

# Time for Risk: Future Time Perspective and Tolerance to Ambiguity as Factors Explaining Positive and Negative Risk-Taking in Adulthood

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## Research Article

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# Abstract

Risk-taking persists across the lifespan, but we know it is not ubiquitous across all adults. As goals and motivations vary across individuals and age groups, so too does risk behavior. Although risk is often considered in the context of maladaptive behaviors, risks can also be positive, allowing individuals to pursue meaningful goals in a socially accepted way. In this study, we were interested in examining positive and negative risk-taking in adults. The first aim of the study was to test associations among future time perspective, tolerance to ambiguity, and sensitivity to reward and punishment with positive and negative risk-taking in adults ( $N = 275$ , ages 19–71 years). The second aim of the study was to explore profiles of adult risk-takers using cluster analysis. Results indicated that greater future time perspective and reward sensitivity, but lower punishment sensitivity, were associated with greater positive risk-taking while higher reward sensitivity was associated with greater negative risk-taking. Further, cluster analysis yielded three groups of adult risk-takers: (1) oldest average age and lowest overall risk-taking, future time perspective, and reward sensitivity; (2) medium age, highest overall risk-taking, future time perspective, tolerance to ambiguity, and lowest punishment sensitivity; (3) youngest average age and average levels of all key variables. The knowledge gained from the study can lay the foundation for future work on how positive risk-taking may be cultivated across multiple domains of adults' lives.

## Introduction

Risk is a normal and essential part of everyday life. In the most basic sense, risk-taking is engaging in any behavior with uncertain probabilities of desirable and undesirable outcomes, with high-risk behaviors being those with the potential for greatest harm such as injury or death (Duell & Steinberg, 2020). Within this broad definition of risk are categories of risk behaviors, some of which are positive (i.e., socially acceptable and beneficial to wellbeing), and others negative (i.e., antisocial and dangerous). Positive risk-taking has become a subject of intense consideration (Duell & Steinberg 2019, 2021) and research (Duell & Steinberg, 2020; [blinded for review]; Patterson et al., 2019) in recent years, although it is not new to psychology (e.g. Hansen & Breivik, 2001). Nevertheless, most of the empirical work on positive and negative risk-taking has been done with adolescent samples (Duell & Steinberg, 2021). Extending this research to adults is of great social importance as it can help define what drives adults to take positive or negative risks and how to promote positive instead of negative risk-taking at different stages of life.

### Positive and Negative Risk-Taking

Duell and Steinberg (2019, 2021) propose a framework that organizes risk behavior along a spectrum of desirability. At the one end are positive risks that are beneficial to an individual's well-being and socially acceptable (e.g. initiating friendships, applying for promotion, protesting for social justice), and at the other end are negative risks, which are potentially harmful to one's well-being and antisocial (e.g. getting in the car with a drunk driver, binge drinking, stealing). Unlike negative risk-taking, positive risk-taking enables people to explore their environments and pursue meaningful goals in a socially accepted way. However, similar to negative risk-taking, positive risk-taking yields the potential for both rewards and costs. Initiating a friendship with a new coworker, for example, yields the potential benefit of building new relationships, but it also holds the risk of experiencing rejection and embarrassment. An elderly person going grocery shopping alone is important for maintaining their sense of personal agency and autonomy, but they may also be at risk of falling or getting into a motor vehicle accident. To get the benefit of the risk, people must be willing to do things they may not like or at which they may fail (Duell & Steinberg, 2019). Thus, engagement in positive risk-taking is not simply a function of being a prosocial person. There must also be tolerance or inclination for risk (Duell & Steinberg, 2019).

At different stages of adulthood, people are inclined to take different risks that allow them to pursue goals relevant to their life stage (Josef et al., 2016; Rolison et al., 2013). In most urbanized societies, middle adulthood is the period of the most intense activity in the professional and social domains (Kitayama et al., 2020), yielding opportunities to fulfill life aspirations and achieve long-term goals. It is also known as the period of the greatest propensity for risk-taking (Josef et al., 2016; Mamerow et al., 2016). Late adulthood, in turn, offers the opportunity to pursue individual, often postponed, passions and engage to a greater extent in social relationships (Lang & Carstensen, 2002; Delaney et al., 2021). Thus, as goals and motivations vary across individuals and across different age groups, so too does risk behavior (Figner & Weber, 2011; Josef et al., 2016; Mamerow et al., 2016). Several psychological factors, including sensitivity to good and bad outcomes (Duell & Steinberg, 2020), tolerance to ambiguity (Tymula et al., 2012; 2013), and future time perspective (Delaney et al., 2021) have been previously linked with the propensity to engage in risks. However, it is unclear whether these factors contribute to both positive and negative risk-taking in adulthood.

### Factors Associated with Positive and Negative Risk-Taking

Although positive and negative risk-taking are positively correlated (Duell & Steinberg, 2020; Fischer & Smith, 2004; Hansen & Breivik, 2001), they have distinct psychological correlates (Duell & Steinberg, 2020; [blinded for review]). Positive risk-taking is associated with lower sensitivity to reward and higher sensitivity to punishment than negative risk-taking (Duell & Steinberg, 2020). Further, only negative risk-taking is associated with impulsivity (Duell & Steinberg, 2020), which suggests that many negative risks are taken to obtain an immediate reward. Only positive risk-taking is associated with extraversion (Patterson et al., 2019), which may suggest that positive risk-taking reflects outgoing, highly social proclivities. In addition to these traits, there may be other factors influencing individuals' motivations to take positive or negative risks. Such factors include future time perspective, which may influence risk-taking aimed at achieving long-term goals (Delaney et al., 2021), and tolerance to ambiguity, which may increase risk-taking that is motivated by exploration or wanting to try new things (Tymula et al., 2012). We will now describe these factors in more detail and highlight the confirmed and possible associations between them and positive and negative risk-taking.

Future time perspective (FTP) is a cognitive-motivational trait referring to whether people perceive their future time as open-ended or limited, and how many opportunities and plans they see ahead (Lang & Carstensen, 2002). According to socioemotional selectivity theory (Carstensen et al., 1999), peoples' attention shifts from expansive goals (e.g. knowledge acquisition, career development) to emotional goals (e.g. joy, maintaining relationships) with age. Expansive goals are prioritized when future time is perceived as open-ended, whereas emotional goals are prioritized when time is perceived as limited. Research confirms that FTP is negatively related to age (Lang & Carstensen, 2002; Strough et al., 2016). In youth, people usually feel they have a lot of time ahead, so they focus on both immediate and distant opportunities. Through middle adulthood, people focus more on future opportunities until around age 60 years when the balance shifts towards focusing on limited time rather than on opportunities. Negative risks are often thought to be in the service of fulfilling emotional, short-term goals. Although it has been speculated that positive risks may be motivated by longer-term goals (Duell & Steinberg, 2019), this question has yet to be examined empirically, particularly among various stages of adulthood.

Research linking FTP and risk-taking (Delaney et al., 2021) shows that individual differences in FTP mediate age-related changes in social risk-taking (older adults who see fewer opportunities in their future avoid social risk-taking). The authors speculate that older adults avoid social risks because they perceive fewer opportunities to form new friendships and they prefer not to risk conflicts in current relationships. FTP, acting as an important regulator of motivation in adulthood (Lang & Carstensen, 2002) may determine the perception of whether it is worth taking positive risks. When people see many opportunities and time ahead, they may feel that their plans are especially worth the risk. When they perceive future time as limited, they may avoid risk to preserve what they have (Delaney et al., 2021) or feel that it is not worth waiting to do the things that maximize their well-being "here and now" (Strough et al., 2019). Also, considering findings that limited FTP is associated with a greater preoccupation with negative events (Strough et al., 2016), it may be that limited FTP reduces engaging in new or exciting activities, including positive risks.

Tolerance to ambiguity (TA) is another cognitive-motivational trait relating to peoples' attitudes towards novel, complex and unpredictable stimuli (McLain, 2009). Although the dominant response to this type of stimuli is aversion (McLain, 2009), research indicates that people high in TA are more extroverted and open to new experiences (Caligiuri & Talique, 2012), proactive (Bors et al., 2010), and report higher life satisfaction and positive affect (Bardi et al., 2009). In adolescence, TA is responsible for increased risk-taking in conditions where consequences of risks are unknown (Tymula et al., 2012). Even though TA decreases in adulthood (Tymula et al., 2013), adults who are above average on TA may evince higher levels of risk-taking than their adult peers (although this must be confirmed). Findings from related research show that higher TA is associated with greater engagement in prosocial behavior (requiring cooperation or trust) (Vives & FeldmanHall, 2018). From this vantage point, tolerance to ambiguity may enhance risk-taking because it affords people the willingness to try new things.

Risk-taking persists across the lifespan, but we know it is not ubiquitous across all adults. It may be that some adults endorse high levels of positive risk-taking whereas others engage in high levels of negative risk-taking. It is also quite likely that many adults endorse both patterns of risk behavior. To this end, we are interested in factors explaining positive and negative risk-taking in adults, particularly reward and punishment sensitivity, future time perspective, and tolerance to ambiguity. Moreover, we note that there are no studies exploring distinct profiles of risk behavior in adulthood as a function of these characteristics. Previous works indicate the confirmed and possible associations between some traits, positive and negative risk-taking, and (possibly) age, but there is a lack of overall picture of people who are more and less willing to take positive or negative risks. For example, as risk-taking, future time perspective, and tolerance to ambiguity are known to decline with age, one could expect groups of high and low risk-takers differing in age, FTP, and TA. On the other hand, as positive and negative risk-taking may have distinct correlates and vary differently with age, one could expect groups of positive and negative risk-takers to differ in their psychological correlates but not necessarily in age. Ultimately, the knowledge gained from the study can lay the foundation for future work on how positive risk-taking may be cultivated across multiple domains of adults' lives (i.e., at work, in the community, during retirement).

## **Aims of the Present Study**

Given the dearth of literature examining positive and negative risk-taking among adult populations, the present study addresses two key aims. The first aim is hypothesis-driven in that it examines the associations among sensitivity to reward and punishment, future time perspective, and tolerance to ambiguity with positive and negative risk-taking. In a sample of adults ages 19-71 years, we hypothesize that greater future time perspective, tolerance to ambiguity, reward sensitivity, and lower sensitivity to punishment are associated with greater positive risk-taking (H1) and that greater sensitivity to reward and lower sensitivity to punishment are associated with greater negative risk-taking (H2). All analyses are adjusted for age, gender, health, professional activity, and social activity in the last year as well as satisfaction with life<sup>[1]</sup>. The second aim of the study is exploratory in that it examines profiles of adult risk-takers. Although we do not have specific hypotheses about which profiles will emerge, we do anticipate that risk profiles may differ by the levels of risk-taking (e.g. high and low risk-takers), the type of risk taken (e.g. positive and negative risk-takers), or age (e.g. younger and older risk-takers).

<sup>[1]</sup> Factors such as general health, professional activity, and social activity in the last year, as well as satisfaction with life, could also influence risk-taking during the SARS-COV-2 pandemic, as the participants may have been ill for a period of time or have reduced their activity to varying degrees.

## **Method**

# Participants

Two hundred and seventy-five participants (203 women, 72 men) ages 19–71 ( $M = 39.25$ ;  $SD = 13.73$ ) took part in the study. Participant distribution across age cohorts is presented in Table A in the Appendix. The sample included adults living in both large and small towns in Poland, with 3.27% of participants describing their education as vocational, 25.09% as secondary, and 71.64% as higher (which means ongoing or completed bachelor's or master's studies). All participants provided written informed consent.

## Procedure

The research was approved by University Ethics Committee [blinded for review]. The sample was recruited on social media and participated in the study online. Participants were assured anonymity and the opportunity to ask questions (by e-mail), withdraw from the study at any time, and receive information about their results. Participants first answered questions regarding their general health and professional and social activity in the last year. Then, they completed questionnaires measuring positive risk-taking, negative risk-taking, sensitivity to reward and punishment, tolerance to ambiguity, future life perspective, and satisfaction with life.

## Measures

Questions asked at the beginning of the survey concerned the assessment of three variables: (1) participants' general health ("How would you rate your health in the last year on a scale from 1 – very bad to 10 – very good?"), (2) professional activity ("How would you rate your professional activity in the last year on a scale from 1 – I did not work to 10 – I worked a lot?"), and (3) social activity ("How would you rate your social activity in the last year on a scale from 1 – I met people very rarely to 10 – I met people very often?").

**Positive Risk-Taking Scale (PRTS).** To assess positive risk-taking, we used the self-report scale developed by Duell & Steinberg (2020). It consists of 14 behaviors presented in Duell & Steinberg (2020). Because the scale was originally designed for adolescents and young adults, we made slight modifications to make the items appropriate for adults who have completed their education. First, we changed the item: "Tried out for a team or auditioned for a play when you were not sure that you would be picked," to: "Applied for a job, project or participated in a competition when you were not sure that you would be selected". Second, we made minor modifications to three items: "Ran for a leadership role at work (instead of in school) or in some other organization when you were not sure that you could be picked"; "Started learning something that (instead of: Taken a class in a subject) you knew nothing about or that seemed challenging"; and "Started a friendship with someone new when you were not sure how others (instead of: your other friends) would react". Participants rated how often they engaged in each risk over the last year<sup>[2]</sup>, using a 5-point scale from 1 – "never" to 5 – "very often". The mean response to all items is a frequency score of positive risk-taking (PRTS), where higher scores indicated more frequent positive risk-taking (Cronbach's  $\alpha = .83$ ).

**Negative Risk-Taking Scale (NRTS).** To assess negative risk-taking, we selected 23 behaviors from a questionnaire developed for the purpose of our previous studies [blinded for review]. The measure is based on the Adolescent Risk-Taking Questionnaire (Gullone et al., 2000) but certain items were modified so that they were relevant to adults. The selected behaviors are presented in Table B in the Appendix. Participants rated how often they engaged in each risk over the last year<sup>[3]</sup> using a 5-point scale from 1 – "never" to 5 – "very often". As with the PRTS, we chose to compute an average of the frequency scores (NRTS) as an indicator of negative risk-taking, where higher scores indicated more frequent negative risk-taking (Cronbach's  $\alpha = .82$ ).

**Short Version of the Sensitivity to Punishment and Sensitivity to Reward Scale (SPSRQ-SF).** We used the questionnaire of Cooper & Gomez (2008) adapted by Wytykowska et al. (2014) that measures Gray's Behavioral Inhibition System (BIS), which was used as a proxy for sensitivity to punishment and avoidance motivation, and Behavioral Activation System (BAS), which was used as a proxy for sensitivity to rewards and approach motivation. The questionnaire consisted of 24 yes/no statements. The mean response to all items in the BIS subscale indicated sensitivity to punishment (SP) and the mean response to all items in the BAS subscale indicated sensitivity to reward (SR). The Cronbach's  $\alpha$  of the SP scale was .87; for the SR scale, it was .65.

**Multiple Stimulus Types Ambiguity Tolerance Scale (MSTAT-II).** To assess tolerance to ambiguity, we used the scale developed by McLain (2009) and adapted by Lachowska & Ludwikowska (2017). It consists of 13 statements relating to individuals' orientation towards new, unfamiliar, uncertain, illogical, or ambiguous stimuli. Participants rated to what extent they agreed with various statements using a scale from 1 – "definitely disagrees", through 3 – "neither agrees nor disagrees", to 5 – "definitely agrees". The sum of responses to all items in the scale is an indicator of tolerance to ambiguity where higher scores indicate greater tolerance to ambiguity (Cronbach's  $\alpha = .88$ ).

**Future Time Perspective Scale (FTPS).** We used the scale developed by Carstensen & Lang (1996) and adapted by Przepiorka et al. (2020) to assess future time perspective in terms of the socioemotional selectivity theory (SST; Carstensen et al., 1999). The scale consists of 10 statements relating to subjective perception about the amount of time remaining in life. Participants rated to what extent various statements were true for them, using a 7-point scale from 1 – "very untrue" to 7 – "very true". The mean response to all items (general score) is an indicator of future time perspective. The higher the general score, the higher the future time perspective (the perception that there is a lot of opportunities and time remaining in life). In the present study, the Cronbach's  $\alpha$  for the general score was .91.

Satisfaction with Life Scale (SWLS). To assess satisfaction with life, we used the scale developed by Diener et al. (1985) and adapted by Jankowski (2015). Participants rated to what extent they agreed with five statements about their satisfaction with life (e.g., “In most ways my life is close to my ideal.”) using a 7-point scale from 1 – “I definitely don’t agree” to 7 – “I definitely agree”. The mean response to all items is indicated life satisfaction, where higher scores indicated greater life satisfaction (Cronbach’s  $\alpha = .89$ ).

[2] This study was conducted during the SARS-COV-2 pandemic. To minimize potential biases in participants’ access to risk behaviors, participants rated how often they took risks over the last year instead of the last six months (as in the original version of the PRTS scale).

[3] As with the PRTS, participants rated how often they took risks over the last year instead of the last six months (as in the original version of the NRTS).

## Results

Before hypothesis testing, we conducted a confirmatory factor analysis to test whether positive and negative risk-taking were independent or dependent constructs. Results confirmed that positive and negative risk-taking are distinct and are presented in the Appendix. Therefore, we treated positive and negative risk-taking as independent dimensions of risk-taking. We noted that both types of risk are positively and weakly related to each other ( $r = .37, p < .001$ ), consistent with prior literature (e.g., Duell & Steinberg, 2020), and they have to some extent similar correlates (see Table C in the Appendix).

### Descriptive Statistics and Correlations

Descriptive statistics and correlations were calculated in Statistica 13 and are presented in Table C in the Appendix. The effect size is provided in accordance with Evan’s proposal (1996):  $r < .20$  very weak correlation,  $.20-.39$  weak relationship,  $.40-.59$  moderate relationship,  $.60-.79$  strong relationship, and  $> .80$  very strong relationship. Positive risk-taking correlated positively and very weakly with health and professional activity in last year, future time perspective, negatively and very weakly with sensitivity to punishment, positively and weakly with tolerance to ambiguity, sensitivity to reward, and social activity. Positive risk-taking was not related to gender, age, or satisfaction with life. Negative risk-taking was positively and very weakly related with health, positively and weakly associated with professional activity, sensitivity to reward, tolerance to ambiguity, future time perspective, satisfaction with life, but weakly and negatively associated with gender (with women evincing a slightly lower score than men) and sensitivity to punishment. There was no relation between negative risk-taking and age or health.

### Factors Explaining Positive and Negative Risk-Taking

To test our hypotheses, we used linear regression analyses. We analyzed the results using SPSS Statistics 26. Four models are in detail presented in Table 1: model 1 and model 2 for factors explaining positive risk-taking, and model 3 and model 4 for factors explaining negative risk-taking. We tested the same independent variables in the models for both positive and negative risk-taking so that we could compare them.

—Table 1—

Models 1 and 3 included only control variables: age, gender, health, professional activity and social activity in last year, satisfaction with life. Models 2 and 4 included the primary study variables: sensitivity to reward, sensitivity to punishment, tolerance to ambiguity, and future time perspective in addition to the control variables. The results indicated that positive risk-taking was associated with social activity very weakly and positively ( $\beta = .15, p = .02$ ) and satisfaction with life weakly and positively ( $\beta = .23, p = .001$ ). Age, gender, health, and professional activity were not significantly associated with positive risk-taking. Model 1 explained 11% of the variance in positive risk-taking. When sensitivity to reward and punishment, tolerance to ambiguity, and future time perspective were added into the model, social activity and satisfaction with life were no longer significant. In Model 2, results indicated that greater sensitivity to reward ( $\beta = .17, p = .003$ ) was very weakly associated with greater positive risk-taking, lesser sensitivity to punishment ( $\beta = -.14, p = .047$ ) was very weakly associated with greater positive risk-taking, and greater future time perspective ( $\beta = .22, p = .003$ ) was weakly associated with greater positive risk-taking. Tolerance to ambiguity was nonsignificant. Model 2 explained 21% of the variance in positive risk-taking.

Negative risk-taking was associated with gender ( $\beta = -.42, p < .001$ ) such that men took risks more frequently than women and with more social activity in last year ( $\beta = .21, p < .001$ ). Control variables explained 20% of the variance in negative risk-taking in Model 3. After including the main predictors into Model 4, results indicated that negative risk-taking was associated with higher sensitivity to reward ( $\beta = .26, p < .001$ ) and higher social activity ( $\beta = .17, p = .003$ ). Gender was also associated with negative risk-taking in that men engaged in more negative risk-taking than women ( $\beta = -.37, p < .001$ ). Model 4 explained 27% of the variance in negative risk-taking.

### Risk-Taking Profiles via Exploratory Cluster Analysis

Secondly, we were interested to analyze profiles of adult risk-takers in an exploratory way. We included the following variables to create profiles: age, positive and negative risk-taking, tolerance to ambiguity, future time perspective, sensitivity to reward, and sensitivity to punishment. To extract the appropriate number of clusters for the data, we used the NbClust package (Charrad et al., 2015) in R. The NbClust package includes 30 various indices for determining the optimal number of clusters in a dataset and shows the optimal clustering pattern including different results to the user.

The results indicated that the best number of clusters for the data used in this study was 3 clusters. Main cluster analysis was conducted using k-means clustering method in Statistica 13. We present the standardized results of the variables included in the analysis divided across each of the three identified clusters (see Figure 1). Note that the scaling for each of the questionnaires is standardized and therefore can be directly compared.

—Figure 1—

To check whether there were significant differences in the means of tested variables (age, PRTS, NRTS, MSTAT, FTSP, SR, SP) between clusters, we conducted an ANOVA and post-hoc tests applying a Bonferroni correction. The detailed results are presented in Table 2.

—Table 2—

The results indicated three independent profiles of risk-takers. The first group, which we named: Older, lowest risk (cluster 1) was characterized by the highest average age ( $M = 50.97$ , range 31-70), the least frequent positive and negative risk-taking, tolerance to ambiguity lower than in the second group (Older, highest risk), the lowest future time perspective and sensitivity to reward, and sensitivity to punishment higher than the third group (Younger, medium risk). The second group, which we named: Older, highest risk (cluster 2) was characterized by the second oldest age ( $M = 45.60$ , range 25-71), the most frequent positive and negative risk-taking, the highest tolerance to ambiguity, future time perspective, and sensitivity to reward than the first group (Older, lowest risk), and the lowest sensitivity to punishment. The third group, which we named: Younger, medium risk (cluster 3) was characterized by the lowest average age ( $M = 27.16$ , range 19-41), positive risk-taking more frequent than in the first group (Older, lowest risk), and less frequent than in the second group (Older, highest risk), negative risk-taking and tolerance to ambiguity lower than in the second group (Older, highest risk), future time perspective higher than in the first group (Older, lowest risk) and lower than in the second group (Older, highest risk), sensitivity to reward higher than in the first group, and sensitivity to punishment higher than in the second group.

## Discussion

Positive and negative risk-taking, as well as the psychological factors associated with it, have so far been studied in adolescents, but not in adults. In the present study, we examined associations among future time perspective, tolerance to ambiguity, sensitivity to reward and punishment, and positive and negative risk-taking in adults ages 19-71 years. We also explored profiles of adult risk-takers. The presented study is one of the first to identify psychological factors associated with positive risk-taking in adulthood. We found that greater sensitivity to reward, lower sensitivity to punishment, and greater future time perspective were associated with greater positive risk-taking. Further, we identified three groups of adult risk-takers: Older, lowest risk; Older, highest risk; and Younger, medium risk.

The results for the factors explaining positive and negative risk-taking are in line with our hypotheses (except for the tolerance to ambiguity). We will now discuss the three main ones in detail. First, prior work has shown that greater risk-taking is associated with the perception that one has both many opportunities and plans, and ample time ahead (Delaney et al., 2021). According to our expectation, we found that a greater future time perspective was associated with greater positive risk-taking. Thus, unlike negative risk-taking, which is often characterized as impulsive, positive risk-taking may be characterized by a greater orientation to the future. Further, perhaps individuals take positive risks in the service of long-term goals, rather than taking risks to maximize their well-being of the here and now, as would be the case for individuals who have a time-limited perspective (Carstensen et al., 1999).

Second, the fact that we did not find tolerance to ambiguity among factors explaining positive risk-taking is surprising. However, we note that in prior works where tolerance to ambiguity was found to be associated with risk-taking (Tymula et al., 2012), prosocial behavior (Vives & Feldman Hall, 2018), extraversion and openness to experience (Caligiuri & Talique, 2012), or proactivity (Bors et al., 2010), it was measured with either experimental tasks or self-report scales. Thus, the lack of the expected effect in our study may result from the method of measurement. It is worth considering how to measure tolerance to ambiguity because people may have little knowledge of how they respond to novel, complex and unpredictable stimuli. Individuals' behavioral responses (on experimental tasks) may be more strongly associated with their risk behavior than with their self-reported perceptions of their ambiguity tolerance, although this requires empirical examination.

Third and final, among factors explaining negative risk-taking we found sensitivity to reward, gender, and social activity in the last year. The first two are not surprising, as sensitivity to reward is consistently associated with greater health and antisocial risk-taking, and these patterns of negative risk-taking tend to be higher in males (Duell & Steinberg, 2020; Josef et al., 2016). Additionally, our study indicates that it is worth monitoring the level of social activity in further research, as the low level of social activity (e.g. due to isolation) may inhibit risk-taking.

With respect to the findings from the cluster analysis, people engage in comparable levels of both positive and negative risk-taking, such that individuals who take many or few positive risks also take many or few negative risks. These findings parallel those of Duell & Steinberg (2020), whose findings also showed that both types of risk, although distinct, are correlated. Thus, an individual's propensity to take positive and negative risks may be driven by a general risk propensity (Duell & Steinberg, 2020).

As the cluster analysis was exploratory, the findings for subsequent clusters should be treated as a starting point for further, confirmatory analyses. The first group of risk-takers evinced the lowest levels of risk-taking and reward sensitivity, the most limited future time perspective (little time and opportunities ahead), and the highest average age. People in this group can be compared to those described by Delaney et al. (2021), who with age

and a limited future time perspective, avoid certain risks. This finding is also consistent with studies showing a progressive decline in risk-taking in adulthood (especially dangerous risks) (Josef et al., 2016; Mamerow et al., 2016).

The second group (the highest risk-takers, the least sensitive to punishment, the most ambiguity tolerant, with the highest future time perspective) was only five years younger on average than the previous group. However, many of the people in this group are in their fourth or fifth decades of life, which in most countries is a time of the most intense activity in the professional and social domains (Kitayama et al., 2020), as well as the greatest risk propensity (Josef et al., 2016; Mamerow et al., 2016; Rolison et al., 2013). Thus, the period of fulfilling life aspirations and achieving long-term goals is also a time for risk. Further, high FTP scores in this group were not surprising considering studies showing that by the age of 60, regardless of health or retirement, people still focus more on opportunities (immediate or distant) rather than on limited time (Lang & Carstensen, 2002; Strough et al., 2016).

Characteristics of the third group (only people in their 20s and 30s, with medium levels of risk-taking and its psychological correlates) indicated that young adults are not necessarily the highest risk-takers. Also, tolerance to ambiguity and future time perspective are lower in this group than in the group of highest risk-takers. The high sensitivity to punishment characterizing this group suggests that young adults take possible consequences of risk quite seriously, perhaps because, with much of their lives still ahead of them, they have more to lose. That is, without accumulated life experience, the unknown, complex and limitless future may appear dangerous and discourage young adults from taking risks (Blanchard-Fields et al., 2004).

The study also has limitations. Our sample was biased towards women and people with higher education, which limits the generalizability of the findings. Men are known to take more negative risks than women; further, as positive risk-taking often serves positive life goals (e.g. acquisition of new skills, career development), it is possible that higher educated people have more opportunities to take positive risks. Also, we cannot exclude that positive risk-taking is more common among people who are familiar with social media and willing to participate in online surveys (as in our sample). The assessment of health, professional, and social activity was limited by using a single item for each variable. Also, only self-reports, single informant, were used in the study. Potentially adding additional informants or some of the behavioral measures of risk-taking should enhance the validity and reliability of the measures. Profile analysis was limited to the variables selected in the study and should be repeated in a larger group with a more even age distribution. In spite of these limitations, the findings from our study offer a useful starting point for examining diverse patterns of risk behavior across different stages of adulthood.

Altogether, results from this study demonstrate that individuals who take risks are more likely to take both positive and negative risks. In other words, we did not identify profiles of individuals who take either positive or negative risks. However, aside from reward sensitivity, engagement in positive and negative risks is driven by distinct psychological correlates. Whereas negative risk-taking seems to be primarily motivated by reward sensitivity, positive risk-taking is additionally characterized by a greater future time perspective and a dampened sensitivity to punishments. Based on the fact that age was a key distinguishing factor across risk-taking clusters in the sample, future work should further examine how risk behavior changes across the lifespan. Ultimately, we hope the findings from this study lay the foundation for future work examining positive and negative risk-taking in adulthood and how positive risk-taking may be cultivated throughout life.

## Declarations

### Statements and Declarations

**Competing Interests.** Authors declare no conflict of interests.

## References

[blinded for review]

[blinded for review]

Bardi, A., Guerra, V., & Ramdeny, G. (2013). Openness and ambiguity intolerance: Their differential relations to well-being in the context of an academic life transition. *Personality and Individual Differences, 47*(3), 219-223. <https://doi.org/10.1016/j.paid.2009.03.003>

Blanchard-Fields, F., Stein, R., & Watson, T. L. (2004). Age differences in emotion regulation strategies in handling everyday problems. *The Journals of Gerontology: Series B: Psychological Sciences and Social Sciences, 59B*(6): P261–P269. <https://doi.org/10.1093/geronb/59.6.p261>

Bors, D., Gruman, J. A., & Shukla, S. (2010). Measuring tolerance of ambiguity: Item polarity, dimensionality, and criterion validity. *European Review of Applied Psychology-revue Europeenne De Psychologie Appliquee, 60*, 239-245. <https://doi.org/10.1016/j.erap.2010.07.001>

Caligiuri, P., & Tarique, I. (2012). Dynamic cross-cultural competencies and global leadership effectiveness. *Journal of World Business, 47*(4), 612–622. <https://doi.org/10.1016/j.jwb.2012.01.014>

Carstensen, L. L., & Lang, F. R. (1996). *Future Time Perspective Scale*. (Unpublished manuscript). Stanford University.

- Carstensen, L., Isaacowitz, D., & Charles, S. (1999). Taking time seriously. A theory of socioemotional selectivity. *American Psychologist*, *54*, 165–181. <https://doi.org/10.1037//0003-066x.54.3.165>
- Charrad, M., Ghazzali, N., Boiteau, V., & Niknafs, A. (2014). NbClust: An R Package for Determining the Relevant Number of Clusters in a Data Set. *Journal of Statistical Software*, *61*(6), 1–36. <https://doi.org/10.18637/jss.v061.i06>
- Cooper, A., & Gomez, R. (2008). The development of a short form of the sensitivity to punishment and sensitivity to reward questionnaire. *Journal of Individual Differences*, *29*, 90–104. <https://doi.org/10.1027/1614-0001.29.2.90>
- Delaney, R. K., Strough, J., Shook, N. J., Ford, C. G., & Lemaster, P. (2021). Don't risk it. Older adults perceive fewer future opportunities and avoid social risk-taking. *International Journal of Aging & Human Development*, *92*(2):139-157. <https://doi.org/10.1177/0091415019900564>
- Diener, E., Emmons, R. A., Larsen, R. J., & Griffin, S. (1985). The Satisfaction with Life Scale. *Journal of Personality Assessment*, *49*, 71-75. [https://doi.org/10.1207/s15327752jpa4901\\_13](https://doi.org/10.1207/s15327752jpa4901_13)
- Duell, N., & Steinberg, L. (2019). Positive risk taking in adolescence. *Child Development Perspectives*, *13*(1), 48–52. <https://doi.org/10.1111/cdep.12310>
- Duell, N., & Steinberg, L. (2020). Differential correlates of positive and negative risk taking in adolescence. *Journal of Youth and Adolescence*, *49*, 1162-1178. <https://doi.org/10.1007/s10964-020-01237-7>
- Duell, N., & Steinberg, L. (2021). Adolescents take positive risks, too. *Developmental Review*, *62*, 100984. <https://doi.org/10.1016/j.dr.2021.100984>
- Evans, J. D. (1996). *Straightforward Statistics for the Behavioral Sciences*. Pacific Grove: Brooks/Cole Publishing.
- Figner, B., & Weber, E. U. (2011). Who takes risk, when and why? Determinants of risk taking. *Current Directions on Psychological Science*, *20*, 4, 211–216.
- Fischer, S., & Smith, G. T. (2004). Deliberation affects risk-taking beyond sensation seeking. *Personality and Individual Differences*, *36*, 527–537.
- Gullone, E., Moore, S., Moss, S., & Boyd, C. (2000). The adolescent risk-taking questionnaire: Development and psychometric evaluation. *Journal of Adolescent Research*, *15*, 231–250. <https://doi.org/10.1177%2F0743558400152003>
- Hansen, E. B., & Breivik, G. (2001). Sensation seeking as a predictor of positive and negative risk behaviour among adolescents. *Personality and Individual Differences*, *30*, 627–640. [https://doi.org/10.1016/S0191-8869\(00\)00061-1](https://doi.org/10.1016/S0191-8869(00)00061-1)
- Jankowski, K.S. (2015). Is the shift in chronotype associated with an alteration in well-being? *Biological Rhythm Research*, *46*, 237-248. <https://doi.org/10.1080/09291016.2014.985000>
- Josef, A. K., Richter, D., Samanez-Larkin, G. R., Wagner, G. G., Hertwig, R., & Mata, R. (2016). Stability and change in risk-taking propensity across the adult life span. *Journal of Personality and Social Psychology*, *111*(3), 430–450. <https://doi.org/10.1037/pspp0000090>
- Kitayama, S., Berg, M. K., Chopik, W. J. (2020). Culture and well-being in late adulthood: Theory and evidence. *The American Psychologist*, *75*(4):567-576. <https://doi.org/10.1037/amp0000614>
- Lachowska, B., & Ludwikowska, K. (2017). Wyniki wstępnej walidacji Polskiej wersji Skali Tolerancji Niejednoznaczności Wielorakich Typów Bodźców. [Results of the preliminary validation of the Polish version of the Multiple Stimulus Types Ambiguity Tolerance Scale]. *Roczniki Psychologiczne*, *20*(4), 855-874. <http://dx.doi.org/10.18290/rpsych.2017.20.4-5en>
- Lang, F. R., & Carstensen, L. L. (2002). Time counts: Future time perspective, goals, and social relationships. *Psychology & Aging*, *17*, 125–139. <https://doi.org/10.1037/0882-7974.17.1.125>
- Mamerow, L., Frey, R., & Mata, R. (2016). Risk-taking across the life span: A comparison of self-report and behavioral measures of risk-taking. *Psychology & Aging*, *31*(7): 711-723. <https://doi.org/10.1037/pag0000124>
- McLain, D. L. (2009). Evidence of the properties of an ambiguity tolerance measure: The Multiple Stimulus Types Ambiguity Tolerance Scale-II (MSTAT-II). *Psychological Reports*, *105*(3): 975-988. <https://doi.org/10.2466/pr0.105.3.975-988>
- Patterson, M. W., Pivnick, L., Mann, F. D., Grotzinger, A. D., Monahan, K. C., Steinberg, L., Tackett, J. L., Tucker-Drob, E., & Harden, K. P. (2019, October 31). Positive risk-taking: Mixed-methods validation of a self-report scale and evidence for genetic links to personality and negative risk-taking. <https://doi.org/10.31234/osf.io/bq63f>

Przepiorka, A., Jankowski, T., & Sobol, M. (2020). Is future time perspective multidimensional? The Future Time Perspective Scale in a Polish sample. *European Journal of Psychological Assessment*. <https://doi.org/10.1027/1015-5759/a000603>

Rolison, J. J., Hanoch, Y., Wood, S., & Liu, P. J. (2013). Risk-taking differences across the adult lifespan: A question of age and domain. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, 69(6): 870–880. <https://doi.org/10.1093/geronb/gbt081>

Spear, L. P. (2013). Adolescent neurodevelopment. *Journal of Adolescent Health*, 52, S7– S13. <https://doi.org/10.1016/j.jadohealth.2012.05.006>

Strough, J., Bruine de Bruin, W., & Parker, A. M. (2019). Taking the biggest first: Age differences in preferences for monetary and hedonic sequences. *The Journals of Gerontology. Series B: Psychological Sciences & Social Sciences*, 74(6), 964-974. <https://dx.doi.org/10.1093%2Fgeronb%2Fgbx160>

Strough, J., Bruine de Bruin, W., Parker, A. M., Lemaster, P., Pichayayothin, N., & Delaney, R. (2016). Hourglass half full or half empty? Future time perspective and preoccupation with negative events across the life span. *Psychology & Aging*, 31(6), 558-73. <https://doi.org/10.1037/pag0000097>

Tymula, A., Rosenberg Belmaker, L. A., Ruderman, L., Glimcher, P. W., & Levy, I. (2013). Like cognitive function, decision making across the life span shows profound age-related changes. *Proceedings of the National Academy of Sciences of the United States of America*, 110(42), 17143-8. <https://doi.org/10.1073/pnas.1309909110>

Tymula, A., Rosenberg-Belmaker, L. A., Roy, A. K., Ruderman, L., Manson, K., Glimcher, P. W., & Levy, I. (2012). Adolescents' risk-taking behavior is driven by tolerance to ambiguity. *Proceedings of the National Academy of Sciences of the United States of America*, 109, 17135–17140. <https://doi.org/10.1073/pnas.1207144109>

Vives M. L., & FeldmanHall, O. (2018). Tolerance to ambiguous uncertainty predicts prosocial behavior. *Nature Communications*, 12;9(1), 2156. <https://doi.org/10.1038/s41467-018-04631-9>

Wytykowska, A., Białaszek, W., & Ostaszewski, P. (2014). Psychometryczne właściwości polskiej wersji Krótkiej Skali Wrażliwości na Kary i Nagrody (SPSRQ-SF Cooper i Gomez, 2008). [Psychometric parameters of the Polish short version of sensitivity to punishment and reward scale.] *Studia Psychologiczne*, 52(2), 28–39. <https://doi.org/10.2478/v10167-010-0083-6>

## Tables

Table 1

*Linear Regression Results for Predictors of Positive and Negative Risk-Taking among Adults Ages 18-71 Years*

	Positive Risk-Taking				Negative Risk-Taking											
	Model 1		Model 2		Model 3				Model 4							
	$\beta$	B	SE	$p$	$\beta$	B	SE	$p$	$\beta$	B	SE	$p$	$\beta$	B	SE	$p$
Constant		34.67	3.55	<.001		29.04	5.01	<.001		45.44	3.18	<.001		37.92	4.56	<.001
Age	-.09	-.05	.04	.14	-.01	-.01	.04	.82	-.13	-.07	.03	.02	-.05	-.03	.03	.43
Gender	-.03	-.53	1.10	.63	.03	.51	1.05	.63	-.42	-7.17	.99	<.001	-.37	-6.35	.96	<.001
Health	-.04	-.19	.32	.57	-.07	-.32	.31	.29	-.01	-.01	.29	.97	.01	.01	.28	.96
Professional activity	.12	.31	.17	.07	.07	.19	.16	.24	.05	.13	.15	.40	.03	.08	.15	.59
Social activity	.15	.54	.23	.02	.09	.31	.22	.16	.21	.72	.21	<.001	.17	.61	.20	<.003
SWLS	.23	.28	.08	.001	.03	.04	.09	.71	.02	.03	.08	.73	-.07	-.08	.08	.35
SR					.17	.62	.20	.003					.26	.90	.19	<.001
SP					-.14	-.28	.14	.047					-.02	-.03	.13	.81
MSTAT					.11	.10	.06	.10					.05	.05	.05	.38
FTPS					.22	.16	.05	.003					.08	.05	.05	.26

$N = 275$ , Positive risk-taking: Model 1 = .11, Model 2 = .21,  $\Delta .10$ ,  $p < .001$ . Negative risk-taking: Model 3 = .20, Model 4 = .27,  $\Delta .07$ ,  $p < .001$ . SWLS – satisfaction with life, SR – sensitivity to reward, SP – sensitivity to punishment, MSTAT – tolerance to ambiguity, FTPS – future time perspective.

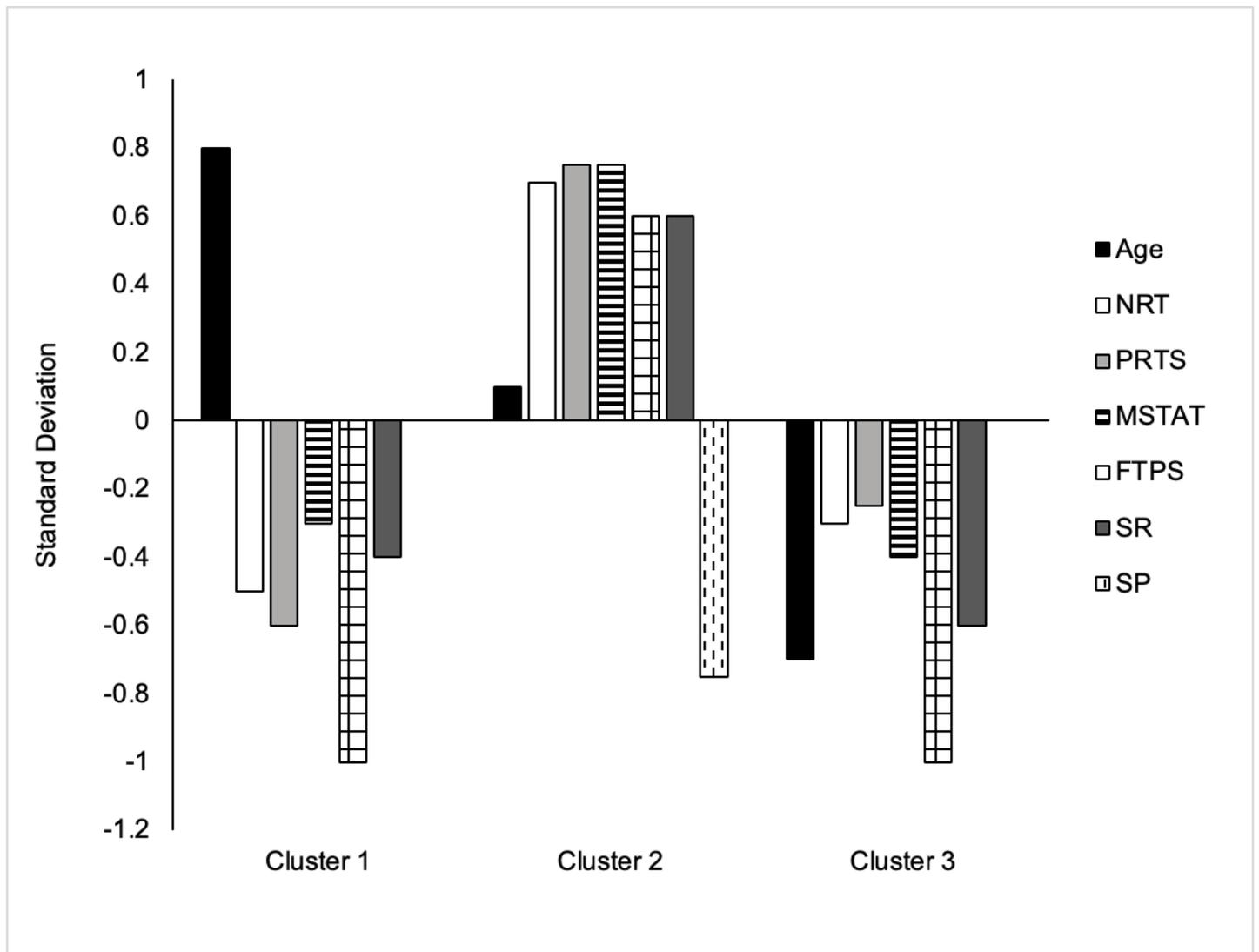
Table 2

Descriptive Statistics and ANOVA results for Three Clusters

Variable	Cluster 1		Cluster 2		Cluster 3		ANOVA <sup>1</sup> (mean differences across clusters)	Comparison of clusters with Bonferroni post-hoc test		
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>		1 & 2 <i>p</i> -value	1 & 3 <i>p</i> -value	2 & 3 <i>p</i> -value
Age	50.97	10.56	45.60	10.03	27.16	6.35	$H(2,275)=182.37^{***}$	< .001	< .001	< .001
PRTS	36.21	6.30	46.88	7.43	40.61	6.95	$F(2,272)=48.03^{***}$	< .001	< .001	< .001
NRTS	32.01	5.70	38.33	8.35	34.31	7.19	$F(2,272)=15.84^{***}$	< .001	.10	< .001
MSTAT	35.89	7.98	45.23	8.01	37.82	7.38	$F(2,272)=34.20^{***}$	< .001	.29	< .001
FTPS	24.29	7.93	45.01	8.30	39.77	8.36	$F(2,272)=134.33^{***}$	< .001	< .001	< .001
SR	3.21	1.76	4.36	2.32	4.34	2.33	$H(2,275)=13.46^{**}$	< .01	< .01	1.00
SP	6.19	4.08	2.97	2.79	7.23	3.92	$H(2,275)=56.76^{***}$	< .001	.17	< .001

Note: PRTS – positive risk-taking, NRTS – negative risk-taking, MSTAT – tolerance to ambiguity, FTPS – future time perspective, SR – sensitivity to reward, SP – sensitivity to punishment. \*\*  $p < .01$ , \*\*\*  $p < .001$ . Cluster 1  $N = 73$ , cluster 2  $N = 86$ , cluster 3  $N = 116$ . <sup>1</sup>If the assumption of homogeneity of variance in the subgroups was not met, a Kruskal-Wallis' ANOVA ( $H$ ) was used

Figures



## Figure 1

Personal risk profile. Results for each variable were standardized (*SD*) to allow comparisons across the three clusters. PRTS – positive risk-taking, NRTS – negative risk-taking, MSTAT – tolerance to ambiguity, FTPS – future time perspective, SR – sensitivity to reward, SP – sensitivity to punishment. Cluster 1: Older (*M* age = 50,97), lowest risk; Cluster 2: Older (*M* age = 45,64), highest risk, Cluster 3: Younger (*M* age = 27,16), medium risk

## Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

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