any investigation of ESM would be incomplete without their mention. Furthermore, it is this theory of peaks, valleys and flows that makes ESM and ESM-like studies of values and behavior, particularly values that are linked to environmental behavior, so interesting. This thesis argues that such a belief in context and content, or ecological validity, makes the inclusion of ESM studies in socio-environmental research necessary. And ESM works best when in conjunction with other methods, argue Scollon et al. (2003).

With this in mind, it is important to note where else ESM-type studies have and are evolving. While certainly most ESM efforts are spent in socio-psychological investigations of specific groups or specific activities and remain paper-and-pencil or PDA driven (e.g. McCance, 2010; Verduyn, 2009), some of the most recent studies using ESM, aided by broadband mobile-phones, (e.g. Killingsworth & Gilbert, 2010) or those developing the technology (e.g. Hicks et

al., 2010; Uy et al., 2010), are expanding beyond purposive samples. This, according to Zuzanek (1999), would be a significant challenge. And certainly in 1999 it would have seemed so. Yet the advance of mobile technology and broadband capable devices has made the once small sample size and purposive necessity of ESM a thing of the past. Not only increased sample sizes, but more heterogeneous samples are now possible, as seen in Killingsworth and Gilbert's study (2010). Greater heterogeneity both in populations and in activities, events or experiences means greater generalizability and greater external validity across ESM studies. While ESM remains an excellent tool for investigating specific populations and activities, it need not be restricted to those investigations. iPhones and broadband mobile-phones make ESM available to all the social sciences.

It was with this in mind that the current study was proposed, and conducted. As stated previously, Brown and Kasser (2005) argued for additional research into values, well-being and pro-environmental behavior, research that could not only reduce recall error and SDR, but also move past self-reporting. This thesis argues that ESM, along with the iPhone as its signaling and recording device, is a particularly good fit for such efforts, despite having never been used previously in similar investigations. The current research was conducted thus not only because ESM may be able to address recall error, SDR and self-reporting as was requested, but also because it may provide complementary benefits to a great number of socio-environmental investigations. Chapter Three presents the results from the current study in hopes of supporting such claims.

Chapter Three:
An Application of the Experience Sampling Method and the Apple iPhone: Investigating the Effect of Values and Well-being on Pro-Environmental Behavior

3.0. Introduction

The previous chapter introduced the Experience Sampling Method (ESM), and presented a number of rationales for incorporating it into the field of socio-environmental research. It also argued that using broadband-capable mobile phones, the Apple iPhone in particular, would assist not only in the deployment of ESM, but also in gathering more and more accurate data across socio-environmental methodologies. Chapter One described a few of the theoretical models used to investigate pro-environmental behavior as well as identify that behavior's determinants. The introductory chapter's latter half focused specifically on Schwartz's (1994) theories of clustered value orientations and Kasser's (2010) theory that self-transcendent value orientations lead to, if not at least correlate positively with, increased pro-environmental behaviors—for the rest of Chapter Three these theories will be jointly referred to as the "value orientation theory of Pro-Environmental Behavior," or VO-PEB. The chapter ultimately concluded with Brown and Kasser's (2005) call for additional research into value orientations and pro-environmental behavior, in particular research that takes account of recall errors and biases and socially desirable responding (SDR), and if possible moved past self-reporting.

Chapter Three and the study described herein incorporate ESM and broadband mobile-phones and directly respond to Brown and Kasser's (ibid) call for additional value-oriented research. It will be argued here that ESM and the iPhone when used conjointly are particularly adept at reducing recall errors and biases, as well as conducting direct monitoring—as opposed to relying solely on self-reporting. Great efforts were also taken in the current study to reduce

SDR by couching the study as an investigation into consumers' behavior (not participants' pro-environmental behavior). While the study's original title, "Determining the Relationship between Attitudes, Well-being and Private-Sphere Environmental Behavior," may suggest otherwise, the data collected was less specific to participants' attitudes and much more specific to their individual value orientations and those factors that most contribute to their subjective well-being. It also investigated their pro-environmental behaviors, as well as their attitudes regarding renewable energy, sustainability efforts and climate change.

Chapter Three begins with an overview of the study and its specific rationales and objectives. The chapter will then present the study's hypotheses followed by an analysis of the data collected. The chapter will then conclude by presenting the results, a brief discussion of their implications, and suggestions for additional research.

3.1. Overview of the Current Study

The data presented in this chapter comes from the study entitled "Determining the Relationship between Attitudes, Well-being and Private-Sphere Environmental Behavior," a project sponsored by the Sustainable Michigan Endowed Project (SMEP) and Michigan State University. It consisted of an examination of 71 Michigan State University sophomores, all of whom were individually surveyed using the Experience Sampling Method (ESM) and the students' Apple iPhones. These surveys were conducted during four one-week periods across January and February of 2011. Researchers initiated this study in September of 2010 with three objectives in mind: first, (RO:1) develop and test a robust, rapidly deployable, and near real-time instrument for measuring individuals' attitudes, values, well-being, and private-sphere pro-environmental behavior; second, (RO:2) use the instrument in the examination and interpretation

of the relationship between attitudes, values, well-being and behavior; and third, (RO:3) attempt to reduce the errors and biases often found in previous socio-environmental studies, studies which identified either through explicit means or implicitly through their content their intended *pro-environmental* goal, vis-à-vis measures of pro-environmental attitudes and behavior.

3.1.1 Method and Instrument: ESM and the Apple iPhone

In order to achieve these objectives the study used ESM, which asks individuals to provide responses to both open- and closed-end questions at several random points throughout each day for the period of one week (Hektner et al., 2007). Instead of asking participants to log their responses in a journal or enter them into a computer, the study adopted the Apple iPhone as its survey instrument. The iPhone is not merely a technologically savvy signaling device; it can act as the interactive medium in which researchers communicate with participants, and the participants communicate their responses to the researchers. The iPhone and ESM complement each other well, as was discussed in Chapter Two; however, a brief summary of their conjoint benefits follows.

One of the critiques mentioned in previous chapters regarding ESM is the burdensome nature of its investigation. ESM requires a great deal of effort on the part of the respondent (and the researcher). That effort is lessened by the use of the respondent's own mobile phone as the signaling and recording device, as was accomplished in this study. As opposed to carrying a journal, PDA, or beeper, the respondent need only carry her cell-phone, a device she likely carries regularly. This study also purposely used SMS messaging and psychometric Likert-scale questions as the primary mode of question and response. This allowed the participant to quickly engage and disengage with the instrument and the survey. Other studies (e.g. Hicks et al., 2010;

Killingsworth & Gilbert, 2010; Uy et al., 2010) have focused on the development of web-based applications which require respondents to log-in or engage physically and cognitively with the survey instrument for greater periods of time.

Respondents generally carry their iPhone with them at all times. As a result such an instrument also encourages more accurate self-reporting of attitudes and activities, phenomena that researchers consider to be time-sensitive measures. Using iPhones as the survey instrument also allows for bilateral communication, something that many scholars who study post-normal science (e.g. Funtowicz & Ravetz, 2003; Batie, 2008; Rittel & Webber, 1973) argue is necessary in order to pursue—if not achieve—sustainability. While this form of communication was not used in the current study, much of the media and value-oriented inquiries used in evincing participants' attitudes and the specific manner in which they were used would likely work well in such pursuits. This study certainly suggests that ESM need no longer be one-dimensional—information can be exchanged between the researcher and respondent and vice-versa, regardless of either's location—and may be a great tool in post-normal deliberative research.

The iPhone also allows for more in-depth queries that use and specialize in interactive multimedia like videos, web-pages, news articles and subject-initiated photographic—and even video—reports. Finally, and specific to this study, the iPhone was chosen as the primary technology because it accentuated the purposely deceptive intention of the experiment, "Determining the relationship between attitudes, well-being and *consumer* behavior." The deceptive element was key in addressing RO-3, as will be seen below.

3.1.2. Research Objectives

The objectives of this study, listed previously in Section 3.1, are as follows:

RO: 1—Develop and test a robust, rapidly deployable, and near real-time instrument for measuring individuals' attitudes, values, well-being, and private-sphere pro-environmental behavior.

RO: 2—Use the instrument in the examination and interpretation of the relationship between attitudes, values, well-being and behavior.

RO: 3—Attempt to reduce the errors and biases often found in previous socio-environmental studies, studies which identified either through explicit means or implicitly through their content their intended *pro-environmental* goal, vis-à-vis measures of pro-environmental attitudes and behavior.

Each of these three objectives speaks to the particular method that was chosen for this study. RO:1 called for both ESM as the primary method and the Apple iPhone as the primary survey instrument. ESM is not typically used in the examination of individuals' global perspectives, such as values, attitudes, or subjective well-being; this is primarily because of the significant costs typically involved (Hektner et al., 2007). However, by incorporating the iPhone as the survey instrument, both the financial costs and the human and capital resources necessary were reduced substantially, certainly to the level of mailed questionnaires and interviews, if not much lower. This allows such inquiries to be made alongside the "snapshot style" questions more commonly found in ESM research.

RO:2 speaks specifically to the current study's examination of VO-PEB, in particular individuals' value orientations, subjective well-being, and their propensities to engage in pro-environmental behavior. RO:3 speaks to Brown and Kasser's (2005) proposition for additional

research that accounts for recall error and biases and socially desirable responding (SDR). In addition the current study's construction as a consumer behavior study avoids inadvertently activating the participants' values, a phenomena that Kasser (2011) argues results in an automatic shift in their attitudes and behavior.

3.1.3. Values, SWB, and Pro-Environmental Behavior in Previous Studies

Schwartz's work (1992, 1994, 2006) identifies 10 types of basic priorities people have across the world, two of which Schwartz identifies as *self-enhancement* values, i.e. power and achievement, and two types of which Schwartz identifies as *self-transcendent* values, i.e. benevolence and universalism (Kasser, 2010). Kasser and his colleagues (e.g. Grouzet et al., 2005; Kasser & Ryan, 1996; Ryan et al., 1999; Schmuck et al., 2000) identify three types of goals they call *extrinsic* or *materialistic*, which align with Schwartz's (1994) self-enhancement values: financial success, image and status. They identify three types of goals they call *intrinsic*, which align with Schwartz's (ibid) self-transcendent values: self-acceptance, affiliation, and community feeling.[1]

Past research shows that self-enhancing and extrinsic values have been associated with attitudes and values that are inconsistent with environmental stewardship (Saunders & Munro, 2000; Good, 2007; Schwartz, 1992, 2006; Schultz et al., 2005) and behavior that is ecologically detrimental (Richins & Dawson, 1992; Brown & Kasser, 2005: Gatersleben et al., 2008; Kasser, 2005, in press). On the other hand, self-transcendent and intrinsic values and goals have been associated with attitudes and values that *are* consistent with environmental stewardship (Schultz

[1] For the remainder of this paper, "self-enhancing, extrinsic and materialistic" will be used interchangeably, as will the terms "self-transcendent and intrinsic."

et al., 2005; Gatersleben et al., 2008; Kasser, 2005) and behavior that *is* ecologically sensitive or pro-environmental (Sheldon & McGregor, 2000; Brown & Kasser, 2005; Kasser, in press). In addition, Ahuvia and Wong (2002), Banerjee and Dittmar (2008) and Kasser et al. (1995) argue that the two primary causes of high materialistic or extrinsic values are social modeling, i.e. being exposed to people or messages suggesting that "money, power, possessions, achievement, image and status are important aims to strive for in life" (Kasser, 2010: 92), and insecurity, i.e. economic hardship, poor interpersonal relationships, hunger, personal self doubt, or social exclusion (ibid: 92). Thus, individuals exposed to a high degree of materialistic social modeling or insecurity are more likely to hold materialistic or extrinsic values than are those who are exposed to a lesser degree of the same. And as such, those individuals will exhibit little pro-environmental behavior.

Regarding subjective well-being, research has shown (Kasser & Ryan, 1993, 1996; Sheldon & Kasser, 1995; Sheldon et al., 2004) that intrinsically oriented individuals report greater well being than those who focus on extrinsic values. And Brown and Kasser (2005) report positive correlations between subjective well-being and pro-environmental behavior. The authors ultimately conclude that "happy people live in more ecologically responsible ways because such individuals hold intrinsically oriented values" (ibid: 360).

All of this research suggests one fairly straightforward supposition: individuals who hold intrinsically oriented values lead happier lives than and perform more pro-environmental behavior than those individuals who hold extrinsically oriented values.

3.1.4. Values, SWB and Pro-Environmental Behavior in the Current Study

In examining the supposition above, the current study asked each participant questions about their values, subjective well-being, and pro-environmental behavior. In order to examine both their values and their SWB, questions were asked about their level of satisfaction, both for the day and in general, and about the specific contributions to that level of satisfaction. For example, participants were asked about the effect that their personal relationships, their personal finances, or their health had on their level of satisfaction. Asking each individual about these effects was intended to examine whether or not each effect or value contributed to their overall satisfaction. If, as Rokeach (1973) suggests, values are the psychological representations of what people believe is important in life, then those individuals who report no effect for a particular question can be thought not to hold or be pursuant of that particular value. As opposed to asking an individual "how much he or she values a particular [goal or value]," asking "what effect does [this value] have on your level of satisfaction" releases the individual from having to *self-identify* his or her motivations and instead should provide responses that more closely represent his or her real attachment to values. More will be said about what effects align with what values (i.e. self-transcendent or self-enhancement) below.

Each individual was also asked two hypothetical questions regarding what type of vehicle they would like to own and what city they would like to live in were cost not a concern. These two questions were aimed at ascertaining both the individuals' value orientations and level of environmental concern.

Regarding pro-environmental behavior, the current study focused on the individuals' diet, transportation and housing choices, as these are typically identified as the most ecologically consequential human activities (Brown & Leon, 1999). Brown and Kasser (2005: 358) identify

that "meat eaters who drive many miles per week and live in large houses have larger ecological footprints than do vegetarians who use public transportation and live in small homes." The study also focused on respondents' recycling behavior, as many previous studies have used recycling as their primary pro-environmental variable (e.g. Guagnano et al., 1995; Hopper, 1991; De Young, 1988-89; Corral-Verdugo, 1997). The study also inquired about the participants' technology choices, e.g. the age and type of their computers, televisions, gaming systems, automobiles, etc. These questions were intended to examine the frequency with which participants exchanged and upgraded technology.

The study also measured how often the individuals dined outside their homes and identified the foods and beverages each individual kept in her refrigerator (through photographs)—photographs were also used to identify participants' recycling behavior. The study also asked about the individuals' transportation choices on multiple days throughout the week. These self-reports and photographs were thought to be more accurate than would be those reports gained through reflective single-administration surveys that suffer from recall error and biases, such as telescoping, part-whole effects, and satisficing. Only the current approach, i.e. that of the Experience Sampling Method and other methods similar, allows for this type of longitudinal behavioral monitoring.

Certainly monitoring individuals' behavior over the period of one week leaves the research open to extrapolation errors, i.e. the faulty assumption that this single week of behavior is representative of the individual's typical activities. However only through additional research or replicating longitudinal studies can those assumptions be verified or rejected.

3.1.5. Science, Expertise and Values in Pro-Environmental Knowledge

The current study asked the participants to watch three short videos (See Appendix A for the video's hyperlinks) and respond to three questions immediately afterward. Each video used a unique approach to inform its viewers about renewable energy, sustainability and climate change. The first, a National Geographic video starring Natalie Portman and Chloe Sevigny, argues that compact fluorescent light bulbs can help reverse the effects of global warming. It was theorized by the researchers to advance a self-transcendent value orientation. The second video, a Plastics Industry Trade Association video, starring Andrew Winston, the founder of Winston Eco-Strategies, argues for the durability of sustainability as a theme in both the consumption and production of industrial products. He does so from a self-enhancement value orientation. The final video, from 1958, starring Dr. Frank Baxter, examines global warming from neither a self-transcendent or self-enhancement perspective and instead uses fear, or insecurity, a proposed cause of self-enhancement values (Kasser, 2010), as its primary motivation.

Upon conclusion of each video, the participants were asked to measure the video's scientific content and expertise and were then asked about the accuracy of statements made during the video. The intent of these questions was to determine the effectiveness of each message and to examine the participants' reactions to each, i.e. what level of trust the narrator was able to achieve. It was theorized that those individuals who showed self-transcendent value orientations may react differently than those with self-enhancement value orientations. More will be said about this below.

3.1.6. Hypotheses

This study is primarily the application of a method and instrument to VO-PEB, which argues that individuals who hold intrinsically oriented (or self-transcendent) values lead happier lives than and perform more pro-environmental behavior than those individuals who hold extrinsically oriented (or self-enhancement) values (Brown & Kasser, 2005). The method and instrument were discussed principally in Chapter Two. VO-PEB will be examined below as this thesis's hypotheses.

The first hypothesis is informed by Brown and Kasser's (2005) argument that happier people, i.e. people with high subjective well-being (SWB) perform more pro-environmental behaviors than those with low SWB. This can be tested in the current study by comparing the participants' SWB measures and their pro-environmental behaviors (or lack of). Null Hypothesis 1 (**$H_0$1**) then states that there is no association between individuals' reported SWB measures and their pro-environmental behaviors. Whereas alternative Hypothesis 1 (**H1**) argues that there is a positive relationship between participants' self-reported SWB and participants' pro-environmental behaviors.

The second hypothesis is informed by the VO-PEB, which states that individuals who hold intrinsically oriented values perform more pro-environmental behaviors than those who hold extrinsically oriented values. Null Hypothesis 2 (**$H_0$2**) thus states that there is no association between self-transcendent or materialistic value orientations and pro-environmental behaviors. Whereas alternative Hypothesis 2 (**H2**) argues that individuals who demonstrate self-transcendent value orientations will engage in more pro-environmental behaviors than those individuals who demonstrate materialistic value orientations.

This can be tested by examining the participants' answers to "contributions to satisfaction"[2] questions and then comparing those answers to the individuals' pro-environmental behaviors. One of the contributions of this study specifically is that both negative and positive effects on an individual's level of satisfaction are considered telling of his or her value orientation. For example, if an individual reports that her financial situation has caused a great positive effect to her level of satisfaction, that contribution is interpreted as a sign of an extrinsic value orientation. An individual who recently lost her job and reports her financial situation, or lack of income, as a great negative effect to her level of satisfaction is still considered to be evincing an extrinsic value orientation. Only the lack of an effect constitutes the lack of that particular value orientation. For example, an individual who reports her personal finances having little to no effect on her level of satisfaction is considered to be void of that particular value orientation. Thus Hypothesis 2 suggests that individuals who consistently report great positive or negative effects to their level of satisfaction from materialistic or extrinsic value-oriented phenomena will exhibit less pro-environmental behavior than those who report great positive or negative effects to their level of satisfaction from intrinsic value-oriented phenomena.

The third hypothesis (and its corollary) examines whether individuals who hold intrinsically oriented values are happier than those individuals who hold extrinsically oriented values. Null Hypothesis 3 (**$H_0$3**) states that there is no association between participants' value orientations and their self-reported SWB. Whereas, the alternative Hypothesis 3 (**H3**) states that a positive relationship exists between participants' self-transcendent value orientations and self-

[2] See Appendix A for a list of the "contributions to satisfaction" questions.

reported SWB, and a negative relationship **(H3A)** between participants' materialistic value orientations and their self-reported SWB.

The four and fifth hypotheses are informed by Kasser's (2010, 2011) work on the effectiveness of pro-environmental information campaigns. Kasser argues that campaigns that focus on power and achievement as values (i.e. success, image and status) fail to evince sustained pro-environmental behavioral change in individuals. Campaigns that focus on universalism and benevolence however are comparatively successful. The current study presented the participants with three pro-environmental knowledge videos, one of which focused on self-transcendent values, and two which focused on either self-enhancement values or the cause of self-enhancement, i.e. fear and insecurity.

Null Hypothesis 4 (**$H_0$4**) argues that there is no association between individuals' attribution of expertise and the video's value orientation, while Null Hypothesis 5 (**$H_0$5**) argues that there is no association between individuals' value orientations and their attribution of expertise to the knowledge campaign. Alternative Hypothesis 4 (**H4**) states that individuals will attribute greater expertise to a pro-environmental knowledge campaign that relies on self-transcendent value orientations than a campaign that relies on self-enhancement values. Alternative Hypothesis 5 (**H5**) states that individuals who demonstrate self-transcendent value orientations will attribute greater expertise to a pro-environmental knowledge campaign that relies on self-transcendent value orientations.

3.1.7. Rating-Scale

For most of this study and many previous studies (e.g., Bailey, 1994; Ferrer-i-Carbonell & Gowdy, 2007), seven-point Likert scales were used. These scales seem to be best in terms of

reliability, percentage of undecided respondents, and respondents' ability to discriminate between the scale values (Schwarz et al., 1991). Only the endpoints of the Likert scale were labeled with words, e.g. very satisfied or very unsatisfied, extremely happy or completely miserable, for the satisfaction and contribution to satisfaction questions. It has been suggested that reliability and validity can be improved if all points on the scale are labeled with words (Krosnick & Berent, 1993; Peters & McCormick, 1966). Respondents also report being more satisfied if all points are labeled (Dickinson & Zellinger, 1980)—the video-response questions in this study labeled each scale point. Yet this level of detail and accuracy was simply not appropriate in the context of MMS messages sent via broadband phones. It would also be difficult if not superfluous to label the numbers on some of the rating-scales, in particular those that dealt with a single continuum, e.g. "1: not satisfied at all to 7: completely satisfied."

Nevertheless, there has been recent discussion concerning the selection of the numbers themselves, suggesting that the numbers used, e.g. 1 to 7 as opposed to -3 to 3, can produce shifts in responses (Schwarz et al., 1991). Krosnick (1999) suggests that the numbers should reinforce the meanings of the words, and Ajzen (1991) blames uni-polar, as opposed to bi-polar, scaling of belief items for the low correlations found in studies of Fishbein and Ajzen's (1975) model of expectancy value. Regardless of these findings, uni-polar scales were used in the current study to prevent, if not at least encourage participants away from anchoring their responses at zero.

This study relied primarily on single-response measures. The reliability of these measures varies considerably, "depending on the particular judgment required of the subject" (Fishbein & Ajzen, 1975: 108). Because of this unreliability, variables measuring a construct are often computed as an average of responses to several related items shown to be highly correlated

(Hektner et al., 2007). In ESM however, repeated measurement often takes the place of multiple items. Still, it is important to note that during ESM periods, respondents will often tend to find a stable anchor around which they vary their responses. This leads to a decrease in variability, or a decrease in the standard deviations of their responses (ibid). As stated above, to discourage anchoring at a value of zero, uni-polar scales were used.

3.1.8. Analytical Methods

The five hypotheses listed above are concerned with the presupposed associations between value orientations, SWB and PEB, and thus this study relied primarily on chi-square tests. Chi-square tests are principally used to simultaneously classify data with respect to two or more traits that are observed for each sample element (Bhattacharyya & Johnson, 1977). For example, students may be classified, and were for this study, by their self-reported SWB and as having one of two value orientations. It is possible using contingency tables to then infer whether or not particular characteristics appear to manifest independently or whether certain levels of one characteristic tend to be associated or contingent with some levels of another (ibid). To clarify, chi-square tests are able to demonstrate that high levels of SWB are independent of, or are associated more readily with one of two, value orientations.

For this study, individuals were classified as either having a self-transcendent value orientation or a materialistic value orientation—more will be said about this and the following classifications in Sections 3.3.3.1 through 3.3.3.5. Individuals were also classified as either engaging or not engaging in particular pro-environmental behaviors. Finally their self-reported subjective well-being, responses which ranged from a minimum of 1 to a maximum of 7, were

added, averaged and recoded onto a scale of 0 to 1. Using chi-square tests the study was able to determine if associations between these variables as measured exist.

Once the sample data were collected, the researchers coded it using Microsoft Excel. More will be said about the coding of specific datasets in the results sections below. Once the data were coded, IBM SPSS Statistics Version 19 was used to analyze those results. Using SPSS's crosstabs function and chi-square test statistic function, each of the classifications introduced above were analyzed and associations or the lack of associations between them were examined. The study relied upon SPSS's ability to separate variables to the extent allowed for by the number of different results attained. To clarify, individuals' SWB was represented by a code; that code could have been .075, .350, .465, or any number between zero and 1, to the thousandth decimal place. Instead of breaking down these SWB codes into quartiles, as is sometimes done, SWB was separated into categories that equaled the number of different responses received. This process allowed for much greater detail and should produce more accurate chi-square statistics.

Because chi-square tests only test for independence, Pearson correlation coefficients were also created for some of the classification variables—these coefficients are depicted in the data tables in the results sections below. This was done to determine whether there existed a positive or negative correlation between certain variables, for example between responses to certain contribution to satisfaction questions and SWB. SPSS was used to analyze and calculate these statistics as well.

All of the data analyzed are represented in data tables in the following sections, and in the appendices. Both the chi-square critical value (to a significance of 95%) and the chi-square statistic attained are presented, alongside the Pearson correlation coefficient and that

coefficient's significance. The number of observations (N) and degrees of freedom are also presented.

3.2. Sample Construction and Signal-Response Rate

External validity is a concern with any analytical method; however, there are specific concerns regarding ESM. Because ESM is typically targeted at a specific population or specific event, generalizing such a study's results to a larger population can be difficult (Hektner et al., 2007). ESM also typically requires more resources per participant than most methods, so sample populations are often small in comparison—Zuzanek (1999) argues that attempting to change from this manner of purposive sampling to a more representative sampling technique in ESM will be a significant challenge.

This study was initially intended to sample a number of specific populations so as to retain some level of external validity and to compare and contrast the results between samples. Twelve iPhones were purchased by the researchers, prepared and made ready to be distributed to three distinct populations. These populations were designated as Michigan State University students, staff members, and members of the faculty. It was hypothesized that the primary distinction amongst the three would be their level of income and their respective level of job-security—an economic constraint that is said to often affects individuals' subjective well-being and one's willingness to behave pro-environmentally. Security concerns are also considered causes of self-enhancement value orientations (Kasser, 2010). In addition, distributing the devices to the members of each population would avoid the self-selection bias inherent in sampling only those individuals who already owned iPhones. Due to time constraints, Internal Review Board (IRB) restrictions and concerns regarding the retrieval of distributed phones

however, the issuing of phones was substituted for sampling only those individuals who already owned the device. However, the number of individuals in each population who owned iPhones was too small to be viable, and so only university students were sampled.

As a result it could be argued that this study fails to test the iPhone as a generalizable or universal ESM instrument because the study's participants were already familiar with the instrument and its functions. However, this argument fails to consider that most individuals' phones are broadband-capable and capable of interacting with the current study in its original form. As a result, while it may be true that the iPhone itself was not tested as a capable instrument for non-iPhone owners, broadband-capable mobile phones *were* tested.

Before presenting the response rate for this study it is important to note the distinction between response rates for single-administration surveys (SAS) and ESM surveys. Whereas SAS typically have only one response rate, ESM trifurcates that rate. SAS response rates refer to the proportion of recruits for the study sample who actually agree to participate. ESM, because of its complexity, identifies this rate as the *volunteer rate*. The *signal-response rate* then describes the proportion of signals for which responses are completed, and the *attrition rate* describes the proportion of participants who do not complete subsequent waves of data collection. Attrition rates only apply to those studies that are longitudinal, i.e. contain more than one data collection period per population. One of the reasons that this study used iPhones as opposed to paper-and-pencil or a computerized entry method was that it was hypothesized that signal-response rates would be greater in a study that relied on the former than those studies that relied on the latter. This was found to be the case as will be reported below; however, because each individual was required to own this specific technology volunteer rates were extremely low.

These low volunteer rates remain a sticking point. Due to IRB regulations, the language used in any document must match the language in all documents. Because this project used a novel method (ESM) and instrument (iPhones), the review process was more comprehensive and extended than was initially proposed or predicted, and thus the evolution of documents, method and instrument was stifled. This produced both positive and negative results. Positively, the implications of this study are specific to Apple iPhone users exclusively. Negatively, this study was unable to sample students who had phones comparable in power and function to iPhones, e.g. Google Android and Blackberry mobile-web devices, as discussed above. While there may exist anecdotal evidence that iPhone users are unique from others, little empirical evidence exists delineating what exactly those differences are. This study did not attempt to determine these differences. The homogeneity of the sample however may be useful in other respects, which will be discussed below. It also remains to be seen whether the homogeneity of this sample provides advantages in quality or power as compared to a higher volunteer rate and a larger sample. Additional studies comparing the results of this study with those that use multiple instruments are necessary.

To construct this study's sample, 7862 students were initially contacted by email with instructions that researchers at MSU were looking for individuals to participate in an iPhone Study. The participants' primary tasks were described within the email as answering questions sent to them as text messages, taking pictures with their iPhone of their environment, of what they purchased at the store, or of events and activities in which they had participated or were participating. They were also told that they would be sent links to short film-clips that they would be asked to view and comment upon. They were instructed that approximately five questions per day would be sent to them no earlier than 8am and no later than 9pm for a period

of seven days. Filling out a short paper survey at the conclusion of the survey was also required. They were asked to respond to the email if they were interested in learning more about participating in the study.

103 students replied to the initial email, and 11 students were recruited in person. These 114 students were then sent via email a letter of consent, which contained more detailed instructions, the specific dates and times that their examination period would begin and end, and notice that each would receive $20 as an incentive for participating. They were instructed that their receiving the incentive was not dependent upon their answering every question. Of the 114 students, n=71 (62.3%) students agreed to participate. Hektner et al. (2007) identify that volunteer rates for ESM studies vary greatly, as low as 12 percent for unskilled, blue-collar workers to 91 percent for fifth and eighth graders (Csikszentmihalyi & Larson, 1987). This study's volunteer rate was 0.89 percent. This was expected based on the technological requirements of the study, and would likely have been much higher if the researchers were able to recruit all students with mobile-broadband camera-equipped phones. Regardless of the low volunteer rate, samples of this size are not uncommon for ESM studies (e.g. Feldman Barrett, 2004) and studies with as few as 5 or 10 participants can still provide rich data that can be used reliably in statistical analyses (Hektner et al., 2007: 34).

Each student received 37, 39 or 41 questions each by text messaging, depending on which examination period he or she participated, spread across seven days (mean = 5.57 questions/day). In total 2777 questions were texted to the participants with a signal-response rate of 98.13 percent. Only 52 questions were not answered, and of these 44.2 percent (n=23) were video-responses and 17.3 percent (n=9) were photograph-responses, those questions that required the most effort of the participants.

This signal-response rate of 98.13 percent is much higher than those rates reported from previous ESM studies, providing immediate support for the researchers' early conjecture regarding the benefits of mobile-phone based ESM studies. Typical signal-response rates range from 70 to 80 percent (e.g. Csikszentmihalyi & Larson, 1987; Hormuth, 1986; Larson et al., 2002; Zuzanek, 1999; Mannell et al., 2005) and rates amongst university students can range from 50 to 75 percent depending on both hardware and whether or not follow-up signals were used (Zuzanek, 1999; Feldman Barrett, 2004). Follow-up signals were used in this study.

None of the studies mentioned used mobile phones as either signaling devices or as reporting devices. In addition, this study was the only one to ask respondents to take photographs or to watch and react to videos. While the latter is not likely to be incorporated quickly into more typical ESM studies, the former could be a valuable addition, helping researchers to gain insight into the ecological context of participants' responses or even their psychological states, e.g. through providing photographs which represent one's mood. While the photograph-response questions had the lowest signal-response rate (95.77%), it was still a rate much higher than those seen in previous studies. See Table 1 below for all sample and response rates.

Table 1. Study Sample and Response Rates

Initial Contacts	%	Possible Volunteers	%	Volunteer Rate	%
By Email					
7862	100%	103	1.31%	70	0.89%
Face-to-Face Contacts					
11	100%	11	100%	1	9.09%

Questions Asked	Questions Answered	Signal-Response Rate %
Total		
2777	2725	98.13%
Video-Response		
639	616	96.40%
Photograph-Response		
213	204	95.77%
Text-Response		
1925	1905	98.96%

3.3. Results and Discussion

3.3.1. The Apple iPhone and ESM

This study was a joint application of ESM and broadband mobile-phones, iPhones specifically, to Schwartz (1994) & Kasser's (2010) value orientation theory of pro-environmental behavior. That method and instrument's successful application suggest broadband mobile-phones are not only capable but preferable to PDAs, written research journals and beeper technology in ESM studies. The extremely high signal-response rate (98.13 percent) achieved in this study suggests that the burden of such studies is reduced significantly with the incorporation of mobile-phone technology. Such a high signal-response rate alone would be significant; however, when combined with the incorporation of multimedia and direct behavioral monitoring, as well as the considerable reduction in financial and human resources necessary to enact such research, this study suggests that mobile-phone technology-driven ESM studies are an extremely attractive

alternative to single-administration surveys, focus groups, interviews, and many lab-setting experimental designs.

There are thus in reality two implications of this study's methodological and instrumental application. The first concerns ESM and the second concerns ESM's setting in socio-environmental research as a whole. The first implication is that mobile-phones make ESM easier, cheaper and possibly more accurate. Replacing PDAs, beepers and research journals with mobile-phones likely reduces the participants' burden, and as seen in this study certainly reduces the researchers' burdens. And such reductions should allow for greater flexibility, larger sample-sizes and more accurate data, as respondents no longer need carry additional materials during the research period. They need only carry the one device from which they are rarely free. Yet what respondents and their researchers can accomplish with that device is much greater in comparison to what those previous instruments afforded. The broadband mobile-phone's audio and video capabilities, as well as photographic ability, increase the type of questions and interactions available to the researcher. Furthermore, instead of relying on self-reported attitudes, emotions, times, locations, and behaviors, respondents can now provide researchers with real, objective evidence of the same (or what may prove not to be the same!).

Another result of the current study's implementation was the significantly reduced financial and human resources necessary to field it. Previous ESM efforts required not only considerable human resources both to develop and analyze the study, but often times the preferred instruments must be purchased or constructed. This study not only used the respondents' own technology and thus reduced technology costs—or at least shifted those costs to the respondents unwittingly, but was also free from having to train or provide extensive instruction to the respondents regarding that technology. Minimal physical contact was

necessary, which both reduces the burden for the respondent and reduces the human resources and preparation necessary for the research team.

Other studies (e.g. Hicks et al., 2010; Killingsworth & Gilbert, 2010; Uy et al., 2010) have advised developing web-based applications to assist in the design, deployment and analysis stages of mobile-phone-driven ESM research. This thesis and research suggests that such efforts may backfire. Not only can the up-front costs, both financial and human, be significant—though certainly not in every case, but the cognitive requirement of the respondents may also be increased, requiring greater physical or cognitive engagement with the device. Such an increase would erode one of the significant advantages afforded by mobile-phone instrumentation, i.e. the reduced burden such technology affords the respondent.

3.3.2. The Apple iPhone, ESM and Socio-Environmental Research

The first proposition of this study is that mobile-phones, specifically Apple iPhones, and SMS messaging—as opposed to web-applications—streamline and expand ESM research, allowing for more and more accurate deployments of the method within socio-psychological research. The second supposition is that ESM and mobile-phone technology need not be confined to socio-psychological research and instead are a cost-effective, high-quality and high-accuracy alternative to many of the methods currently used in socio-environmental research. This supposition is supported by the current study's implementation, yet not necessarily supported by the current study's data analysis and hypothesis-testing—more will be said about this in following sections.

ESM specialists like Joel Hektner, Jennifer Schmidt and Mihalyi Csikszentmihalyi (Hektner et al., 2007: 12) argue that ESM is best at examining, for example, the psychology of

adolescence, family dynamics, the experience of psychopathology, the experience of media, gender differences, and the "optimal experience of flow." Yet this study suggests that ESM need not be confined to the field of psychology. While socio-environmental researchers are now and will continue to be engaged in studies of pro-environmental behavior, investigating the determinants of that behavior will increasingly transcend any single discipline. Pro-environmental behavioral research requires understanding both the internal and external coordinates of experiences—as ESM aids in accomplishing—as well as the internal and external constraints affecting individuals' pro-environmental attitudes and behaviors—something ESM has not yet been applied to in force.

This latter form of investigation has long been accomplished with much cheaper and more global or generalized examinations of individuals' resources, constraints and surroundings, and for good reason. Using ESM to investigate what type of vehicle a person owns would not be warranted previously due to the high costs of implementing such a study. And certainly to some, ESM will never be, and should never be, the preferred method to acquire such data—this study used a paper survey to gain such information. However, ESM does provide more accurate data about what type of vehicle a person *drives*, or drives *in* (as opposed to which vehicle he simply *owns*).

For example an individual may own a certain vehicle, but may often car-pool or catch a ride with a friend in the summer. He may drive his vehicle more in the winter because of the snow. His car may be temperamental and he must often drive a rental car. Certainly, single-administration surveys, focus groups and interviews are all capable of investigating such behavior to a similar extent; however, each is limited by recall bias and error, and the specific effort of the individual to generalize his or her own behavior. Furthermore, these efforts lack

ecological validity, or how the specific setting of our experiences, behaviors and attitudes affect both our conception and reporting of such phenomena. ESM allows for such investigation. However, until mobile-phone technology could be incorporated, as is presented in this thesis, such investigations were deemed too costly. The current study suggests that such limitations may no longer exist.

3.3.3. Hypotheses

Schwartz (1994) and Kasser's (2010) value orientation theory of pro-environmental behavior has been investigated for over two decades, often through single-administration surveys. Yet Kasser and Brown (2005: 364) argue for future research that, "requests reports over a limited time frame…to help circumvent biases due to retrospective reporting" and moves beyond self-reports (e.g. uses direct observation). Sections 3.3.3.1 through 3.3.3.5 report such results from the current study. Table 2 below also presents a summary of the data collected—certain aspects of Table 2 will not be addressed or explained until later sections.

Table 2. Summary of Sample Characteristics

Variable	N	TOT SWB	SWB ST DEV	PEB	PEB ST DEV
Individuals					
Males	40	0.785	0.117	1	0.6
Females	31	0.723	0.094	1.05	0.71
ST Individuals	27	0.767	0.109	1.14	0.66
SE Individuals	37	0.744	0.12	0.96	0.66
Unclassified Individuals	7	0.792	0.07	0.86	0.48
ST Males	14	0.797	0.111	1.167	0.617
SE Males	20	0.770	0.136	0.947	0.621
ST Females	13	0.736	0.098	1.115	0.74
SE Females	17	0.714	0.095	0.971	0.717

Variable	N	MEAN	ST DEV
Subjective Well Being (0-1)			
TOT SWB	71	0.893	0.111
GEN SWB	71	0.770	0.141
SNAP SWB	71	0.749	0.137
Pro-Environmental Behavior			
REC (0-1)	57	0.456	0.503
TRANS (0-1)	71	0.641	0.398
PEB (0-2)	71	1.007	0.657

3.3.3.1. Hypothesis 1: SWB & Pro-Environmental Behavior

H1 stated that a positive relationship exists between participants' self-reported SWB and participants' pro-environmental behavior. In order to test this hypothesis the participants were asked two types of questions regarding their subjective well-being. The first type of question asked them to report their general level of satisfaction.[3] This question was asked twice, once on the first day of the research period and once on the last day. The other SWB questions asked

[3] All questions are listed in Appendix A and asked for Likert-scale responses on a scale of 1 to 7.

respondents about their levels of satisfaction on particular days—these were randomly asked throughout the week and at different times of day. The participants' responses to these questions were then combined to form three variables: total SWB (TOTAL SWB), general SWB (GEN SWB), and snapshot SWB (SNAP SWB). TOTAL SWB was a weighted average of all level of satisfaction questions; GEN SWB was a weighted average of only the general level of satisfaction questions (asked at the beginning and end of each research period), and SNAP SWB was a weighted average of only the random daily level of satisfaction questions. GEN SWB represents the level of subjective well-being that would most likely be reported during a single administration survey (SAS). TOT SWB then can be considered a combination of the SAS and the ESM self-reports.

A respondent's pro-environmental behavior (PEB) was measured using two methods. The first asked the respondent to report on certain behaviors that he or she had performed during the day. These ranged from manner of primary transport (i.e. walking, the bus, automobile, biking) (asked twice) to the length of time the individual spent online, talking on the phone or watching television, or the number of meals the individual ate at a restaurant or at home. The second method of inquiry required the individual to photograph his or her behavior. The respondent was asked to photograph her recycling and the inside of her refrigerator, as well as the type of television set and video-game system she owned. At no point was a participant asked *if* or *why* he did or did not engage in a particular behavior.

To examine the relationship between participants' SWB and PEB and to determine if that relationship was positive, i.e. high SWB inferred greater performance of PEB, Chi-Square tests were performed on each of the SWB variables and on the participants' recycling behavior (REC=1 if participant recycles; 0 if not) and transportation behavior (TRANS=1 if participant

walks, bikes or uses mass-transit; 0 if participant drives automobile), as well as a weighted average of the two (PEB=2 if participant recycles and does not drive; 1 if participant recycles and drives or does not recycle and walks, bikes or uses mass-transit; 0 if participant does neither). Other behaviors either did not demonstrate sufficient variance or demonstrated variance that was dependent upon the specific day, date or time the signal was received, e.g. time spent online was much higher on weekdays then on weekend days, across all examination periods. As a result these behaviors were left out of the analysis. The results of analysis are shown below in Table 3.

Table 3. SWB and Pro-Environmental Behavior Results

Variable 1	Variable 2	df	N	Pearson χ^2 Critical Value	Pearson χ^2 Statistic	Asymp. Signif.	Pearson's R (Correl.)	Approx. Signif.
TOTAL SWB	REC	23	56	35.172	23.166	0.451	-0.119	0.384
TOTAL SWB	TRANS	46	70	62.830	35.800	0.861	0.077	0.526
TOTAL SWB	PEB	92	70	115.390	81.331	0.779	-0.048	0.694
GEN SWB	PEB	36	70	50.998	47.414	0.097	-0.072	0.551
SNAP SWB	PEB	60	70	79.082	49.136	0.841	0.002	0.986

The results in Table 3 show that there is no significantly positive (or negative) relationship between the respondents' self-reported SWB and their pro-environmental behaviors recycling or mode of transportation, thus Null Hypothesis 1 (H_o1) cannot be rejected. There are many possible reasons no association was found; however, the most obvious is that extrapolating individuals' general behavior from their daily behavior is

problematic. Brown and Kasser (2005) used retrospective reporting of individuals' PEBs to investigate the relationship between PEB and SWB. Yet individuals reporting their PEBs are subject to a number of errors and biases, most notably socially-desirable responding (SDR) and recall error. Regardless of whether respondents are aware of the researchers' intentions, it is possible that individuals over-report PEB, despite Milfont (2009) and Schahn and Bohner's (2002) assertions that the effects of SDR are insignificant in socio-environmental research.

Regarding recall errors, this study's investigation of PEBs took only a snapshot of the respondents' behavior. And thus it is difficult to generalize (even within the sample). Were the signals sent on different days or the examination period to take place in a different month, it is very possible that the participants' PEB reports would be very different. Yet these contextual variables, or external coordinates of experience (Hektner et al., 2007), are certainly important to recognize and raise questions regarding individuals' own reports of their generalized behavior. The very fact that snapshots are so variable, or may be so variable, raises questions about the veracity of individuals' retrospective and generalized reports. Do they report their PEB performance on average or in average situations? The former is more accurate, though not necessarily more interesting, than the latter, especially if the latter means only that they recycle if there is a bin nearby or walk to work if it is sunny and 72 degrees. This average may rarely occur, yet in remembering it may be this behavior or behavioral context that dominates. ESM studies, and their use of randomized signaling, are particularly helpful in discerning these inconsistencies.

These variables are subject to a great deal of underlying constraints and effects, particularly in a sample of university sophomores, some living in dorms. For example, an

individual living in a one-room dorm without a car may rarely consider the impact of his PEB, but due to resource constraints may appear to be engaging in PEB. Or an individual living at home with his parents and commuting twenty miles to school each day may still very much wish to be environmentally conscious, yet cannot behave accordingly. These concerns certainly need to be considered and may imply only that a much weaker relationship than hypothesized exists *within this sample* regarding SWB and PEB. Or, it may be that resources, situations and constraints external to the individual dominate variables like SWB elsewhere as well, making such correlations between SWB and PEB superfluous. More research is of course necessary.

3.3.3.2. Hypothesis 2: Values and Pro-Environmental Behavior

H2 stated that individuals who demonstrate intrinsic value orientations will engage in more pro-environmental behaviors than those individuals who demonstrate extrinsic or self-enhancing value orientations. In order to examine this hypothesis the participants were asked two types of questions; the first were in regard to their PEB and are described in Section 3.3.3.1. The second type of question was about specific contributions to respondents' overall level of satisfaction (these questions are referred to as "contributions to satisfaction"). For example, individuals were asked questions about their personal appearance, their feelings of personal success, and how they believed others viewed them. Each question asked the respondents to report the effect that each phenomena had on their level of satisfaction (for the specific day in which the signal was received, *not* in general). The intent of these questions was to determine the individuals' value orientations as a function of these effects, or more importantly the *strength* of these effects. As stated previously, Rokeach (1973) considers values the psychological representations of what people believe is important in life, thus those individuals who report no

effect for a particular question can be thought not to hold or be pursuant of that particular value. As stated previously both positive *and* negative effects are considered representative of a value-laden position! Only the lack of an effect suggests the corresponding lack of its representative value orientation.

As described in H2 above, Schwartz (1994) and Kasser (2010) argue that self-transcendent value orientations lead to pro-environmental attitudes and behavior, while self-enhancing value orientations lead to a lack of PEB and pro-environmental attitudes. The specific goals, beliefs and values that make up these broader categories sometimes vary. However Kasser argues that in general, image, status and financial success generally denote the self-enhancing values, while community feeling, self-acceptance and affiliation denote self-transcendent values. To capture self-enhancing (SE) value orientations then, this study asked each respondent to rate the effect of his (1) personal appearance, (2) personal finances, (3) feelings of success, (4) purchases and (5) how others viewed them on his overall level of satisfaction for the day. To capture self-transcendent (ST) value orientations, this study asked each respondent to report the effect of her (1) religious beliefs (or a religious event) (asked on Sunday), (2) relationships, (3) local environmental quality, and (4) the day's weather, on her overall level of satisfaction for the day. Each participant was also asked about her (1) education (or experience at school) and (2) health. These responses to health and education were not thought to be ST or SE value-laden.

At the end of each examination period, each participant was then classified as a self-transcendent (ST) or self-enhancing (SE) individual based on his or her answers. Those individuals who consistently reported effects from SE-value satisfaction contributions were designated SE individuals (1=SE), and those individuals who consistently reported effects from

ST-value satisfaction contributions were designated ST individuals (0=ST). Two methods were used however to determine which classification each individual received. The first counted all effects within an ST or SE category; i.e. the answers 1, 2, 3, 5, 6, and 7 all contributed to the classification. The second counted only strong effects; i.e. the answers 1, 2, 6, and 7 only contributed to the classification. Responses of "4" were deemed no effect and were considered to represent no value-attachment to the specific contribution question. To examine the relationships between value orientations and PEB, Chi-square tests were conducted on each of the individual contributions and the PEBs, as well as on the SE/ST individuals and PEBs. Tests included both variables representing all effects and those representing only strong effects. A sample of the results is presented in Tables 4 and 5 below (the full table of results is in Appendix B).

Table 4. Individual Value Orientations and Pro-Environmental Behavior Results

Variable 1	Variable 2	df	N	Pearson χ^2 Critical Value	Pearson χ^2 Statistic	Asymp. Signif.	Pearson's R (Correl.)	Approx. Signif.
SE=1/ST=0	REC	1	51	3.841	0.184	0.668	0.060	0.675
SE=1/ST=0	TRANS	2	64	5.991	4.237	0.120	-0.192	0.128
SE=1/ST=0	PEB	4	63	9.488	1.973	0.741	-0.064	0.621

Table 5. Individual Contributions to Satisfaction and Pro-Environmental Behavior Results

Variable 1	Variable 2	df	N	Pearson χ^2 Critical Value	Pearson χ^2 Statistic	Asymp. Signif.	Pearson's R (Correl.)	Approx. Signif.
Self-Enhancement Values (Extreme Effects Only)								
Personal Appearance								
	REC	1	57	3.841	2.263	0.132	-0.199	0.137
	TRANS	2	71	5.991	1.115	0.573	-0.113	0.346
	PEB	4	70	9.488	4.145	0.387	-0.165	0.172
Personal Finances	REC	1	57	3.841	0.524	0.469	0.096	0.478
	TRANS	2	71	5.991	0.344	0.842	0.038	0.753
	PEB	4	70	9.488	4.966	0.291	0.088	0.47
Self-Transcendent Values (Extreme Effects Only)								
Religious Events	REC	1	57	3.841	0.118	0.731	0.045	0.737
	TRANS	2	70	5.991	0.537	0.764	-0.067	0.582
	PEB	4	69	9.488	1.170	0.883	-0.042	0.731
Relation-ships	REC	1	57	3.841	0.427	0.514	-0.087	0.522
	TRANS	2	70	5.991	1.908	0.385	-0.018	0.882
	PEB	4	69	9.488	0.786	0.940	-0.085	0.488
Self-Enhancement Values (All Effects)								
Purchases	REC	1	17	3.841	0.562	0.453	0.182	0.485
	TRANS	**2**	**22**	5.991	**6.079***	**0.048**	**-0.454***	**0.034**
	PEB	4	21	9.488	3.012	0.556	-0.213	0.353
How Others Viewed	REC	1	31	3.841	0.040	0.841	0.036	0.847
	TRANS	2	40	5.991	2.364	0.307	-0.148	0.361
	PEB	4	39	9.488	1.803	0.772	-0.037	0.823
Value-free?								
Education	REC	1	48	3.841	0.032	0.858	0.026	0.862
	TRANS	**2**	**61**	5.991	**6.053***	**0.048**	**0.315***	**0.014**
	PEB	4	60	9.488	2.453	0.653	0.170	0.195

* denotes 95% Significance
** denotes 99% Significance

As with Hypothesis 1, the data do not demonstrate that a statistically significant relationship exists between the value orientations and the pro-environmental behaviors as measured in the study. As a result, H_o2 cannot be rejected. Neither self-transcendent individuals nor self-enhancing individuals engage in more or less PEB consistently. While transportation decisions appear to correlate positively with self-transcendence (R= -0.192, α= .128), they do not do so significantly.

Value orientations were tested both on an *individual participant basis*, i.e. by the classification of respondents as self-enhancing and self-transcendent (SE=1 and ST=0) and on a *value basis* by each individual variable representing one of the two value orientations. Table 5 shows a sample of this data. What is immediately apparent is the lack of significant associations between the contribution to satisfaction responses and the PEBs measured in the study, with only purchases (χ^2= 6.079, df= 2; R= -.454) and education (χ^2= 6.053, df=2; R= .315) as the lone exceptions (both associating with individuals' transportation choices). The possible reasons for such a lack of correlation are numerous; however one in particular stands out.

The contribution to satisfaction questions may successfully identify individuals' value orientations only with repeated exposure. This study aimed at capturing momentary snapshots of individuals' daily life and subjective well-being. As a result, questions were asked attempting to attain what specifically contributed to their overall level of satisfaction each day. Yet certainly these contributions vary, as do most likely the strength of each contribution. Earlier an example was given that argued that an individual who has just lost his job would regardless of this event identify himself as self-transcendent or self-enhancing (i.e. the event would not mitigate or accentuate personal finances as a major determinant of his SWB). Despite the results of this study, this may still very much be true. However a single response fails to capture the

individual's typical (or mean) response. That day may very well be a 1 or a 2; however, he may very well answer 4 on most if not all other days.

Thus the very facet that makes ESM a powerful measure of behavior, values and attitudes, i.e. its ability to capture instantaneous snapshots of each phenomena, also requires those who use it as a method to be extremely patient. If single-administration surveys (SAS) generalize too much, i.e. introduce errors by asking respondents to interpret broad swaths of their behavior or beliefs, ESM may generalize too little, accidentally—or intentionally—measuring behavioral or attitudinal oddities. These oddities may also not necessarily be tied to the individual, particularly in socio-environmental applications. For example, if the study takes place in the winter, during periods of intense snow-fall, individuals across samples may be more likely to answer in a particular direction because of this environmental reality. Again, this is not a failing of ESM—it is valuable in providing a check on SAS research that may underreport such anomalies and provide overly optimistic—or pessimistic—claims of PEB and pro-environmental attitudes or values.

Before moving to Hypothesis 3 (and 3A), the relationships between the contributions, education and purchases, deserve some attention. The data show that on average, individuals who report a great effect from their education on their overall SWB make significantly less (R is negative) pro-environmental transportation choices. And on average, individuals who report a great effect from the purchases they make on their overall SWB make significantly more (R is positive) pro-environmental transportation choices. The possible contextual or constraint-based explanations for such antithetical results are too numerous to expound upon here. Yet what is perhaps most interesting is that perhaps the context and constraints *do not* matter. Perhaps the value-behavior relationships seen here dominate those external variables and the underlying

values that guide each 'contribution to satisfaction' do predict pro-environmental and non-environmental behavioral decisions and attitudes. Obviously more research is necessary before such claims can be made, yet it is perhaps only through ESM that such apparent anomalies can be identified, and perhaps only through ESM can these relationships truly be understood.

3.3.3.3. Hypothesis 3: Values and SWB

H3 and H3A stated that a positive relationship exists between participants' SWB and ST value orientations, and a negative relationship exists between participants' SWB and SE value orientations. To examine these relationships two types of questions were asked of the participants, both of which have been described previously in Sections 3.3.3.1 (SWB) and 3.3.3.2 (Contributions to Satisfaction). As with Hypothesis 2, the relationships were examined both on an *individual participant basis* by comparing SWB and the cumulated classification designators ST and SE, and on a *value basis* by comparing SWB and the specific contribution to satisfaction responses. A sample of the results is given below in Tables 6 and 7 (the full table of results is in Appendix C).

Table 6. Individual Value Orientations and SWB Results

Variable 1	Variable 2	df	N	Pearson χ^2 Critical Value	Pearson χ^2 Statistic	Asymp. Signif.	Pearson's R (Correla.)	Approx. Signif.
SE=1/ST=0	TOTAL SWB	21	63	32.671	17.505	0.680	-0.113	0.377
	GEN SWB	9	64	16.919	6.429	0.696	-0.073	0.564
	SNAP SWB	15	64	24.996	16.548	0.347	-0.101	0.426

Table 7. Individual Contributions to Satisfactions and SWB Results

Variable 1	Variable 2	df	N	Pearson χ^2 Critical Value	Pearson χ^2 Statistic	Asymp. Signif.	Pearson's R (Correla.)	Approx. Signif.
Self-Enhancement Values (Extreme Effects Only)								
Personal Appear-ance	**TOTAL SWB**	**23**	**70**	**35.172**	**37.568***	**0.028**	**0.370****	**0.002**
	GEN SWB	9	71	16.919	11.639	0.234	**0.325****	**0.006**
	SNAP SWB	15	71	24.996	20.399	0.157	**0.288***	**0.015**
Personal Finances	TOTAL SWB	23	70	35.172	24.384	0.383	-0.224	0.063
	GEN SWB	9	71	16.919	8.180	0.516	-0.147	0.22
	SNAP SWB	15	71	24.996	17.753	0.276	-0.160	0.183
Self-Transcendent Values (Extreme Effects Only)								
Religious Events	TOTAL SWB	23	69	35.172	20.487	0.612	0.157	0.197
	GEN SWB	9	70	16.919	9.789	0.368	0.029	0.812
	SNAP SWB	15	70	24.996	10.639	0.778	0.212	0.078
Relation-ships	TOTAL SWB	23	69	35.172	18.977	0.703	0.223	0.066
	GEN SWB	9	70	16.919	10.163	0.337	**0.276***	**0.021**
	SNAP SWB	15	70	24.996	11.577	0.711	0.125	0.302
Weather	**TOTAL SWB**	23	67	35.172	22.383	0.497	**0.238***	**0.052**
	GEN SWB	9	68	16.919	5.357	0.802	0.144	0.241
	SNAP SWB	15	68	24.996	23.111	0.082	**0.247***	**0.042**

* denotes 95% Significance
** denotes 99% Significance

The data demonstrate that the cumulative effects of the ST and SE value orientations as measured in this study are not predictive of SWB, i.e. there is no consistent or significant positive or negative relationship between value orientations and SWB. Again, H_o3 cannot be rejected. This lack of association is clarified by the *value basis* comparisons illustrated in Table 6.

There is a positively significant relationship between the effects of individuals' personal appearance on their SWB and their overall (TOTAL) SWB (χ^2= 37.568, df= 23; R= .370). That positive relationship is also consistent across their GEN SWB (R= .325) and SNAP SWB (R= .288) (for clarification on these measures see Section 3.3.3.1). While such a relationship may initially seem glaringly obvious, it is important to remember that the effect of one's personal appearance as measured is *not* only positive. *Both* negative and positive effects were measured and contributed to the overall 'personal appearance contribution to satisfaction.' This data does not support Kasser (2010, 2011) and Brown and Kasser's (2005) supposition that self-enhancing values such as image and status contribute negatively to SWB. Of course this dataset is based on a small sample of iPhone owning students, who may collectively feel more positive about their personal appearance than non-iPhone owning students. And thus such data lacks the generalizability necessary to refute such assertions. However, such results supported by and instructed by Kasser's call for research to move past self-reports and mitigate SDR and recall error cannot and should not be ignored.

While the contribution to satisfaction category *personal appearance* does not support Brown and Kasser's supposition, the *relationships* and *weather* categories do provide initial support (R= .276 and R= .238, respectively). These effects correlate significantly with GEN

SWB for *relationships* and with TOTAL SWB and SNAP SWB for *weather*. While the results for *relationships* may be robust, the results for *weather* may be ecologically invalid since the examination periods all took place during the winter season. Replication of such results would need to occur both within the same season and across all seasons to ensure such results hold.

Certainly the same limitations that were discussed in Section 3.3.3.2 regarding the momentary, often non-replicated, and ungeneralizable nature of this study's contribution to satisfaction questions are in play here. Yet as was mentioned previously, this does not automatically invalidate the results but instead suggests that greater attention and more study, particularly research that utilizes ESM, is necessary.

3.3.3.4. Hypothesis 4: Values and Pro-environmental Knowledge Campaigns

Hypothesis 4 stated that individuals will attribute greater expertise to a pro-environmental knowledge campaign that relies on self-transcendent value orientations than a campaign that relies on self-enhancement values. In order to examine this hypothesis each participant was first asked a series of contribution to satisfaction questions (as described in Section 3.3.3.2.) so as to be categorized as either a ST or SE individual. He or she was then shown three video-clips and asked three questions regarding each clip at the video's conclusion. All videos were sent to and watched on the participants' Apple iPhone.

The first video was designated as relying upon and advancing a self-transcendent value orientation. The second video was designated as relying upon and advancing a self-enhancing value orientation. The questions asked at the conclusion of each video asked the respondent to gauge the video narrator's expertise, the scientific content of each video, and the accuracy of the narrator's claims. Due to inconsistencies in the language of each narrator and the vagueness of

certain pre-identified claims the accuracy questions were thrown out and not a part of this study's data analysis. The third video relied upon fear and insecurity, two causes of self-enhancing value orientation (Kasser, 2010), and were not a part of Hypothesis 4's analysis (but were analyzed for Hypothesis 5).

Paired Samples Tests were conducted on the data to determine which of the two videos (STVID and SEVID) the participants attributed greater expertise and scientific content to as well as to which video received a greater average of both (STCODE and SECODE). The results are shown below in Tables 8 and 9.

Table 8. Environmental Knowledge Video Results I

Paired Samples Statistics

Entire Sample

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	ST Expertise	2.500	68	0.889	0.108
	SE Expertise	2.790	68	0.821	0.100
Pair 2	ST Scientific	1.410	68	0.717	0.087
	SE Scientific	1.790	68	0.703	0.085
Pair 3	STCODE	3.910	68	1.313	0.159
	SECODE	4.590	68	1.225	0.149

Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	ST & SE Expertise	68	0.245*	0.044
Pair 2	ST & SE Scientific	68	0.348**	0.004
Pair 3	ST & SE CODE	68	0.376**	0.002

* denotes 95% Significance
** denotes 99% Significance

Table 9. Environmental Knowledge Video Results II

Entire Sample		Paired Differences					
					95% Confidence Interval of the Difference		
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper	Sig. (2-tailed)
Pair 1	ST & SE Expertise	-0.294	1.052	0.128	-0.549	-0.04	0.024**
Pair 2	ST & SE Scientific	-0.382	0.811	0.098	-0.579	-0.186	0**
Pair 3	ST & SE CODE	-0.676	1.419	0.172	-1.020	-0.333	0**

* denotes 95% Significance
** denotes 99% Significance

The results in Tables 8 and 9 show that the SE video and its narrator were thought to show more expertise and greater scientific content than the ST video and its narrators. Certainly there are underlying factors at play in each video with regards to the theme, content, cinematography, setting, language used, and even the subject matter (i.e. the ST video was advocating high-efficiency light-bulbs and the SE video was advocating sustainable consumer products). Each video definitely has multiple influences on each respondent's attitudes and values. Thus it would certainly not be appropriate to extrapolate from these results that self-transcendent videos in general are thought to show less expertise or less scientific content than self-enhancing videos. When one separates the sample by gender however, the results do become more interesting—see Table 10 below.

Table 10. Environmental Knowledge Video Results by Gender

Paired Samples Statistics

Gender			Mean	N	Std. Deviation	Std. Error Mean
F	Pair 1	ST Expertise	2.83	30	0.648	0.118
		SE Expertise	2.77	30	0.728	0.133
	Pair 2	ST Scientific	1.5	30	0.572	0.104
		SE Scientific	1.93	30	0.691	0.126
	Pair 3	ST CODE	4.33	30	0.959	0.175
		SE CODE	4.7	30	1.208	0.221
M	Pair 1	ST Expertise	2.24	38	0.971	0.157
		SE Expertise	2.82	38	0.896	0.145
	Pair 2	ST Scientific	1.34	38	0.815	0.132
		SE Scientific	1.68	38	0.702	0.114
	Pair 3	ST CODE	3.58	38	1.464	0.237
		SE CODE	4.5	38	1.247	0.202

Here we see that females attribute greater expertise to the ST video than to the SE video, however attribute greater scientific content to the SE video than do males. Males on the other hand attribute much greater expertise (greater than the entire sample mean) to the SE video and less scientific content to the SE video than the sample mean. Overall, females attribute greater scientific content and expertise to both videos than do both males and the overall sample means. Such relationships do not provide sufficient evidence to reject H_o4.

3.3.3.5. Hypothesis 5: Values and Pro-environmental Knowledge Campaigns II

Hypothesis 5 stated that individuals who demonstrate self-transcendent value orientations attribute greater expertise to a pro-environmental knowledge campaign that relies on self-transcendent value orientations. In order to test this hypothesis the study examined the value orientations and the video-response questions on an *individual participant basis* and on an

individual *value basis* as seen previously in Section 3.3.3.3. Two analyses were conducted. The first tested the association between individuals classified as SE or ST and the expertise, scientific content and accuracy of statements made in each of the three videos (including the video that used fear and insecurity, a cause of SE values).[4] The second tested the individual contribution to satisfaction responses and the video-response variables listed above. Both analyses looked for positive associations between SE individuals or values and the SE video, and ST individuals or values and the ST video. A sample of the results is given below in Tables 11 and 12 (the full table of results is in Appendix D).

Table 11. Individual Value Orientations and Environmental Knowledge Videos

Variable 1	Variable 2	df	N	Pearson χ^2 Critical Value	Pearson χ^2 Statistic	Asymp. Signif.	Pearson's R (Correla.)	Approx. Signif.
SE=1/ST=0	ST EXPERTISE	4	63	9.488	**11.541***	**0.021**	-0.138	0.282
	SE EXPERTISE	3	61	7.815	4.668	0.198	-0.224	0.083
	SE-CAUSE EXPERTISE	4	62	9.488	2.068	0.723	0.127	0.325
	ST SCI.CONTENT	3	63	7.815	2.196	0.533	0.129	0.313
	SE SCI.CONTENT	3	61	7.815	1.922	0.589	-0.082	0.532
	SE-CAUSE SCI. CONTENT	3	62	7.815	2.585	0.460	0.139	0.283
	ST ACCURACY	3	61	7.815	1.300	0.729	-0.069	0.595
	SE ACCURACY	3	60	7.815	1.403	0.705	-0.110	0.402

* denotes 95% Significance

[4] Questions regarding the accuracy of the narrators' statement were asked only for ST and SE videos, not the SE-CAUSE video.

Of the eight video-response variables, the only one to show a significant positive relationship to a value orientation, in this case to self-transcendence, is ST expertise (χ^2= 11.541, df= 4, and R= -.138). This alone supports Hypothesis 5 (H5), i.e. ST individuals attribute greater expertise to ST videos than to SE videos. The other seven video-response variables however do not show significant associations and thus H5 must be rejected.

Table 12. Individual Contributions to Satisfaction and Environmental Knowledge Videos

Variable 1	Variable 2	df	N	Pearson χ^2 Critical Value	Pearson χ^2 Statistic	Asymp. Signif.	Pearson's R (Correla.)	Approx. Signif.
Self-Enhancement Values (Extreme Effects Only)								
Personal Finances	ST EXPERTISE SE	4	70	9.488	0.853	0.931	-0.009	0.938
	EXPERTISE SE-CAUSE	3	68	7.815	2.363	0.501	-0.094	0.446
	EXPERTISE ST	4	68	9.488	5.354	0.253	0.211	0.084
	SCI.CONTENT SE SCI.CONT	3	70	7.815	2.937	0.401	0.118	0.332
	SE-CAUSE SCI.CONT ST	3	68	7.815	3.778	0.286	0.129	0.294
	ACCURACY SE	3	68	7.815	3.899	0.273	0.208	0.09
	ACCURACY ST	3	66	7.815	7.741	0.052	0.192	0.116
Purchases	EXPERTISE SE	2	22	5.991	1.689	0.430	-0.261	0.24
	EXPERTISE ST	2	21	5.991	5.923	0.052	0.380	0.089
How Others Viewed You	EXPERTISE SE	4	39	9.488	0.415	0.981	0.020	0.904
	EXPERTISE SE-CAUSE	3	37	7.815	1.837	0.607	0.130	0.442
	EXPERTISE ST SCICONT	4	38	9.488	1.759	0.780	0.134	0.423
		2	39	5.991	5.924	0.052	0.289	0.074

Table 12 (cont'd)

Self-Transcendent Values (Extreme Effects only)								
Local Environment Quality	ST EXPERTISE	4	70	9.488	5.125	0.275	-0.008	0.947
	SE EXPERTISE	3	68	7.815	3.735	0.291	0.022	0.857
	SE-CAUSE EXPERTISE	4	68	9.488	2.949	0.566	-0.156	0.205
	ST SCICONT	3	70	7.815	4.294	0.231	0.111	0.36
	SE SCICONT	3	68	7.815	6.896	0.075	0.302	0.012
	SE-CAUSE SCICONT	3	68	7.815	1.344	0.719	0.061	0.62
	ST ACCURACY	3	68	7.815	3.181	0.365	0.200	0.101
	SE ACCURACY	3	66	7.815	3.561	0.313	0.223	0.071

Table 12 presents the results of the Chi-square tests of individual values and goals (as represented by the contribution to satisfaction questions) and the video-response questions. The nearly significant (94.8%) associations present are between the values *personal finances* and the accuracy of the ST narrator's statement (χ^2= 7.741, df= 3 and R= .192), *purchases* and the SE video's expertise (χ^2= 5.923, df= 2 and R= .380) and *how others viewed you* and the ST video's scientific content (χ^2= 5.924, df= 2 and R= .289). While the second association supports Hypothesis 5, the first and last associations do not. The lack of consistent significant associations, either positive or negative, suggests either that the value orientations tested for in this study are independent of the manner in which the individuals attributed expertise to the ST and SE videos, or that limitations previously discussed regarding both the manner in which these value orientations were reported and the videos' content etc. sufficiently dominate those associations. Further research is required, perhaps a study that utilizes multiple pro-

environmental knowledge campaigns, multiple videos, websites, advertisements, podcasts, etc. each of which utilizes a predominantly ST or SE value-oriented focus.

3.4. Conclusions

The current study was a conjoint application of ESM and the Apple iPhone on the value orientation theory of pro-environmental behavior. The results of this application varied. While the experiment's design, implementation and analysis all proved that the iPhone is a capable instrument and an excellent complement to ESM, it remains to be seen whether ESM and the iPhone used conjointly produce accurate socio-psychological data—much less socio-environmental data. This experiment in using the iPhone as a survey instrument certainly implemented an ESM study at a significantly reduced cost. Financial, physical and human resource requirements were all moderated considerably.

Though twelve iPhones were purchased, this proved unnecessary as only one was used in the study, and that one exclusively by the researcher. All preliminary contact with the participants was done via email or through the participants' own phone. No training of the participant or the technology was necessary And only one physical meeting was necessary, this to distribute the $20 incentive and receive the paper-survey that had been emailed to all participants. Only one researcher was responsible, and necessary, to conduct the entire ESM survey, and his responsibilities consisted primarily of emailing and texting the participants survey questions, as well as receiving the responses and recording and coding the data. Such data if recorded at the moment of response did not prove burdensome, and seemed comparatively less than that of single-administration surveys. Furthermore, the recording, coding and analyzing was and likely can be accomplished while the survey is being conducted, decreasing the

monotony that may commonly accompany such efforts. While the project had a relatively low number of participants (n=71), this study concludes that a single researcher could conduct a similar investigation of up to two hundred participants.

The significance of such savings cannot and should not be overlooked. According to the literature regarding ESM (e.g. Hektner et al, 2007), the number one barrier to using ESM and its variants outside the field of psychology is its high cost. This study demonstrated that those costs are only associated with previous research instruments and that adopting novel technologies, such as the iPhone, eliminate such barriers, making ESM available to other disciplines and arenas of investigation.

This study concludes that the adoption of ESM is a high-quality alternative to single-administration surveys, focus groups and interviews. This is extremely important for socio-environmental researchers. ESM has been shown previously to be adept at reducing recall errors and biases (ibid), and can if used appropriately—particularly due to the randomness of the signaling and response schedule—likely eliminate socially desirable responding, satisficing and part-whole effects. This study was unable to conduct similar investigations using different methods and instruments to verify these capabilities; however this study argues that such investigations are not only worthy, but critical.

Brown and Kasser (2005) argued that their research especially needed to be replicated in a manner that focused on mitigating SDR and recall error. They are not alone. ESM, when used alongside the iPhone, can also reduce researchers' reliance on self-reporting, a key source of inaccuracy in socio-environmental surveys according to Corral-Verdugo (1997). This is possible because the iPhone allows the researcher to directly monitor the respondents' behavior through the use of the device's camera. This study used the iPhone's camera to verify individuals'

recycling behavior, their television and videogame behaviors and their food purchases. Such phenomena, which this study urges is important to socio-environmental investigations, may be inaccurately self-reported or even degraded through SDR or satisficing. Utilizing the iPhone's photographic capabilities provided this study with a possible way around such biases and errors. The device also allows the respondent to access multimedia and the internet, allowing expanded types of research, as demonstrated in this study's use of pro-environmental YouTube videos.

Perhaps ESM's two greatest advantages are its focus on ecological validity and intrapersonal variation, and both were on display in this study. Lab-based experiments, computer-aided and telephone surveys, focus groups and interviews all extract the respondent from his or her natural environment. Yet ESM and the iPhone allow for direct access—which is of particular relevance in socio-environmental research, as most is typically aimed in at least some way at measuring individuals' relationship *with their environment*! The current study allowed researchers to investigate that relationship while the respondent experienced, both physically and cognitively, the environment in question. The exact benefits of such measurement were outside the purview of the current study, but should certainly be researched in the future.

ESM is also able to penetrate and examine individuals' values, beliefs and attitudes, phenomena that are often time, space or context dependent. And the iPhone decreases the time and distance between the action and its reporting thus increasing the ecological validity of the result. In this study researchers were able to ask students about their feelings regarding school on days the student was in class; it is even possible the students were in class at the very moment they received the signal. This should increase the accuracy of such responses over paper-surveys or computer-administered surveys that rely on retrospective reporting.

As socio-environmental researchers become more and more interested in comparing individuals' values, worldviews and pro-environmental attitudes, ESM's focus on intrapersonal variation is key. It is no longer enough to measure general demographic trends. Instead, one must now determine what creates transformation within the individual.

The second principal focus of this study was on individuals' values and well-being, in an attempt to discern a relationship between those two variables and one's pro-environmental behavior. This proved particularly difficult and complex, both because that relationship is naturally complex and because ESM relies on snapshots of individuals' well-being and behavior. These snapshots, as opposed to what single-administration studies (SAS) generate, which are typically generalized self-reports about one's behavior averaged over a certain period of time, are inherently more variable. This variation makes any type of relational analysis much more difficult. A study such as this because of its limited scope and breadth was not able to rely on the replication of particular questions and of samples to generate more robust results.

It is also important to note that this study was only able to control for certain variables. While the sample population was fairly homogenous, i.e. of similar age, in the same class, and at the same institution, other factors certainly play a role in their behavior, well-being and value orientations. Certain analyses were run in which vehicle ownership, gender, employment status, and whether or not students lived in a dorm or in an apartment, were controlled. These analyses produced similar results to those presented in the tables above and in the appendices. Despite these analyses, it is not possible to argue that this study's results are ceteris paribus. For example individuals' families, their family's income, their distance to school and work, their class schedule, their clothes (personal appearance was one of the values examined) and their

extracurricular activities all likely play a role in the variables and associations examined in this study. Yet these variables were not controlled for in this study.

Thus, the apparent lack of relation between the variables examined in this study is either a) truly a result of their independence, b) a result of individuals' true variability, or c) a result of variables that were unaccounted for in this examination. While the first two results would be interesting and worthy of further investigation, the third muddies such a conclusion. Were we to presume however for a moment that control variables were accounted for in this study's results, the inherent variability between and within individuals would be a convincing rationale to pursue ESM-style investigations such as this. Furthermore, regardless of this study's results, such variability if it exists should make researchers think twice about the data that their SAS generate. Such data may not only be rife with recall error and biases, but it may also only be capturing individuals' most typical behavior under certain normalized circumstances—not how that individual actually behaves typically. It may also capture less tangible phenomena like values or beliefs outside of their typical context. Such delineation is extremely important, and ESM studies such as this regardless of their results make that delineation apparent.

Clearly the gulf that separates how individuals feel, believe and act in the moment and how they feel, believe and act in general is wide. Yet focusing efforts solely on SAS forgets about that opposite shore. This study does not present evidence that snapshots of well-being, values and behavior are more robust or revealing. Instead, this study only suggests that such snapshots may not always align with individuals' generalized accounts and that more research focusing on both snapshots and generalized accounts is necessary. Such research should focus much more in-depth on each of the three phenomena investigated here—amongst many others.

Only in conducting ESM-style investigations can researchers argue that they are unnecessary. This study suggests the opposite, that they are indeed very necessary.

APPENDICES

APPENDIX A

ESM Survey Questions
(Contribution to Satisfaction Questions are marked with an asterisk)

1. On a scale of 1-7, 1 being not satisfied at all, and 7 being completely satisfied, what number best describes how satisfied you are with your life these days?

2. On a scale of 1-7, 1 being not satisfied at all, and 7 being completely satisfied, what number best describes how satisfied you are with how your day today has gone so far?

3. On a scale of 1-7, 1 being completely miserable, and 7 being extremely happy, what number best describes your level of content so far today?

4. On a scale of 1-7, 1 being not at all, and 7 being very much, what number best describes how much control you've had over your life today?

5. On a scale of 1-7, with 1 being very poorly and 7 being very well, please choose the number that best describes how well you slept last night.

6. *On a scale of 1-7, with 1 being very poorly and 7 being very well, please choose the number that best describes how you feel about your personal appearance today.

7. *On a scale of 1-7, with 1 being very poorly and 7 being very well, please choose the number that best describes how you feel other people have viewed you today.

8. On a scale of 1-7, with 1 being none at all and 7 being very much, please choose the number that best describes how much time you feel you have had for yourself today.

9. *On a scale of 1-7, with 1 being none at all and 7 being very much, please choose the number that best describes how successful you've felt today.

10. *On a scale of 1-7, with 1 being none at all and 7 being very much, please choose the number that best describes how often you thought about the quality of the environment around you today.

11. *On a scale of 1-7, 1 being a great negative effect, and 7 being a great positive effect, what number best describes the effect that your personal finances have had on your level of satisfaction today?

12. *On a scale of 1-7, 1 being a great negative effect, and 7 being a great positive effect, what number best describes the effect that your health has had on your level of satisfaction today?

13. *On a scale of 1-7, 1 being a great negative effect, and 7 being a great positive effect, what number best describes the effect that your relationships (e.g. family, friends, co-workers) has had on your level of satisfaction today?

14. *On a scale of 1-7, 1 being a great negative effect, and 7 being a great positive effect, what number best describes the effect that purchases you have made today have had on your level of satisfaction?

15. *On a scale of 1-7, 1 being a great negative effect, and 7 being a great positive effect, what number best describes the effect that today's weather has had on your level of satisfaction?

16. *On a scale of 1-7, 1 being a great negative effect, and 7 being a great positive effect, what number best describes the effect that your education (or your experience at school today) has had on your current level of satisfaction?

17. *On a scale of 1-7, 1 being a great negative effect, and 7 being a great positive effect, what number best describes the effect that your religious beliefs or a religious event have had on your level of satisfaction today?

18. *On a scale of 1-7, 1 being a great negative effect and 7 being a great positive effect, what number best describes the effect that your local environment has had on your level of satisfaction today?

19. If you could purchase any vehicle today, no matter the cost (the vehicle would cost you nothing), what vehicle would you purchase? (Please be as specific as possible)

20. If you could move to any city in the world today, what city would it be?

21. If you could do anything in the world tonight, and money was not a concern, what would you do? (Please be as specific as possible)

22. At your earliest convenience, please use your iPhone's camera to take a picture(s) of the inside and outside of your refrigerator.

23. At your earliest convenience, please use your iPhone's camera to take a picture(s) of your television set.

24. At your earliest convenience, please use your iPhone's camera to take a picture(s) of something outside your home that makes you feel pleasant or happy.

25. At your earliest convenience, please use your iPhone's camera to take a picture(s) of where you store your garbage can(s) and/or recycling container(s).

26. At your earliest convenience, please use your iPhone's camera to take a picture of the odometer in your automobile.

27. Please text back one, and only one, of the following as what you used for your primary mode of transportation today so far: Automobile, Bus, Motorcycle, Scooter, Bicycle, Walking

28. Please text back approximately how many miles you drove your car yesterday.

29. Please text back how many trips you made (or errands you ran) on your bicycle yesterday. (Please count each roundtrip as only 1)

30. Please text back how many hours and/or minutes you have spent in front of a computer today?

31. Please text back how many hours and/or minutes you spent in front of a computer yesterday?

32. Please text back approximately how many minutes you spent on the telephone yesterday.

33. Please text back approximately how many minutes you have spent on the telephone today.

34. Please text back approximately how many hours and/or minutes you spent watching television or movies yesterday.

35. Please text back approximately how many hours and/or minutes you have spent watching television or movies today.

36. Please text back the number of meals you ate yesterday at home and the number you ate yesterday at a restaurant. [Example: For 2 meals eaten at home and 1 at a restaurant, text "2-1"]

37. Please text back the number of meals you have eaten today at home and the number you ate at a restaurant. [Example: For 2 meals eaten at home and 1 at a restaurant, text "2 home-1 away"]

38. Please text back approximately how many hours and/or minutes you spent online today.

39. Please watch the video "This Bulb" by clicking on the following hyperlink: http://www.youtube.com/watch?v=FvOBHMb6Cqc

40. Having watched the video "This Bulb," what level of expertise do you feel it demonstrated?
    i. None at all
    ii. Very little
    iii. Some
    iv. Much
    v. Very much

41. Having watched the video "This Bulb," how would you describe the video's content?
    i. Not at all scientific
    ii. A little scientific
    iii. Somewhat scientific
    iv. Very scientific

42. In the video "This bulb," Natalie Portman purports that "'this bulb' will help reverse the effects of global warming." How accurate do you believe this statement to be?
    i. Not at all accurate
    ii. A little accurate
    iii. Somewhat accurate
    iv. Very accurate

43. Having watched the video "This Bulb," how much do you feel you yourself have contributed to climate change TODAY?
    i. Much less than the average American
    ii. Moderately less than the average American
    iii. The same as the average American
    iv. More than the average American
    v. Much more than the average American
    vi. I have not contributed to climate change today

44. Having watched the video "This Bulb," how likely are you to replace any of the light bulbs in your house or apartment with compact fluorescent bulbs (as seen in the video)?
    i. Very unlikely,
    ii. Unlikely,
    iii. Likely,
    iv. Very likely,
    v. Already use compact fluorescent bulbs

45. Please watch the video "Unchained Goddess" by clicking on the following hyperlink: http://www.youtube.com/watch?v=qF9WdV8pUPk

46. Having watched "Unchained Goddess," a movie clip produced in 1958, what level of expertise do you feel its narrator Dr. Frank Baxter demonstrated?
    i. None at all
    ii. Very little
    iii. Some
    iv. Much
    v. Very much

47. Having watched "Unchained Goddess," a movie clip produced in 1958, how would you describe the video's content?
    i. Not at all scientific
    ii. A little scientific
    iii. Somewhat scientific
    iv. Very scientific

48. What effect does the fact that "Unchained Goddess" was filmed in 1958 have on your willingness to believe its narrator Dr. Baxter?
   i. Because of the video's age, I am less willing to believe Dr. Baxter
   ii. Because of the video's age, I am more willing to believe Dr. Baxter
   iii. I am equally willing to believe Dr. Baxter regardless of the video's age
   iv. Regardless of the video's age, I do not believe Dr. Baxter

49. Having watched "Unchained Goddess," what level of responsibility do you feel personally for climate change?
   i. None at all
   ii. Very little
   iii. Some
   iv. Much
   v. Very much

50. Having watched "Unchained Goddess," who do you feel is most responsible for climate change?
   i. No human being is responsible
   ii. My parents and grandparents' generations are most responsible
   iii. My generation is most responsible
   iv. Future generations are most responsible

51. Having watched "Unchained Goddess," who do you feel is most responsible for taking action to prevent or mitigate (slow down) climate change?
   i. No human being is responsible
   ii. My parents and grandparents' generations are most responsible
   iii. My generation is most responsible
   iv. Future generations are most responsible

52. Please watch the video "Andrew Winston at Sustain 08" by clicking on the following hyperlink: http://www.youtube.com/watch?v=xtpHzVplr1U

53. Having watched the video, "Andrew Winston at Sustain 08," what level of expertise do you feel its narrator Andrew Winston demonstrated?
   i. None at all
   ii. Very little
   iii. Some
   iv. Much
   v. Very much

54. Having watched the video "Andrew Winston at Sustain 08," how would you describe the video's content?
   i. Not at all scientific
   ii. A little scientific
   iii. Somewhat scientific
   iv. Very scientific

55. In the video "Andrew Winston at Sustain 08," Andrew Winston describes the "forces driving sustainability" as "natural resource pressures, resource constraints, how much water we have, and how much stable climate we have." How accurate do you believe this statement to be?
    i. Not at all accurate
    ii. A little accurate
    iii. Somewhat accurate
    iv. Very accurate

56. Having watched the video, "Andrew Winston at Sustain 08," how would you describe yourself?
    i. Willing to pay significantly more (prices 20% or higher) for "green" products
    ii. Willing to pay moderately more (prices 10-19% higher) for "green" products
    iii. Willing to pay slightly more (prices 1-9% higher) for "green" products
    iv. Not willing to pay more for "green" products, but would choose similarly priced "green" products over "non-green" products
    v. Not willing to purchase "green" products at any price

APPENDIX B

Values and Pro-Environmental Behavior Data

Table 13. Values and Pro-Environmental Behavior

Variable 1	Variable 2	df	N	Pearson χ^2 Critical Value	Pearson χ^2 Statistic	Asymp. Signif.	Pearson's R (Correla.)	Approx. Signif.
SE=1/ST=0	REC	1	51	3.841	0.184	0.668	0.060	0.675
SE=1/ST=0	TRANS	2	64	5.991	4.237	0.120	-0.192	0.128
SE=1/ST=0	PEB	4	63	9.488	1.973	0.741	-0.064	0.621
Self-Enhancement Values (Extreme Effects Only)								
Personal Appearance	REC	1	57	3.841	2.263	0.132	-0.199	0.137
	TRANS	2	71	5.991	1.115	0.573	-0.113	0.346
	PEB	4	70	9.488	4.145	0.387	-0.165	0.172
Personal Finances	REC	1	57	3.841	0.524	0.469	0.096	0.478
	TRANS	2	71	5.991	0.344	0.842	0.038	0.753
	PEB	4	70	9.488	4.966	0.291	0.088	0.47
Feeling of Success	REC	1	56	3.841	0.007	0.932	-0.011	0.934
	TRANS	2	70	5.991	0.624	0.732	0.078	0.519
	PEB	4	69	9.488	4.056	0.399	0.056	0.647
Purchases	REC	1	17	3.841	0.052	0.819	0.056	0.832
	TRANS	2	22	5.991	1.257	0.533	-0.238	0.285
	PEB	4	21	9.488	1.125	0.890	-0.171	0.458
Others Viewed	REC	1	31	3.841	0.040	0.842	0.036	0.849
	TRANS	2	40	5.991	1.887	0.389	-0.016	0.924
	PEB	4	39	9.488	2.372	0.668	0.070	0.671
Self-Transcendent Values								
Religious Events	REC	1	57	3.841	0.118	0.731	0.045	0.737
	TRANS	2	70	5.991	0.537	0.764	-0.067	0.582
	PEB	4	69	9.488	1.170	0.883	-0.042	0.731
Relation-ships	REC	1	57	3.841	0.427	0.514	-0.087	0.522
	TRANS	2	70	5.991	1.908	0.385	-0.018	0.882
	PEB	4	69	9.488	0.786	0.940	-0.085	0.488

Table 13 (cont'd)

Variable 1	Variable 2	df	N	Pearson χ^2 Critical Value	Pearson χ^2 Statistic	Asymp. Signif.	Pearson's R (Correl.)	Approx. Signif.
Environ-ment Quality	REC	1	57	3.841	0.470	0.493	-0.091	0.502
	TRANS	2	71	5.991	3.101	0.212	-0.053	0.658
	PEB	4	70	9.488	4.518	0.340	-0.106	0.381
Weather	REC	1	56	3.841	0.383	0.536	-0.083	0.545
	TRANS	2	68	5.991	2.942	0.230	0.065	0.6
	PEB	4	67	9.488	2.610	0.625	0.036	0.772
Value-free?								
Education/ Class	REC	1	48	3.841	2.350	0.125	-0.221	0.131
	TRANS	2	61	5.991	3.119	0.210	0.225	0.081
	PEB	4	60	9.488	3.039	0.551	0.029	0.826
Health	REC	1	56	3.841	0.394	0.530	-0.084	0.539
	TRANS	2	70	5.991	0.824	0.662	-0.051	0.673
	PEB	4	69	9.488	3.661	0.454	-0.099	0.416
Self-Enhancement Values (All Effects (including minimal))								
Personal Appearance	REC	1	57	3.841	0.438	0.508	-0.088	0.517
	TRANS	2	71	5.991	3.932	0.140	-0.143	0.235
	PEB	4	70	9.488	4.597	0.331	-0.157	0.194
Personal Finances	REC	1	57	3.841	0.020	0.886	-0.019	0.889
	TRANS	2	71	5.991	2.901	0.234	-0.047	0.699
	PEB	4	70	9.488	5.440	0.245	-0.079	0.514
Feeling of Success	REC	1	56	3.841	0.004	0.952	-0.008	0.953
	TRANS	2	70	5.991	0.419	0.811	-0.075	0.538
	PEB	4	69	9.488	1.328	0.857	-0.096	0.43
Purchases	REC	1	17	3.841	0.562	0.453	0.182	0.485
	TRANS	2	22	5.991	6.079*	0.048	-0.454*	0.034
	PEB	4	21	9.488	3.012	0.556	-0.213	0.353

Table 13 (cont'd)

Variable 1	Variable 2	df	N	Pearson χ^2 Critical Value	Pearson χ^2 Statistic	Asymp. Signif.	Pearson's R (Correl.)	Approx. Signif.
How Others Viewed	REC	1	31	3.841	0.040	0.841	0.036	0.847
	TRANS	2	40	5.991	2.364	0.307	-0.148	0.361
	PEB	4	39	9.488	1.803	0.772	-0.037	0.823
Self-Transcendent Values								
Religious Events	REC	1	57	3.841	0.001	0.977	0.004	0.978
	TRANS	2	70	5.991	2.119	0.347	-0.148	0.222
	PEB	4	69	9.488	3.137	0.535	-0.114	0.352
Relation-ships	REC	1	57	3.841	2.144	0.143	-0.194	0.148
	TRANS	2	70	5.991	1.504	0.472	0.049	0.688
	PEB	4	69	9.488	0.595	0.964	-0.051	0.679
Environ-ment Quality	REC	1	57	3.841	0.994	0.319	-0.132	0.327
	TRANS	2	71	5.991	1.804	0.406	-0.147	0.222
	PEB	4	70	9.488	4.494	0.343	-0.173	0.153
Weather	REC	1	56	3.841	0.000	0.983	-0.003	0.983
	TRANS	2	68	5.991	0.266	0.875	-0.006	0.964
	PEB	4	67	9.488	1.808	0.771	-0.026	0.837
Value-free?								
Education/ Class	REC	1	48	3.841	0.032	0.858	0.026	0.862
	TRANS	2	61	5.991	6.053*	0.048	0.315	0.014
	PEB	4	60	9.488	2.453	0.653	0.170	0.195
Health	REC	1	56	3.841	0.004	0.952	-0.008	0.953
	TRANS	2	70	5.991	0.970	0.616	0.003	0.979
	PEB	4	69	9.488	4.696	0.320	-0.010	0.934

* denotes 95% Significance
** denotes 99% Significance

APPENDIX C

Values and Subjective Well-Being Data

Table 14. Values and Subjective Well-Being

Variable 1	Variable 2	df	N	Pearson χ^2 Critical Value	Pearson χ^2 Statistic	Asymp. Sig.	Pearson's R (Correl.)	Approx. Signif.
	TOTAL							
SE=1/ST=0	SWB	21	63	32.671	17.505	0.680	-0.113	0.377
	GEN							
	SWB	9	64	16.919	6.429	0.696	-0.073	0.564
	SNAP							
	SWB	15	64	24.996	16.548	0.347	-0.101	0.426
Self-Enhancement Values (Extreme Effects Only)								
Personal	TOTAL							
Appearance	SWB	23	70	35.172	37.568**	0.028	0.370**	0.002
	GEN							
	SWB	9	71	16.919	11.639	0.234	0.325**	0.006
	SNAP							
	SWB	15	71	24.996	20.399	0.157	0.288*	0.015
Personal	TOTAL							
Finances	SWB	23	70	35.172	24.384	0.383	-0.224	0.063
	GEN							
	SWB	9	71	16.919	8.180	0.516	-0.147	0.22
	SNAP							
	SWB	15	71	24.996	17.753	0.276	-0.160	0.183
Feeling of	TOTAL							
Success	SWB	23	69	35.172	21.274	0.564	0.084	0.492
	GEN							
	SWB	9	70	16.919	11.295	0.256	0.139	0.253
	SNAP							
	SWB	15	70	24.996	15.080	0.446	0.051	0.674
	TOTAL							
Purchases	SWB	11	21	19.675	12.375	0.336	0.163	0.479
	GEN							
	SWB	6	22	12.592	5.254	0.512	-0.073	0.748
	SNAP							
	SWB	10	22	18.307	10.620	0.388	0.173	0.44

Table 14 (cont'd)

Variable 1	Variable 2	df	N	Pearson χ^2 Critical Value	Pearson χ^2 Statistic	Asymp. Sig.	Pearson's R (Correl.)	Approx. Signif.
Self-Transcendent Values								
Religious Events	TOTAL SWB	23	69	35.172	20.487	0.612	0.157	0.197
	GEN SWB	9	70	16.919	9.789	0.368	0.029	0.812
	SNAP SWB	15	70	24.996	10.639	0.778	0.212	0.078
Relation-ships	TOTAL SWB	23	69	35.172	18.977	0.703	0.223	0.066
	GEN SWB	9	70	16.919	10.163	0.337	0.276**	0.021
	SNAP SWB	15	70	24.996	11.577	0.711	0.125	0.302
Environ-mental Quality	TOTAL SWB	23	70	35.172	30.675	0.131	-0.009	0.939
	GEN SWB	9	71	16.919	7.381	0.598	0.042	0.729
	SNAP SWB	15	71	24.996	14.809	0.465	-0.065	0.589
Weather	TOTAL SWB	23	67	35.172	22.383	0.497	0.238*	0.052
	GEN SWB	9	68	16.919	5.357	0.802	0.144	0.241
	SNAP SWB	15	68	24.996	23.111	0.082	0.247*	0.042
Value-free?								
Education/ Class	TOTAL SWB	21	60	32.671	26.451	0.190	0.123	0.347
	GEN SWB	9	61	16.919	7.649	0.570	0.088	0.499
	SNAP SWB	14	61	23.685	12.752	0.546	0.124	0.343

Table 14 (cont'd)

Variable 1	Variable 2	df	N	Pearson χ^2 Critical Value	Pearson χ^2 Statistic	Asymp. Sig.	Pearson's R (Correl.)	Approx. Signif.
Self-Enhancement Values (All Effects (Including minimal))								
Personal Appearance	TOTAL SWB	23	70	35.172	14.276	0.919	0.158	0.191
	GEN SWB	9	71	16.919	6.120	0.728	0.030	0.803
	SNAP SWB	15	71	24.996	17.853	0.270	0.225	0.059
Personal Finances	TOTAL SWB	23	70	35.172	15.108	0.891	-0.001	0.995
	GEN SWB	9	71	16.919	3.477	0.942	-0.097	0.421
	SNAP SWB	15	71	24.996	20.945	0.139	0.104	0.39
Feeling of Success	TOTAL SWB	23	69	35.172	25.408	0.330	-0.061	0.619
	GEN SWB	9	70	16.919	5.256	0.811	-0.033	0.784
	SNAP SWB	15	70	24.996	17.956	0.265	-0.042	0.729
Purchases	TOTAL SWB	11	21	19.675	12.296	0.342	0.354	0.115
	GEN SWB	6	22	12.592	5.018	0.542	-0.010	0.946
	SNAP SWB	10	22	18.307	15.207	0.125	0.305	0.167
How Others Viewed	TOTAL SWB	11	39	19.675	8.580	0.661	0.084	0.611
	GEN SWB	9	40	16.919	13.810	0.129	0.087	0.595
	SNAP SWB	8	40	15.507	4.352	0.824	0.059	0.719
Self-Transcendent Values								
Religious Events	TOTAL SWB	23	69	35.172	21.320	0.567	-0.016	0.896
	GEN SWB	9	70	16.919	7.702	0.564	-0.171	0.156
	SNAP SWB	15	70	24.996	16.095	0.376	0.135	0.265

Table 14 (cont'd)

Variable 1	Variable 2	df	N	Pearson χ^2 Critical Value	Pearson χ^2 Statistic	Asymp. Sig.	Pearson's R (Correl.)	Approx. Signif.
Relation-ships	TOTAL SWB	23	69	35.172	16.802	0.819	-0.005	0.965
	GEN SWB	9	70	16.919	7.036	0.633	0.136	0.263
	SNAP SWB	15	70	24.996	11.576	0.711	-0.112	0.355
Environ-mental Quality	TOTAL SWB	23	70	35.172	18.427	0.734	-0.004	0.972
	GEN SWB	9	71	16.919	10.939	0.280	0.109	0.367
	SNAP SWB	15	71	24.996	8.159	0.917	-0.103	0.393
Weather	TOTAL SWB	23	67	35.172	11.772	0.974	0.005	0.969
	GEN SWB	9	68	16.919	6.309	0.709	-0.005	0.967
	SNAP SWB	15	68	24.996	17.166	0.309	0.032	0.799
Value-free?								
Education/ Class	TOTAL SWB	21	60	32.671	26.683	0.182	0.128	0.33
	GEN SWB	9	61	16.919	12.621	0.181	0.207	0.109
	SNAP SWB	14	61	23.685	15.924	0.318	0.013	0.92
Health	TOTAL SWB	22	69	33.924	22.501	0.430	0.054	0.659
	GEN SWB	9	70	16.919	3.947	0.915	0.018	0.884
	SNAP SWB	14	70	23.685	11.234	0.668	0.037	0.759

* denotes 95% Significance
** denotes 99% Significance

APPENDIX D

Values and Environmental Knowledge Videos Data

Table 15. Values and Environmental Knowledge Videos

Variable 1	Variable 2	df	N	Pearson χ^2 Critical Value	Pearson χ^2 Statistic	Asymp. Sig.	Pearson's R (Correl.)	Approx. Sig.
SE=1/ST=0	ST EXPERTISE	4	63	9.488	11.541*	0.021	-0.138	0.282
	SE EXPERTISE	3	61	7.815	4.668	0.198	-0.224	0.083
	SE-CAUSE EXPERT	4	62	9.488	2.068	0.723	0.127	0.325
	ST SCICONT	3	63	7.815	2.196	0.533	0.129	0.313
	SE SCICONT	3	61	7.815	1.922	0.589	-0.082	0.532
	SE-CAUSE SCICONT	3	62	7.815	2.585	0.460	0.139	0.283
	ST ACCURACY	3	61	7.815	1.300	0.729	-0.069	0.595
	SE ACCURACY	3	60	7.815	1.403	0.705	-0.110	0.402
Self-Enhancement Values (Extreme Effects Only)								
Personal Appearance	ST EXPERTISE	4	70	9.488	1.300	0.861	-0.029	0.814
	SE EXPERTISE	3	68	7.815	1.269	0.737	0.080	0.515
	SE-CAUSE EXPERTISE	4	68	9.488	3.499	0.478	0.176	0.151
	ST SCICONT	3	70	7.815	3.916	0.271	0.196	0.104
	SE SCICONT	3	68	7.815	2.234	0.525	-0.037	0.763
	SE-CAUSE SCICONT	3	68	7.815	2.302	0.512	0.032	0.796
	ST ACCURACY	3	68	7.815	5.699	0.127	-0.171	0.164
	SE ACCURACY	3	66	7.815	2.792	0.425	-0.016	0.9
Personal Finances	ST EXPERTISE	4	70	9.448	0.853	0.931	-0.009	0.938
	SE EXPERTISE	3	68	7.815	2.363	0.501	-0.094	0.446

Table 15 (cont'd)

Variable 1	Variable 2	df	N	Pearson χ^2 Critical Value	Pearson χ^2 Statistic	Asymp. Sig.	Pearson's R (Correl.)	Approx. Sig.
	SE-CAUSE EXPERTISE	4	68	9.448	5.354	0.253	0.211	0.084
Pers. Finan.	ST SCICONT	3	70	7.815	2.937	0.401	0.118	0.332
	SE SCICONT	3	68	7.815	3.778	0.286	0.129	0.294
	SE-CAUSE SCICONT	3	68	7.815	3.899	0.273	0.208	0.09
	ST ACCURACY	3	68	7.815	7.741	0.052	0.192	0.116
	SE ACCURACY	3	66	7.815	1.288	0.732	0.134	1.081
Feeling of	ST							
Success	EXPERTISE	4	69	9.488	2.424	0.658	-0.005	0.966
	SE EXPERTISE	3	67	7.815	4.390	0.222	0.039	0.753
	SE-CAUSE EXPERTISE	4	67	9.488	1.515	0.824	0.022	0.859
	ST SCICONT	3	69	7.815	1.564	0.668	-0.050	0.681
	SE SCICONT	3	67	7.815	2.202	0.531	0.012	0.922
	SE-CAUSE SCICONT	3	67	7.815	0.707	0.871	-0.080	0.522
	ST ACCURACY	3	67	7.815	3.121	0.373	-0.207	0.092
	SE ACCURACY	3	65	7.815	2.035	0.565	0.171	0.173
	ST							
Purchases	EXPERTISE	2	22	5.991	1.689	0.430	-0.261	0.24
	SE EXPERTISE	2	21	5.991	5.923	0.052	0.380	0.089
	SE-CAUSE EXPERTISE	4	21	9.488	2.250	0.690	-0.166	0.472
	ST SCICONT	3	22	7.815	3.634	0.304	-0.040	0.861
	SE SCICONT	2	21	5.991	1.081	0.582	-0.123	0.597
	SE-CAUSE SCICONT	3	21	7.815	3.900	0.272	-0.046	0.843
	ST ACCUR.	2	21	5.991	0.915	0.633	0.162	0.483
	SE ACCURACY	2	20	5.991	0.899	0.638	0.212	0.371

Table 15 (cont'd)

Variable 1	Variable 2	df	N	Pearson χ^2 Critical Value	Pearson χ^2 Statistic	Asymp. Sig.	Pearson's R (Correl.)	Approx. Sig.
How Others Viewed	ST EXPERTISE SE	4	39	9.488	0.415	0.981	0.020	0.904
	EXPERTISE SE-CAUSE	3	37	7.815	1.837	0.607	0.130	0.442
	EXPERTISE	4	38	9.488	1.759	0.780	0.134	0.423
	ST SCICONT	2	39	5.991	5.924	0.052	0.289	0.074
	SE SCICONT	3	37	7.815	5.069	0.167	0.166	0.328
	SE-CAUSE SCICONT	3	38	7.815	4.479	0.214	0.042	0.804
	ST ACCURACY SE	3	37	7.815	5.964	0.113	0.122	0.473
	ACCURACY	3	36	7.815	4.655	0.199	0.316	0.061
<u>Self-Transcendent Values</u>								
Religious Events	ST EXPERTISE SE	4	70	9.488	3.905	0.419	0.050	0.679
	EXPERTISE SE-CAUSE	3	68	7.815	1.748	0.626	0.039	0.75
	EXPERTISE	4	67	9.488	1.133	0.889	0.044	0.722
	ST SCICONT	3	70	7.815	3.111	0.375	0.088	0.469
	SE SCICONT	3	68	7.815	3.134	0.371	0.098	0.426
	SE-CAUSE SCICONT	3	67	7.815	1.367	0.713	0.019	0.877
	ST ACCURACY SE	3	68	7.815	0.058	0.996	0.009	0.939
	ACCURACY	3	66	7.815	2.100	0.552	0.040	0.749
Local Environment Quality	ST EXPERTISE SE	4	70	9.488	5.125	0.275	-0.008	0.947
	EXPERTISE SE-CAUSE	3	68	7.815	3.735	0.291	0.022	0.857
	EXPERTISE	4	68	9.488	2.949	0.566	-0.156	0.205
	ST SCICONT	3	70	7.815	4.294	0.231	0.111	0.36
	SE SCICONT	3	68	7.815	6.896	0.075	0.302	0.012

Table 15 (cont'd)

Variable 1	Variable 2	df	N	Pearson χ^2 Critical Value	Pearson χ^2 Statistic	Asymp. Sig.	Pearson's R (Correl.)	Approx. Sig.
Env. Quality	SE-CAUSE SCICONT	3	68	7.815	1.344	0.719	0.061	0.62
	ST ACCURACY	3	68	7.815	3.181	0.365	0.200	0.101
	SE ACCURACY	3	66	7.815	3.561	0.313	0.223	0.071
Weather	ST EXPERTISE	4	68	9.488	3.819	0.431	-0.010	0.937
	SE EXPERTISE	3	67	7.815	3.491	0.322	-0.103	0.406
	SE-CAUSE EXPERTISE	4	65	9.488	1.451	0.835	-0.037	0.772
	ST SCICONT	3	68	7.815	0.812	0.847	-0.106	0.39
	SE SCICONT	3	67	7.815	1.927	0.588	-0.016	0.901
	SE-CAUSE SCICONT	3	65	7.815	0.954	0.812	-0.105	0.405
	ST ACCURACY	3	66	7.815	0.595	0.898	0.008	0.946
	SE ACCURACY	3	65	7.815	2.204	0.531	0.131	0.298
Education/ Class	ST EXPERTISE	4	60	9.488	3.218	0.522	-0.197	0.132
	SE EXPERTISE	3	58	7.815	1.669	0.644	-0.153	0.253
	SE-CAUSE EXPERTISE	4	58	9.488	4.606	0.330	0.170	0.202
	ST SCICONT	3	60	7.815	3.956	0.266	0.038	0.776
	SE SCICONT	3	58	7.815	3.456	0.327	0.027	0.838
	SE-CAUSE SCICONT	3	58	7.815	0.751	0.861	0.054	0.688
	ST ACCURACY	3	58	7.815	2.877	0.411	0.043	0.746
	SE ACCURACY	3	56	7.815	0.655	0.884	0.075	0.583

Table 15 (cont'd)

Variable 1	Variable 2	df	N	Pearson χ^2 Critical Value	Pearson χ^2 Statistic	Asymp. Sig.	Pearson's R (Correl.)	Approx. Sig.
Health	ST EXPERTISE	4	69	9.488	3.780	0.437	0.007	0.953
	SE EXPERTISE	3	67	7.815	0.597	0.897	0.068	0.583
	SE-CAUSE EXPERTISE	4	68	9.488	0.871	0.929	0.068	0.58
	ST SCICONT	3	69	7.815	2.767	0.429	0.016	0.895
	SE SCICONT	3	67	7.815	7.463	0.059	-0.049	0.691
	SE-CAUSE SCICONT	3	68	7.815	5.636	0.131	-0.227	0.063
	ST ACCURACY	3	67	7.815	1.349	0.718	0.048	0.701
	SE ACCURACY	3	65	7.815	0.272	0.965	0.024	0.849

* denotes 95% Significance
** denotes 99% Significance

REFERENCES

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Adamowicz, W., Louviere, J., & Williams, M. (1994). Combining Revealed and Stated Preferences Methods for Valuing Environmental Amenities. *Journal of Environmental Economics and Management, 26*, 271-292.

Ahuvia, A., & Wong, N. Y. (2002). Personality and values based materialism: Their relationship and origins. *Journal of Consumer Psychology, 12*, 389-402.

Ajzen, I. (1991). The Theory of Planned Behavior. *Organizational Behavior and Human Decision Processes, 50*, 179-211.

Ajzen, I., & Fishbein, M. (1980). *Understanding Attitudes and Predicting Social Behavior*. Englewood Cliffs, NJ: Prentice Hall.

Allen, J. B., & Ferrand, J. L. (1999). Environmental locus of control, sympathy, and proenvironmental behavior: A test of Geller's actively caring hypothesis. *Environment and Behavior, 31*, 338-353.

Amelang, M., & Bartussek, D. (1970). Untersuchungen zur Validitat einer neuen Lugen-Skala [Validity studies of a new lying scale]. *Diagnostica, 16*, 103-122.

Bagozzi, R. P. (1992). The Self-Regulation of Attitudes, Intentions, and Behavior. *Social Psychology Quarterly, 55*(2), 178-204.

Bailey, K. D. (1994). *Methods of Social Research* (Fourth Edition ed.). New York: The Free Press.

Bandura, A. (1977). Self-Efficacy: Twoard a Unifying Theory of Behavioral Change. *Psychological Review, 84*, 191-215.

Bandura, A. (1982). Self-Efficacy Mechanism in Human Agency. *American Psychologist, 37*, 122-147.

Bandura, A., Adams, N. E., & Beyer, J. (1977). Cognitive processes mediating behavioral change. *Journal of Personality and Social Psychology, 35*, 125-139.

Bandura, A., Adams, N. E., Hardy, A. B., & Howells, G. N. (1980). Tests of the generality of self-efficacy theory. *Cognitive Therapy and Research, 4*, 39-66.

Banerjee, R., & Dittmar, H. (2008). Individual differences in children's materialism: The role of peer relationships. *Personality and Social Psychology Bulletin, 34*, 17-31.

Bartlett, F. C. (1932). *Remembering*. Cambridge: Cambridge University Press.

Batie, S. (2008). Wicked Problems and Applied Economics. *American Journal of Agricultural Economics, 5*, 1176-1191.

Bhattacharyya, G. K., & Johnson, R. (1977). *Statistical Concepts and Methods*. New York: John Wiley & Sons.

Bickman, L. (1972). Environmental attitudes and actions. *Journal of Social Psychology, 87*(2), 323-324.

Blake, J. (1999). Overcoming the 'Value-Action Gap' in Environmental Policy: tensions between naitonal policy and local experience. *Local Environment, 4*(3), 257-278.

Blake, J., & Davis, K. (1964). Norms, Values and Sanctions. In R. L. Faris (Ed.), *Handbook of Modern Sociology* (pp. 456-484). Chicago: Rand-McNally.

Bodenhausen, G. V., & Wyer, R. S. (1987). Social Cognition and Social Reality: Information Acquisition and Use in the Laboratory and the Real World. In H. J. Hippler, N. Schwarz & S. Sudman (Eds.), *Social Information Processing and Survey Methodology* (pp. 6-41). New York: Springer-Verlag.

Borden, D., & Francis, J. L. (1978). Who cares about ecology? Personality and sex difference in environmental concern. *Journal of Personality, 46*, 190-203.

Brehm, J. W. (1966). *A theory of psychological reactance*. New York: Academic Press.

Brown, K. W., & Kasser, T. (2005). Are Psychological and Ecological Well-Being Compatible? The Role of Values, Mindfulness, and Lifestyle. *Social Indicators Research, 74*, 349-368.

Brown, M., & Leon, W. (1999). *The Consumer's Guide to Effective Environmental Choices*. New York: Three Rivers.

Brownstone, D., Bunch, D. S., & Train, K. (2000). Joint mixed logit models of stated and revealed preferences for alternative-fuel vehicles. *Transportation Research Part B, 34*, 315-338.

Brunswik, E. (1949). *Systematic and Representative Design of Psychological Experiments*. Berkeley, CA: University of California Press.

Cohen, P., & Cohen, J. (1996). *Life values and adolescent mental health*. Mahway, NJ: Erlbaum.

Corral-Verdugo, V. (1997). Dual "realities" of conservation behavior: Self-report vs. observations of re-use and recycling behavior. *Journal of Environmental Psychology, 17*, 135-145.

Cote, S., & Moskowitz, D. S. (1998). On the dynamic covariation between interpersonal behavior and affect: Prediction from neuroticism, extroversion, and agreeableness. *Journal of Personality and Social Psychology, 75*, 1032-1046.

Crowne, D. P., & Marlowe, D. (1960). A new scale of social desirability independent of psychopathology. *Journal of Consulting Psychology, 24*, 349-354.

Crowne, D. P., & Marlowe, D. (1964). *The approval motive*. New York: Wiley.

Csikszentmihalyi, M. (1988). The flow experience and its significance for human psychology. In I. S. Csikszentmihalyi & M. Csikszentmihalyi (Eds.), *Optimal Experience: Psychological Studies of Flow in Consciousness*. New York: Cambridge University Press.

Csikszentmihalyi, M. (2000). *Beyond boredom and anxiety* (2nd ed.). San Francisco: Jossey-Bass.

Csikszentmihalyi, M., & Graef, R. (1980). The experience of freedom in everyday life. *American Journal of Community Psychology, 18*, 402-414.

Csikszentmihalyi, M., & Larson, R. W. (1984). *Being adolescent: Conflict and growth in the teenage years*. New York: Basic Books.

Csikszentmihalyi, M., & Larson, R. W. (1987). Validity and reliability of the experience sampling method. *Journal of Nervous and Mental Disease, 175*(9), 526-536.

Csikszentmihalyi, M., & Schneider, B. (2000). *Becoming adult: How teenagers prepare for the world of work*. New York: Basic Books.

Daly, H. E. (1973). *Toward a steady-state economy*. San Francisco: W. H. Freeman.

De Young, R. (1988-89). Exploring the difference between recyclers and non-recyclers: The role of information. *Journal of Environmental Systems, 18*, 341-351.

De Young, R. (1996). Some psychological aspects of reduced consumption behavior: The role of intrinsic satisfaction and competence motivation. *Environment and Behavior, 28*, 358-409.

De Young, R. (2000). Expanding and Evaluating Motives for Environmentally Responsible Behavior. *Journal of Social Issues, 56*(3), 509-526.

Dechesne, M., Pyszezynski, T., Arndt, J., Ransom, S., Sheldon, K. M., & van Knippenberg, A. (2003). Literal and symbolic immortality: The effect of evidence of literal immortality on self-esteem striving in response to mortality salience. *Journal of Personality and Social Psychology, 84*, 722-737.

Delle Fave, A., & Massimini, F. (2003). Making disability into a resource: The role of optimal experience. *The Psychologist, 16*, 9-10.

Dickinson, T. L., & Zellinger, P. M. (1980). A comparison of the behaviorally anchored rating mixed standard scale formats. *Journal of Applied Psychology, 65*, 147-154.

Diener, E., & Fujita, F. (1995). Resources, personal strivings, and subjective well-being: A nomothetic and idiographic approach. *Journal of Personality and Social Psychology, 68*, 926-935.

Dietz, T., Stern, P. C., & Guagnano, G. A. (1998). Social structural and social psychological bases of environmental concern. *Environment and Behavior, 30*(4), 450-472.

Dunlap, R. E., & Liere, K. D. V. (1977). Land Ethic or Golden Rule: Comment on "Land Ethic Realized" by Thomas A. Heberlein, JSI, 28(4), 1972. *Journal of Social Issues, 33*(3), 200-211.

Dunlap, R. E., & Liere, K. D. V. (1978). The "new environmental paradigm": A proposed measuring instrument and preliminary results. *Journal of Environmental Education, 9*, 10-19.

Dunlap, R. E., Liere, K. D. V., Mertig, A. G., & Jones, R. E. (2000). Measuring Endorsement of the New Environmental Paradigm: A Revised NEP Scale. *Journal of Social Issues, 56*(3), 425-442.

Dwyer, W. O., Leeming, F. C., Cobern, M. K., Porter, B. E., & Jackson, J. M. (1993). Critical review of behavioral interventions to preserve the environment: Research since 1980. *Environment and Behavior, 25*, 275-321.

Edwards, A. L. (1957). *The social desirability variable in personality assessment and research*. New York: Dryden.

Edwards, A. L. (1970). *The measurement of personality traits by scales and inventories*. New York: Holt-Rinehart-Winston.

Eigner, S. (2001). The relationship between "protecting the environment" as a dominant life goal and subjective well-being. In P. Schmuck & K. M. Sheldon (Eds.), *Life Goals and Well-Being: Towards a Positive Psychology of Human Striving* (pp. 182-201). Seattle, WA: Hogrefe and Huber.

Eysenck, H. J., & Eysenck, S. B. G. (1964). *The manual of the Eysenck Personality inventory*. London: U of London Press.

Feldman Barrett, L. (2004). Feelings or Words? Understanding the content in self-report ratings of emotional experience. *Journal of Personality and Social Psychology, 87*(2), 266-281.

Fenichel, O. (1945). *The Psychoanalytic Theory of Neurosis*. New York: W. W. Norton.

Ferrer-i-Carbonell, A., & Gowdy, J. M. (2007). Environmental Degradation and Happiness. *Ecological Economics, 60*, 509-516.

Fishbein, M. (1967). Attitude and the prediction of behavior. In M. Fishbein (Ed.), *Readings in attitude, theory and measurement*. New York: Wiley.

Fishbein, M., & Ajzen, I. (1975). *Belief, Attitude, Intention, and Behavior: an introduction to theory and research*. Reading, MA: Addison-Wesley.

Frable, D. E. S., Platt, L., & Hoey, S. (1998). Concealable stigmas and positive self-perceptions: Feeling better around similar others. *Journal of Personality and Social Psychology, 74*, 909-922.

Funtowicz, S., & Ravetz, J. (2003). *Post-Normal Science*. Paper presented at the International Society for Ecological Economics.

Gatersleben, B., Meadows, J., Abrahamse, W., & Jackson, T. (2008). Materialistic and environmental values of young people. Unpublished Unpublished manuscript. University of Surrey.

Geller, E. S. (1995). Actively Caring for the Environment: An Integration of Behaviorism and Humanism. *Environment and Behavior, 27*(2), 184-195.

Gneezy, U., & Rustichini, A. (2000). A Fine is a Price. *The Journal of Legal Studies, XXIX*(January), 1-17.

Goffman, E. (1959). *The presentation of self in everyday life*. Garden City, NY: Doubleday/Anchor.

Good, J. (2007). Shop 'til we drop? Television, materialism and attitudes about the natural environment. *Mass Communication and Society, 10*, 365-383.

Grouzet, F. M. E., Kasser, T., Ahuvia, A., Fenandez-Dols, J. M., Kim, Y., & Lau, S. (2005). The structure of goal contents across 15 cultures. *Journal of Personality and Social Psychology, 89*, 800-816.

Groves, R. M. (1987). Research on Survey Data Quality. *Public Opinion Quarterly, 51*, S156-S172.

Guagnano, G. A., Stern, P. A., & Dietz, T. (1995). Influences on Attitude-Behavior Relationships: A Natural Experiment with Curbside Recycling. *Environment and Behavior, 27*(5), 699-718.

Hartig, T., Kaiser, F. G., & Bowler, P. A. (2001). Psychological restoration in nature as a positive motivation for ecological behavior. *Environment and Behavior, 33*, 590-607.

Heberlein, T. A. (1972). The Land Ethic Realized: Some Social Psychological Explanations for Changing Environmental Attitudes. *Journal of Social Issues, 28*(4), 79-87.

Heberlein, T. A. (1981). Environmental Attitudes. *Zeitschrift fur Umweltpolitik, 2*, 241-270.

Hektner, J. M., Schmidt, J. A., & Csikszentmihalyi, M. (2007). *Experience Sampling Method: Measuring the Quality of Everyday LIfe*. Thousand Oaks: Sage Publications.

Hicks, J., Ramanathan, N., Kim, D., Monibi, M., Selsky, J., Hansen, M., et al. (2010). AndWellness: An Open Mobile System for Activity and Experience Sampling. *Wireless Health, October 5-7*, 1-10.

Hines, J. M., Hungerford, H. R., & Tomera, A. N. (1987). Analysis and synthesis of research on responsible environmental behavior: A meta-analysis. *Journal of Environmental Education, 18*(2), 1-8.

Hnatiuk, S. H. (1991). Experience sampling with elderly persons: An exploration of the method. *International Journal of Aging and Human Development, 33*, 45-64.

Hopper, J. R. (1991). Recycling as Altruistic Behavior: Normative and Behavioral Strategies to Expand Participation in a Community Recycling Program. *Environment and Behavior, 23*(2), 195-220.

Hormuth, S. E. (1986). The sampling of experiences in situ. *Journal of Personality, 54*, 262-293.

Hufford, M. R., Shields, A. L., Shiffman, S. S., Paty, J., & Balabanis, M. (2002). Reactivity to ecological momentary assessment: An example using undergraduate problem drinkers. *Psychology of Addictive Behaviors, 16*, 205-211.

Hurlburt, R. T. (1997). Randomly sampling thinking in the natural environment. *Journal of Consulting and Clinical Psychology, 65*, 941-949.

Husserl, E. (1962). *Ideas: General Introduction to Pure Phenomenology* (W. R. B. Gibson, Trans.). London, New York: Macmillan.

Jencks, C. (1990). Varieties of altruism. In J. J. Mansbridge (Ed.), *Beyond self-interest* (pp. 53-67). Chicago: University of Chicago Press.

Johnson, M., Hashtroudi, S., & Lindsay, D. S. (1993). Source Monitoring. *Psychological Bulletin, 114*(1), 3-28.

Kahneman, D., & Krueger, A. B. (2006). Developments in the Measurement of Subjective Well-Being. *Journal of Economic Perspectives, 20*(1), 3-24.

Kahneman, D., Krueger, A. B., Schkade, D. A., Schwarz, N., & Stone, A. A. (2004). A survey method for characterizing daily life experience: The Day Reconstruction Method (DRM). *Science 306*(5702), 1776-1780.

Kaiser, F. G. (1998). A General Measure of Ecological Behavior. *Journal of Applied Social Psychology, 28*(5), 395-422.

Kaiser, F. G., Ranney, M., Hartig, T., & Bowler, P. A. (1999). Ecological behavior, environmental attitude, and feelings of responsibility for the environment. *European Psychologist, 4*(2), 59-74.

Kals, E., Schumacher, D., & Montada, L. (1999). Emotional affinity toward nature as a motivational basis to protect nature. *Environment and Behavior, 31*, 178-202.

Kaplan, S. (2000). Human Nature and Environmentally Responsible Behavior. *Journal of Social Issues, 56*(3), 491-508.

Kaplan, S., & Kaplan, R. (1989). The visual environment: Public participation in design and planning. *Journal of Social Issues, 45*, 59-86.

Karapanos, E., Zimmerman, J., Forlizzi, J., & Martens, J.-B. (2009). *User Experience Over Time: An Initial Framework*. Paper presented at the CHI 2009.

Kasser, T. (2002). *The high price of materialism*. Cambridge, MA: MIT Press.

Kasser, T. (2005). Frugality, generosity, and materialism in children and adolescents. In K. A. Moore & L. H. Lippman (Eds.), *What do children need to flourish? Conceptualizing and measuring indicators of positive development* (pp. 357-373). New York: Springer Science.

Kasser, T. (2010). Ecological Challenges, Materialistic Values, and Social Change. In R. Biswas-Diener (Ed.), *Positive Psychology as Social Change*. New York: Springer.

Kasser, T. (2011). *Human Identity and Environmental Challenges*.

Kasser, T. (in press). Cultural values and the well-being of future generations: A cross-national study. *Journal of Cross-Cultural Psychology*.

Kasser, T., & Ryan, R. M. (1993). A dark side of the American dream: Correlates of financial success as a central life aspiration. *Journal of Personality and Social Psychology, 65*, 410-422.

Kasser, T., & Ryan, R. M. (1996). Further examining the American Dream: Differential correlates of intrinsic and extrinsic goals. *Personality and Social Psychology Bulletin, 22*, 280-287.

Kasser, T., Ryan, R. M., Couchman, C. E., & Sheldon, K. M. (2004). Materialistic values: Their causes and consequences. In T. Kasser & D. Kanner (Eds.), *Psychology and consumer culture: The struggle for a good life in a materialistic world* (pp. 11-28). Washington, DC: American Psychological Association.

Kasser, T., Ryan, R. M., Zax, M., & Sameroff, A. J. (1995). The relations of maternal and social environments to late adolescents' materialistic and prosocial values. *Developmental Psychology, 31*, 907-914.

Kasser, T., & Sheldon, K. M. (2000). Of wealth and death: Materialism, mortality salience, and consumption behavior. *Psychological Science, 11*, 352-355.

Katzev, R. D., & Johnson, T. R. (1987). *Promoting energy conservation: An analysis of behavioral research*. Boulder, CO: Westview Press.

Killingsworth, M. A., & Gilbert, D. T. (2010). A Wandering Mind Is an Unhappy Mind. *Science, 330*, 932.

Klinger, E. (1978-1979). Dimensions of thought and imagery in normal waking states. *Journal of Altered States of Consciousness, 4*, 97-113.

Krosnick, J. A. (1999). Survey Research. *Annual Review of Psychology, 50*, 537-567.

Krosnick, J. A., & Berent, M. K. (1993). Comparisons of party identification and policy preferences: the impact of survey question format. *American Journal of Political Science, 37*, 941-964.

Kubey, R., Larson, R. W., & Csikszentmihalyi, M. (1996). Experience sampling method applications to communication research questions. *Journal of Communication, 46*, 99-120.

Lamiell, J. T. (1997). Individuals and the differences between them. In R. Hogan, J. A. Johnson & S. R. Briggs (Eds.), *Handbook of Personality Psychology* (pp. 117-141). San Diego, CA: Academic Press.

Larson, R. W., Moneta, G., Richards, M. H., & Wilson, S. (2002). Continuity, stability, and change in daily emotional experience across adolescence. *Child Development, 73*, 1151-1165.

Larson, R. W., & Richards, M. H. (1994). *Divergent realities: The emotional lives of mothers, fathers, and adolescents*. New York: Basic Books.

Lawton, M. P. (1999). Methods and concepts for time-budget research on elders. In W. E. Pentland, A. S. Harvey, M. P. Lawton & M. A. McColl (Eds.), *Time use research in the social sciences* (pp. 107-125). New York: Kluwer.

Lee, Y. S. (2005). Measuring the gender gap in household labor: Accurately estimating wives' and husbands' contributions. In B. Schneider & L. J. Waite (Eds.), *Being together, working apart: Dual-career families and the work-life balance* (pp. 229-247). New York: Cambridge University Press.

Lehmann, J. (1999). *Befunde empirischer Forschung zu Umweltbildung and Umweltbewusstsein*: Opladen, Leske und Burich.

Leopold, A. (1948). *A Sand County Almanac*. New York: Oxford University Press.

Levin, G. (1993, April 12). Too green for their own good. *Advertising Age, 64*(29).

Lynn, P. (2001). The impact of incentives on response rates to personal interview surveys: Role and perception of interviewers. *International Journal of Public Opinion Research, 13*, 326-336.

Mannell, R. C., Zuzanek, J., & Aronson, R. (2005). *Internet/Computer Use and Adolescent Leisure Behavior, Flow Experiences and Psychological Well-Being: The Displacement Hypothesis*. Paper presented at the Eleventh Canadian Congress on Leisure Research.

Mayer, F. S., & Frantz, C. M. (2004). The connectedness to nature scale: a measure of individuals feeling in community with nature. *Journal of Environmental Psychology, 24*, 503-515.

McAdams, D. P. (1995). What do we know when we know a person? *Journal of Personality, 63*, 365-396.

McCance, A. S. (2010). *Emotional Labor in Intercultural Service Encounters: An Experience Sampling Study.* University of Illinois, Urbana-Champaign.

Meadows, D. H., Meadows, D. L., Randers, J., & III, W. W. B. (1972). *The Limits to Growth*. New York: Universe Books.

Milfont, T. L. (2009). The effects of social desirability on self-reported environmental attitudes and ecological behavior. *Environmentalist, 29*, 263-269.

Milfont, T. L., & Duckitt, J. (2004). The structure of environmental attitudes: a first- and second-order confirmatory factor analysis. *Journal of Environmental Psychology, 24*, 289-303.

Mulligan, C. B., Schneider, B., & Wolfe, R. (2000). Time use and population representation in the Sloan Study of Adolescents. Alfred P. Sloan/University of Chicago Center for the Study of Working Families.

Neter, J., & Waksberg, J. (1964). A study of response errors in expenditure data from household interviews. *Journal of the American Statistical Association, 59*(305), 18-55.

Nowlis, D. P., & Cohen, A. Y. (1968). Mood-reports and the college natural setting: A day in the lives of three roommates under academic pressure. *Psychological Reports, 23*, 551-566.

Oishi, S., Diener, E., Scollon, C. N., & Biswas-Diener, R. (2004). Cross-Situational Consistency of Affective Experiences Across Cultures. *Journal of Personality and Social Psychology, 86*(3), 460-472.

Omoto, A. M., & Snyder, M. (1995). Sustained helping without obligation: Motivation, longevity of service, and perceived attitude change among AIDS volunteers. *Journal of Personality and Social Psychology, 68*, 671-686.

Pato, C., Ros, M., Troccoli, B., & Tamayo, A. (2004). *Environmental beliefs: an empirical validation with Brazilian students*. Paper presented at the 18th Conference of the International Association for People Environment Studies.

Paulhus, D. L. (1984). Two-component models of socially desirable responding. *Journal of Personality and Social Psychology, 46*, 598-609.

Paulhus, D. L. (2002). Socially Desirable Responding: The Evolution of a Construct. In H. I. Braun, D. N. Jackson & D. E. Wiley (Eds.), *The role of constructs in psychological and educational measurement* (pp. 49-69). Mahwah, NJ: Erlbaum.

Paulhus, D. L., & Reid, D. B. (1991). Enhancement and denial in socially desirable responding. *Journal of Personality and Social Psychology, 60*, 307-317.

Pelham, B. W. (1993). The idographic nature of human personality: Examples of the idiographic self-concept. *Journal of Personality and Social Psychology, 64*, 665-677.

Peters, D. L., & McCormick, E. J. (1966). Comparative reliability of numerically anchored versus job-task anchored rating scales. *Journal of Applied Psychology, 50*, 92-96.

Pirages, D. C., & Ehrlich, P. R. (1974). *Ark II: Social response to environmental imperatives*. San Francisco: W. H. Freeman.

Pruitt, D. G. (1972). Methods for resolving differences of interest: A theoretical analysis. *Journal of Social Issues, 28*(1), 133-154.

Richins, M. L., & Dawson, S. (1992). A consumers values orientation for materialism and its measurement: Scale development and validation. *Journal of Consumer Research, 19*, 303-316.

Rindfleisch, A., Burroughs, J. E., & Denton, F. (1997). Family structure, materialism, and compulsive consumption. *Journal of Consumer Research, 23*, 312-325.

Rittel, H. W., & Webber, M. M. (1973). Dilemmas in a General Theory of Planning. *Policy Sciences, 4*, 155-169.

Robinson, J. P. (1985). The validity and reliability of diaries versus alternative time use measures. In F. T. Juster & F. P. Stafford (Eds.), *Time, goods, and well-being*. Ann Arbor: Institute for Social Research, Univeristy of Michigan.

Rokeach, M. (1968). *Beliefs, attitudes, and values*. San Francisco: Jossey-Bass.

Rokeach, M. (1973). *The nature of human values*. New York: Free Press.

Ryan, R. M., Chirkov, V. I., Little, T. D., Sheldon, K. M., Timoshina, E., & Deci, E. L. (1999). The American dream in Russia: Extrinsic aspirations and well-being in two cultures. *Personality and Social Psychology Bulletin, 25*, 1509-1524.

Sackeim, H. A., & Gur, R. C. (1978). Self-deception, other-deception and consciousness. In G. E. Schwartz & D. Shapiro (Eds.), *Consciousness and self-regulation: Advances in research* (Vol. 2, pp. 139-197). New York: Plenum Press.

Saunders, S., & Munro, D. (2000). The construction and validation of a consumer orientation questionnaire (SCOI) designed to measure Fromm's (1955) 'marketing character' in Australia. *Social Behavior and Personality, 28*, 219-240.

Schahn, J. (2002). The role of behavioral costs and social desirability as predictors of environmental attitudes and conservation behavior: an analysis on aggregate and on individual data level. *Zeitschrift fur Differentielle und Diagnostische Psychologie, 23*, 45-54.

Schahn, J., & Bohner, G. (2002). *Evaluation Research in Environmental Sociology and in Environmental Psychology: Methodological Aspects*. Paper presented at the Bericht aus dem Psychologischen Institut.

Schlenker, B. R., & Weigold, M. F. (1989). Goals and the self-identification process: Constructing desired identities. In L. A. Pervin (Ed.), *Goal concepts in personality and social psychology* (pp. 243-290). HIllsdale, NJ: Lawrence Erlbaum Associates.

Schmuck, P., Kasser, T., & Ryan, R. M. (2000). Intrinsic and extrinsic goals: Their structure and relationship to well-being in German and U.S. college students. *Social Indicators Research, 50*, 225-241.

Schultz, P. W., Gouveia, V. V., Cameron, L. D., Tankha, G., Schmuck, P., & Franek, M. (2005). Values and their relationship to environmental concern and conservation behavior. *Journal of Cross-Cultural Psychology, 36*, 457-475.

Schultz, P. W., Zelezny, L. C., & Dalrymple, N. J. (2000). A multinational perspective on the relation between Judeo-Christian religious beliefs and attitudes of environmental concern. *Environment and Behavior, 32*, 576-591.

Schuman, H., & Johnson, M. P. (1976). Attitudes and Behavior. *Annual Review of Sociology, 2*, 161-207.

Schwartz, S. H. (1977). Normative influences on altruism. In L. Berkowitz (Ed.), *Advances in Experimental Social Psychology* (Vol. 10, pp. 221-279). New York: Academic Press.

Schwartz, S. H. (1992). Universals in the content and structure of values: Theoretical advances and empirical tests in 20 countries. In M. P. Zanna (Ed.), *Advances in experimental social psychology* (Vol. 25, pp. 1-65). Orlando, FL: Academic.

Schwartz, S. H. (1994). Are There Universal Aspects in the Structure and Contents of Human Values? *Journal of Social Issues, 50*(4), 19-45.

Schwartz, S. H. (2006). Les valeurs de base de la personne: theorie, measures et applications. *Revue Francaise de Sociologie, 47*(4), 929-968.

Schwartz, S. H., & Biisky, W. (1987). Toward a psychological structure of human values. *Journal of Personality and Social Psychology, 53*, 550-562.

Schwartz, S. H., & Howard, J. A. (1981). A normative decision-making model of altruism. In J. P. Rushton & R. M. Sorrentino (Eds.), *Altruism and helping behavior: Social, personality, and developmental perspectives*. HIllsdale, NJ: Lawrence Erlbaum.

Schwartz, S. H., & Tessler, R. C. (1972). A test of model for reducing measured attitude-behavior discrepancies. *Journal of Personality and Social Psychology, 24*, 225-236.

Schwarz, N., & Bless, H. (1992). Constructing reality and its alternatives: Assimilation and contrast effects in social judgment. In L. L. Martin & A. Tesser (Eds.), *The construction of social judgements* (pp. 217-245). Hillsdale, NJ: Erlbaum.

Schwarz, N., Knauper, B., Hippler, H. J., Noelle-Neumann, E., & Clark, L. F. (1991). Rating scales: Numeric values may change the meaning of scale labels. *Public Opinion Quarterly, 55*, 570-582.

Schwarz, N., Strack, F., & Mai, H.-P. (1991). Assimilation and contrast effects in part-whole question sequences: A conversational logic analysis. *Public Opinion Quarterly, 55*(1), 3-23.

Scollon, C. N., Kim-Prieto, C., & Diener, E. (2003). Experience Sampling: Promises and Pitfalls, Strengths and Weaknesses. *Journal of Happiness Studies, 4*, 5-34.

Sheldon, K. M., & Kasser, T. (1998). Pursuing personal goals: Skills enable progress but not all progress is beneficial. *Personality and Social Psychology Bulletin, 24*, 1319-1331.

Sheldon, K. M., & McGregor, H. (2000). Extrinsic value orientation and the tragedy of the commons. *Journal of Personality, 68*, 383-411.

Sheldon, K. M., Ryan, R. M., Deci, E. L., & Kasser, T. (2004). The Independent Effects of Goal Contents and Motives on Well-Being: It's Both What You Pursue and Why You Pursue It. *Personality and Social Psychology Bulletin, 30*(4), 475-486.

Shiffman, S. S., Hufford, M., Hickcox, M., Paty, J., Gnys, M., & Kassel, J. (1997). Remember that? a comparison of real-time versus retrospective recall of smoking lapses. *Journal of Consulting and Clinical Psychology, 65*(2).

Shogren, J. F., & Taylor, L. O. (2008). On Behavioral-Environmental Economics. *Review of Environmental Economics and Policy, 2*(1), 26-44.

Sloboda, J. A., O'Neill, S. A., & Ivaldi, A. (2001). Functions of music in everyday life: An exploratory study using the Experience Sampling Method. *Musicae Scientiae, V*, 9-32.

Sohr, S. (2001). Eco-activism and well-being: Between flow and burnout. In P. Schmuck & K. M. Sheldon (Eds.), *Life Goals and Well-Being: Towards a Positive Psychology of Human Striving* (pp. 202-215). Seattle, WA: Hogrefe and Huber.

Stern, P. A., Dietz, T., & Guagnano, G. A. (1995). The New Ecological Paradigm in Social-Psychological Context. *Environment and Behavior, 27*(6), 723-743.

Stern, P. C. (2000). Toward a Coherent Theory of Environmentally Significant Behavior. *Journal of Social Issues, 56*(3), 407-424.

Stern, P. C., & Dietz, T. (1999). A Value-Belief-Norm Theory of Support for Social Movements: The Case of Environmentalism. *Human Ecology Review, 6*(2), 81-97.

Stern, P. C., Dietz, T., & Kalof, L. (1993). Value Orientations, Gender, and Environmental Concern. *Environment and Behavior, 25*(3), 322-348.

Stern, P. C., & Oskamp, S. (1987). Managing scarce environmental resources. In D. Stokols & I. Altman (Eds.), *Handbook of environmental psychology* (Vol. 2, pp. 1043-1088). New York: Wiley.

Stickgold, R., Malia, A., Fosse, J. A., & Hobson, J. A. (2000). Brain-mind states: I. longitudinal field study of sleep/wake factors influencing mentation reportion length. *Sleep: Journal of Sleep and Sleep Disorder Research, 24*, 139-242.

Stone, A. A., Shiffman, S. S., & DeVries, M. W. (1999). Ecological momentary assessment. In D. Kahneman, E. Diener & N. Schwartz (Eds.), *Well-Being: Foundations of a Hedonic Psychology* (pp. 26-39). New York: Russell Sage Foundation.

Tarrant, M. A., & Cordell, H. K. (1997). The effect of respondent characteristics on general environmental attitude-behavior correspondence. *Environment and Behavior, 29*, 618-637.

Tourangeau, R., & Bradburn, N. M. (2010). The Psychology of Survey Response. In P. V. Marsden & J. D. Wright (Eds.), *Handbook of Survey Research*. Bingley, UK: Emerald Group.

Tourangeau, R., Rips, L., & Rasinski, K. (2000). *The psychology of survey response*. Cambridge: Cambridge University Press.

Tversky, A., & Kahneman, D. (1981). The Framing of Decisions and the Psychology of Choice. *Science, 211*(4481), 453-458.

Uy, M. A., Foo, M.-D., & Aguinis, H. (2010). Using Experience Sampling Methodology to Advance Entrepeneurship Theory and Research. *Organizational Research Methods, 13*(1), 31-54.

Verduyn, P., Delvaux, E., Van Coillie, H., Tuerlinckx, F., & Mechelen, I. V. (2009). Predicting the Duration of Emotional Experience: Two Experience Sampling Studies. *Emotion, 9*(1), 83-91.

Waite, B. M., Claffey, R., & Hillbrand, M. (1998). Differences between volunteers and nonvolunteers in a high-demand self-recording study. *Psychological Reports, 83*, 199-210.

Wallach, M. A., & Wallach, L. (1983). *Psychology's sanction for selfishness: The error of egoism in theory and therapy*. San Francisco: W. H. Freeman.

Webb, E. J., Campbell, D. T., Schwartz, R. D., & Sechrest, L. (1966). *Unobtrusive Measures: Nonreactive Researchin the Social Sciences*. Chicago: Rand McNally.

Weber, B., Holt, A., Neuhaus, C., Trautner, P., Elger, C., & Teichert, T. (2007). Neural evidence for reference-dependence in real-market transactions. *NeuroImage, 35*, 441-447.

Weigel, R. H. (1983). Environmental attitudes and the prediction of behavior. In N. R. Feimer & E. S. Geller (Eds.), *Enviornmental Psychology: Directions and Perspectives*. New York: Praeger.

Wells, A. (1985). *Variations in self-esteem in the daily life of mothers.* University of Chicago.

White Jr., L. T. (1967). The historical roots of our ecological crisis. *Science, 155*, 1203-1207.

Wiggins, J. S. (1959). Interrelationships among MMPI measures of dissimulation under standard and social desirability instructions. *Journal of Consulting Psychology, 23*, 419-427.

Williams, G. C., Cox, E. M., Hedberg, V. A., & Deci, E. L. (2000). Extrinsic life goals and health risk behaviors in adolescents. *Journal of Applied Social Psychology, 30*, 1756-1771.

Williams, R. (1968). The Concept of Norms. In D. Sills (Ed.), *International Encyclopedia of the Social Sciences*. New York: Macmillan.

Wiseman, M., & Bogner, F. X. (2003). A higher-order model of ecological values and its relationship to personality. *Personality and Individual Differences, 34*, 783-794.

Yarmey, D. (1979). *The psychology of eyewitness testimony*. New York: Free Press.

Zuzanek, J. (1999). *Experience Sampling Method: Current and potential research applications*. Paper presented at the Workshop on Time-use Measurement and Research.