The Structure of Intra-Individual Value Change

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Abstract

Values are assumed to be relatively stable during adulthood. Yet, little research has examined value stability and change and there are no published studies on the structure of value change. Based on Schwartz's (1992) value theory, this paper proposes that the structure of intra-individual value change mirrors the circumplex-like structure of values, so that conflicting values change in opposite directions and compatible values change in the same direction. Four longitudinal studies, varying in life contexts, time gaps, populations, countries, languages, and value measures supported the proposed structure of intra-individual value change. An increase in the importance of any one value is accompanied by slight increases in the importance of compatible values and by decreases in the importance of conflicting values. Thus, intra-individual changes in values are not chaotic, but occur in a way that maintains Schwartz's value structure. Furthermore, the greater the extent of life-changing events the greater the value change found whereas age was only a marginal negative predictor of value change when life events were taken into account. Implications for the structure of personality change are discussed.

Values are viewed as primarily stable (e.g., Feather, 1971; Rokeach, 1973; Schwartz, 1997). Indeed, most of the research on values relies on the assumption that values can be used as stable personality characteristics. Although value researchers (e.g., Rokeach, 1973; Schwartz, 2005b) have noted that values can change, this issue has been largely neglected in theory and research in psychology. Moreover, research that has scrutinized value change has examined individual values in isolation from other values. This paper builds on our knowledge of the inter-relationships among values as suggested and confirmed by Schwartz (1992) in examining, for the first time, the structure of real-life longitudinal intra-individual value change. Specifically, it examines intra-individual value change in natural life settings to see whether values change in an organized manner, in which increases in the importance of any value are accompanied by increases in similar values and by decreases in conflicting values, thereby mirroring the structure of values proposed by Schwartz (1992).

Values

Values (e.g., achievement, security) convey what is important to people in their lives. Values affect perceptions, attitudes, and behavior (e.g., Rokeach, 1973; Schwartz, 1992). The impact of values has been confirmed in numerous studies testing a wide variety of perceptions, attitudes and behaviors, from the mundane, such as interrupting people in conversations, to important decisions in life, such as career choices (e.g., Bardi & Schwartz, 2003; Sagiv, 2002; see reviews in Bardi, Calogero, & Mullen, 2008; Hitlin & Piliavin, 2004; Schwartz, & Bardi, 2001). Because of their wide-ranging influence, values are seen as guiding principles in people's lives that exist across contexts and time, rendering them as relatively stable personality characteristics (Rokeach, 1973; Schwartz, 1997).

People differ in the importance with which they hold values. Hence, any value can be important to one person and not important to another. People also differ in their personal value hierarchies; that is, in the relative importance with which they hold different values. Rokeach (1973) and Schwartz (1992) argued that this personal hierarchy of values is crucial in determining perceptions, attitudes and behaviors, as most choices contrast at least two values. For example, the decision to contribute in a social dilemma game depends not only on the absolute personal importance of benevolence values of helping, but also on the relative personal importance of benevolence values compared to the personal importance of the conflicting values of power (Schwartz, 1996).

One of the leading value theories, proposed by Schwartz (1992), defines ten values according to the motivations that underlie them. A key feature of this theory is the structure of the inter-relationships among the ten values. Specifically, the inter-relationships among these values form a quasi circumplex (a circle without specific gradients) of motivational conflicts and compatibilities, such that each value shares a motivation with adjacent values in the circle and has a conflicting motivation with values on the opposite side of the circle. The ten values and the full structure of conflicts and compatibilities can be seen in Figure 1 (see Schwartz, 1992, for a detailed explanation of the shared motivation between each pair of adjacent values in the circle, as well as for an explication of the motivational conflicts between values). As can be seen in the figure, it is also possible to divide the circle into four more general types of values, organized as two pairs of conflicting higher order value dimensions (openness to change vs. conservation and self-enhancement vs. self-transcendence).

It is important to note that values on opposite sides of the value circle are not antonyms; thus there is no lexical contradiction between them (e.g., the value item *freedom* that measures self-direction and the value item *obedient* that measures conformity are located on opposite sides

of the circle but they are not antonyms). Rather, their contradiction is based on their conflicting motivations. Motivations are considered conflicting if they often lead to opposite behaviors or judgment and they are considered compatible if they often lead to the same behavior or judgment. To illustrate, if you are asked by your superior to do something to which you object you can respond in two opposing ways: comply or not comply. Complying would enable you to fulfill your conformity and security values (adjacent values in the circle) while violating your self-direction values (opposite values in the circle). Not complying would enable you to fulfill your self-direction values while violating your conformity and security values. Hence, the pursuit of different values has practical, psychological, and social consequences that may conflict or be compatible with one another. Consequently, holding opposite values as highly important is bound to cause internal conflicts and may lead to lower well-being. In addition, it may cause practical and social problems, as it may lead to inconsistent behavior that may be perceived unfavorably by others, at least in Western cultures. Schwartz (1992) contended that, because of this, most people value one side of this circle more than the other. Empirically, this results in the quasi circumplex structure of inter-relationships between the ten values, which has been confirmed in numerous samples around the world (e.g., Schwartz, 1992, 2005a).

Value Change

The value literature in psychology has assumed that values are largely stable and, perhaps as a result of this, very little has been said regarding value change. In other disciplines, however, the topic of value change has received more attention. These include sociology (reviewed in Hitlin & Piliavin, 2004; Spates, 1983), political science (e.g., Inglehart, 1997; McCann, 1997), education (e.g. reviews in Chatard & Selimbegovic, 2007; Eccles, Wigfield, Harold, & Blumenfeld, 1993), and organizational behavior (e.g., Chatman, 1991).

The focus on values as stable in the psychological literature has been important for value research because it implies values are largely stable individual-difference variables that can be used to predict other personal outcomes. This view is based primarily on the good test-retest reliability obtained with value questionnaires (e.g., Schwartz, 2005b). However, it is possible to obtain good test-retest reliability and still observe mean level changes, as has been shown with regard to personality traits (Ramirez-Esparza, Gosling, Benet-Martínez, Potter, & Pennebaker, 2006). This is because a group of people may all shift in one direction while maintaining the order of people on the relevant continuum.

In discussing value change, it is first important to distinguish between different types of possible value change, including mean level changes and rank order changes (for more detail see Bardi & Goodwin, 2009; for specific instructions regarding the statistical analysis of each type of change see Biesanz, West, & Kwok, 2003). Mean level change refers to a change in the mean importance of a value across individuals (i.e., mean importance in a sample). That is, a mean level increase indicates that the importance of a certain value has increased on average in a group of people. Mean level changes are typically the focus of attention in research on value change in all of the relevant disciplines, including sociology (see reviews in Hitlin & Piliavin, 2004; Spates, 1983), political science (e.g., Inglehart, 1997), education (e.g., reviews and findings in Chatard & Selimbegovic, 2007; Eccles et al., 1993), and organizational behavior (e.g., Chatman, 1991), as well as psychology (e.g., Feather, 1975). For example, Inglehart and Baker (2000) found an increase in values of tolerance across cultures throughout the second half of the 20th century.

Mean level changes in values have been suggested and observed as a function of societal changes, such as economic development (e.g., Inglehart, 1997), the impact of an organization on

employees (Chatman, 1991), and the impact of educational programs (reviewed in, e.g., Chatard & Selimbegovic, 2007). Rokeach (1973) suggested that in addition to culture and societal changes, values may change to reflect changes in personal experience. These changes in personal experience may also result in mean level changes if different people experience the same personal experience (e.g., a historical event that affects the personal lives of all people in society, such as war). However, it implies rank order changes if different people experience different personal experiences.

Rank order change refers to a change in the rank order of individuals on a continuum of value importance. This type of change is reflected in longitudinal correlations (or test-retest reliability/correlations). This is a type of intra-individual change as individuals differ in their change of values. That is, the importance of the tested value has increased for some individuals and decreased for others. This type of change is of more interest in the discipline of psychology than other disciplines, but has been studied mainly to reflect the stability of values (e.g., Schwartz, 2005b). We add to this literature, by being the first to examine the structure of change in intra-individual value systems, rather than focusing on longitudinal correlations in individual values.

Rokeach (1968) suggested changes in values occur when people experience a state of inconsistency between their values and behavior due to new information from a significant other, or by realizing there are inconsistencies in their existing values hierarchy. According to Rokeach (1968), this leads to a value change to restore consistency. Indeed, Rokeach (1968, 1973) developed a successful values change intervention built on this idea. Research using this value change intervention is reviewed in Kristiansen and Hotte (1996).

Schwartz and Bardi (1997) suggested people may adjust their values to fit the opportunities in their environment, arguing such change is more likely to occur in young people (Bardi & Schwartz, 1996). However, their research used comparisons of cohorts rather than a longitudinal design, thus their evidence can only be considered indirect. Similarly, Verkasalo, Goodwin, and Bezmenova (2006) used cohort comparisons and found an increase in the importance of security values following the 9/11 terrorist attack, although value importance subsequently returned to its base-line level. This rebound effect strengthens the validity of the adaptation explanation because, as objective security levels returned to pre-9/11 levels, no long-term adaptation was required. Similar trends were found in an archival study that analyzed value-words in American newspapers during the 20th century (Bardi et al., 2008). Security values were mentioned more often in American newspapers at the beginning of World-War II and during the cold war.

There has also been recent interest in mean level changes in values as a function of age. Schwartz (2005b) suggested values may change with age for a number of reasons. First, values may change as a result of physiological changes. For example, he suggested hedonism is likely to become less important in old age because senses are less sharp and do not enable as much physical enjoyment as in young age. Second, values may change to adapt to new life situations. For example, Schwartz suggested achievement values are more important in young people as they are building their career. Schwartz confirmed these hypotheses, as well as others, in a cross-sectional study correlating age with values. Similar studies have found converging evidence (Puohiniemi, 2002; Verkasalo, Lönnqvist, Lipsanen & Helkama, in press). Schwartz noted, however, that such cross-sectional studies cannot disentangle the suggested effects from cohort effects. A life-span longitudinal study has not been done yet. Additional possible mechanisms of value change are addressed in Bardi and Goodwin (2009).

Most of the research that examined value change using longitudinal designs has followed students during their education (e.g., Feather, 1975; Helkama et al., 2003; Sheldon, 2005). The changes found ranged from minor changes (e.g., Helkama et al., 2003) to large shifts in values (e.g., Sheldon, 2005). In samples with no particular life changes, test-retest reliabilities of values were around .90 over a month, and around .60 over two years, indicating stability in values (as reviewed in Schwartz, 2005b). However, we propose that, even if there is only a small change in values, this change may be systematic and meaningful.

There are currently no publications that deal with change in the system of values as a whole. The only reference to this issue is Rokeach's (1973) suggestion that a value change entails a change in the whole system of values in the sense that a change in the importance of one value should entail a change in the hierarchy of values (the order of personal importance of values). Yet, the structure of inter-relationships among values in the Schwartz (1992) model raises a question about the inter-relationships among changes in the value system. In other words, when values change as part of natural changes in life, do they change in a chaotic or in an organized way? Based on the known structure of the inter-relationships among values we propose that, when values change, the system of values changes to reflect this quasi-circumplex of conflicts and compatibilities. That is, we should find evidence that values change in the same direction as their compatible values in the value-circle and in opposite directions to their conflicting values in the circle. Hence, the structure of value change should mirror the value structure.

Some supporting evidence for the general principle of our suggestion originates from research on the self. Specifically, shifts in the self towards the individual-self occur at the expense of shifts towards the collective-self as a result of experimental manipulations (Gaertner, Sedikides, & O'Mara, 2008).

A previous study on value change offers some indirect evidence that supports this suggestion. Krishnan (2008) followed business students throughout their university studies and found a mean level increase in self-enhancement values and a simultaneous decrease in benevolence values. However, because the focus of analyses was on mean level changes it is not clear whether this pattern also occurred at an individual level, as we suggest in this paper.

A more direct support for our expectation can be found in an unpublished study that found changing one value in a laboratory experiment resulted in an average change in the same direction of values from the same higher-order type and an average change in the opposite direction in values from the opposite higher-order type (Maio, Pakizeh, Cheung, & Rees, in press). However, Maio et al. (in press) examined value change only in Schwartz's four higher order values, whereas we examined the structure of the more specific ten types of values, providing a more detailed picture of value change and its structure. More importantly, Maio et al.'s (in press) finding was obtained in a laboratory experiment in which only one value was manipulated. In real life, during a period of time such as a year, many different events happen in a person's life that could potentially lead to changes in the importance attached to different values and sometimes encourage increases in opposite values. Hence, in real life, it is unclear that value change would occur in the organized manner found in a 'clean' laboratory experiment.

Given this rationalization, it might seem that a chaotic change in values is more plausible in real life. Why, then, do we expect a systematic change in the value system in real life? Our expectation is based on the nature of the conflicts and compatibilities of values. Many life situations confront opposing values or enable compatible values to be pursued at the same time. Hence, when a person experiences an increase in two opposing values, he or she is bound to be

faced with the same internal conflict repeatedly. To illustrate, let us revisit our previous example of an employee being asked by his or her superior to do something objectionable. Recall that this situation confronts the opposing values of conformity and self-direction. A person who has recently experienced an increase in both conformity and self-direction values is likely to feel tension in such situations, as s/he would be torn between the option of complying, which would express recently increased conformity values and the option of not-complying, which would express recently increased self-direction values. Another possibility may be that the person has recently increased the importance of conformity values and decreased the importance of security values. Thus, two adjacent values (which share a motivation for maintaining the status quo) have become further apart in importance. In this case, the person is likely to be drawn towards complying due to the recently increased conformity values and, at the same time, he or she would be drawn to the opposite response of not complying due to the recently decreased importance of security values. Hence, this situation is likely to lead to an unpleasant internal conflict.

Personal value conflict (as illustrated in the previous paragraph) is also likely to impact the perception and judgment of situations and people. That is, a person whose conformity and self-direction (opposing) values both increased in importance is likely to feel confused when judging another person's behavior, as behaviors often reflect multiple adjacent values (see evidence in Bardi & Schwartz, 2003). Thus, when a person sees a peer at work complying with a superior's objectionable request, s/he is likely to feel some support for the peer's decision due to her/his increased conformity values and, at the same time, feel some discomfort with the peer's decision due to her/his increased self-direction values. This is likely to leave the person torn and confused.

In the long run, such conflicts are likely to result in decreasing or increasing one of these values to avoid recurring conflicts in judgment and in making decisions. This process, however, may not happen overnight. A single occurrence of such a conflict may not be sufficiently disturbing to change values. But, as the person confronts an increasing number of situations that conflict these two values, he or she is bound to feel recurrent discomfort and is likely to be motivated to resolve this conflict. This is in line with Schwartz's (1992) original explanation for the emergence of the value circle, with the addition of dynamic changes in values. Hence, if a person decides conformity is more important than previously, self-direction will be less important than previously. Therefore, after some time, we should be able to observe a systematic change in the system of values, such that compatible values change in the same direction and conflicting values change in opposite directions.

The aim of this paper is to test our proposition regarding the structure of intra-individual value change. To examine the generality of the findings, we conducted four longitudinal studies that varied in life context, time gaps, populations, countries, languages, and value measures. Although some random variance should be expected in examining such a research question, if the four studies find essentially the same expected value-change structure, this would provide evidence for the proposed structure of intra-individual value change.

Study 1

The most obvious time to look for value change is during adolescence, as this is often thought of as a phase of life with many important changes, including biological, cognitive, and social transitions (see reviews in Blonigen, Carlson, Hicks, Krueger, & Iacono, 2008; Steinberg & Morris, 2001). Therefore, Study 1 used adolescents.

Method

Participants. 811 (379 girls) high school students from eight schools in Germany and neighboring countries[1] participated in the study that collected values data at two different times. Their average age at Time 1 was 15 (*SD* = 2).

Instrument. At both times, the Portraits Value Questionnaire (PVQ) 40 (Schwartz, Lehmann, & Roccas, 1999) was used to obtain the values data. This questionnaire consists of descriptions of people in terms of values, such as "He thinks it is important that every person in the world be treated equally. He believes everyone should have equal opportunities in life." In the female version all portraits are formulated in the female form, such as "She likes surprises. It is important to her to have an exciting life." For each one of these statements the respondents are asked to answer the question "How much like you is this person?" on a six-point response scale ranging from "very much like me" to "not like me at all". Schwartz (2005b) recommended using this value instrument with adolescents, as it does not require the high level of abstraction necessary in his original value instrument (the SVS, Schwartz, 1992). The PVQ has been found to have good internal reliabilities and good convergence with the original SVS (Schwartz, 2005b). In this sample, the Cronbach-alpha reliability coefficients were similar to previous findings (see, e.g., Schwartz, 2005b); ranging from .47 for tradition to .79 for achievement. Ipsatized value scores were used, in which the mean value score of the participant across all 40 items in the value instrument was subtracted from the value score of each item. This is a standard procedure when using the PVQ and SVS instruments (e.g., Cohrs, Moschner, Maes, & Kielmann, 2005; Schwartz, 1992, 2005b). It is used because the crucial aspect of each value is its importance compared with the other values and because it controls for response tendencies that create random variability (see Schwartz, 2005b for more detail).

Procedure. All of the schools were visited at the beginning and the end of the school year (i.e., nine months apart).

Analytic Approach. Value-change scores were calculated in two ways to assess the structure of value-change in an exploratory and confirmatory analysis. First, the algebraic difference between the Time 2 and Time 1 value scores (Time 2 minus Time 1) was calculated, in line with Maio et al's (in press) method of measuring change in values. These value-change scores were submitted to a principal components analysis, from which two varimax rotated factors were obtained. The structure of the value-change was assessed by comparing the order of values in the component plot with Schwartz's (1992) theoretical structure. This method of testing the value structure of Schwartz's (1992) theory has been successfully used in the past (e.g., Cohrs et al., 2005). We used Schwartz's (1992) criteria for assessing the fit between the expected order of the values in the circle and the obtained data. Schwartz (1992) counted the number of single inversions of the order of adjacent values ('moves') required to rearrange the observed order to match the ideal order of values in the circle. When two theoretically adjacent values are located as if they 'interchanged' places, but are still adjacent to one another, one move is needed to reach the ideal order. Because in this paper we have used component plots rather than SSA[2], the order of the values is less clear if a value emerges close to the mid-point of the plot (i.e., the crossing point of the axes of the two factors). This raises difficulties in deciding how many

moves are needed to reach the ideal structure, when more than one move is needed. Therefore, to adapt Schwartz's (1992) method to the analyses used in this paper, we only distinguish between one move and multiple moves. We refer to the former as a small deviation from the theoretical structure and to the latter as a large deviation from the theoretical structure. Finding the structure of the value-change scores is similar to Schwartz's (1992) theoretical structure would provide support for our theoretical suggestion about the structure of value change.

Next, the intra-individual difference in the rank order of the importance of the values between the Time 2 and Time 1 was calculated, as an alternative value change measure for use in confirmatory ordinal multidimensional scaling (MDS). The rank order value-change scores were analyzed with and without regional restrictions to compare intra-individual value change with the theoretically expected four-quadrant solution representing the tradeoffs between the higher order dimensions of self-enhancement versus self-transcendence and openness to change versus conservation[3]. The PROXSCAL routine in SPSS was used to compute the confirmatory MDS solution (Borg & Groenen, 1997, 2005). Regional restrictions were imposed as a linear combination of two theoretically driven facets (see Appendix A) to see whether an acceptable MDS solution could be found to separate the values by straight lines derived from the facets. As suggested by Borg and Groenen (2005), Kruskal's Stress measure (Stress 1 in SPSS) for the confirmatory or theoretically-constrained solution was compared with the Stress obtained for the unconstrained solution. If the theoretically-constrained Stress is not much higher than for the unconstrained solution, the theoretical solution is supported (Borg & Groenen, 2005). In this case, it is the comparison between fit indices that is important, although a fair fit is desirable. According to Kruskal (1971), a stress coefficient of .20 is a fair fit, .10 is a good fit and .00 a perfect fit.

Results

Descriptive analyses. Table 1 presents the ipsatized mean importance and standard deviations of the values at Time 1. It also presents the mean value-change scores and indicates the values for which there was a significant paired mean difference between Time 1 and Time 2. Specifically, there was a significant mean level decrease in the importance of benevolence ($t_{(807)}$ = 4.27, $p < .001$) and universalism ($t_{(807)}$ = 4.28, $p < .001$) and an increase in the importance of power ($t_{(808)}$ = 6.44, $p < .001$), achievement ($t_{(806)}$ = 3.85, $p < .001$) and self-direction ($t_{(808)}$ = 2.08, $p = .05$) values. It seems individuals in this sample changed in a fairly consistent manner, at least in terms of the self-enhancement to self-transcendence dimension. This finding was obtained despite the high longitudinal correlations (test-retest) reported in column 3 of Table 1 that ranged from .58 (for security and self-direction values) to .68 (for conformity values). Such correlations are typically considered good test-retest reliabilities, suggesting stability in values. Yet, as suggested, even if there are only small changes in values these changes may be systematic and meaningful, as was examined next by observing the structure of value change.

Intra-individual value change. The structure of value change was first examined by comparing the algebraic difference (value-change) component scores (Time 2 minus Time 1) to Schwartz's (1992) theoretical structure. The two factor solution representing the openness to change vs. conservation and self-enhancement vs. self-transcendence dimensions explained 36% of the variance. However, the most crucial aspect of this analysis is the order of the value-change variables on the component plot, which can be seen in Figure 2. The order of the value-change variables in Figure 2 is very similar to the theoretical model shown in Figure 1. Indeed, there are only two small deviations from the theoretical model. The first small deviation shows achievement and power values have exchanged locations. As they are very close to one another

in the component plot, this change is very small. The second small deviation shows universalism and benevolence have changed places. However, the same change occurred in Time 1. In Time 2, universalism and benevolence were in the correct order, but very close to one another on the component plot. Hence, the universalism and benevolence change in the structure of value-change is in line with a-priori expectations. Similar small deviations from the theoretical structure have been commonly found in other studies. Indeed, Schwartz (1992) reported that only one of 40 samples examined matched the theoretical structure perfectly.

Next, the structure of value change was examined by comparing the MDS results for the two-dimensional unconstrained and theoretically-constrained MDS solutions based on rank order value-change scores. The theory-consistent configuration produced a Stress of .074, which was only slightly larger than the unconstrained solution which produced a Stress of .068. In addition, the Dispersion Accounted for (DAF) and Tucker's Coefficient of Congruence were above .99 in both cases. The extremely small difference in Stress supports the acceptability of the theory-consistent solution. Columns 4 and 5 of Table 1 report the final two-dimensional theoretically-constrained coordinates. The projection of points onto parallel lines representing each facet and the regional spacing of the values supports Schwartz's higher order dimensions. In this case, only one value, tradition, was borderline. However, its decomposed raw stress score was less than .01, providing a very small contribution to overall Stress. Thus, the rank order value-change data supports Schwartz's (1992) higher-order theoretical structure.

Discussion

As expected, we found that intra-individual value change was in line with the theoretical structure of values delineated by Schwartz (1992). In the exploratory analysis, only two small deviations between the value-change scores and Schwartz's theoretical structure were found, one of which would be expected, as the same deviation occurred in Time 1. This is remarkable, considering the random variance that should be expected in measuring values with a gap of nine months. In the confirmatory analysis, the theoretically-constrained MDS solution produced an acceptable solution that supports Schwartz's (1992) higher-order dimensional structure.

The results support the suggestion that value change follows Schwartz's (1992) theoretically driven structure. That is, the same conflicts and congruities that organize the structure of values at a given time also organize its change. Whenever a value is increased in importance, values that stem from similar motivations (adjacent in the value circle) tend to increase in importance, while values that stem from conflicting motivations decrease in importance.

These results were found with high school students during a time of change (Blonigen et al, 2008). Would the same pattern be found with older participants? In adults, value change would be expected primarily during a major change in life, as individuals are likely to adapt to a new life situation partly by adapting their values (see Schwartz & Bardi, 1997 for more explanation). Thus, in Study 2 we attempted to replicate the results of Study 1 with a sample of slightly older adults going through a major life change.

Study 2

The aim of this study was to replicate the findings of Study 1 with older participants from a different population, in a different country with a different language and using a different value instrument that measures Schwartz's (1992) model. A major life transition many young adults experience in modern societies is the transition to college. Indeed, Sheldon (2005) found changes in life aspirations during college. Hence, Study 2 measures change in college students' values from the beginning of their first year to the beginning of their second year.

Method

Participants. 129 (110 women) students at the University of Kent, UK, participated in the study that collected values data at two time points for partial course credit. Their average age at Time 1 was 20 (*SD* = 4).

Instruments. The 56-item Schwartz Value Survey (SVS, Schwartz, 1992) was used to measure values. Each value item is followed by a short definition in parenthesis, for example, "EQUALITY (equal opportunity for all)". Participants rate each value as a guiding principle in their own life on a 9-point scale from -1 (*opposed to my principles*) to 0 (*not important*) to 7 (*of supreme importance*). The asymmetry of the scale reflects the discriminations people naturally make in the importance of values (Schwartz & Bardi, 2001). This asymmetry can be seen as a statistical weakness of the scale. However, respondents rarely use the -1 rating, thus any impact this asymmetry might have is likely to be minimal (in this sample, only 4% of the participants used the -1 rating more than twice and 71% of the participants did not use this rating at all). Further, Lee and Soutar (in press) illustrated that this asymmetry has very little impact on correlations. In addition, since the scale is widely used, it was important to use it without modifications. Forty four of the value items have been found to have nearly equivalent meaning across 47 nations around the world (Schwartz, 1992, 1994; Schwartz & Sagiv, 1995) and are used to index the ten types of values. The ten values are measured by between 2 (for hedonism values) and 8 (for universalism) value items, reflecting differences in the breadth of different values (see Bardi & Schwartz, 2003). Many studies with samples around the world have established the SVS has good internal reliability, temporal stability, and external validity and that the value scores are not contaminated by social desirability (see a review in Schwartz & Bardi, 2001). In this sample, the Cronbach-alpha reliability coefficients were similar to previous findings; ranging from .54 for Security to .78 for Hedonism. As in Study 1, value scores were ipsatized by subtracting the personal mean of value scores to control for individual differences in scale tendencies.

Procedure. The surveys were conducted online as part of a mass testing in the beginning of the academic year. Time 1 was in the beginning of the first year at university and Time 2 was in the beginning of the second year of university.

Results and Discussion

Descriptive analysis. Table 2 presents the ipsatized mean importance and standard deviations of the values at Time 1. It also presents the mean level value-change scores and indicates those values for which there was a significant paired mean difference between Time 1 and Time 2. In this case, there was a mean level decrease in the importance of benevolence ($t_{(128)}$ = 2.25, p = .03) and an increase in the importance of power ($t_{(128)}$ = 2.39, p = .02) values. These sample changes were more limited, but similar in direction to those found in study 1. In addition, the longitudinal correlations (test-retest) shown in column 3 indicate good stability in values.

Intra-individual value change. A principal components analysis of the algebraic value-change scores was used to assess the order of the 10 value types. The two factor solution explained 36% of the variance and corresponded to the openness to change vs. conservation and self-enhancement (excluding achievement) vs. self-transcendence dimensions. The component plot is shown in Figure 3. The structure of value-change was similar to the theoretical model, with two deviations[4]. As in Study 1, universalism and benevolence exchanged places, forming a small deviation from the theoretical model. In addition, achievement was located close to the mid-point of the plot, creating a large deviation from the theoretical model. And indeed, achievement did not load onto either of the two factors. Despite these deviations, the structure of value change was close to the expected theoretical structure.

The confirmatory MDS supported the acceptability of the regionally constrained theory-consistent solution. The theory-consistent configuration had a Stress of .19, which was only slightly larger than the unconstrained solution Stress (.17). In addition, the Dispersion Accounted for (DAF) was .97 and Tucker's Coefficient of Congruence was .98 in both cases[5]. Columns 4 and 5 of Table 2 report the final two-dimensional theoretically-constrained coordinates. The projection of points onto parallel lines representing each facet and the regional spacing of the values supports Schwartz's higher order dimensions. In this case, only one value, benevolence is borderline. However, its decomposed raw stress was less than .04. Thus, the rank order value-change data again supports Schwartz's (1992) higher-order theoretical structure.

The results provided further support to the structure of value change. The replication was obtained in a different population, in a different country with a predominantly different language and using a different value instrument. In both studies, the gap between the two assessments was about a year. It is possible that, when change in the values system occurs, it begins with turmoil, in which one value change does not immediately lead to the rest of the values in the circle changing to fit the first change in value importance. It is possible it takes time for the structure of values to change so an increase in one value is accommodated by increases in adjacent values and decreases in opposite values. It may be that the time gap of approximately a year meant we were able to witness an 'organized' value change in which the system of values changed in a way that was compatible with the value model. This raises the question as to whether the theoretical structure of value change would be found for a relatively short time gap between value assessments. Study 3 examined this question.

Study 3

Study 3 was undertaken to see whether the theoretical structure of value change was evident three months after the beginning of a life transition. Unpublished laboratory research suggests that we should expect this, as Maio et al. (in press) found manipulating value change in a laboratory led to systematic changes in Schwartz's (1992) four higher order values. Yet, it is unclear if this is true in real life, as only one value category was manipulated in the experiment.

It was important to keep all of the characteristics of the previous sample the same except for one, namely, the time gap. Hence, in this Study, British undergraduate students responded to the same value instrument at the same Time 1 used in Study 2 (i.e. the beginning of the first year of university studies). However, Time 2 in this study was three months after the beginning of the first year.

Method

Participants. 119 (98 women) students at the University of Kent, UK, participated in the study for partial course credit. Their average age at Time 1 was 20 (*SD* = 4).

Instruments. As in Study 2, the Schwartz (1992) Value Survey (SVS) was used to measure values. In this sample, the Cronbach-alpha reliability coefficients were similar to previous findings; ranging from .56 for Self-direction to .81 for Universalism. As in Study 1 and Study 2, value scores were ipsatized by subtracting the personal mean of value scores, to control for individual differences in scale tendencies.

Procedure. The surveys were conducted online. As noted earlier, Time 1 occurred in the beginning of the first year of studies and Time 2 occurred 3 months later.

Results and Discussion

Descriptive analysis. Table 3 presents the ipsatized mean importance and standard deviations of the values at Time 1. It also presents the mean value-change scores and indicates the values for which there was a significant paired mean difference between Time 1 and Time 2. In this case, the mean level change in importance across individuals suggested a significant increase in universalism ($t_{(118)}$ = 2.24, p =.03) and power ($t_{(118)}$ = 1.99, p = .05) values. In addition, the longitudinal correlations (test-retest) shown in column 3 indicate stability in values.

Intra-individual value change. The two-factor principal components analysis of the algebraic value-change scores explained 33% of the variance in this case. The component plot is shown in Figure 4. As in Studies 1 and 2, the structure of value-change was very similar to the theoretical structure of values. There were only two deviations from the theoretical structure, one small and one large. The small deviation was the same as in Study 1 and Study 2, as the locations of universalism and benevolence interchanged. The large deviation was that stimulation was located away from hedonism and close to tradition and conformity. Stimulation had low loadings on both factors (-.34 and .27, on factor 1 and 2 respectively) and, most unexpected, was its negative correlation with the change in hedonism values (r = -.26, p < .01). That is, although hedonism and stimulation stem from similar motivations and are, therefore, adjacent in the theoretical value circle, in this sample the change in the importance of stimulation was not associated with the change in the importance of hedonism values. Still, the structure of intra-individual value change was generally similar to the theoretical model, suggesting values change according to the theoretical model of conflicts and compatibilities, even when change is measured after a relatively short gap of three months.

The confirmatory MDS also provided some support for the acceptability of the theory-consistent solution. The theory-consistent configuration produced a Stress of .23, which was larger than the unconstrained solution which produced a Stress of .15. However, the Dispersion Accounted for (DAF) was .95 and Tucker's Coefficient of Congruence was .97 for the constrained solution, compared with .98 and .99 for the unconstrained solution. Further, at least some of the Stress for the theoretically-constrained solution was due to the imposed regional constraint of hedonism being co-located with the openness to change values, rather than between stimulation and achievement, as the Stress dropped to .20 when the Hedonism constraint was set free. Columns 4 and 5 of Table 3 report the final two-dimensional theoretically-constrained coordinates. The projection of points onto parallel lines representing each facet and the regional spacing of the values supports Schwartz's higher order dimensions. In this case, Tradition was borderline, however its decomposed raw stress was less than .02. Thus, the rank order value-change data offers some support for Schwartz's (1992) higher-order theoretical structure.

Study 4

The three studies presented so far were based on young participants. Values are considered as relatively stable variables, consolidating in young adulthood and remaining relatively stable throughout life (e.g., Rokeach, 1973). However, Rokeach (1973) suggested values may change during adulthood, partly as a result of changes in personal experience. This raises the question as to whether the expected structure of value change would be evident in a population of adults not necessarily going through a life change, or at least not going through similar life changes. Study 4 used an adult sample to examine this issue. We also aimed to generalize the results by changing other features of the study. Hence, Study 4 was conducted in a different country (Australia), with a different value instrument and with a time gap of two years. Further, we examined the possibility that universalism, which consistently switched places in

Study 2 and Study 3, was functioning as two value sub-types (nature and social concern), as suggested by Schwartz and Boehnke (2004). Finally, we examined possible correlates of value change, including major life changes and age.

Life changes. It has been suggested values change primarily as a result of life changes that require adjustment (e.g., Rokeach, 1973; Schwartz & Bardi, 1997). Therefore, we measured the occurrence of life changing events to see if the extent of life changes between the times of assessment was associated with greater value change.

Age. Studies 1, 2, and 3 had homogeneous samples in terms of age. Using a general population adult sample (with age ranging from 18 to 67) enabled us to see whether value change decreases with age, as previously implied (see Bardi & Schwartz, 1996).

Method

Participants. 135 (72 women) members of an online consumer research panel in New South Wales, Australia, took part in the study. Their average age at Time 1 was 39 ($SD = 12$), ranging between 18 and 67.

Instruments. At both times, the Schwartz Value Best Worst Survey (SVBWS: Lee, Soutar, & Louviere, 2008) was used to measure values[6]. This instrument asks respondents to choose the most important and least important values from 11 subsets of Schwartz's (1992) value types, each subset containing six value types, derived from a balanced incomplete block design shown in Appendix B. Each value type is represented by the 3 value items with the strongest reliability across cultures. In this case, the subsets were created for 11 value types as the universalism value was divided into Universalism nature (including the value items of *unity with nature*, *protecting the environment* and *world of beauty*) and Universalism social (including the value items of *equality*, w*orld at peace* and *social justice*). Appendix C presents subset 1 as an example. This design resulted in each respondent seeing each value type 6 times and each pair of value types 3 times. Following Lee et al. (2008), the square root of the best/worst ratio[7] was calculated to produce tradeoff scores that do not require ipsatization.

Holmes and Rahe's (1967) scale was used in Time 2 to measure the extent of life changing events that had occurred since Time 1. Participants were asked to indicate whether a range of life changing events had happened to them since the Time 1 assessment, with each event being allocated a number of points indicating the extent to which this event is likely to change the participant's life. Thirty three of the original 43 items were included; ranging from the death of a spouse (100 points) to a change in schools (20 points). The 10 excluded items were minor life events that were unlikely to elicit value change, such as a change in recreation.

Procedure. The surveys were conducted online by a commercial research company as part of a larger study into people's consumption behavior. In this case, there was a time gap of approximately two years between Time 1 and Time 2.

Results and Discussion

Descriptive analysis. Table 4 presents the mean importance and standard deviations of the values at Time 1. It also presents the mean value change scores and indicates those values for which there was a significant paired mean difference between Time 1 and Time 2. In this case, the mean level change in importance across individuals only increased for hedonism ($t_{(134)} = 2.17$, $p = .03$). In addition, the longitudinal correlations (test-retest) shown in column 3 indicated lower stability than in Studies 1 to 3, which may be attributed to the sample, the longer timeframe, differences in life-events or the difference in the measurement device.

Intra-individual value change. The two-factor principal components analysis of the algebraic value change scores explained 33% of the variance. The component plot is shown in

Figure 5. Once again, the structure that emerged was similar to the theoretical structure of values. It had two deviations from the theoretical structure. One small deviation saw a change in place between hedonism and achievement/power. However, this deviation was also evident in the value structures in the Time 1 and Time 2 assessments; hence it was in line with expectations. The large deviation was in the placement of universalism-social, but not universalism-nature, near security. Interestingly, both universalism sub-types were located next to each other in Time 1 and Time 2, however, security was located closer than expected to Universalism, near to the mid-point where the two axes crossed in both time periods. In this case, the change in universalism-social (including world at peace and social justice items) was similar to the change in the security (including national security and social order items). And indeed, the algebraic difference in universalism-social values was positively correlated with that of security values ($r = .17$, $p = .05$) whereas the algebraic difference in universalism-nature was not correlated with that of security values ($r = -.09$, NS). It may be that in change in values related to social issues (as in the universalism-social and the security values) is experienced similarly in the short term as greater social involvement and hence such change occurs in the same direction. However, we would expect that in the longer term these changes would occur in opposite directions according to the basic motivations that underlie them.

The confirmatory MDS supported the acceptability of the theory-consistent solution. The theory-consistent configuration produced a Stress of .12, which was only slightly larger than the unconstrained solution Stress (.09). In addition, the Dispersion Accounted for (DAF) was above .98 and Tucker's Coefficient of Congruence was above .99 for both solutions. Columns 4 and 5 of Table 4 report the final two-dimensional theoretically-constrained coordinates. The projection of points onto parallel lines representing each facet and the regional spacing of the values supports Schwartz's higher order dimensions. While Self-direction and Universalism-Environment were borderline, their decomposed raw stress was less than .02 in both cases. Thus, the rank order value-change data also supported Schwartz's (1992) general structure.

Correlates of Value Change

The inter-relationships between absolute value-change scores (Time 2 minus Time 1), the extent of life changes in the two year period, and age were also examined. We examined their relation to overall absolute value change (average absolute difference of all ten value types) and to the absolute change in specific value types.

Correlations. As expected, the life event score was positively related to overall absolute value change ($r = .25$, $p < .01$). Hence, experiencing a great extent of life changing events contributed to greater value change over the two year period. As expected, age was negatively related to overall absolute value change ($r = -.15$, $p = .04$). Interestingly, the life event score and age were uncorrelated ($r = .00$, $p = .99$). It seems life events in the two year period did not vary linearly with age.

Regression. First, the life event score and age were entered into a multiple regression model in order to see if they predicted overall absolute value change[8]. The general predictive model was significant (multiple R = .29; $F_{(2,121)} = 5.41$, $p < .01$). The extent of life-changing events was a significant positive predictor of overall value change ($\beta = .24$, $t = 2.77$, $p = .006$), whereas age was only a marginal negative predictor of change ($\beta = -.16$, $t = 1.77$, $p = .08$). This suggests the extent of the life changes a person experiences is a more crucial factor to value change than age.

We also examined whether life events and age predicted the absolute change in the eleven specific values. In this analysis we also included the Time 1 value score as a control variable, so the influence of life events and age on value-change is independent of their original level of value importance. Only one significant prediction was found (tradition - multiple R = .57; F (3,120) = 18.94, p < .001). The magnitude of life-changing events was a significant positive predictor of the absolute change in tradition values (β = .16, t = 2.11, p = .04), whereas age was not significant (β = -.12, t = 1.60, p = .11). In addition, the control variable (tradition score at Time 1) was a significant predictor of the change in Tradition (β = .53, t = 7.07, p < .001). We also examined the average change in tradition values, rather than the absolute change, to see if life-changing events or age produced a directional change in tradition, but the equation was not significant.

What could be the explanation to this pattern of findings? The more impactful the life-changing event the more it may undermine people's basic assumptions about life. Hence, a great extent of life-changing events may lead the person to challenge tradition values, particularly if these values are already quite important. Some people may react by becoming more traditional and devout, perhaps responding to the 'shock' to the system of basic assumptions by strengthening their belief in god who may be seen as responsible to what happened. Others may react in the opposite way, by deciding that perhaps there is no god, or that traditional way of life is inadequate and therefore should be abandoned. Future research should attempt to replicate this finding and test the proposed explanation directly.

While there was an overall change in values as a function of life-changing events, only one of the ten values was identified as consistently changing after the occurrence of life-changing events. Hence, the main finding of this set of analyses is that although life-changing events are predictive of value change, the contents of the values that change are probably not be a direct function of the mere occurrence of life-changing events. Rather, the particular values that change are probably a function of the nature of the life event, the adaptation required in terms of values, and the individual's interpretation of the life-changing event.

General Discussion

Values are considered to be relatively stable, although there is some acknowledgement that they can change (e.g., Hofmann-Towfigh, 2007; Inglehart, 1997; Rokeach, 1973; Schwartz, 2005b). Yet, the topic of value change has been largely neglected and there are currently no published papers on the structure of value change. This paper suggested the structure of intra-individual value change should mirror the value structure found by Schwartz (1992; 2005a). Four longitudinal studies that varied in countries, languages, populations, contexts of change, time gaps, and value measures provided consistent support for this argument, suggesting the findings are generalizable. Hence, when an intra-individual change in values occurs, it is not random or chaotic. Rather, it is organized according to the same conflicts and compatibilities that organize values.

The heterogeneity of the sample used in Study 4 also enabled us to examine predictors of value change. As we expected, the extent of life changing events was positively related to value change, supporting the idea that values change when people adjust to a new life situation. This is in line with Lewis's (1997) suggestion that personality change is determined by changes in life circumstances. This finding also fits with the recent finding that individuals differ in their

trajectories of personality change (Vaidya, Gray, Haig, Mroczek, & Watson, 2008), as individuals differed in the values that were changed as a result of life changing events.

Interestingly, the effect of life events was larger than the effect age had on value change, suggesting the need to adjust to situations impacts more strongly on value change than age. In line with this, the literature on change in personality traits has explained the finding of greater personality change in young adulthood as stemming from the many changes in the lives of young adults, such as taking on new important professional and family roles (Roberts, Walton, & Viechtbauer, 2006), implying the crucial factor in personality change is adapting to life changes. The weaker effect age had on value change is also consistent with recent findings that, unlike previous suggestions that people change little after early adulthood, some personality traits change at a faster pace during middle adulthood than in early adulthood (Srivastava, John, Gosling, & Potter, 2003).

Value theory emphasizes the stability of values (e.g., Rokeach, 1973; Schwartz, 1997). Our data confirm this idea as most of the test-retest correlations in our studies would be considered high. In the first three studies of high school and university students the correlations ranged from .48 to .76, with only one of the 30 correlations being less than .50. In the more heterogeneous adult sample, across a longer time period of two years and using a different value measure, the correlations were lower, ranging from .26 to .58. A median split using life events in this sample, indicated that those who experienced a smaller degree of life changing events had higher test-retest correlations, ranging from .36 (power) to .68 (self direction). Nonetheless, we suggested that, even if there is only a small change in values, this change is systematic and meaningful. The structure of intra-individual value change found across the four longitudinal studies supports this proposition, as do the findings about the correlates of value change in Study 4. This is in line with recent calls to examine the dynamics of personality change, even when test-retest correlations are high (Fraley & Roberts, 2005). Future research on value change should not be discouraged because of the relative stability of values.

A consistent deviation from our expectation, occurring in 3 of the 4 studies, was the interchange in location of benevolence and universalism value-change. A closer examination of the patterns of correlations among the value-change variables revealed a consistent pattern. Change in universalism values tended to be negatively correlated with change in self-direction values. Moreover, the change in universalism tended to be more negatively related than the change in benevolence to all the individualistic values (power, achievement, hedonism, stimulation, and self direction; see Schwartz, 1992). This resulted in the location of universalism value-change being further away from self-direction and the rest of the individualistic values than the theory predicts, leading to the interchange between benevolence and universalism.

What could explain this pattern of findings? It may be that the transcendence beyond selfish interests, which is part of universalism values, seems more blatant in the short run compared to the long run. Hence, an increase in the importance of universalism values is accompanied by stronger decreases in self-direction and the other individualistic values than what would be expected by the Schwartz (1992) theory. Perhaps the salience of the increased importance of universalism values such as equality and protecting the environment brings to the fore-front practical thoughts about sacrificing one's convenience in order to pursue these values, leading to a reduction in individualistic values. Similarly, decreasing the importance of such values may make salient the freedom from restraints to convenient behavior of not needing to take the time and effort to protect the environment or treat others fairly. It may be that the shared motivation of self-direction and universalism, being reliance on independent judgment and

acceptance of diversity (Schwartz, 1992), is less readily salient and takes more time to affect people's value profile, perhaps due to its abstractness. Future research should examine this possibility directly.

Limitations

Although we demonstrated consistent results for our proposition, it is important to address some possible limitations to the findings. We first address two possible limitations in the calculation of our variables, followed by a cross-cultural limitation and the possibility of temporary change.

This paper is unique as no other research was found that has examined the structure of naturally occurring longitudinal value change. To do this, we used algebraic difference scores across two time periods of varying lengths. While alternatives to difference scores have been suggested in the examination of predictive relationships (e.g., Edwards 1994), we have found no alternative to the use of these scores in the examination of the structure of change. Further, the criticism over using difference scores refers primarily to their use in regression (Campbell & Kenny, 1999), which was not the main analysis of the current paper. We did, however, attempt to account for the fact that difference scores are likely to be correlated with their terms (Johns, 1981) in the regression analysis of individual value change (e.g., the change in tradition). To do this, we added the Time 1 importance of the tested value as an independent predictor to control for the level of importance at Time 1. In addition, we examined the possibility that the value-change scores were simply a replication of the value structure at Time 1. We used the PERMAP computer program (Heady & Lucas, 1997) to check the congruency between two dimensional perceptual maps, with and without Time 1 as covariates, as there was no way to do this with the principal component analysis reported in this paper. Cliff's (1966) matching program was then used to assess the goodness of fit between the maps, with and without Time 1 as covariates. In all cases, the congruency between maps was high and well above minimal congruency standard of .80 suggested by Cliff (1996). This suggests the theoretically consistent value change structure was not primarily driven by the starting values structure.

Three of the four studies used ipsatized scores, which meant changes balanced to zero. While it could be argued that this meant a change in one value is necessarily offset by a change in another value, there is no reason these changes would follow the theoretical structure of values. That is, although the sum of increases in value importance across values should be balanced with the sum of decreases in value importance, this does not mean changes in theoretically conflicting values would be the ones balanced to zero. Further, the MDS analysis used the change in the rank order between Time 2 and Time 1, rather than the change in value scores, which is the same with or without ipsatization at the intra-individual level.

A possible cross-cultural caveat is that the results were limited to respondents from Western countries. However, recent studies on longitudinal value change in India found a similar pattern, in which mean level increases in self-enhancement values were accompanied by mean level decreases in self-transcendence values (Krishnan, 2008). Although we cannot conclude that the intra-individual structure of change was the same as that found in the current studies, they imply our basic suggestion may also be valid in non-Western cultures. Future research should study the intra-individual structure of value change in non-Western cultures to assess the cross-cultural generality of our findings.

Finally, our studies included only two times of assessment. It is possible the changes observed are fleeting and indicate value fluctuations rather than real value change, as was the case in the values change study following the 9/11 attack. Whether value fluctuations should be

considered as a real change depends on the definition of value change. Bardi and Goodwin (2009) defined value change as a change in value scores in a value questionnaire. This definition was based on the notion that people know what their values are (see, e.g., Schwartz & Bilsky, 1987). Hence, this definition entails that temporary change in values, such as experimentally induced value change, is a real change, albeit temporary. They suggest a theoretical model of processes of value change that address temporary changes in values and long-term value change. Further, temporary changes in values may be meaningful, as our findings indicate. Future longitudinal studies on values with additional times of assessment should be undertaken in order to assess meaningful trajectories of value change.

Implications for Personality Change

The approach outlined in this paper provides a way to test for systematic change in other circumplex models. For example, the circumplex model of interpersonal traits (e.g., Wiggins, 1979) could be subjected to the same examination as longitudinal change in traits that are part of a circumplex should show the same systematic pattern we found. Indeed, the structure of change of traits in circumplex models should be even cleaner than the structure we found because many traits in such models are antonyms of one another (e.g., *cold* and *warm*), whereas there are no antonyms in the values model and negative relations between pairs of values are only due to such values being based on conflicting motivations. In contrast, other measures of personality, such as the Big Five traits, are considered to be independent of one another. Hence, a change in one trait should not have any consequences for change in a different trait.

To conclude, the structure of intra-individual value change mirrors the structure of values. Hence, although values are relatively stable, they do change occasionally, and such change is systematic and meaningful. Therefore, there is scope for studying value change. We hope that this research will stimulate further studies that aim to understand the dynamics of value change, as well as its antecedents and consequences.

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Footnotes

[1] Seven of the schools were located in different parts of Germany. One of the schools was located in the Czech Republic. 521 students were German, 284 students had other nationalities (6 unknown). 532 students filled in the German version of the questionnaire, 279 students were given the English questionnaire. Participants that used questionnaires in different languages or that came from different countries did not differ on relevant data, such as demographics, value importance, etc.

[2] The two-dimensional space created by the orthogonal factor analysis is equivalent to the SSA's 2-dimensional map, as both methods are based on the same correlations. We chose to use factor analysis rather than an SSA due to its greater familiarity for most readers. However, as expected, in all four samples the structure of value change using SSA was almost identical to the ones we present here using factor analysis. All of the SSA maps are available from the authors upon request.

[3] Initially both centered and uncentered algebraic difference scores from each study were submitted to the CIRCUM software (Browne, 1992). The results were promising and very similar to those reported by Perrinjaquet, Furrer, Usunier, Cestre and Valette-Florence (2007) for the theoretically predicted unequally spaced-unequal communalities solutions. They were also similar to the results from entering the Time 1 value scores. However, the lower sample sizes in studies 2, 3 and 4 resulted in a number of errors, including Haywood cases which could not be resolved with the current data.

[4] Given the high proportion of female respondents, we reran the analysis excluding the male respondents. The results were very similar, with 37% of the variance being accounted for in the two-dimensional solution, which illustrated the same small deviation switch between benevolence and universalism and the same large deviation for achievement.

[5] The female only sample produced very similar results (Stress = .18; DAF = .97 and Tucker's coefficient = .98 for the constrained solution), however benevolence was no longer borderline.

[6] A more formal discussion of BWS, including formal proofs of the measurement properties associated with different cognitive processes that respondents might use to make best and worst choices, was provided by Marley and Louviere (2005).

[7] For value type j:

$$\text{SVBWS score } v_j = \frac{1}{S} \sum_{s=1}^{S} \sqrt{\frac{Most\, v_j}{Least\, v_j}}$$

where

- v_j is the SVBWS score for the jth value type.

- $Most\, v_j$ is the weighted sum representing the *most important* score for the jth value type in a set. In the case of six values per set, there are 64 or 2^6 possible combinations (sets) of the six value types. One of these sets is empty, so there are 63 sets in which a choice must be made. If a person chooses consistently with their ordering of value types, s/he would choice the most important value type in every set in which it appears (i.e., 32 times), the second most important value type in every set in which it appears but the most important value type does not (i.e., 16 times), and so on, eventually choosing the least important value type once. Thus, following Lee,

et al. (2008) the value type chosen as *most important* received a score of 64, the value type chosen as the *least important* received a score of 1, and the remaining value types received a score of 7.5 (or ¼ of the remaining choices 2, 4, 8, 16).

- Least v_j weighted sum representing the *least important* score for the jth value type in a set.

Here, the value type chosen as the *least important* received a score of 64, the value type chosen as *most important* received a score of 1, and the value types not chosen received a score of 7.5.

[8] We also examined the possibility that age and life events may interact, but the moderated relationship was not significant.

Table 1

Mean Importance, Longitudinal Correlations, and theory-constrained MDS solution (Study 1)

Values	Mean Importance (STD)			Longitudinal Correlations	Theoretically-constrained MDS dimensions	
	Time 1	Value △	Absolute Value △		Dimension 1	Dimension 2
Benevolence	.64 (.66)	-.08***	.46	.60	.23	.20
Universalism	.27 (.66)	-.09***	.44	.62	.32	.60
Self-Direction	.63 (.64)	.04*	.45	.58	.06	-.17
Stimulation	.31 (.95)	.04	.59	.65	.85	-.72
Hedonism	.63 (.91)	-.04	.58	.64	.06	-.76
Achievement	-.06 (.85)	.10***	.57	.61	-.84	-.48
Power	-1.03 (1.04)	.19***	.68	.66	-.29	-.25
Security	-.28 (.65)	-.04	.47	.58	-.08	.58
Conformity	-.39 (.84)	-.02	.53	.68	-.35	.63
Tradition	-.82 (.87)	.01	.56	.66	.05	.36

Note. Value importance is ipsatized by centering on the personal mean importance across all values; the significance of paired mean comparisons between Time 1 and Time 2 value importance scores are indicated in the value-change mean column (Value △; * *p*<.05; ** *p* < .01; *** *p* < .001); value-change scores are the algebraic difference of Time 2 minus Time 1 value scores; standard deviations for the value change scores ranged between .58 for Self Direction to .86 for Power; longitudinal correlations are test-retest correlations.

Table 2

Mean Importance, Longitudinal Correlations, and theory-constrained MDS solution (Study 2)

Values	Mean Importance (STD)			Longitudinal Correlations	Theoretically-constrained MDS dimensions	
	Time 1	Value △	Absolute Value △		Dimension 1	Dimension 2
Benevolence	.78 (.65)	-.11*	.42	.65	.10	.78
Universalism	.12 (.73)	.04	.44	.70	.14	.40
Self-Direction	.47 (.68)	-.07	.52	.54	.30	-.22
Stimulation	-.16 (1.08)	-.15	.69	.68	.75	.06
Hedonism	.85 (.99)	-.15	.77	.53	.66	-.84
Achievement	.34 (.67)	-.1	.56	.50	-.36	-.35
Power	-2.16 (1.35)	.23*	.89	.64	-.11	-.41
Security	-.14 (.74)	.1	.55	.53	-.89	.02
Conformity	-.16 (.90)	.06	.64	.50	-.46	.38
Tradition	-1.47 (.95)	.04	.78	.53	-.15	.17

Note. Value importance is ipsatized by centering on the personal mean importance across all values; the significance of paired mean comparisons between Time 1 and Time 2 value importance scores are indicated in the value-change mean column (Value △; * $p<.05$; ** $p < .01$; *** $p < .001$); value-change scores are the algebraic difference of Time 2 minus Time 1 value scores; standard deviations for the value change scores ranged between .54 for Benevolence to 1.12 for Power; longitudinal correlations are test-retest correlations.

Table 3

Mean Importance, Longitudinal Correlations, and theory-constrained MDS solution (Study 3)

Values	Mean Importance (STD)			Longitudinal Correlations	Theoretically-constrained MDS dimensions	
	Time 1	Value △	Absolute Value △		Dimension 1	Dimension 2
Benevolence	.79 (.73)	-.12	.56	.48	.17	.14
Universalism	-.01 (.73)	.10*	.40	.76	.39	.55
Self-Direction	.50 (.69)	.08	.44	.64	.29	.02
Stimulation	-.12 (1.13)	-.03	.68	.67	.64	-.31
Hedonism	.74 (1.23)	.01	.84	.60	.56	-.87
Achievement	.39 (.69)	.03	.47	.62	-.47	-.39
Power	-2.02 (1.31)	.19*	.83	.70	-.12	-.39
Security	-.06 (.72)	-.04	.51	.57	-.49	.77
Conformity	.04 (.69)	-.13	.56	.70	-.80	.26
Tradition	-1.39 (1.04)	-.05	.71	.66	-.17	.22

Note. Value importance is ipsatized by centering on the personal mean importance across all values; the significance of paired mean comparisons between Time 1 and Time 2 value importance scores are indicated in the value-change mean column (Value △; * $p<.05$; ** $p < .01$; *** $p < .001$); value-change scores are the algebraic difference of Time 2 minus Time 1 value scores; standard deviations for the value change scores ranged between .51 for Universalism to 1.05 for Hedonism; longitudinal correlations are test-retest correlations.

Table 4

Mean Importance, Longitudinal Correlations, and theory-constrained MDS solution (Study 4)

Values	Mean Importance (STD)			Longitudinal Correlations	Theoretically-constrained MDS dimensions	
	Time 1	Value △	Absolute Value △		Dimension 1	Dimension 2
Benevolence	2.53 (1.55)	-.24	1.27	.34	.17	.18
Uni Social	1.81 (1.41)	-.15	.82	.39	.15	.46
Uni Environ	2.24 (1.58)	-.03	1.23	.56	.11	.50
Self-Direction	2.12 (1.28)	.02	.86	.58	.18	.08
Stimulation	1.43 (1.07)	.19	.79	.41	.36	-.84
Hedonism	1.36 (.92)	.21*	.76	.45	.30	-.50
Achievement	1.50 (1.28)	.14	.85	.45	-.19	-.74
Power	.72 (.76)	.08	.54	.26	-.18	-.90
Security	1.35 (1.02)	-.09	.64	.31	-.30	.55
Conformity	1.87 (1.27)	-.18	.87	.43	-.27	.18
Tradition	1.08 (.86)	.05	.64	.37	-.34	1.03

Note. The significance of paired mean comparisons between Time 1 and Time 2 value importance scores are indicated in the value-change mean column (Value △; * $p<.05$; ** $p < .01$; *** $p < .001$);value-change scores are the algebraic difference of Time 2 minus Time 1 value scores; standard deviations for the value change scores ranged between 1.78 for Universalism-Environment to .98 for Power; longitudinal correlations are test-retest correlations.

Figure Captions

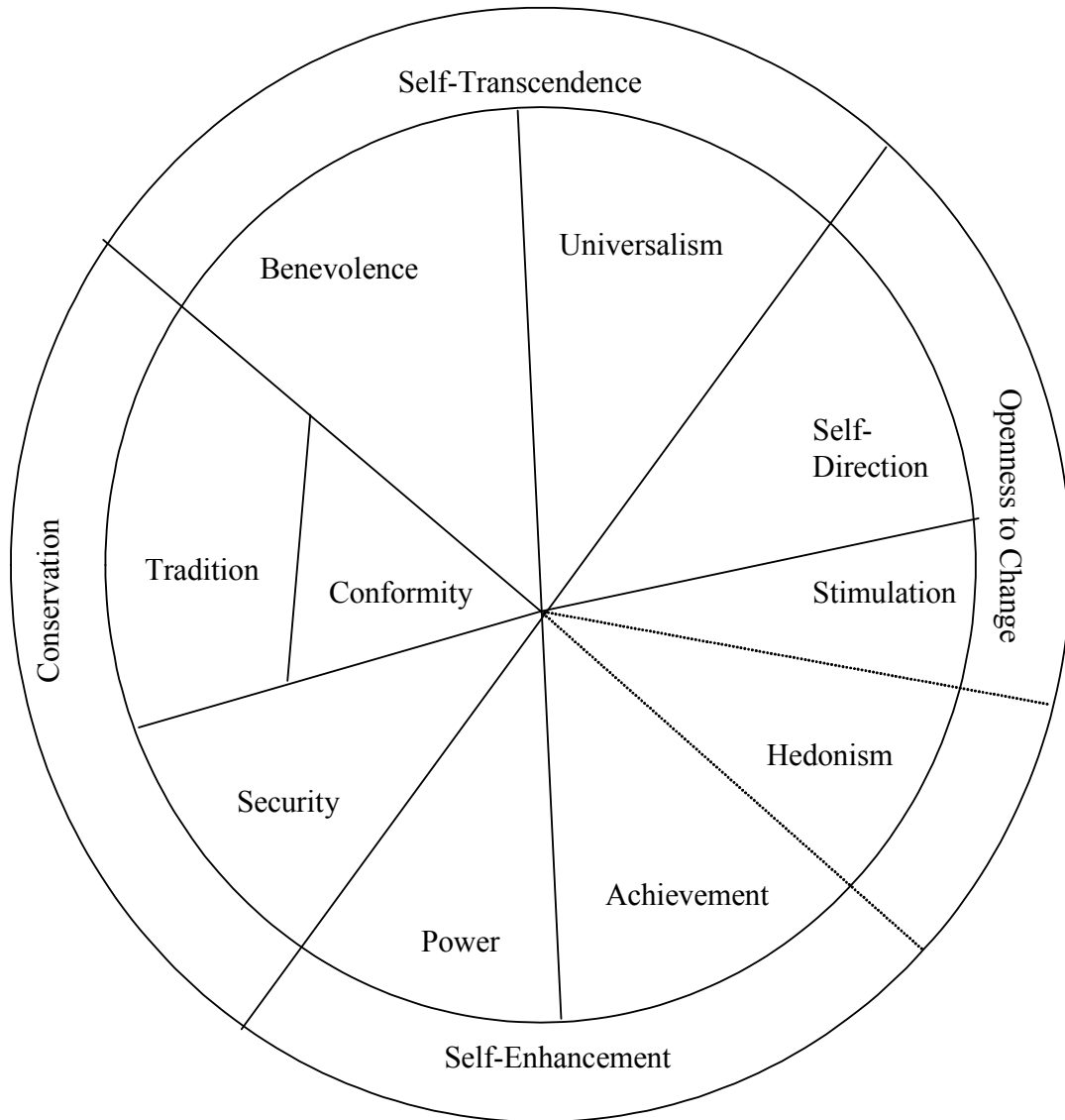*Figure 1.* The theoretical structure of values.

Figure 2. Study 1: Component plot of difference score of values (Time 2 minus Time 1) in a two dimensional space.

Figure 3. Study 2: Component plot of difference score of values (Time 2 minus Time 1) in a two dimensional space.
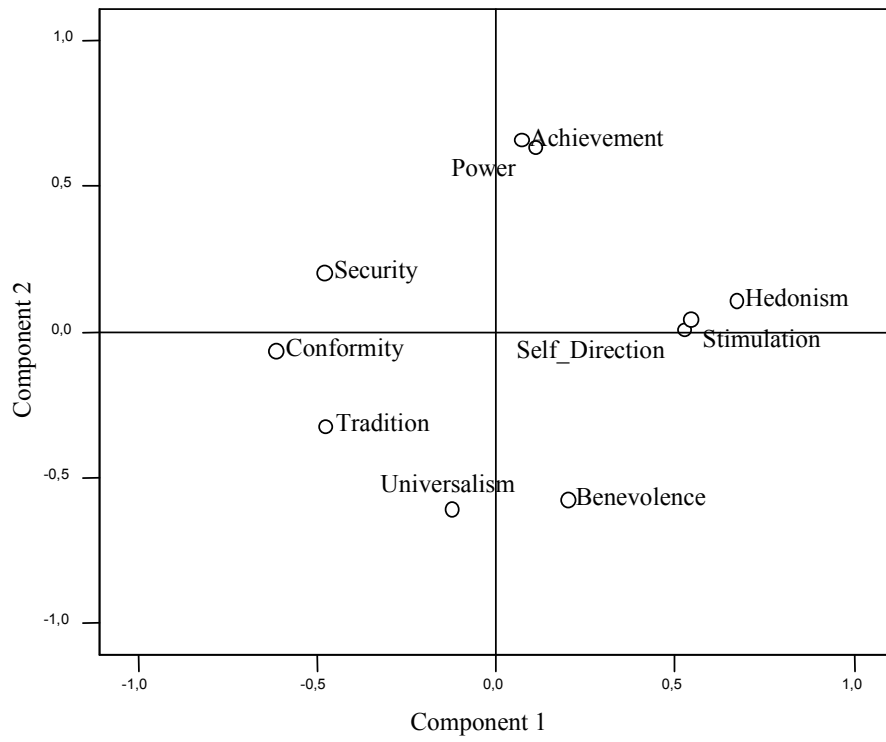
Figure 4. Study 3: Component plot of difference score of values (Time 2 minus Time 1) in a two dimensional space.

Figure 5. Study 4: Component plot of difference score of values (Time 2 minus Time 1) in a two dimensional space.
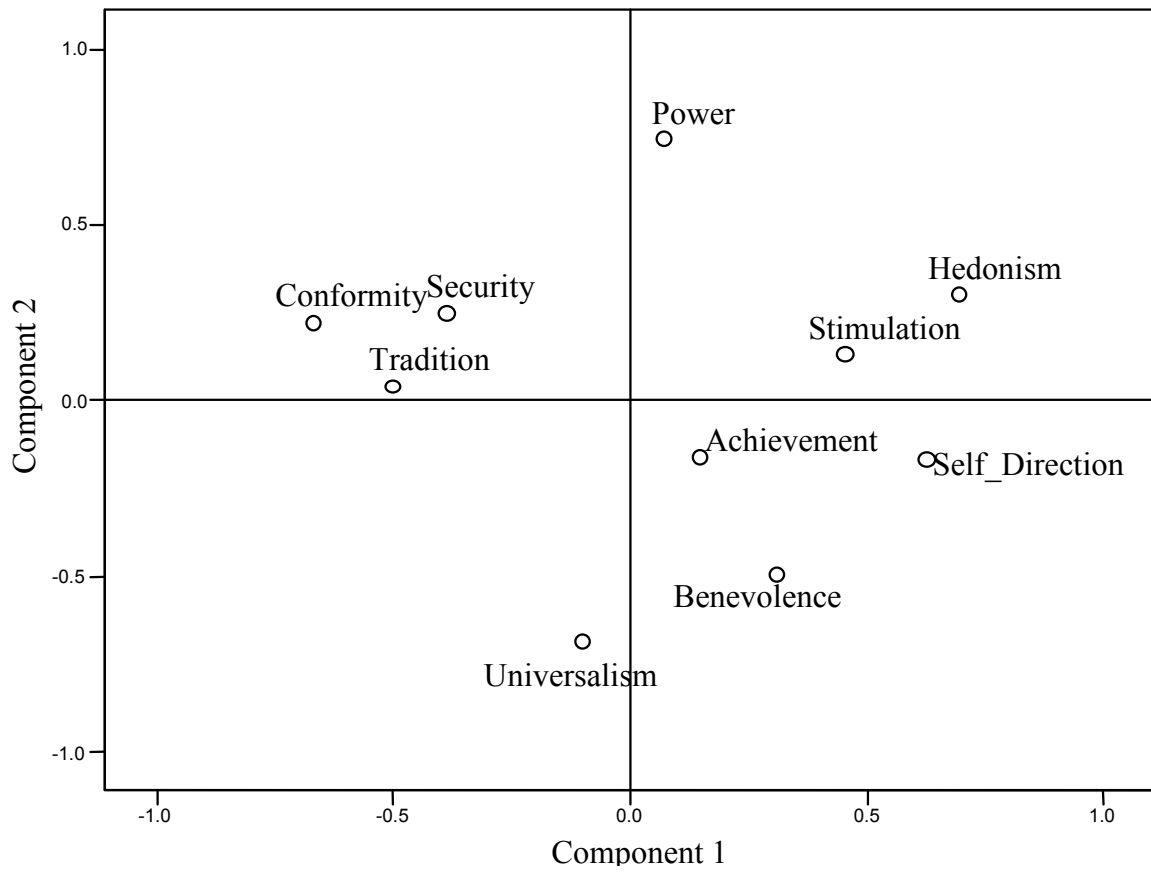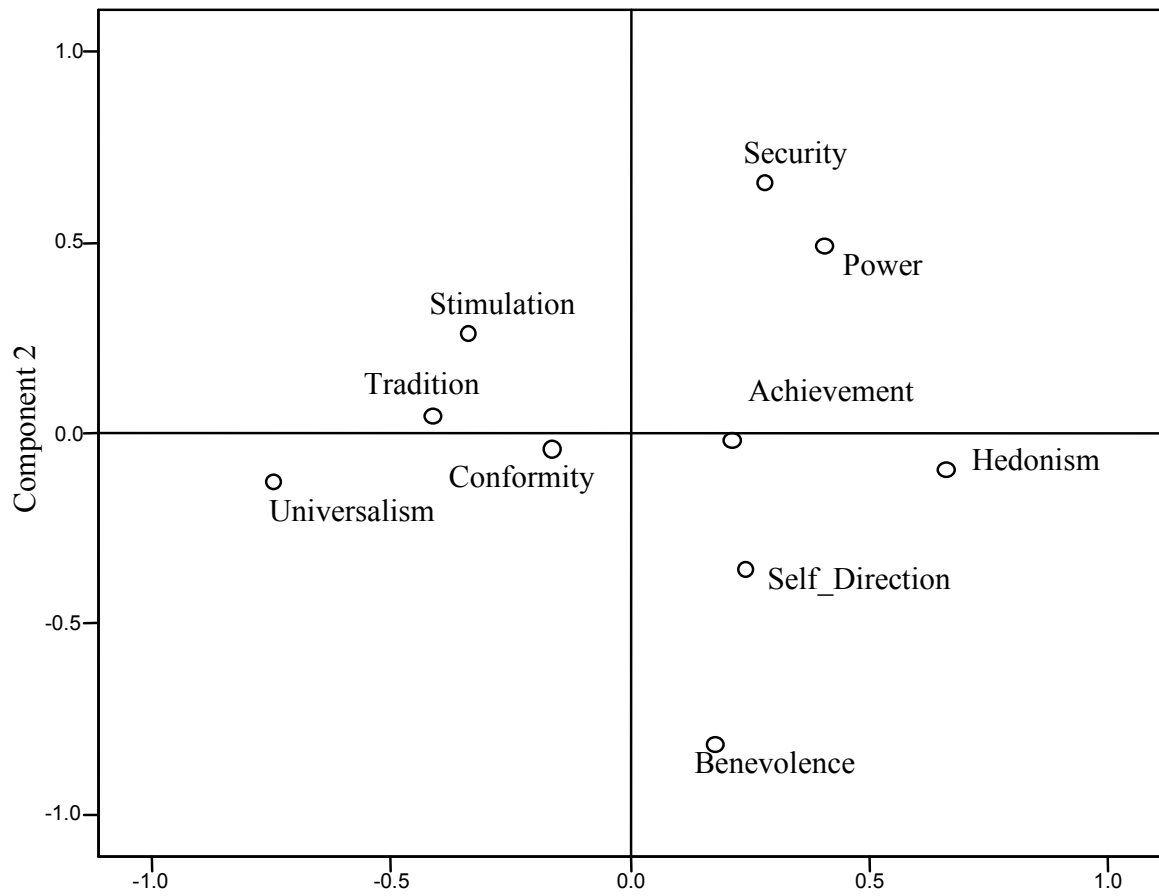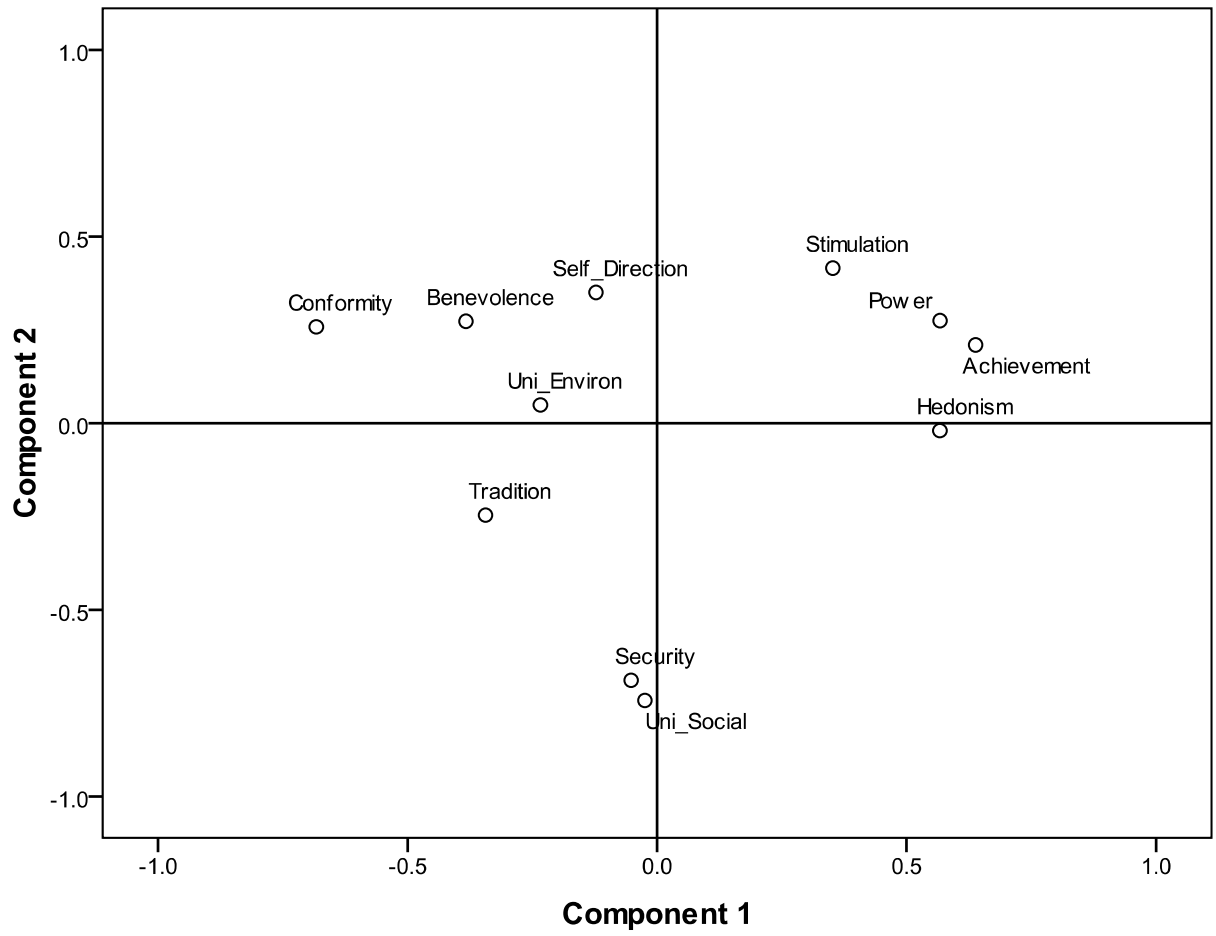
Self-Transcendence

Universalism

Benevolence

Self-Direction

Openness to Change

Conservation

Tradition

Conformity

Stimulation

Security

Hedonism

Power

Achievement

Self-Enhancement

Appendix A

MDS Constraints to represent Schwartz (1992) theoretical structure

	Facet 1: Self-transcendence to Self-enhancement	Facet 2: Conservation to Openness to change
Self-transcendence values	3	2
Self-enhancement values	1	2
Openness to change values	2	1
Conservation values	2	3

Appendix B

SVBWS Experimental Design

SVBWS Value Types	Subsets										
	1	2	3	4	5	6	7	8	9	10	11
Power	0	1	1	0	1	1	1	0	0	0	1
Achievement	1	0	1	1	0	1	1	1	0	0	0
Hedonism	0	1	0	1	1	0	1	1	1	0	0
Stimulation	0	0	1	0	1	1	0	1	1	1	0
Self Direction	0	0	0	1	0	1	1	0	1	1	1
Universalism - nature	1	0	0	0	1	0	1	1	0	1	1
Benevolence	1	1	0	0	0	1	0	1	1	0	1
Tradition	1	1	1	0	0	0	1	0	1	1	0
Conformity	0	1	1	1	0	0	0	1	0	1	1
Security	1	0	1	1	1	0	0	0	1	0	1
Universalism - social	1	1	0	1	1	1	0	0	0	1	0

Appendix C

The first set in the Schwartz Values Best Worst Scale (SVBWS, Lee et al., 2008)

Which is the MOST and Least important factor to you as a guiding principle in YOUR life?

For more information hold your mouse over any word in each set.

Most Important		Least Important
O	Successful, capable, ambitious.	O
O	Protecting the environment, a world of beauty, unity with nature.	O
O	Helpful, honest, forgiving.	O
O	Devout, accepting portion in life, humble.	O
O	Clean, national & family security, social order.	O
O	Equality, world at peace, social justice.	O