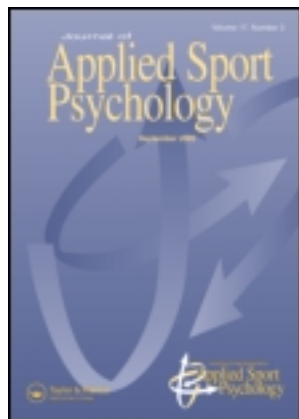


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Personality Characteristics of BASE Jumpers

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BASE jumping is an extreme sport, which is associated with significant risk of injury and death. We aimed to determine whether BASE jumpers have different personality characteristics to an age-matched, normal control population. An international population of BASE jumpers was examined using the Temperament and Character Inventory (TCI). Mean age was thirty-four years; fifty-nine (87%) jumpers were male; twenty-eight (41%) jumpers had sustained a significant injury. A substantial proportion of the BASE jumpers presented extremely low scores in the temperament measure of Harm Avoidance ($p < 0.001$); the extent of which has not been reported in any other population.

INTRODUCTION

Extreme, risk-taking sports continue to grow in popularity and capture increasing public interest (Pain & Pain, 2005). BASE jumping is arguably the most dangerous of the extreme sports: it developed out of skydiving and uses specially adapted parachutes to jump from fixed objects. BASE is an acronym that stands for the four categories of fixed objects that one can jump off: building, antenna, span (a bridge, arch, or dome), and earth (a cliff or other natural formation). Although the popularity of the sport is rapidly increasing, the total number of participants worldwide in 2002 was estimated at approximately 700 (Maeland, 2004).

Recent studies have calculated the annual fatality risk as one death per 60 participants, and the serious injury rate (requiring hospital care) as 0.2%–0.4% per jump; BASE jumping is therefore associated with a five- to 16-fold risk for death or injury when compared with skydiving (Monasterio & Mei-Dan, 2008; Soreide, Ellingsen, & Knutson, 2007; Westman, Rosen, Berggren, & Bjornstig, 2008). Monasterio, Carmont, & Mei-Dan (2012) found that 72% of experienced BASE jumpers had witnessed the death or serious injury of other participants in the sport in which 76% had at least one near-miss incident and only 6% had not sustained an injury, near-miss or witnessed a fatality from BASE jumping. It is therefore not surprising that there exists a widespread belief that BASE jumpers are in some way unusual.

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Given the growing popularity of BASE jumping and the potentially life threatening consequences of the sport, it is important to clarify whether personality factors contribute to participation in the sport and risk of injury. So far there have been no published studies on the personality characteristics of BASE jumpers. A number of studies have investigated the relationship between personality traits and participation in high-risk physical sports (Castanier, Le Scanff, & Woodman, 2010; Cronin, 1991; Diehm & Armatas, 2004; Freixanet, 1991; Jack & Ronan, 1998; Zuckerman, 1983); sensation-seeking is by far the most consistently studied personality factor in the literature. Most of these studies have found that participants in high-risk sports tend to score higher on Zuckerman's Sensation Seeking (SS) Scale compared to low-risk sports participants and control groups (Diehm & Armatas, 2004; Freixanet, 1991; Jack & Ronan, 1998; Zuckerman, 1983). Zuckerman (1983) defines sensation seeking as "the need for varied, novel and complex sensations and experiences and the willingness to take physical and social risks for the sake of such experience." In addition, a smaller number of studies have also considered other personality variables such as neuroticism, extraversion and conscientiousness (Castanier et al., 2010; Freixanet, 1991). Castanier et al. (2010) investigated 302 men involved in high-risk sports (downhill skiing, mountaineering, rock climbing, paragliding, and skydiving) and found that personality types with a configuration of low conscientiousness combined with high extraversion and/or high neuroticism were greater risk-takers.

The majority of the research to date therefore has almost exclusively focused on the relationship between a particular personality trait, SS and participation in risk-taking sports. In our opinion, this approach is far too narrow as it only provides information about one aspect of personality and ignores other important personality factors that may contribute to participation in risk-taking sports and help to understand the motivation for sports risk-taking behavior in general.

The aim of this study was to explore the possible psychobiological contribution to BASE jumping. The personality model employed was the temperament and character inventory (TCI) (Cloninger, Przybeck, Svrakic, & Wetzell, 1994a).

Cloninger's Temperament and Character Inventory (TCI)

The TCI is a self-report personality questionnaire, which accounts for both normal and abnormal variation in the two major components of personality: temperament and character. The TCI-235 is a 235-item self-reported questionnaire designed to assess differences between people in seven basic dimensions of temperament and character.

Temperament refers to the automatic emotional responses that are thought to be moderately heritable, independent, genetically homogenous and stable over time. There are four temperament dimensions:

- **Novelty seeking** (NS; a tendency to activate or initiate new behaviors with a propensity to seek out new or novel experiences, impulsive decision-making, extravagance, quick loss of temper, and active avoidance of frustration).
- **Harm avoidance** (HA; a tendency to inhibit behaviors with a propensity to worry in anticipation of future problems, fear of uncertainty, rapid fatigability, and shyness in the company of strangers).
- **Reward dependence** (RD; a tendency to maintain behaviors manifested by dependency on the approval of others, social attachments, and sentimentality).
- **Persistence** (P; a tendency to be hard-working, industrious, and persistent despite frustration and fatigue).

Character refers to self-concepts and individual differences in goals and values that can be influenced by social factors, learning, and the process of maturation. The character dimensions are as follows:

- **Self-directedness** (SD; which refers to self-determination, personal integrity, self-integrity, and willpower).
- **Cooperativeness** (C; which refers to individual differences in identification with and acceptance of other people).
- **Self-transcendence** (ST; which refers to feelings of religious faith, or viewing oneself as an integral part of the universe in other ways; Cloninger, Przybeck, Svrakic, & Wetzel, 1994a).

Numerous studies have supported the validity of Cloninger's model and its utility for understanding behavior and clinical syndromes. Extensive data on the reliability and validity of the TCI in the English language have been reported, and the TCI has been shown to have sound psychometric characteristics (Cloninger, 1987; Cloninger, Przybeck, Svrakic, & Wetzel, 1994d; Cloninger, Svrakic, & Przybeck, 1993). For example, twin studies have shown that the temperament dimensions are moderately heritable and that each is genetically homogenous and genetically independent from the others (Heath, Cloninger, & Martin, 1994; Stallings, Hewitt, Cloninger, Heath, & Eaves, 1996). NS and HA have been associated with depression, anxiety disorders, drug use, and alcoholism (Cloninger et al., 1994a). In addition low scores on SD and/or C has been shown to increase the risk of personality disorders (Svrakic, Whitehead, Przybeck, & Cloninger, 1993).

The benefit of using this model is that it provides broad information on temperament and character, and there is a large volume of research with this model in different clinical, non-clinical, and control populations, across a number of different countries.

We hypothesized that BASE jumpers would present with high NS and low HA temperament scores when compared to normative data. We also hypothesized a positive relationship between NS and a negative relationship between HA and accident frequency and severity.

METHODS AND PARTICIPANTS

Participants

Subjects were a diverse group of BASE jumpers enrolled into the study on a volunteer basis. One of the authors (Mei-Dan) is a BASE jumper and his involvement facilitated access to experienced participants. Volunteers were included if they had been involved in the sport for at least 6 months and had made at least 10 jumps. Volunteers were recruited from international BASE jump group meetings, adventure website forums, and from personal communication among the international BASE jumping community.

Subjects agreed in writing to participate in the study and responded to a number of pen and paper questionnaires.

Study/Outcome Measures

Demographic, accidents and BASE jumping characteristics:

A total of 68 BASE jumpers enrolled in the study. Of those 59 were male (87%) and 39 single (58%). The mean age was 34 years (*SD* 7.6). Subjects were asked to provide information on the number of years they had been involved in BASE jumping. Subjects were also asked to estimate the number of BASE jumps per year, the frequency of near misses, whether they

Table 1
Demographic and injury findings

	Minimum	Maximum	Mean	SD
Age (years)	21	68	34	7.6
Time BASE jumping (years)	0.5	17	5.8	4.5
Total No. of jumps	12	2300	286	354
Severity (AIS)	2	5	3.1	

AIS: Injury Abbreviated Scale.

had witnessed anyone dying from the sport and whether they had suffered any serious BASE jumping accident.

Injuries were rated according to severity using the abbreviated injury scale (AIS). The AIS is an anatomically based scoring system to determine the severity of single injury based on the survivability of the injury (Joint Committee on Injury Scaling., 1980). The AIS is categorized as 1 (minor), 2 (moderate), 3 (severe, not life-threatening), 4 (serious, life threatening), 5 (critical, survival uncertain), and 6 (maximum, currently untreatable).

Cloninger's Temperament and Character Inventory (TCI):

We compared the TCI results between BASE jumpers and a previously collected age-matched control sample which used the Temperament and Character Inventory (TCI-235) (Cloninger, Przybeck, Svrakic, & Wetzels, 1994c).

RESULTS

Means and standard deviation on age, number of years BASE jumping and estimated total number of BASE jumps is provided in Table 1. Description, number and severity of accidents are provided in Table 2. Forty two percent of BASE jumpers had suffered at least one serious

Table 2
Type of injury and injury score

Type of Injury	No. of Incidents	AIS
ICU related, Multi Trauma (Pneumothorax, ACLS required, Head Injury, Cervical spine)	3	5
Head Injury/Concussion	2	4/3
Fx Thoraco-Lumber-Scapal Spine	6	4/3
Fx Ribs	5	4/3
Fx/Dx Upper limb (arm, forearm, Scapula)	4	4/3
Fx Upper limbs (hand\wrist)	4	3/2
Fx Femur	2	3
Fx Dx/Open of Ankle/Tibia Fibula	3	3
Fx Ankle (simple)	9	3/2
Fx Talus	2	3
Fx Calcaneus	2	3
Fx Foot (mid/forefoot)	7	3/2
Tear Achilles	1	2
Head major laceration	1	2

Table 3
TCI findings in BASE jumpers and controls

	NS***	HA***	RD*	P	SD*	C	ST***
Base jumpers	22.8 (5.7)	7.9 (6.3)	13.8 (4.8)	5.5 (1.4)	33.4 (6.7)	33.7 (5.6)	12.7 (7.0)
Controls	19.0 (5.8)	12.4 (6.9)	15.6 (4.3)	5.7 (2.1)	32.0 (7.0)	33.6 (6.7)	18.7 (6.3)

NS: Novelty seeking; HA: Harm avoidance; RD: Reward dependence; P: Persistence; SD: Self directedness; C: Cooperativeness; ST: Self transcendence.

BASE jumpers ($n = 68$) and Controls ($n = 181$); TCI-235 score means and (SD).

* $p < 0.05$, *** $p < 0.001$.

injury (M AIS score = 3.1) and 72% had witnessed a fatality or serious accident associated with the sport.

An independent-samples t test was used to compare TCI-235 scores in BASE jumpers relative to an age group-matched population. A two-sided significance level (α) was set at 0.05. Spearman's non-parametric correlation coefficients were used to explore the association between TCI findings and accidents. Means and standard deviations of the seven temperament and character dimensions of the TCI-235 for both groups are shown in Table 3. BASE jumpers score significantly higher than the normative population on NS and SD. In addition, BASE jumpers score significantly lower on HA, RD, and ST compared to the normative population. However, the BASE jumper's scores do not differ significantly from the normative population on P or C.

There is no association between temperament and character traits and accident measures, strongest Spearman's $r = -0.09$.

All TCI scores, except HA, are distributed relatively normally. As the histogram on Figure 1 shows, HA scores have a markedly skewed distribution. In particular a significant proportion of BASE jumpers have extremely low HA scores; 40% have a score of 4 or less.

DISCUSSION

The purpose of this study was to determine whether BASE jumpers score differently to an age-matched control population in temperament and character, and whether there was a relationship between these measures and the frequency and severity of accidents.

Partially in line with our hypothesis, we found that BASE jumpers have higher NS and SD scores, and lower HA, RD, and ST scores. However, as the mean differences are modest and there are large standard deviations across the measures of temperament and character, the findings suggest that there is not a tightly defined personality profile among BASE jumpers and that generally they are not markedly different from their peers.

The exception is that a substantial number (40%) have extremely low HA scores. In a normal population around 5% have HA scores of 4 or less. The eight-fold increase in BASE jumpers suggests that a large proportion have a temperament profile characterized by low HA.

The finding of low HA is not surprising or counterintuitive, as individuals with low scores on this dimension are described as carefree, relaxed, daring, courageous, composed, and optimistic even in situations that worry most people. These individuals are described as outgoing, bold, and confident. Their energy levels tend to be high, and they impress others as dynamic, lively, and vigorous. The advantages of low HA are confidence in the face of danger and uncertainty, leading to optimistic and energetic efforts with little or no distress. The disadvantages are

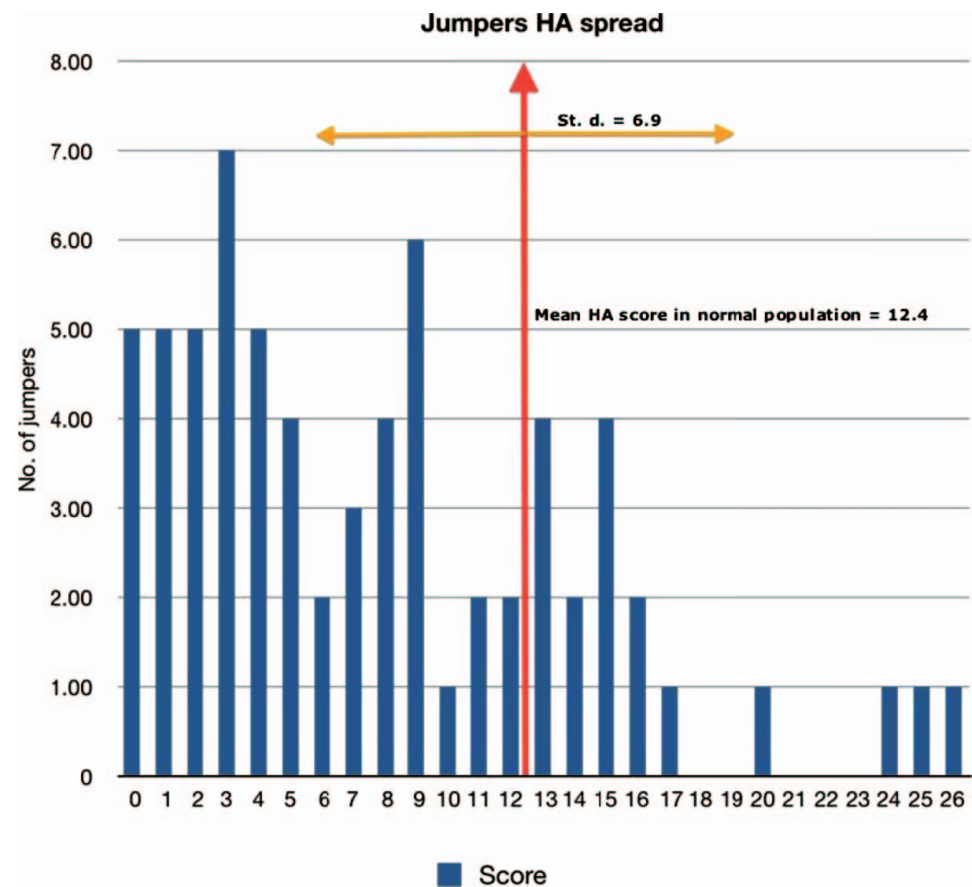


Figure 1. HA scores in BASE jumpers (color figure available online).

related to unresponsiveness to danger, which can lead to foolhardy optimism (Cloninger et al., 1994a). In our study there was a high prevalence of witnessed and experienced serious trauma, and near misses among BASE jumpers; despite this participants persisted in the sport and this suggests that they are likely to possess considerable psychological resilience to the effects of trauma. A number of studies have examined the relationship between Cloninger’s temperamental traits and risk of PTSD and other anxiety disorders in general, with a consistent finding of elevated HA (Cloninger, Przybeck, Svrakic, & Wetzel, 1994b; Gil & Caspi, 2006; Richman & Frueh, 1997). Low HA scores in BASE jumpers may confer some protection against PTSD and anxiety disorders, and so may contribute to psychological resilience in the face of this considerable trauma. Replication of this finding in other risk-taking sports populations could have important applications as it may help to predict psychological response to sports trauma.

As there is a strong correlation between Zuckerman’s SS and Cloninger’s NS scales (Zuckerman & Cloninger, 1996), the finding of high NS is consistent with the previously demonstrated relationship between SS and various risk-taking sports (Cronin, 1991; Diehm & Armatas, 2004; Freixanet, 1991; Jack & Ronan, 1998; Zuckerman, 1983). Individuals who score high on NS

enjoy exploring unfamiliar places and situations. They are easily bored, try to avoid monotony and so tend to be quick-tempered, excitable and impulsive and enjoy new experiences and seek out thrills and adventures irrespective of what others think of this behavior. NS is reinforced by a constellation of genetically determined neurotransmitters, particularly those in the dopamine/pleasure system (Golimbet, Alfimova, Gritsenko, & Ebstein, 2007; Schinka, Letsch, & Crawford, 2002). High NS suggests that to some extent BASE jumpers have lower levels of circulating dopamine and therefore may be in a state of under arousal, which may in turn contribute to engagement in risk-taking sports.

Low scores in RD in general suggests that there is less reliance or indifference towards approval from others; therefore, lower RD scores among BASE jumpers may indicate a bias toward engagement in a sport that does not rely on the participation of others.

In order to participate in extreme sports such as BASE jumping, participants require highly developed skills that can only be acquired by repeated and consistent practice over time, and after undergoing a fairly rigorous apprenticeship. As SD refers to self-determination and maturity, or the ability of an individual to control, regulate and adapt behavior to fit the situation in accord with individually chosen goals and values, it is unsurprising that BASE jumpers scored high on this measure. High SD with an emphasis on discipline and skill acquisition may also help to explain why BASE jumpers engage in risk-taking behaviors by normative rather than impulsive/disorganized antisocial means (such as drug use and criminal behavior). Previous research has shown that a combination of high NS and low HA increases the risk of drug use (Gunnarsdottir, Pingitore, Spring, Konopka, Crayton, Milo, & Shirazi, 2000; Wills, Vaccaro, & McNamara, 1994).

ST is a character trait that in general denotes a propensity to religious and transpersonal experience, and a tendency to self-forgetfulness. As BASE jumping requires a high level of performance under extreme stress, meticulous attention to detail and split-second decision-making, a capacity for sustained focus over prolonged periods of time, and in situations of physical and psychological stress is important. High ST with its attendant propensity for self-forgetfulness and openness to transpersonal experience is likely to be disadvantageous to BASE jumpers as it may lead to distractibility and diminished focus on a highly specific task. Individuals who score low on ST tend to be proud, impatient, unfulfilled, self-aware, and generally struggle to accept failure (Cloninger et al., 1994a); this may also contribute to their drive to achieve in extreme sports despite exposure to risk.

Interestingly, there was no association between any particular personality traits and injury measures, with the strongest Spearman's $r = -0.09$, which may indicate that the risk of injury is not determined by a single trait, but rather by a combination of traits. To the author's knowledge there is only one other study that has used the TCI in risk-taking sports people. This study found that experienced mountaineers scored higher than a normative population in NS and SD, and lower on HA and ST (Monasterio, Alamri, & Mei-Dan, 2012); these findings in combination with those of the current study provide good scientific evidence of the TCI's construct validity.

Cloninger's model of personality has been applied to non-risk taking sport populations with mixed results. Seznec, Lepine, & Pelissolo (2003) utilized the TCI to examine a sample of 18 elite racing cyclists from the French junior racing team and compared them with 26 age and gender matched controls of the same nationality (Seznec et al., 2003). The only significant difference between the populations related to higher RD in cyclists. Han et al. (2006) examined a mixed population of 277 high school boys engaged in endurance-, combat-, power- and team-sports and compared them with a population of 152 high school boys non-athletes, to determine whether there were any differences in temperament, and state and trait anxiety (Han et al., 2006). HA scores of athletes were higher than in non-athletes, and there was no difference

in other temperaments between groups. Levels of trait and state anxiety were higher in the athletes than in the non-athletes group. These sport participants did not show the characteristic findings of our study populations and therefore the differences in temperament and character of BASE jumpers cannot be attributed to regular, general participation in sports.

Application of the Findings

The research findings describe a combination of temperament and character traits associated with participation in BASE jumping, and add to the knowledge base and understanding of personality factors that contribute to engagement in risk-taking behavior in a normative way. Findings of elevated NS and low HA may help to discriminate between participants in high-risk and low-risk sports.

In our study BASE jumpers scored significantly low in HA and it is hypothesized that this may confer resilience to the psychological trauma (anxiety disorders in general and PTSD) associated with near-misses and the significant physical injuries which are a part of the sport. Confirmation of this finding in future research may lead to the use of HA scores to predict those at higher risk of anxiety disorders and psychological distress and the provision of targeted treatment interventions after sports-related trauma.

Limitations of the Study

Several methodological limitations need to be considered in interpreting the results of this study. The population was not a random sample. All participants who volunteered were included. This may have led to selection bias and the sample may represent a population of particularly high-risk-taking BASE jumpers as 42% had suffered serious injury and 72% had witnessed fatality or serious accident, yet persisted in the sport. BASE jumpers who had experienced prior accidents may have been more motivated to share their experience and therefore more likely to participate in the study. As the study included only active jumpers, cautious BASE jumpers, who had given up the sport following an injury or a near-miss experience, may have been excluded. Alternatively, the sampling process may have excluded particularly high-risk groups as less experienced, more impulsive and higher risk-taking jumpers may have been involved in fatal accidents at earlier stages of their BASE jumping careers and therefore were unavailable for inclusion in the study.

Although the sample size is relatively small, it is likely to represent between 5 and 10% of the total world BASE-jumping population. An added limitation may be the forced-choice nature of the TCI questionnaire in which participants score either true or false for each question, whereas the answer may lie somewhere in the middle. However, this is not rare in psychometric tests of personality and there is extensive data showing the reliability and validity of the TCI (Cloninger, 1987; Cloninger et al., 1994d; Cloninger et al., 1993). In addition, the findings of the study were to a significant extent consistent with the study hypothesis. Finally, the choice to engage in BASE jumping may have been influenced by cultural, environmental and familiar background, which was not taken into account in the present study.

CONCLUSION

BASE jumping is an adventure sport associated with significant risk of physical injury and psychological distress. The findings of the study indicate that BASE jumpers present with TCI scores which are different from those of a normal control population and sports participants engaged in low-risk sports. In addition a substantial proportion of the population presents with extremely low scores in the measure of HA, which has not been previously reported in other

populations. However, the large standard deviations across the measures of temperament and character indicate that there isn't a tightly defined personality profile among BASE jumpers, and that factors other than personality, such as opportunity and social and cultural influences, contribute to engagement in the sport.

REFERENCES

- Castanier, C., Le Scanff, C., & Woodman, T. (2010). Who takes risks in high-risk sports? A typological personality approach. *Research Quarterly for Exercise and Sport*, 81(4), 478–484.
- Cloninger, C. R. (1987). A systematic method for clinical description and classification of personality variants. A proposal. *Archives of General Psychiatry*, 44(6), 573–588.
- Cloninger, C. R., Przybeck, T. R., Svrakic, D. M., & Wetzel, R. D. (1994a). Basic description of the personality scales. In C. R. Cloninger (Ed.), *The Temperament and Character Inventory (TCI): A guide to its development and use* (pp. 19–27). St Louis, MO: Center for Psychobiology of Personality, Washington University.
- Cloninger, C. R., Przybeck, T. R., Svrakic, D. M., & Wetzel, R. D. (1994b). Clinical and epidemiological applications. In C. R. Cloninger (Ed.), *The Temperament and Character Inventory (TCI): A guide to its development and use* (pp. 107–132). St Louis, MO: Center for Psychobiology of Personality, Washington University.
- Cloninger, C. R., Przybeck, T. R., Svrakic, D. M., & Wetzel, R. D. (1994c). Norms and demographic correlates of the TCI. In C. R. Cloninger (Ed.), *The Temperament and Character Inventory (TCI): A guide to its development and use* (pp. 85–91). St Louis, MO: Center for Psychobiology of Personality, Washington University.
- Cloninger, C. R., Przybeck, T. R., Svrakic, D. M., & Wetzel, R. D. (1994d). Reliability and validity indicators. In C. R. Cloninger (Ed.), *The Temperament and Character Inventory (TCI): A guide to its development and use* (pp. 75–84). St Louis, MO: Center for Psychobiology of Personality, Washington University.
- Cloninger, C. R., Svrakic, D. M., & Przybeck, T. R. (1993). A psychobiological model of temperament and character. *Archives of General Psychiatry*, 50(12), 975–990.
- Cronin, C. (1991). Sensation seeking among mountain climbers. *Personality and Individual Differences*, 12(6), 653–654. doi: 10.1016/S0191-8869(03)00124-7
- Diehm, R., & Armatas, C. (2004). Surfing: An avenue for socially acceptable risk taking, satisfying needs for sensation seeking and experience seeking. *Personality and Individual Differences*, 36(3), 663–677. doi: 10.1016/S0191-8869(03)00124-7
- Freixanet, M. G. (1991). Personality profile of subjects engaged in high physical risk sports. *Personality and Individual Differences*, 12(10), 1087–1093. doi: 10.1016/0191-8869(91)90038-D
- Gil, S., & Caspi, Y. (2006). Personality traits, coping style, and perceived threat as predictors of post-traumatic stress disorder after exposure to a terrorist attack: a prospective study. *Psychosomatic Medicine*, 68(6), 904–909. doi: 10.1097/01.psy.0000242124.21796.f8
- Golimbet, V. E., Alfimova, M. V., Gritsenko, I. K., & Ebstein, R. P. (2007). Relationship between dopamine system genes and extraversion and novelty seeking. *Neuroscience and Behavioral Physiology*, 37(6), 601–606. doi: 10.1007/s11055-007-0058-8
- Gunnarsdottir, E. D., Pingitore, R. A., Spring, B. J., Konopka, L. M., Crayton, J. W., Milo, T., & Shirazi, P. (2000). Individual differences among cocaine users. *Addictive Behaviors*, 25(5), 641–652.
- Han, D. H., Kim, J. H., Lee, Y. S., Bae, S. J., Bae, S. J., Kim, H. J., . . . Lyoo, I. K. (2006). Influence of temperament and anxiety on athletic performance. *Journal of Sports Sciences and Medicine*, 5, 381–289.
- Heath, A. C., Cloninger, C. R., & Martin, N. G. (1994). Testing a model for the genetic structure of personality: a comparison of the personality systems of Cloninger and Eysenck. *Journal of Personality and Social Psychology*, 66(4), 762–775.
- Jack, S. J., & Ronan, K. R. (1998). Sensation seeking among high- and low-risk sports participants. *Personality and Individual Differences*, 25, 1063–1083. doi: 10.1016/S0191-8869(98)00081-6

- Joint Committee on Injury Scaling. (1980). *The Abbreviated Injury Scale (AID). Revision*. Arlington Heights, IL: American Association for Automotive Medicine.
- Maeland, S. (2004). Basehopping-nasjonale selvbilder-sublime opplevelser. [http://www.idunn.no/ts/nat/2004/01]. *Norsk Anthropologisk tidsskrift*, 1, 86–99.
- Monasterio, E., & Mei-Dan, O. (2008). Risk and severity of injury in a population of BASE jumpers. *The New Zealand Medical Journal*, 121(1277), 70–75.
- Monasterio, M. E., Alamri, Y., & Mei-Dan, O. (2012). Personality variables in a population of mountain climbers. Manuscript submitted for publication.
- Mei-Dan, O., Carmont, M. R., & Monasterio, M. E. (2012). The epidemiology of severe and catastrophic injuries in BASE jumping. *Clinical Journal of Sports Medicine*, 22, 262–267.
- Pain, M. T., & Pain, M. A. (2005). Essay: Risk taking in sport. *Lancet*, 366 Suppl 1, S33–34. doi: 10.1016/S0140-6736(05)67838-5
- Richman, H., & Frueh, B. C. (1997). Personality and PTSD II: personality assessment of PTSD-diagnosed Vietnam veterans using the Cloninger Tridimensional Personality Questionnaire (TPQ). *Depression and Anxiety*, 6(2), 70–77.
- Schinka, J. A., Letsch, E. A., & Crawford, F. C. (2002). DRD4 and novelty seeking: results of meta-analyses. [Meta-Analysis]. *American Journal of Medical Genetics*, 114(6), 643–648. doi: 10.1002/ajmg.10649
- Seznec, J. C., Lepine, J. P., & Pelissolo, A. (2003). Dimensional personality assessment of the members of the French junior national team of road cycling. *L'Encephale*, 29(1), 29–33.
- Soreide, K., Ellingsen, C. L., & Knutson, V. (2007). How dangerous is BASE jumping? An analysis of adverse events in 20,850 jumps from the Kjerag Massif, Norway. *The Journal of Trauma*, 62(5), 1113–1117. doi: 10.1097/01.ta.0000239815.73858.88
- Stallings, M. C., Hewitt, J. K., Cloninger, C. R., Heath, A. C., & Eaves, L. J. (1996). Genetic and environmental structure of the Tridimensional Personality Questionnaire: three or four temperament dimensions? *Journal of Personality and Social Psychology*, 70(1), 127–140.
- Svrakic, D. M., Whitehead, C., Przybeck, T. R., & Cloninger, C. R. (1993). Differential diagnosis of personality disorders by the seven-factor model of temperament and character. *Archives of General Psychiatry*, 50(12), 991–999.
- Westman, A., Rosen, M., Berggren, P., & Bjornstig, U. (2008). Parachuting from fixed objects: descriptive study of 106 fatal events in BASE jumping 1981–2006. *British Journal of Sports Medicine*, 42(6), 431–436. doi: 10.1136/bjism.2008.046565
- Wills, T. A., Vaccaro, D., & McNamara, G. (1994). Novelty seeking, risk taking, and related constructs as predictors of adolescent substance use: an application of Cloninger's theory. *Journal of Substance Abuse*, 6(1), 1–20.
- Zuckerman, M. (1983). Sensation seeking and sports. *Personality and Individual Differences*, 4(3), 285–294. doi: 10.1016/0191-8869(83)90150-2
- Zuckerman, M., & Cloninger, C. R. (1996). Relationship between Cloninger's, Zuckerman's and Eysenck's dimensions of personality. *Personality and Individual Differences*, 21(2), 283–285. doi: 10.1016/0191-8869(96)00042-6