Personality and Individual Differences 205 (2023) 112093

Contents lists available at ScienceDirect

Personality and Individual Differences

journal homepage: www.elsevier.com/locate/paid

Motivated to compete but not to care: The fundamental social motives of risk-taking behaviors

Javier Salas-Rodríguez [a,*], Luis Gómez-Jacinto [a], Isabel Hombrados-Mendieta [a], Natalia Del Pino-Brunet [a], Miguel Basto-Pereira [b]

[a] Department of Social Psychology, Social Anthropology, Social Work and Social Services, Faculty of Psychology, Málaga University, Málaga, Spain
[b] William James Center for Research, ISPA-Instituto Universitário, R. Jardim do Tabaco 34, 1100-304 Lisboa, Portugal

ARTICLE INFO

Keywords:
Fundamental social motives
Risk-taking behaviors
Sex
Life stages

ABSTRACT

Based on the evolutionary framework of risk-taking, the present study aims to examine how the fundamental social motives relate to health risks, interpersonal risks and deviant non-violent behaviors as a function of sex and across different life stages of transitioning to adulthood. A total of 1370 Spanish adolescents and young individuals participated in the survey study. The results showed that status-seeking and kin care (family) were the principal social motives related to risk-taking behaviors. Specifically, status-seeking acted as a promoting factor of risk-taking behaviors, while kin care (family) exerted the opposite effect. Therefore, the results in general demonstrate the significant role of the fundamental social motives on risk-taking behaviors. The impact of sex and age group on the relationship between social motives and risk-taking behaviors is discussed.

1. Introduction

Substance use, unsafe sexual practice, self-harm, transport injuries and interpersonal violence are examples of risk-taking behaviors related to the main causes of death in adolescents and youth (GBD 2019 Adolescent Mortality Collaborators, 2021). Generally, engagement in risk-taking behaviors has been explained by approaches such as psychopathological (e.g., Satchell et al., 2018) or developmental cognitive imbalances during adolescence and youth (Murray et al., 2021). Both approaches assume that risk-taking is irrational or illogical; given the potential costs to both the individual carrying them out (e.g., injuries and death), and to the proximate environment and society in general (Hawley, 1999).

One important consequence of a dysfunctional perspective on risk-taking behaviors has been to overlook the potential payoffs for the individuals who engage in them. However, risk-taking can be used as a means of gaining status and ascending in social hierarchies (Van Kleef et al., 2021), and as a mating strategy (Baker & Maner, 2009).

1.1. An adaptive perspective on risk-taking behaviors

The fundamental social motives approach proposes that individuals are equipped with a set of social motives defined as "*systems shaped by our evolutionary history to energize, organize and select behavior to manage recurrent social threats and opportunities to reproductive fitness*" (Neel et al., 2016, p. 887). Social motives help individuals to cope with the evolutionary challenges of survival, growth and reproduction, and are arranged in a hierarchical disposition following an adaptive logic. More specifically, survival and social motives will form the bases for mate acquisition, which in turn will be the prior requirement for establishing a long-term partner, the ultimate objective being the production and rearing of offspring. Moreover, one motive does not replace another; rather, the individual assigns motives different priority along the life cycle. As Kenrick et al. (2010) established, individuals need to continue to contribute to their social and physical needs even after they have started to mate. Activation of the social motives will depend on the evolutionary objective to be achieved, which generates individual differences at the affective, cognitive and behavioral level (Kenrick et al., 2010). As a result, social motives have been demonstrated as powerful means for analyzing individual differences in a wide variety of behaviors (Cook et al., 2021). Age and sex are two factors that help to understand these individual differences (Ko et al., 2020).

* Corresponding author.
E-mail addresses: jsalas@uma.es (J. Salas-Rodríguez), jacinto@uma.es (L. Gómez-Jacinto), mihombrados@uma.es (I. Hombrados-Mendieta), nataliabrun@uma.es (N. Del Pino-Brunet), mbpereira@ispa.pt (M. Basto-Pereira).

https://doi.org/10.1016/j.paid.2023.112093
Received 21 June 2022; Received in revised form 7 December 2022; Accepted 11 January 2023
Available online 25 January 2023

1.2. Life stages

Through the different stages of the life cycle, individuals will have to cope with different evolutionary objectives (Kenrick et al., 2010). According to the evolutionary goals of each life stage, the social motives to be prioritized will be different. Specifically, adolescence and young adulthood are characterized as mating stages, in which mate-seeking, status and affiliation motives will exert a strong influence (Griskevicius & Kenrick, 2013). The activation of these social motives might help to explain why risk-taking behaviors are typically initiated and heightened during this life stage (Willoughby et al., 2021).

Previous studies have examined risk-taking in young adults aged 18–30 years (e.g., Vincke, 2016) or even up to 35 years (e.g., Tamás et al., 2019). Research assume no differences in these individuals aged 18–30 years, since studies typically did not take into account the relevant developmental changes during this 12 years' period. However, findings suggest a specific pre-adult period of emerging adulthood at approximately 18–25 years old (Hochberg & Konner, 2020). From an evolutionary standpoint, emerging adulthood is a particularly relevant biological stage in humans and other mammals. In human beings, the brain continues its maturation process until approximately the age of 25 years. In addition, emerging adulthood is characterized as a social stage where individuals develop the skills needed for mating and reproduction success. In short, emerging adulthood is an extension of the adolescent stage aimed at growth and brain maturation but increasing the individual's reproductive value, which allows the acquisition of survival skills and reproductive behaviors (Hochberg & Konner, 2020).

1.3. Sex

In general, men are more predisposed to take risks than women anywhere (e.g., Mata et al., 2016). One explanation for these sex differences comes from social and gender norm theories, which establish that differences between men and women in risk-taking are socially constructed and learned (Heise et al., 2019). From an evolutionary perspective, sex differences in risk-taking are due mainly to the higher disposition of men towards mating compared to women, who in turn are more oriented towards caring and parenting (Ko et al., 2020). Given their fundamental role in offspring survival, females' minimal parental investment is greater than male parental care (Mogilski, 2021; Trivers, 1972). According to the evolutionary perspective, that is one of the reasons why women tend to be more averse to risk-taking than men (Archer, 2019).

Men compared to women can increase their reproductive success through access to multiple partners (Mogilski, 2021; Trivers, 1972). Wilson and Daly (1985) coined the term *young male syndrome* to refer to the higher tendency of young men to take interpersonal risks as a mechanism for enhancing their reputation and achieving status and access to resources, including opposite-sex partners. In addition, Apalkova et al. (2018) found that women judged occasional risk-takers as more attractive than lower risk-takers for short-term relationships. For this purpose, men may exhibit health risks (e.g., Vincke, 2016) or take part in interpersonal risks (e.g., Griskevicius et al., 2009).

On the other hand, women tend to take unhealthier risks that are aimed at increasing their attractiveness (Hill & Durante, 2011), and to rely on interpersonal risks and deviant behaviors, such as denigration of same-sex competitors and trying to socially exclude them (Vaillancourt & Krems, 2018).

1.4. Present study

Because of the lack of research on the contribution of fundamental social motives to risk-taking according to sex and the life stages, our first aim was to explore the relationship between fundamental social motives and engagement in different risk-taking behaviors across men and women and different life stages in the transition to adulthood. In addition, our second aim was to compare engagement in the three types of risk-taking behaviors as a function of sex and age.

2. Methods

2.1. Participants

A total of 1370 participants from the metropolitan area of Málaga (Spain) took part in the study. Data from young adults (26–30 years old, $n = 487$) were collected in community settings; data from emerging adults (18–24 years old, $n = 598$) were collected both in community settings and high schools; and data from adolescents (14–17 years old, $n = 285$) were exclusively collected in high schools. Most of the participants were Spanish ($n = 1287$), aged 14–30 years ($M = 21.83$, $SD =$

Table 1
Sociodemographic characteristics for each of the sample.

		Adolescents ($n = 285$)	Emerging adults ($n = 598$)	Young adults ($n = 487$)	Full sample ($N = 1370$)
Sex	Men	141 (49,5 %)	288 (48,2 %)	248 (50,9 %)	677 (49,5 %)
	Women	143 (50,2 %)	310 (51,8 %)	239 (49,1 %)	692 (50,5 %)
Nationality	Spain	267 (93,7 %)	555 (92,8 %)	465 (95,5 %)	1287 (94,0 %)
	Foreign	17 (6,0 %)	43 (7,2 %)	22 (4,5 %)	82 (6,0 %)
Education	No studies/ primary	109 (38,2 %)	13 (2,2 %)	22 (4,5 %)	144 (10,5 %)
	Secondary	176 (61,8 %)	115 (19,2 %)	110 (22,6 %)	401 (29,3 %)
	Post-secondary	0 (0,0 %)	402 (67,2 %)	221 (45,4 %)	623 (45,5 %)
	Tertiary	0 (0,0 %)	68 (11,4 %)	133 (27,3 %)	201 (14,7 %)
Relationship status	In a relationship	95 (33,3 %)	365 (61,0 %)	369 (75,8 %)	829 (60,5 %)
	Single	190 (66,7 %)	233 (39,0 %)	118 (24,2 %)	541 (39,5 %)
Parental status	Yes	Not measured	19 (3,4 %)	88 (18,1 %)	107 (10,2 %)
	No	Not measured	540 (96,6 %)	399 (81,9 %)	939 (89,8 %)
Employment status	Employee	0 (0,0 %)	77 (12,9 %)	252 (51,7 %)	329 (24,1 %)
	Unemployed	0 (0,0 %)	34 (5,7 %)	61 (12,5 %)	95 (7,0 %)
	Student	285 (100,0 %)	475 (79,4 %)	144 (29,6 %)	904 (66,2 %)
	Housework	0 (0,0 %)	4 (0,7 %)	16 (3,3 %)	20 (1,5 %)
	Other	0 (0,0 %)	6 (1,0 %)	11 (2,3 %)	17 (1,2 %)
Age *M* (*SD*)		15.94 (0.83)	20.42 (1.74)	27.01 (1.83)	21.83 (4.50)

Note. Education: No studies/primary (no more than 6 years); Secondary (10 years of schooling finished); Post-secondary (12 years of schooling finished); Tertiary (at least 15 years of schooling finished).

4.50), students (66.23 %) and at post-secondary level (i.e., 12 years of school finished; 45.51 %). Table 1 summarizes the sociodemographic statistics.

2.2. Measures

2.2.1. Fundamental social motives inventory – short version

This inventory (FSM: Neel et al., 2016; Spanish version: Gómez-Jacinto & Salas-Rodríguez, 2018) was applied to measure the following social motives: self-protection, disease avoidance, affiliation (group), affiliation (exclusion concern), affiliation (independence), status, mate-seeking, and kin care (family). The FSM short form is an abbreviated version of the FSM that includes 33 of the original items, with three items per social motive. The response format from the original version was reduced from a 7-point to a 5-point Likert scale. Participants rated their level of agreement across the items at that time in their life on a scaled that ranged from *Strongly disagree* to *Strongly agree*. Both the Spanish and original versions of the FSM showed satisfactory psychometric qualities (Gómez-Jacinto & Salas-Rodríguez, 2018; Neel et al., 2016). In the present study, the internal consistency of the dimensions ranged between $\alpha = 0.82$ for mate-seeking to $\alpha = 0.65$ for affiliation (exclusion concern).

2.2.2. Risky behavior questionnaire (RBQ)

This questionnaire is a one-dimensional instrument that measures, through 20 questions, participants' level of engagement in a wide range of risk-taking behaviors in the last six months (Auerbach & Gardiner, 2012; Spanish version: Gómez-Jacinto & Salas-Rodríguez, 2018). Responses were operationalized on a four-point Likert scale from *Never* to *Always*. Items were grouped into three risk-taking domains: health risks (substance use, unsafe sexual practices, self-injurious behaviors); interpersonal risks (aggressive and/or violent behaviors); and deviant non-violent behaviors (illegal and dangerous behaviors). The internal consistency in the current sample was appropriate, ranging between $\alpha = 0.70$ (interpersonal risks) to $\alpha = 0.63$ (health risks).

2.2.3. Sociodemographic questionnaire

Participants reported their sex (man/woman), nationality (Spanish/foreign), level of education (none/primary, secondary, postsecondary, or tertiary), employment status (employed, unemployed, student, housework, other), relationship status (in a relationship/single), parental status (yes/no), and age (in years).

2.3. Procedure and statistical analysis

For access to the general community sample, undergraduate Social Psychology students were trained to handle the questionnaires for the adult population aged 18–30 years. Participants were recruited from community settings, including universities, workplaces and sports organizations. The survey was carried out in two phases: at the end of 2016 ($n = 429$) and at the beginning of 2017 ($n = 617$). The high school sample ($n = 324$) was obtained from six education centers, where members of the research team and school counsellors handed the questionnaires to students during school hours. A subgroup of participants from the community settings responded to the Risky Behavior Questionnaire and the Fundamental Social Motives Inventory using a 5-point and a 7-point Likert scale, respectively. Therefore, it was necessary to standardize these data to the remaining sample before conducting the statistical analyses.

Regarding data analysis, hierarchical linear regressions were carried out separately by sex and by life stage. Sex and age were introduced as predictors in Step 1. Given that groups at risk of social exclusion are a relevant variable in the study of risky deviant behaviors (Piquero et al., 2015), nationality was introduced as a predictor in Step 1 to control its potential effect. In all cases, health risks, interpersonal risks and deviant non-violent behaviors were introduced as dependent variables, and the fundamental social motives were added in Step 2 as predictors. Because only 39.5 % of the participants were in a relationship and 10.2 % were parents (see Table 1), we decided not to introduce the mate retention and kin care (children) social motives in the regression analysis to avoid a significant loss of participant data.

Finally, hierarchical linear regressions were carried out to verify interaction effects between sex and age for health risks, interpersonal risks, and deviant non-violent behaviors, respectively. Sex, age, and sex*age were the predictor variables. Age was introduced as a continuous variable and nationality as a control variable.

The present study was approved by the ethical committee on experimentation from the University of Málaga (CEUMA) (Registry number: 45-2018-H). In all the waves, participants gave their consent before answering the questionnaires. In the adolescent wave, parents and/or legal tutors of the participants were informed so that they could approve the objectives and methods of the study.

3. Results

Table 2 summarizes the descriptive statistics and the correlations. The three domains of risk-taking behaviors had significant positive correlations between them. Status and kin care (family) motives were the only ones that correlated with all the three domains of risk-taking behaviors. Status seeking is positively correlated with health risks, interpersonal risks, and deviant non-violent behaviors. Kin care (family) showed a negative association with the three domains of risk-taking behaviors.

The results of the hierarchical regression analyses for the prediction of health risks are displayed in Table 3. Status seeking was positively related to risky health behaviors in both men and women and in emerging adults and young adults. Kin care (family) was negatively related to health risks in men and women and in adolescents and young adults. Self-protection motive was negatively related to health risks in men and in adolescents. Affiliation (independence) motive was inversely related to health risks in women and in emerging adults.

The data in Table 4 show that, for all models, individuals with a higher activation-of-status motive showed greater engagement in interpersonal risks. Mate seeking was positively related to interpersonal risks for both men and women and in young adults. Kin care (family) was negatively correlated with interpersonal risks in men and in emerging adults. Affiliation (group) motive was negatively associated with interpersonal risks in women and in emerging adults. Affiliation (exclusion concerns) motive was negatively related to interpersonal risks in men and in young adults. In adolescents, self-protection motive was negatively related to interpersonal risks.

Table 5 indicates that status seeking was positively related to engagement in deviant non-violent behaviors in men and women and in emerging adults and young adults. Mate seeking motive was positively associated with deviant non-violent behaviors in females and young adults, and kin care (family) was negatively related to deviant non-violent behaviors in men and in adolescents and in emerging adults. In addition, affiliation (group) was negatively associated with deviant non-violent behaviors in women and in emerging adults. Last, self-protection motive was negatively correlated with deviant non-violent behaviors in women and in adolescents.

The interaction effects between sex and age for the three types of risk-taking behavior are presented in the supplementary materials (Table S1). For health risks, the interaction effect between sex and age was significant. Women took more health risks than men during adolescence. This pattern reversed later, in early adulthood, when men began to take more health risks than women (Fig. S1). For interpersonal risks, the interaction between sex and age was almost significant. Specifically, men engaged in more interpersonal risks than women from adolescence to young adulthood (Fig. S2). Finally, the interaction effect between sex and age for deviant non-violent behaviors was non-significant.

Table 2
Statistical descriptive and correlations for the variables included in the study.

	M	*SD*	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Health risks	4.56	3.37	–													
2. Interpersonal risks	2.05	2.39	0.44***	–												
3. Deviant non-violent behaviors	4.16	2.95	0.55***	0.61***	–											
4. Self-protection	10.14	3.08	−0.09***	0.01	−0.08**	–										
5. Disease avoidance	9.16	3.24	−0.02	0.03	−0.05†	0.35***	–									
6. Affiliation independence	8.28	3.13	−0.04	−0.02	−0.02	0.09**	0.06*	–								
7. Affiliation group	11.65	2.70	−0.01	−0.06*	−0.04	0.14***	0.12***	−0.23***	–							
8. Affiliation exclusion concern	9.15	3.02	−0.04	−0.04	−0.02	0.27***	0.19***	−0.07*	0.28***	–						
9. Status	8.67	3.02	0.09**	0.23***	0.15***	0.19***	0.20***	0.03	0.16***	0.24***	–					
10. Mate seeking	6.60	3.54	0.02	0.16***	0.11***	0.09**	0.03	0.04	0.00	0.17***	0.20***	–				
11. Kin care family	13.42	2.32	−0.08**	−0.11***	−0.10***	0.06*	0.09**	−0.16***	0.21***	0.04	0.02	−0.08**	–			
12. Sex	0.51	0.50	−0.03	−0.17***	−0.12***	0.07*	−0.01	0.02	0.01	0.15***	−0.08**	−0.14***	0.16***	–		
13. Age	21.83	4.50	0.17***	−0.15***	−0.10***	−0.07*	0.05†	0.03	0.09***	−0.07*	−0.10***	−0.24***	0.09**	−0.02	–	
14. Nationality	0.06	0.24	0.00	0.01	0.03	−0.04	−0.05†	0.03	−0.02	0.02	−0.03	0.05†	−0.09**	0.02	−0.03	–

Note. The whole data sample was entered into descriptive and correlation analyses.
† $p < .1$.
* $p < .05$.
** $p < .01$.
*** $p < .001$.

4. Discussion

The purpose of this study was to examine the relationship between the fundamental social motives and risk-taking behaviors. To the best of our knowledge, this is the first study to assess the role of fundamental social motives in intrapersonal and interpersonal risk-taking behaviors, including antisocial outcomes, across sex and different stages of development. In general, the findings showed that status-seeking acted as a risk factor for risk-taking behaviors, as it was expected. Remarkably, kin care (family) acted as a protective factor. Furthermore, the association of status and kin care (family) with risk-taking behaviors through adolescence, emerging adulthood and young adulthood suggests a long-term effect of these motives. The inverse association found between status and kin care (family) with the three types of risk-taking behaviors would be in line with the tradeoff between mating and parenting effort (Ko et al., 2020). Consistent with this allocation problem, our findings show that individuals who engage in risk-taking behaviors are more motivated to seek status but less motivated towards kin care.

Our findings suggest that the search for status promoted engagement in risk-taking behaviors which supports the adaptive function of risk-taking as a means of attaining the respect and deference from others in adolescence and youth (Ellis et al., 2012). Interestingly, the effect of status-seeking over health risks and deviant non-violent behaviors showed a growth pattern, with the highest correlation occurring in young adulthood. Moreover, the status motive related only with interpersonal risks in adolescents, even though adolescence is considered to be the onset of a wide variety of risk-taking behaviors (Willoughby et al., 2021). This finding is particularly relevant because violent behaviors such as aggression peak in adolescence (Willoughby et al., 2021). Mate-seeking promoted higher interpersonal risks and deviant non-violent behaviors in young adults. Given that emerging adulthood is still a developmental stage of maturation (Hochberg & Konner, 2020), it is possible that it is not until young adulthood that mate-seeking starts to exert its higher influence on behavior, when individuals are biologically, socially and economically more prepared (and/or pressured) for having children.

Kin care (family) exerted a protective effect against some of the risk-taking behaviors in the life stages analyzed. This finding reinforces the high value of family support as a buffer against youth and adolescent risk-taking behaviors (e.g., Steiner et al., 2019). In addition, kin care (family) might activate in individuals an awareness of the potential costs that risk-taking behaviors could have on their relatives, thus reducing their involvement.

In adolescents, self-protection inversely predicted engagement in the three risk-taking behaviors. Thus, self-protection appears to show an adaptive function by reducing the likelihood of engaging in highly costly behaviors in a developmental stage where individuals start to spend more time with peers and less with parents. In emerging adults, affiliation (independence) was related to less engagement in health risks and affiliation (group) was related to less interpersonal risks and deviant non-violent behaviors. These findings reinforce the view of emerging adulthood as a relevant social stage of development (Hochberg & Konner, 2020).

4.1. Fundamental social motives of risk-taking behaviors in men and women

Mate-seeking only predicted interpersonal risks among men, suggesting that aggressive behaviors are the main strategy to mate-seeking, in line with other studies (Griskevicius et al., 2009). In addition, this relationship can be explained by the *male warrior hypothesis* (McDonald et al., 2012), which establishes that men engage in interpersonal conflicts to gain access to reproductive resources, in this case opposite-sex partners. These findings can also be explained by gender norm approaches which state that across most of societies, aggressive strategies are perceived as a valid strategy to increase male sexual opportunities

Table 3
Hierarchical linear models on health risks.

	Men (n = 654)		Women (n = 664)		Adolescents (n = 254)		Emerging adults (n = 580)		Young adults (n = 484)	
	β	Std. error	β	Std. error	β	Std. error	β	Std. error	β	Std. error
Sex					0.23***	0.39	−0.05	0.29	0.00	0.30
Age	0.24***	0.03	0.15***	0.03						
Nationality	−0.02	0.56	0.02	0.51	0.01	0.75	0.01	0.54	−0.04	0.71
Self-protection	−0.09*	0.04	−0.07†	0.05	−0.17*	0.08	−0.05	0.05	−0.04	0.05
Disease avoidance	−0.03	0.04	0.03	0.04	0.04	0.06	0.01	0.05	−0.06	0.05
Affiliation (Independence)	−0.03	0.04	−0.09*	0.04	−0.06	0.07	−0.10*	0.05	0.01	0.05
Affiliation (group)	0.02	0.05	−0.05	0.05	−0.06	0.08	−0.07	0.06	0.00	0.06
Affiliation (exclusion concern)	−0.08†	0.05	−0.02	0.05	−0.08	0.07	−0.07	0.05	−0.04	0.05
Status	0.13**	0.05	0.12**	0.04	0.10	0.08	0.11*	0.05	0.20***	0.05
Mate seeking	0.02	0.04	0.10*	0.04	0.08	0.06	0.06	0.04	0.09†	0.05
Kin care (family)	−0.08*	0.05	−0.09*	0.06	−0.15*	0.07	−0.08†	0.07	−0.10*	0.07
Adjusted R^2	0.07		0.04		0.06		0.03		0.05	
F for change in R^2	2.79**		4.04***		2.30*		2.82**		4.07***	

† $p < .1$.
* $p < .05$.
** $p < .01$.
*** $p < .001$.

Table 4
Hierarchical linear models on interpersonal risks.

	Men (n = 651)		Women (n = 667)		Adolescents (n = 253)		Emerging adults (n = 582)		Young adults (n = 483)	
	β	Std. error	β	Std. error	β	Std. error	β	Std. error	β	Std. error
Sex					−0.16*	0.32	−0.16***	0.20	−0.04	0.20
Age	−0.13**	0.02	−0.07†	0.02						
Nationality	−0.03	0.42	0.06	0.33	0.01	0.64	0.04	0.37	−0.02	0.48
Self-protection	−0.02	0.03	0.00	0.03	−0.15*	0.06	0.04	0.03	−0.01	0.03
Disease avoidance	0.02	0.03	0.04	0.03	−0.07	0.05	0.08†	0.03	0.03	0.03
Affiliation (independence)	−0.06	0.03	−0.07†	0.03	−0.08	0.05	−0.08†	0.03	−0.03	0.03
Affiliation (group)	−0.03	0.04	−0.08*	0.03	−0.03	0.07	−0.09*	0.04	−0.04	0.04
Affiliation (exclusion concern)	−0.12**	0.03	−0.03	0.03	−0.12†	0.06	−0.03	0.04	−0.11*	0.04
Status	0.21***	0.03	0.20***	0.03	0.30***	0.07	0.14**	0.03	0.25***	0.03
Mate seeking	0.08*	0.03	0.10**	0.02	0.06	0.05	0.06	0.03	0.16**	0.03
Kin care (family)	−0.09*	0.04	−0.07†	0.04	−0.10†	0.06	−0.11*	0.05	−0.06	0.04
Adjusted R^2	0.08		0.07		0.13		0.08		0.09	
F for change in R^2	5.58***		6.11***		4.20***		4.27***		6.44***	

† $p < .1$.
* $p < .05$.
** $p < .01$.
*** $p < .001$.

Table 5
Hierarchical linear models on deviant non-violent behaviors.

	Men (n = 648)		Women (n = 666)		Adolescents (n = 250)		Emerging adults (n = 580)		Young adults (n = 484)	
	β	Std. error	β	Std. error	β	Std. error	β	Std. error	β	Std. error
Sex					0.04	0.39	−0.17***	0.24	−0.04	0.27
Age	−0.06	0.03	−0.08*	0.02						
Nationality	0.01	0.53	0.02	0.44	0.03	0.80	0.03	0.45	−0.01	0.64
Self-protection	−0.07	0.04	−0.11**	0.04	−0.23**	0.07	0.00	0.04	−0.07	0.04
Disease avoidance	−0.05	0.04	0.00	0.04	−0.05	0.06	0.00	0.04	−0.08†	0.04
Affiliation (independence)	−0.04	0.04	−0.03	0.03	−0.02	0.07	−0.08†	0.04	0.02	0.04
Affiliation (group)	0.03	0.05	−0.10*	0.04	0.03	0.08	−0.12**	0.05	−0.02	0.05
Affiliation (exclusion concern)	−0.06	0.04	0.02	0.04	−0.11	0.07	0.02	0.04	−0.04	0.05
Status	0.17***	0.04	0.13**	0.04	0.13†	0.08	0.15**	0.04	0.21***	0.04
Mate seeking	0.03	0.04	0.09*	0.03	0.13†	0.06	0.04	0.03	0.14**	0.04
Kin care (family)	−0.11**	0.05	−0.02	0.05	−0.15*	0.07	−0.09*	0.06	−0.06	0.06
Adjusted R^2	0.04		0.05		0.07		0.07		0.07	
F for change in R^2	3.74***		4.09***		3.55**		3.35**		5.37***	

† $p < .1$.
* $p < .05$.
** $p < .01$.
*** $p < .001$.

(Heise et al., 2019).

In women, mate-seeking positively predicted health risks, interpersonal risks and deviant non-violent behaviors. This finding was particularly remarkable given that, compared with men, mate seeking related to a higher variety of risk-taking behaviors in women. Women's engagement in health risks could be aimed at increasing their attractiveness (Hill & Durante, 2011), whereas engaging in interpersonal risks and deviant non-violent behaviors could be directed towards romantic competition (Vaillancourt & Krems, 2018).

Kin care (family) was related with a reduction of engagement in health risks, interpersonal risks and deviant non-violent behaviors in men. In accordance with the good-father hypothesis (Lu et al., 2015), men's interest in caring for their relatives could have a signaling function for attracting women who put more emphasis on rearing as opposed to competition qualities. As a result, lesser engagement in risk-taking behaviors would act as an honest indicator of men's kin care compromise. It is interesting that kin care (family) correlated negatively only with health risks in women, which could be explained by their higher minimal investment in offspring survival (Trivers, 1972). Affiliation and self-protection motives were shown to be a protective factor towards some of the risk-taking behaviors in both men and women. This finding suggests that these motives seem to be not only crucial in women's aversion to social and physical risk-taking behaviors (Benenson et al., 2021) but also in men, specifically by decreasing engagement in health and interpersonal risk-taking behaviors.

4.2. Interaction effects between sex and age on risk-taking behaviors

Women's greater expression of health risks during adolescence might be due to their earlier entry in puberty (Fechner, 2003). However, in the initial stages of emerging adulthood, men surpass women in health risks, although both sexes still express an increase in these risk-taking behaviors. This is in line with the proposition that emerging adulthood is a developmental stage in which mating motives become more salient and individuals begin to experience greater autonomy from their parents (Hochberg & Konner, 2020).

With respect to interpersonal risks, the results were in the opposite direction, with men expressing the highest levels of these behaviors during adolescence. In addition, men engaged in interpersonal risks more than women throughout the life stages analyzed. Also, although not significant, the pattern of deviant non-violent behaviors was similar to that of interpersonal risks. These findings suggest that the use of violence and deviant behaviors as a dominance mechanism appears to be more effective and adaptive in the high school years, being less accepted later in university and older years.

In general, these results are in line with the *young male syndrome* hypothesis, given the greater tendency of men to express risk-taking behaviors. However, the pattern is different in the function of the type of risk-taking behavior, which could depend on differences in evolutionary needs from adolescence to young adulthood. Specifically, emerging and young adult males showed more engagement in health risks, which could be related to the aim of meeting their reproductive needs. In contrast, interpersonal risks and deviant non-violent behaviors were more frequent in male adolescents, possibly as a way of attaining social dominance and respect from peers.

4.3. Implications, limitations and future directions

The present study has several relevant theoretical and practical implications. At a theoretical level, the findings strengthen the major role of the social status motive on risk-taking behaviors in both men and women. On the other hand, kin care (family) stood out as the main protective factor against the engagement in risk-taking behaviors. As Ko et al. (2020) suggested, despite its relevance in human behavior, social and evolutionary psychologists have paid little attention to kin relations. The results from the present study reinforce the need to carry out further research to analyze the role of kinship relationships on human behavior. Moreover, even though we have found some commonalities in the impact of social motives on risk-taking behaviors in adolescence and emerging and young adulthood, there have also been unique influences in specific life stages, reinforcing the need to establish a distinction between these life stages (Hochberg & Konner, 2020).

This work is not free of limitations. Mate retention and kin care (children) dimensions were omitted from the regression analyses to avoid losing a high proportion of cases. Furthermore, despite the level of concordance between both gender and sex self-identification (e.g., Kal Kaltiala-Heino & Lindberg, 2019), the binary approach that was applied, and the fact that only biological sex was evaluated across samples, are important limitations. Moreover, the sample was obtained in Spain, a Western context, which means that the generalizability of results can be challenging for other culturally, socially, and politically diverse countries. In addition, due to the cross-sectional nature of present study, it would be appropriate to carry out longitudinal research to test the intra-individual long-term effects of social motives on risk-taking behaviors. Finally, given that the *young male syndrome* hypothesis covers an age range from the final years of adolescence to young adulthood, it is necessary to compare the interaction effects between sex and age including other developmental stages.

Nonetheless, our findings have several implications. This work highlights the key protective role of family bonds in relation to risk-taking behaviors. In addition, they suggest the potential adaptive value of risk-taking behaviors and might explain why health and safety campaigns aimed at adolescents and young people are not as effective as expected and may even exert the opposite effect. Instead of using zero-risk interventions, efforts might be oriented towards reducing the potential costs of risk-taking behaviors.

CRediT authorship contribution statement

Javier Salas-Rodríguez: Methodology, Formal analysis, Investigation, Data curation, Writing – original draft, Visualization. **Luis Gómez-Jacinto:** Conceptualization, Supervision, Project administration. **Isabel Hombrados-Mendieta:** Funding acquisition, Resources. **Natalia del Pino-Brunet:** Methodology, Investigation. **Miguel Basto-Pereira:** Formal analysis, Writing – review & editing, Validation.

Declaration of competing interest

None.

Data availability

Data will be made available on request.

Acknowledgements

This research was supported by the Andalucía ERDF 2014-20 OP [UMA18-FEDERJA-071], the Research Grants of the Reina Sofia Centre on Adolescence and Youth, and with national funds from FCT – Fundação para a Ciência e Tecnologia, I.P., in the context of the project UID/04810/2020. Funding for open access charge: Universidad de Málaga / CBUA.

We are truly grateful for the reviewers' thoughtful comments. Thank you for helping us improve this manuscript.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.paid.2023.112093.

References

Apalkova, Y., Butovskaya, M. L., Bronnikova, N., Burkova, V., Shackelford, T. K., & Fink, B. (2018). Assessment of male physical risk-taking behavior in a sample of Russian men and women. *Evolutionary Psychological Science, 4*(3), 314–321.

Archer, J. (2019). The reality and evolutionary significance of human psychological sex differences. *Biological Reviews, 94*, 1381–1415.

Auerbach, R. P., & Gardiner, C. K. (2012). Moving beyond the trait conceptualization of self-esteem: The prospective effect of impulsiveness, coping, and risky behavior engagement. *Behaviour Research and Therapy, 50*(10), 596–603.

Baker, M. D., & Maner, J. K. (2009). Male risk-taking as a context-sensitive signaling device. *Journal of Experimental Social Psychology, 45*(5), 1136–1139. https://doi.org/10.1016/j.jesp.2009.06.006

Benenson, J. F., Webb, C. E., & Wrangham, R. W. (2021). Self-protection as an adaptive female strategy. *Behavioral and Brain Sciences*, 1–86.

Cook, C. L., Krems, J. A., & Kenrick, D. T. (2021). Fundamental motives illuminate a broad range of individual and cultural variations in thought and behavior. *Current Directions in Psychological Science, 30*(3), 242–250.

Ellis, B. J., Del Giudice, M., Dishion, T. J., Figueredo, A. J., Gray, P., Griskevicius, V., Hawley, P. H., Jacobs, W. J., James, J., Volk, A. A., & Wilson, D. S. (2012). The evolutionary basis of risky adolescent behavior: Implications for science, policy, and practice. *Developmental Psychology, 48*(3), 598–623.

Fechner, P. Y. (2003). The biology of puberty: New developments in sex differences. In C. Hayward (Ed.), *Gender differences at puberty* (pp. 17–28). Cambridge University Press. https://doi.org/10.1017/CBO9780511489716.003.

GBD 2019 Adolescent Mortality Collaborators. (2021). Global, regional, and national mortality among young people aged 10–24 years, 1950–2019: A systematic analysis for the Global Burden of Disease Study 2019. *The Lancet, 398*(10311), 1593–1618.

Gómez-Jacinto, L., & Salas-Rodríguez, J. (2018). *Motivos evolutivos y conductas de riesgo de los adolescentes y los jóvenes [Paper presentation]*. Cuenca, Spain: III Congreso Internacional de Psicología Social SCEPS.

Griskevicius, V., & Kenrick, D. T. (2013). Fundamental motives: How evolutionary needs influence consumer behavior. *Journal of Consumer Psychology, 23*(3), 372–386.

Griskevicius, V., Tybur, J. M., Gangestad, S. W., Perea, E. F., Shapiro, J. R., & Kenrick, D. T. (2009). Aggress to impress: Hostility as an evolved context-dependent strategy. *Journal of Personality and Social Psychology, 96*(5), 980–994.

Hawley, P. H. (1999). The ontogenesis of social dominance: A strategy-based evolutionary perspective. *Developmental Review, 19*(1), 97–132.

Heise, L., Greene, M. E., Opper, N., Stavropoulou, M., Harper, C., Nascimento, M., Zewdie, D., Darmstadt, G. L., Greene, M. E., & Hawkes, S. (2019). Gender inequality and restrictive gender norms: Framing the challenges to health. *The Lancet, 393* (10189), 2440–2454.

Hill, S. E., & Durante, K. M. (2011). Courtship, competition, and the pursuit of attractiveness: Mating goals facilitate health-related risk taking and strategic risk suppression in women. *Personality and Social Psychology Bulletin, 37*(3), 383–394.

Hochberg, Z., & Konner, M. (2020). Emerging adulthood, a pre-adult life history stage. *Frontiers in Endocrinology, 10*, 918. https://doi.org/10.3389/fendo.2019.00918

Kaltiala-Heino, R., & Lindberg, N. (2019). Gender identities in adolescent population: Methodological issues and prevalence across age groups. *European Psychiatry: The Journal of the Association of European Psychiatrists, 55*, 61–66. https://doi.org/10.1016/j.eurpsy.2018.09.003

Kenrick, D. T., Griskevicius, V., Neuberg, S. L., & Schaller, M. (2010). Renovating the pyramid of needs: Contemporary extensions built upon ancient foundations. *Perspectives on Psychological Science, 5*(3), 292–314.

Ko, A., Pick, C. M., Kwon, J. Y., Barlev, M., Krems, J. A., Varnum, M. E. W., Neel, R., Peysha, M., Boonyasiriwat, W., Brandstätter, E., Crispim, A. C., Cruz, J. E., David, D., David, O. A., de Felipe, R. P., Fetvadjiev, V. H., Fischer, R., Galdi, S., Galindo, O., & Kenrick, D. T. (2020). Family matters: Rethinking the psychology of human social motivation. *Perspectives on Psychological Science, 15*(1), 173–201.

Lu, H. J., Zhu, X. Q., & Chang, L. (2015). Good genes, good providers, and good fathers: Economic development involved in how women select a mate. *Evolutionary Behavioral Sciences, 9*(4), 215–228.

Mata, R., Josef, A. K., & Hertwig, R. (2016). Propensity for risk taking across the life span and around the globe. *Psychological Science, 27*(2), 231–243. https://doi.org/10.1177/0956797615617811

McDonald, M. M., Navarrete, C. D., & Van Vugt, M. (2012). Evolution and the psychology of intergroup conflict: The male warrior hypothesis. *Philosophical Transactions of the Royal Society B: Biological Sciences, 367*, 670–679. https://doi.org/10.1098/rstb.2011.0301

Mogilski, J. K. (2021). Parental investment theory. In T. K. Shackelford (Ed.), *The SAGE handbook of evolutionary psychology: Foundations of evolutionary psychology* (pp. 137–154). Sage Reference.

Murray, A. L., Zhu, X., Mirman, J. H., Ribeaud, D., & Eisner, M. (2021). An evaluation of dual systems theories of adolescent delinquency in a normative longitudinal cohort study of youth. *Journal of Youth and Adolescence, 50*, 1293–1307.

Neel, R., Kenrick, D. T., White, A. E., & Neuberg, S. L. (2016). Individual differences in fundamental social motives. *Journal of Personality and Social Psychology, 110*, 887–907.

Piquero, A. R., Jennings, W. G., Diamond, B., & Reingle, J. M. (2015). A systematic review of age, sex, ethnicity, and race as predictors of violent recidivism. *International Journal of Offender Therapy and Comparative Criminology, 59*(1), 5–26. https://doi.org/10.1177/0306624X13514733

Satchell, L. P., Bacon, A. M., Firth, J. L., & Corr, P. J. (2018). Risk as reward: Reinforcement sensitivity theory and psychopathic personality perspectives on everyday risk-taking. *Personality and Individual Differences, 128*, 162–169.

Steiner, R. J., Sheremenko, G., Lesesne, C., Dittus, P. J., Sieving, R. E., & Ethier, K. A. (2019). Adolescent connectedness and adult health outcomes. *Pediatrics, 144*(1), Article e20183766. https://doi.org/10.1542/peds.2018-3766

Tamás, V., Kocsor, F., Gyuris, P., Kovacs, N., Czeiter, E., & Büki, A. (2019). The young male syndrome—An analysis of sex, age, risk taking and mortality in patients with severe traumatic brain injuries. *Frontiers in Neurology, 10*, Article 366.

Trivers, R. L. (1972). Parental investment and sexual selection. In B. Campbell (Ed.), *Sexual selection and the descent of man 1871–1971* (pp. 136–179). Chicago, IL: Aldine.

Vaillancourt, T., & Krems, J. A. (2018). An evolutionary psychological perspective of indirect aggression in girls and women. In S. M. Coyne, & J. M. Ostrov (Eds.), *The development of relational aggression* (pp. 111–126). Oxford University Press.

van Kleef, G. A., Heerdink, M. W., Cheshin, A., Stamkou, E., Wanders, F., Koning, L. F., Fang, X., & Georgeac, O. A. M. (2021). No guts, no glory? How risk-taking shapes dominance, prestige, and leadership endorsement. *Journal of Applied Psychology, 106* (11), 1673–1694. Advance online publication.

Vincke, E. (2016). The young male cigarette and alcohol syndrome: Smoking and drinking as a short-term mating strategy. *Evolutionary Psychology, 14*(1), 1–13.

Willoughby, T., Heffer, T., Good, M., & Magnacca, C. (2021). Is adolescence a time of heightened risk taking? An overview of types of risk-taking behaviors across age groups. *Developmental Review, 61*, Article 100980.

Wilson, M., & Daly, M. (1985). Competitiveness, risk taking, and violence: The young male syndrome. *Ethology & Sociobiology, 6*(1), 59–73. https://doi.org/10.1016/0162-3095(85)90041-X