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PERSONAL VALUES AND CYBER RISK-TAKING

Abstract

This research explores the relationship between personal values and the tendency to take cyber-risks. We first develop and add six cyber-risk items to the well-known Domain-Specific Risk-Taking (DOSPERT) scale. Importantly, we show that like the other five domains examined by the scale (Health, Ethical, Financial, Recreational, and Social), these cyber items form a separate cluster. Separate clusters are essential in order to employ the DOSPERT scale. We then examine the association between values and cyber risk taking behavior. We find that "conservation (conservatism)" values are negatively correlated with the tendency to take cyber risks. Thus, individuals for whom this value is important are less likely to take cyber risks. We also find that "openness to change" values are positively associated with the tendency to take cyber-risks. Individuals with high scores for this value are more likely to take cyber risks. The findings point to possible "values based" interventions in order to increase cyber-security.

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1. Introduction

We are moving into a world in which assets are primarily digital and not physical. In 2018, physical assets such as buildings and equipment accounted for only 16 percent of the value of S&P 500 firms.[1] Digital assets are increasingly subject to cyber risks. At the "micro" level, such risks include falling prey to ransomware, viruses, and phishing attacks. Cyber-attacks can also result in huge or even catastrophic losses for two reasons: (i) correlated risk and (ii) interdependent risk. Few would dispute that cyber risk is a very serious problem for the global economy and to society.

But there is a "disconnect" between acknowledgement of the problem and action to address the problem. One might expect that greater awareness in recent years about viruses and malware would have resulted in nearly all firms and consumers protecting and insuring their websites, computers and their digital assets. That is not the case. Surprisingly, even in 2016, nearly 25% of the personal computers in the world had no basic protection from viruses and malware.[2]

While technology is important in insuring information security, humans are typically the weakest link in internet security (Tam, Glassman, & Vandenwauver, 2009; Hadlington, 2017). The idea that technology will provide complete protection against phishing attacks is a fallacy. Hence, an important question is what type of individuals are more likely to take cyber risks.

Research in cybersecurity has examined the relationship between individual characteristics (gender, age, etc.) and the tendency to take cyber risks. However, to the best of our knowledge, no research has addressed the relationship between personal values and cyber risks, which is the focus of this study. In this paper, we apply the vast knowledge accrued on personal values in order to determine what values are associated with the taking of cyber risks. Before we begin, we provide a brief introduction to empirical research on values.

[1] See https://ipcloseup.com/2019/06/04/21-trillion-in-u-s-intangible-asset-value-is-84-of-sp-500-value-ip-rights-and-reputation-included/

[2] The New York Times reported (on August 23, 2019) that more than forty local governments in the United States suffered cyber-attacks in 2019. See Ransomware Attacks Are Testing Resolve of Cities Across America, by New York Times, By Manny Fernandez, David E. Sanger and Marina Trahan Martinez, available at https://www.nytimes.com/2019/08/22/us/ransomware-attacks-hacking.html.

1.1 Empirical Research on Values:

Personal values are cognitive representations of abstract, desirable motivational goals that guide the way individuals select actions, evaluate people and events, and explain their actions and evaluations (e.g., Kluckhohn, 1951; Rohan, 2000; Rokeach, 1973; Sagiv, Roccas, Cieciuch, & Schwartz, (2017); Schwartz, 1992). They are a core aspect of people's identity, and serve as standards or criteria that provide social justification for choices and behaviors across situations. Values are recognized as important psychological constructs, because, as guiding principles in people's lives, they are hypothesized to have wide-ranging effects (Feather, 1999; Hitlin & Piliavin, 2004; Maio, 2010). All values may serve to motivate actions, depending on their accessibility and relevance to the situation. The higher a value is in the hierarchy, the more it is likely to motivate action and affect behavior (Schwartz, 1996). Values affect the attractiveness of alternative courses of action by influencing the valence of behaviors that help attain them, which in turn makes it more likely that individuals will engage in those behaviors (Feather, 1988, 1995). That is, values lead people to act in ways that promote their attainment, and refrain from acting in ways that block it (Sagiv & Schwartz, 1995). Values are especially good predictors of behaviors over which individuals have some cognitive control or choice (Roccas et al, 2002) and when behavior is not regulated by social norms (Fischer, 2006).

1.2 Values and Risk

The effect of values on risk has being documented in Griffin, Li, Yue, and Zhao (2009) who found a positive relation between culture level values on risky corporate investment decisions, in which individualism values are positively related to risky decisions and uncertainty avoidance is negatively related to risky decisions. Evidence for the effect of personal values and risk is reported in Berson, Oreg, and Dvir (2008) who tested the relations between CEO values and organizational culture found that CEOs who are high on conservation values (security in particular) would be expected to inhibit the formation of innovation cultures, which highlight flexibility and risk-taking. In contrast, CEOs who emphasize innovation and risk-taking sets lower priority on conservation values. Openness to change values were also associated with the tendency to risky forms of political activism (like protests) and risky sexual behaviors (Goodwin, Kozlova, Nizharadze, & Polyakova, 2004;

Vecchione et al., 2015). However, none of these studies examined the effect of values on cybersecurity risks.

1.3 Theoretical Foundation and Our Hypotheses

The Schwartz value theory is particularly useful for studying behavior related to cyber security because it seeks to provide a comprehensive mapping of values according to the motivations that underlie them (Schwartz, 1992).[3] Schwartz identified ten value types forming a circular structure.[4] According to Schwartz (1992), values differ in the motivational goals to which they are directed. We then, as is typical, grouped these ten values into four broader categories: (i) Openness-to-Change (ii) Conservation (iii) Self-Enhancement and (iv) Self-Transcendence.[5] These four broad categories illustrate two basic conflicts:

(1) Openness to change values express the motivation for autonomy of thought and action (self-direction), and for novelty and excitement (stimulation). These values typically conflict with conservation values that express the motivation of preserving the status quo: commitment to past beliefs and customs (tradition), adhering to social norms and expectations (conformity) and preference for stability and safety (security).

(2) Self-enhancement values express pursuit of self-interest by focusing on gaining control over people and resources (power) or by demonstrating ambition, competence and success (achievement). These values conflict with self-transcendence values that express concern and care for close others (benevolence) or acceptance and tolerance of all people (universalism).

Hypotheses

The relation of openness to change values with risk taking and conservation values with safety and caution is driven from the motivations those values express, openness to change

[3]The Schwartz theory (Schwartz, 1992) has been tested and verified in extensive cross-cultural research (Davidov, Schmidt, & Schwartz, 2008; Schwartz & Rubel, 2005; Spini, 2003.) Roccas and Sagiv (2019) find that values are generally stable over time. Stability means that values are particularly useful in studying individual differences risky behavior.

[4] The Schwartz circle of values is shown in Figure 1 in the Appendix. Figure 1 illustrate the dynamic structure of relations among values. Conflicting values are located in opposing directions around the circle. For any two values, the closer they are on circle, the more similar they are in the motivations they express.

[5] See Table 1 in the Appendix.

values express the goal to seek novelty and exciting experiences, that ultimately involve risk. In contrast, conservation values express the goal of order, secureness and preservation of the past that ultimately promote more safe and familiar experiences (for review see, Schwartz, 2012).

As with risks from other life domains, we hypothesize that the tendency to take cyber risks will be positively correlated with openness to change values and negatively correlated with conservation values. Intuitively, individuals who score high on openness to change values should be more likely to take cyber risks compare to individuals who score high on conservation values who are less likely to take cyber risks. Thus, we predict that cyber risk associated to values in the same vein as risks in other life areas, that is, openness to change values will be positively associated with cyber risk, in contrast conservation values will be negatively associated to cyber risks.

We also hypothesize that that self-enhancement values and self-transcendence are not correlated with cyber risk taking.

1.4 Our Analysis and Results

In this paper, two hundred and fifty-nine Israeli University students participated in our laboratory study. We first created and added six cyber-risk items to the well-known Domain-Specific Risk-Taking (DOSPERT; Blais & Weber, 2002) scale. DOSPERT is a scale that assesses risk taking in five domains: financial decisions, health/safety, recreational, ethical, and social decisions. However, the domains of DOSPERT are based on literature review that conducted twenty years ago (e.g., Byrnes, Miller, & Schafer, 1999), therefore, a major risk domain as cyber-security risks was not include in the original version. Hence, we developed six cyber-risk items to add to the DOSPERT scale.

We first show – similar to the other five domains examined by the scale (Health, Ethical, Financial, Recreational, and Social) – that the cyber items we employ form a separate cluster in the case of our laboratory study. This is essential in order to apply the DOSPERT scale in our analysis.

After completing the DOSPERT scale survey, the students completed the Schwartz Value Scale (SVS) scale.

Then we conduct regression analysis and show that, after controlling for personality traits,[6] the value "conservation" is negatively (and significantly) associated with both (I) general risk taking and (II) cyber risk taking. Individuals who score high on this value are less likely to take general risks and cyber risks. These effects are both significant at the 99 percent level of confidence.

The regressions also show that, after controlling for personality traits, the value "openness to change" is positively (and significantly) associated with both (I) general risk taking and (II) cyber risk taking. Individuals with high scores on openness to change values are more likely to take general risks and cyber risks. These effects are both significant at the 99 percent level of confidence.

Thus in the case of general risk and cyber risk, even after controlling for key personality traits, the higher-order values are significantly associated with risk taking.

2. Methodology

There were 259 participants in the study, of which 195 were women and 64 were men. All were Israeli undergraduates at Universities and Colleges in Israel. The mean age of the participants was 30.8,[7] and the ages ranged from 18-60. All participants filled in three surveys that we now describe:[8]

2.1 Personal Values Survey: Participants completed the short version of the Schwartz Values Survey (SVS, Schwartz, 1992), which includes forty-six items. Participants rated the importance of each of these forty-six the items on a 9 point scale, ranging from "opposed to

[6] We discuss traits in detail in the methodology section.
[7] In Israel, most young people spend several years doing military service. Hence, on average, they are older than their compatriots in other countries.
[8] All surveys were translated into Hebrew.

my values" (−1) to "of supreme importance**"** (7).[9] The forty-six items are then grouped into the ten value types. See Table 1 for the ten values types and the items they include. [10]

We then, as is typical, grouped these ten values into four broader categories: (i) Openness-to-Change (ii) Conservation or Conservatism (iii) Self-Enhancement and (iv) Self-Transcendence. See Table 1.

In all four categories, we calculated the value of Cronbach's alpha, which is a measure of internal consistency, that is, how closely related a set of items are as a group. For the grouping of the values into these four categories to be reliable, Cronbach's alpha should be relatively high. In our data, the values for the Cronbach alpha are respectively (i) α=.817, (ii) α=.832, (iii) α=.734, and (iv) α=.819. The relatively high values of the Cronbach's alpha means that the items in the category received similar values in our data, and that the four "broad category" grouping is of values is appropriate.

2.2 Controlling for Personality Traits:

Although values and traits share similarities in their nature and their content, they are two separated constructs (Park-Leduc, Feldman, & Bardi; Roccas, Sagiv, Schwartz, & Knafo, 2002).[11] Hence, we include traits in the analysis in order to examine whether values are associated with cyber risks after controlling for traits. That is, our question is whether after controlling for traits, are values associated with taking cyber risks?

Table 2 presents the definitions of traits from the Five-Factor Model (FFM), which is the most prominent model used to study values-traits relations (e.g., Haslam, Whelan, & Bastian, 2009; Roccas et al., 2002).

We measured the five personality factors with Saucier's (1994) Big-Five personality traits survey. The scale in this survey consists of 40 traits for five broad personality factors: Agreeableness, Conscientiousness, Extraversion, Neuroticism, and Openness to Experience. Participants were asked to indicate how well the 40 different traits (adjectives) describe their

[9] Choosing zero on this scale means not important at all.
[10] The SVS has that has been validated many times across different cultures (see for example, Gandal, Roccas, Sagiv, &Wrzesniewski, 2005) and hence is appropriate for our use.
[11] Values, unlike traits or attitudes, are inherently desirable (Roccas, Sagiv, Openhiem, Elster, & Gal, [2014]).

personality on a 5-point scale ranging from 1 (very uncharacteristic of me) to 5 (very characteristic of me). The 40 traits included in the analysis and their grouping into the big five traits are shown in Table 2.

2.3 Risk-Taking Attitude Survey The tendency to take risks was assessed using the DOSPERT scale (Blais & Weber, 2006,) which was translated to Hebrew. Participants rated the likelihood that they would participate in different risky behaviors on a seven-point scale, from extremely unlikely (1) to extremely likely (7). The DOSPERT scale assesses risk attitude in five "content" domains, each of which includes 5-7 items. The content domains and their respective Cronbach's alpha are as follows:

(I) Financial (α=.713),
(II) Health/safety (α=.665),
(III) Recreational (α=.836),
(IV) Ethical (α=.517), and
(V) Social (α=.65).

To asses risk attitudes for cyber decisions we built a new content domain by developing six novel cyber-risks items to be include in a newly created cyber category. The high Cronbach's alpha score (α=.728) for the cyber items means the grouping of the six items together in a domain is appropriate. See Table 3 for all of the items in the six categories.

Recent evidence from DOSPERT's meta-analysis research shows variability of Cronbach's alpha score across domains. Specifically, the average α values are lower for Social, Health and Ethical, and the higher for Recreational and Financial, respectively (Shou & Olney, 2020). The Cronbach's α values in this study show the same pattern, with the highest values for Recreational and Financial, and lower values for the other three categories. Importantly, fore our study. The Cronbach's α value for the new Cyber domain is very high: It is below that of Recreation, but above the Cronbach's α value for the other four domains.

3. Analysis and Results

3.1 MDS Analysis: Are our groupings of values and measures appropriate?

Before examining the relationship between values and risk-taking, we employed a multidimensional scaling test[12] (MDS) to our data sets in order to further examine whether our groupings of values and risks are appropriate. MDS serves as a measurements of similarity among groups of items and is commonly used to reduce the complexity of a data set, permitting visual appreciation of the underlying relational structures contained between items and groups of items.

The outcome of MDS analysis is a 'map' where similar items are located in proximity to one another, and dissimilar items are located proportionately further apart. A high proximity of items from the same dimension indicate that those items represent the same content and can be grouped together. (See Oltman, Stricker, & Barrows, 1990). MDS analysis provide a systematic way to determine if the clustering of items in MDS space corresponds with theoretically established groups.

In the case of the ten values, the MDS analysis tests if our data converges to the circumplex structure (see Bilsky, Kanik, & Shwartz, 2011). In other words, the analysis tests whether the grouping of the ten values into four broader value classes is appropriate.

This analysis uses a starting configuration from a design matrix that is based on Schwartz's theoretical model (Figure 1). Each variable has been assigned to its coordinates in the prototypical structure, and the MDS algorithm started from this configuration. Figure 2 shows that our ten values mapped into the expected "circuplex structure." Thus, we find that the grouping of the ten values into the "four higher-order" values [(i) Openness-to-Change (ii) Conservatism (iii) Self-Enhancement and (iv) Self-Transcendence] is appropriate.

We then conducted a Euclidean metric MDS as implemented by PROXSCAL with random starting configurations of 1,000 repetitions (see Borg, Groenen, & Mair, 2013). Similar to the analysis with values, the question is whether the 36 items of the DOSPERT mapped into the six higher-order risk groups (Health, Financial, Social, Ethical, Recreation, and Cyber.) See Table 3.

[12] See Doring, 2010, for discussion on MDS analysis.

Figure 3 shows that (with the exception of Health dimension,) the DOSPERT items from the same higher-order dimension mapped into distinct areas. Moreover, and critical for the analysis, the new cyber items that we developed mapped into a distinct area.

Hence, this provides further evidence that (I) the grouping of the ten values into four broader value classes and (II) the grouping of the 36 DOSPERT items into the six higher order risk groups are appropriate for our analysis. We can now examine the relationship between values and risk, in particular cyber-risk.

3.2 The Relationship between Values and Risk in General and Cyber Risk

Our focus is on the relationship between values and (I) risk in general vs (II) cyber risk. Hence, we take the average of the DOSPERT's five original content domains (all items except the new cyber items) to be the "general" risk-taking measure.[13]

Descriptive Statistics are in Table 4a. The correlation table (Table 4b) shows that openness to change values are positively correlated with risk-taking, both in the general domain and in the cyber domain. Conservation values, on the other hand, are negatively correlated with risk-taking, both in the general domain and in the cyber domain.[14]

As expected, risk-taking attitude did not correlate with self-enhancement and self-transcendence values. The correlations between these two higher-order values with the two risk measures are less than 0.06 in absolute value and not significantly different from zeo.

3.3 Regression Analysis:

[13] This average consistency score across the five domains is often used in this manner. Dee Highhouse et al., 2017.

[14] Consistent with the circular structure of the ten values, the patterns of correlations formed a clear sinusoid curve, in which the most positive correlations were with openness to change values, and most negative with conservation values. The remaining correlations were in between, following their postulated order around the values circle. (See Figure 4.) The pair-wise Spearman correlations also support the sinusoid curve hypothesis, that is, the pattern of correlations between cyber risk-taking and personal values is highly similar to the correlations' patterns of values with other risk-taking domains (.76, .87, .9, .98, and .86 in the Social, Ethical, Financial, Health, and Recreational domains, respectively, all $p < .001$), in other words, in terms of associations with values, cyber risk is not different from any other risks, the top peaks of the values curves are with openness to change values (self-direction or stimulation) and the bottom peaks are with conservation values (mostly with security values).

We next conducted regression analysis, in which the dependent value is the tendency to take risks: We use both (I) general risk, which is the DOSPERT average of the five non-cyber risk categories and (II) the DOSPERT value for cyber risk as dependent variables.

Independent variables of interest are the two higher values - openness to change and conservation. Control variables include gender, age, and "traits."

We include "Openness to Experience" and "Conscientiousness" traits, since these traits are most similar in their content and associated with the values central to our investigation—Openness to change and Conservation (respectively). Table 4b shows that conscientiousness is positively correlated with conservation values and negatively correlated with openness to change values. Openness to experience is positively correlated with openness to change and negatively correlated with conservation values. But these correlations are not very high.[15] Hence, we include these traits in the regressions as well.

The regression in column one of Table 5 uses the "general" risk DOSPERT value as the dependent variable. The results show that both conservation (the value) and conscientiousness (the trait) are negatively correlated with general risk taking. Individuals with high scores of this trait or value are less likely to take risks. These effects are both significant at the 99 percent level of confidence.

Further, the regression shows that both openness to change (the value) and openness to experience (the trait) are positively correlated with general risk taking. Individuals with high scores of this trait or value are more likely to take risks. These effects are both significant at the 99 percent level of confidence. Thus in the case of general risk, even after controlling for key traits, the higher-order values are significantly associated with risk taking.

The regression in column two of Table 5 uses the cyber risk DOSPERT score as the dependent variable. Similar to the regression in column one, the results show that both conservatism (the value) and conscientiousness (the trait) are negatively correlated with cyber

[15] The correlations of values and traits in our data set are consistent with earlier findings (Olver & Mooradian, 2003; Parks-Leduc, Feldman, & Bardi, 2015; Roccas et al., 2002). See Table 4b.

risk taking. Individuals with high scores of this trait or value are less likely to take cyber risks. These effects are both significant at the 99 percent level of confidence.

Further, the regression shows that openness to change (the value) is positively associated with cyber risk taking. Individuals with high scores of this value are more likely to take risks. This effect is significant at the 99 percent level of confidence. The regression shows that the trait "openness to experience" is not significantly associated with general risk taking.

Hence, in summary, our main result is, even after controlling for key traits, the higher-order values "openness to change" and "conservatism" are significantly associated with risk taking in general and cyber risk-taking.

Finally, a note of interest about the effect of gender. In the case of general risk, the regression in column one of Table 5 shows that men are more likely to take risks and this effect is significant at the 99 percent level of confidence. In the case of cyber risk, however, the regression in column two of Table 5 shows that men are not more likely to take cyber risks than women. This issue needs further research.

Further Discussion

We find that, both in the case of general risk and in the case of cyber risk, (and after controlling for key traits) two higher-order values ("Openness to Change" and "Conservation") are significantly associated with risk taking.

Our results illustrate the usefulness of values in revealing the motivational functions of cyber risk-taking, and point to possible values based interventions in increasing cyber-security. People who place more importance on openness to change values (they are more vulnerable to risky cyber behavior) can be targeted to take part in cyber security intervention programs. Additionally, one can use "conservation" values to prompt end users to produce safe cyber behavior and reduce risky cyber behaviors. For example, before choosing password to their PayPal account, users could be asked by the system why it is important for them to lock their doors (A typical answer may be: to keep my family safe). This may induce them to choose a stronger (and unique) password in order to keep their money safe, rather than simply using their Netflix password.

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Appendix

TABLE 1: Definitions of Types of Values[16]

TEN VALUE TYPES	Broad Categories
Universalism (UN): Understanding, appreciation, tolerance and protection of the welfare of all people and of nature (broadminded, wisdom, social justice, equality, a world at peace, a world of beauty, unity with nature, protecting the environment)	**Self-Transcendence**
Benevolence (BE): Preservation and enhancement of the welfare of people with whom one is in frequent personal contact (helpful, honest, forgiving, loyal, responsible)	
Tradition (TR): Respect, commitment and acceptance of the customs and ideas that traditional culture or religion provide the self (humble, accepting my portion in life, devout, respect for tradition, moderate)	**Conservatism/ Conservation**
Conformity (CO): Restraint of actions, inclinations, and impulses likely to upset or harm others and violate social expectations or norms (politeness, obedient, self-discipline, honoring parents and elders)	
Security (SE): Safety, harmony and stability of society, of relationships, and of self (family security, national security, social order, clean, reciprocation of favors)	
Power (PO): Social status and prestige, control or dominance over people and resources (social power, authority, wealth)	**Self - Enhancement**
Achievement (AC): Personal success through demonstrating competence according to social standards (successful, capable, ambitious, influential)	
Hedonism (HE): Pleasure and sensuous gratification for oneself, pleasure, enjoying life)	
Stimulation (ST): Excitement, novelty, and challenge in life (a varied life, an exciting life)	**Openness to Change**
Self-direction (SD): Independent thought and action-choosing, creating, exploring, creativity, freedom, independent, curious, choosing own goals)	

[16] The items in parenthesis are the specific values that used to measure each of the ten values.

TABLE 2: Definitions of the Five Higher Order Traits[19]

FIVE FACTOR MODEL (FFM)
Extraversion (E): the tendency to be sociable, talkative, assertive, and Active vs. to be retiring, reserved, and cautious (bashful, bold, energetic, extraverted, quiet, shy, talkative, withdrawn).
Agreeableness (A): the tendency to be good-natured, complaint, modest, gentle, and cooperative vs. to be ruthless, suspicious, and inflexible (cold, cooperative, harsh, kind, rude, sympathetic, unsympathetic, warm).
Conscientiousness (C): the tendency to be careful, responsible, organized, and scrupulous vs. to be irresponsible, disorganized, and unscruputend (carless, disorganized, efficient, organized, practical, sloppy, systematic).
Neuroticism (N): the tendency to be anxious, depressed, angry, and insecure vs. to be calm and emotionally stable (envious, fretful, jealous, moody, relaxed, temperamental, touchy, unenvious).
Openness to Experience (O): the tendency to be intellectual, imaginative, sensitive, and open-minded vs. to be down-to-earth, insensitive, and conventional (complex, deep, creative, imaginative, intellectual, philosophical, uncreative, unintellectual).

[19] The items in parenthesis are the specific adjectives that used to measure each of the five traits/factors.

Table 3: Domain-Specific Risk-Taking (DOSPERT) Scale[17]

For each of the following statements, please indicate the **likelihood** that you would engage in the described activity or behavior if you were to find yourself in that situation. Provide a rating from *Extremely Unlikely* to *Extremely Likely*, using the following scale:

1	2	3	4	5	6	7
Extremely Unlikely						Extremely likely

1. Admitting that your tastes are different from those of a friend. (S)
2. Going camping in the wilderness. (R)
3. Betting a day's income at the horse races. (FG)
4. Storing personal information or sensitive data in the cloud (Google Drive/Dropbox). (C)
5. Investing 10% of your annual income in a moderate growth diversified fund. (F/I)
6. Drinking heavily at a social function. (H)
7. Taking some questionable deductions on your income tax return. (E)
8. Disagreeing with an authority figure on a major issue. (S)
9. Downloading free anti-virus software from an unknown source. (C)
10. Betting a day's income at a high-stake poker game. (FG)
11. Having an affair with a married man/woman. (E)
12. Passing off somebody else's work as your own. (E)
13. Going down a ski run that is beyond your ability. (R)
14. Investing 5% of your annual income in a very speculative stock. (FI)
15. Entering personal information during website registration or when shopping online. (C)
16. Going whitewater rafting in the spring when the river is flowing very fast. (R)
17. Betting a day's income on the outcome of a sporting event (FG)
18. Engaging in unprotected sex. (H)
19. Revealing a friend's secret to someone else. (E)
20. Driving a car without wearing a seat belt. (H)
21. Investing 10% of your annual income in a new business venture. (FI)
22. Giving out my passwords to another person. (C)
23. Taking a skydiving class. (R)
24. Riding a motorcycle without a helmet. (H)
25. Choosing a career that you truly enjoy over a more secure one. (S)
26. Sharing personal information through social networks/forums. (C)
27. Speaking your mind about an unpopular issue in a meeting at work. (S)
28. Sunbathing without sunscreen. (H)
29. Bungee jumping off a tall bridge. (R)
30. Piloting a small plane. (R)
31. Walking home alone at night in an unsafe area of town. (H)
32. Downloading digital media (e.g., films, music) from unlicensed sources. (C)
33. Moving to a city far away from your extended family. (S)
34. Starting a new career in your mid-thirties. (S)
35. Leaving your young children alone at home while running an errand. (E)
36. Not returning a wallet you found that contains $200. (E)

E = Ethical, FI = Financial Investing, FG = Financial Gambling, H = Health, R = Recreational, and S = Social, C=Cyber.

[21] Our DOSPERT risk variables are calculated as "8 – scale" so that a positive correlation between a value and the DOSPERT risk variable means that this value is associated with more risk taking.

Table 4a: Summary Statistics

	Mean	Std. Dev.	Min	Max
DOSPERT_Total	3.11	1.23	1.00	6.50
DOSPERT_Cyber	2.95	0.75	1.37	5.20
Age	30.76	9.14	18.00	60.00
Gender	0.25	0.43	0.00	1.00
Conservation (V)	4.32	1.02	0.52	6.63
Conscientiousness (T)	3.89	0.58	1.88	5.00
Openness to Change (V)	4.36	1.04	1.23	6.87
Openness to Experience (T)	3.86	0.58	2.25	5.00

Note. The Cap letters in parenthesis marks whether the variables are values (V) or traits (T)

Table 4b: Correlations among Variables

	General Risk	Cyber Risk	Conservation (V)	Conscientiousness (T)	Openness to change (V)	Openness to Experience (T)
General Risk	1.00					
Cyber Risk	0.55	1.00				
Conservation (V)	-0.38	-0.26	1.00			
Conscientiousness (T)	-0.35	-0.30	0.30	1.00		
Openness to Change (V)	0.23	0.16	0.20	-0.10	1.00	
Openness to Experience (T)	0.27	0.10	-0.12	-0.05	0.20	1.00

Table 5: Regression Results (Standard Errors in parentheses)[18]

Independent Variables	Dependent Variable	
	General Risk	Cyber Risk
Age	-0.0022 (0.0043)	-0.0066 (0.0081)
Gender	0.48*** (0.091)	0.26 (0.17)
Conservation (V)	-0.19*** (0.041)	-0.24*** (0.079)
Conscientiousness (T)	-0.27*** (0.070)	-0.42*** (0.13)
Openness to Change (V)	0.16*** (0.039)	0.20*** (0.074)
Openness to Experience (T)	0.18***(0.067)	0.046 (0.12)
R2	0.38	0.16
Adjusted R2	0.36	0.14
N	259	259

***= significant at 99% level, **= significant at the 95% level, and *= significant at the 90% level.

[18] The results are virtually identical if we use robust standard errors.

Figure 1: Schwartz ten value types and starting configuration for the "Values" MDS analysis.

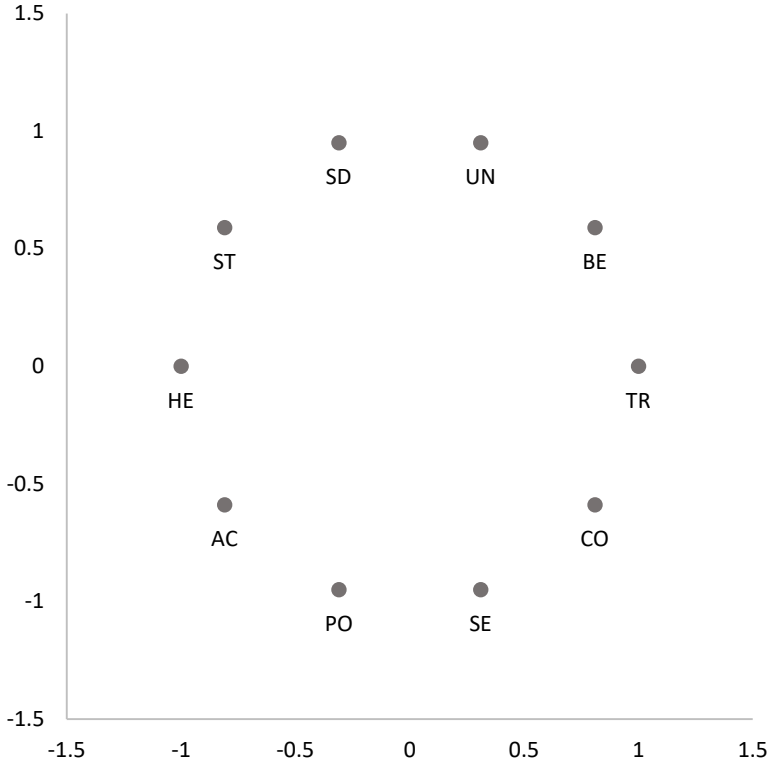
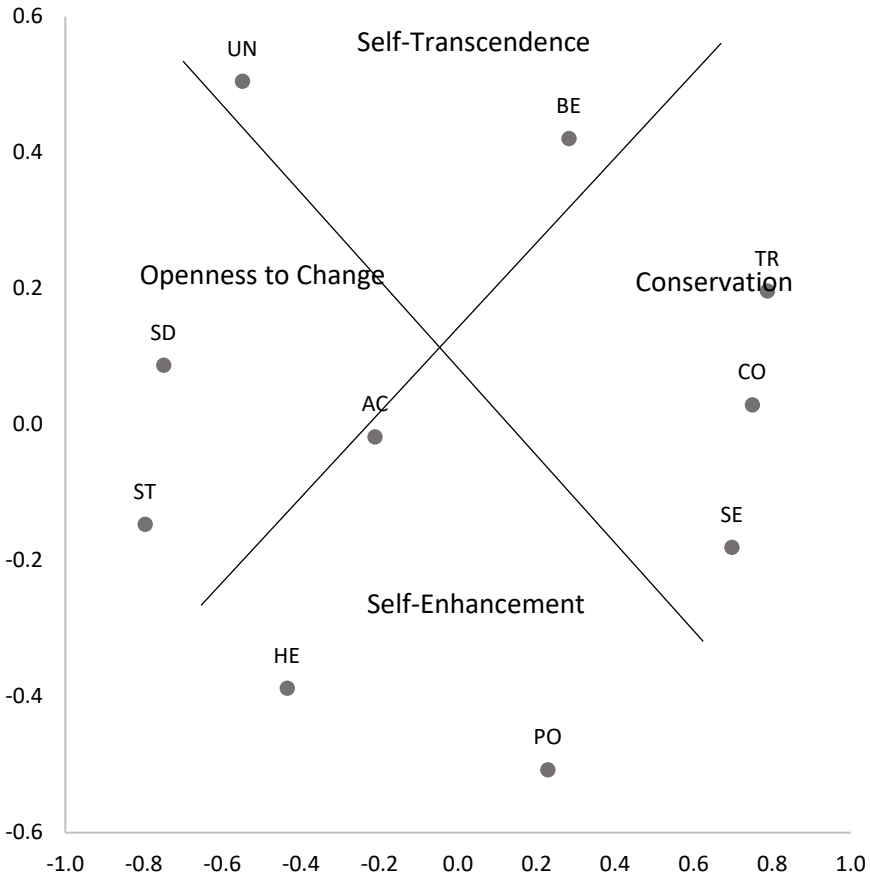


Figure 2: Display of two dimensional ordinal MDS of SVS scores.



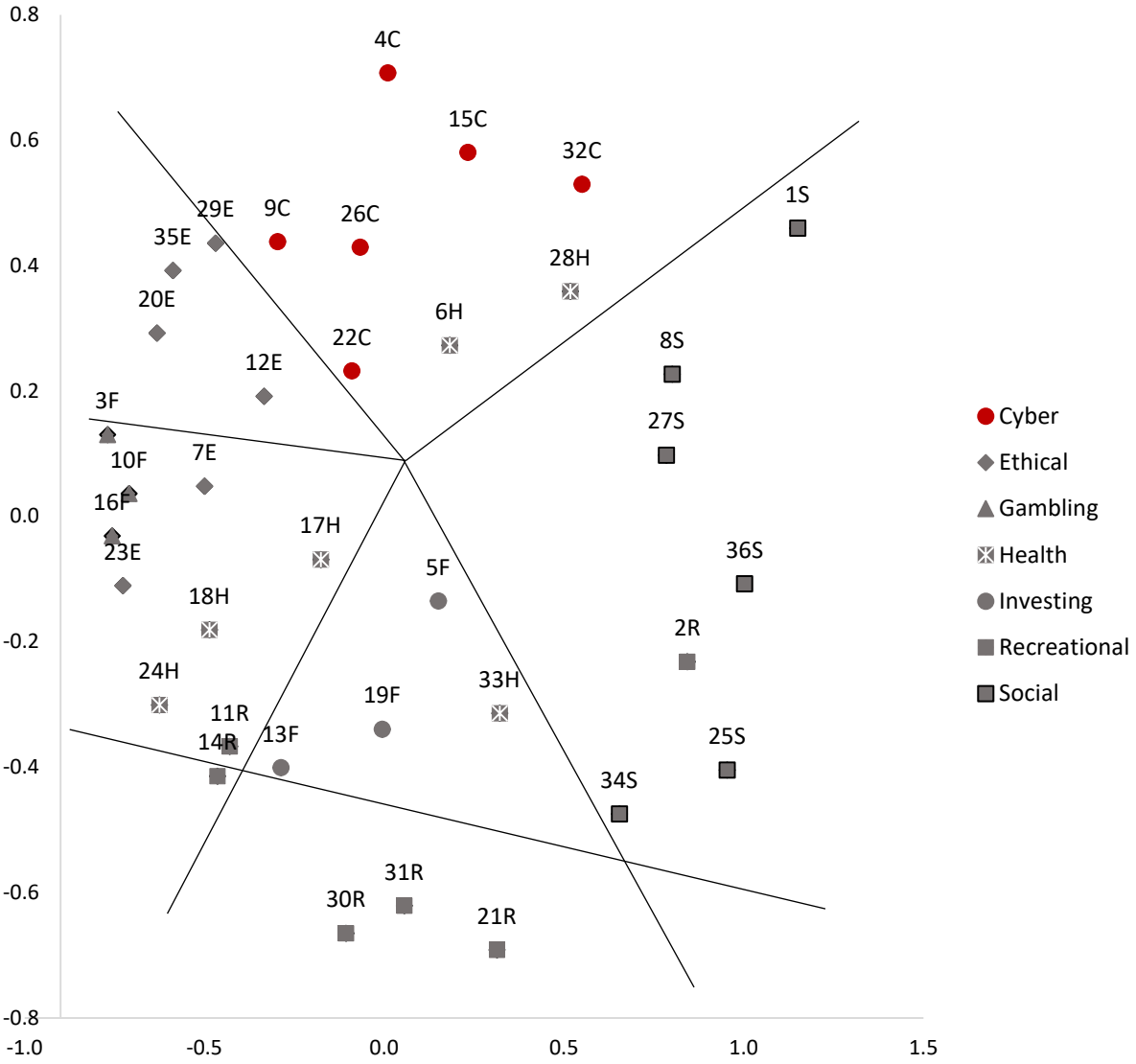


Figure 3: Display of two dimensional MDS map for the DOSPERTS items.

Note. Each point (geometric shape) in the plot (defined by two coordinates) represent a DOSPERT item. The points' numbers represent the chronological order of the DOSPERT's items, the points' letters represent the dimension of which the item measures (C=Cyber, E=Ethical, FG=Financial Gambling, H=Health, FI= Financial Investing, R=Recreational, and S=Social).

Figure 4: Correlations of values with the Cyber risk domain and the general risk score along the Schwartz circumplex.