CBÜ Beden Eğitimi ve Spor Bilimleri Dergisi
CBU Journal of Physical Education and Sport Sciences

Relationships between Flow Experience, Personality, Emotional Intelligence, and Performance in a Race Car Driving Simulation

Yarış Otomobili Sürüş Simülasyonunda Akış Deneyimi, Kişilik, Duygusal Zeka ve Performans Arasındaki İlişki

ORİJİNAL ARAŞTIRMA
ORIGINAL RESEARCH

Erman DOĞAN[1]
Nihal DAL[2]
İlker BALIKÇI[2]
Serdar TOK[2]

[1] School of Physical Education and Sports, Girne American University
[2] Faculty of Sport Sciences, Celal Bayar University

Yazışma Adresi/Correspondence:
Erman DOĞAN
School of Physical Education and Sports, Girne American University
Girne, T.R.N.C.
ermandogan82@gmail.com
nihal_arc@yahoo.com
ilkerbalikci@hotmail.com
tokserdar@gmail.com

Kabul Tarihi/Accepted: 30/03/2017

Abstract:
Objectives: The primary purpose of this study was to examine the relationship among flow experience, personality, emotional intelligence and performance in race car driving simulation. Another aim of the study was to investigate whether flow experience together with personality and emotional intelligence predicts performance in race car driving simulation.
Material and Methods: Thirty individuals who had at least 2 years' experience with car driving simulation programs and equipment were required to drive two time trials of three laps each in the absence of other competitors. Performances were determined by the mean time taken to complete the 3 laps. Driving simulation was carried out via Play Station 3, Logitech G27 Racing Wheel, as well as its accelerator and brake. Gran Turismo 5 car racing simulation program and LG 102 cm HD TV were also used.
Results: Performance in driving was most strongly related to autotelic experience, extraversion, and utilization of emotion. Different combinations o f p ersonality and emotional intelligence dimensions were able to predict certain flow facets.
Conclusion: The results of the present study indicate that flow experience may have the potential to facilitate driving performance. Further, certain personality and emotional intelligence dimensions may lead to the experience of flow.

Keywords: Flow Experience; Personality; Emotional Intelligence; Driving Simulation

Özet:
Amaç: Bu çalışmanın başlıca amacı; akış deneyimi, kişilik, duygusal zeka ve yarış otomobili sürüş simülasyonundaki performans arasındaki ilişkiyi incelemektir. Çalışmanın bir diğer amacı ise akış deneyiminin, kişilik ve duygusal zeka ile birlikte yarış otomobili sürüş simülasyonundaki performansı öngörüp öngöremeyeceğini araştırmaktır. Gereç ve Yöntemler: Araştırmaya yarış otomobili sürüş simülasyonu konusunda en az iki yıl deneyime sahip 30 erkek katılmıştır. Katılımcılar zamana karşı 2x3 turluk sürüş simulasyonunda en iyi tur zamanını yapmayı denemişlerdir. Sürüş simülasyonu için Play Station 3 oyun konsolu, Logitech G27 direksiyon ve pedal seti, Gran Turismo 5 yarış otomobili simülasyon programı ve LG 102 cm HD TV kullanılmıştır.
Bulgular: Sonuçlar sürüş simülasyonundaki performans ile akış deneyimi alt boyutlarından amaca ulaşma deneyimi arasında güçlü bir ilişkiyi göstermiştir. Kişilik ve duygusal zekanın çeşitli kombinasyonları bazı akış boyutlarını anlamlı olarak öngörebilmiştir. Sonuç: Bu çalışmadan elde edilen sonuçlar akış deneyiminin sürüş performansını kolaylaştırabileceğine işaret etmiştir. Buna ek olarak, bazı kişilik ve duygusal zeka boyutlarının akış deneyimine yatkınlık sağlayabileceği de araştırma sonuçlarında ortaya çıkmıştır.

Anahtar Kelimeler: Akış Deneyimi; Kişilik; Duygusal Zeka; Yarış Simülasyonu

ISSN: 2149-1046

Although a wealth of studies exist documenting the link between negative emotional experiences such as fear, anxiety, and stress with athletic performance, less is known regarding the effect of positive emotional states on performance. The concept of flow might be the most appropriate psychological construct to represent positive emotional experiences associated with better performance. Flow is defined as a state in which people are so intensely involved in an activity that nothing else seems to matter (Csikszentmihalyi, 1990). Flow is a multi-faceted concept that includes several dimensions such as pleasure in, intrinsic motivation to continue, and total immersion in an activity, as well as action awareness merging, lack of self-consciousness, complete concentration, a strong feeling of control, time distortion, goal clarity, and immediate feedback (Jackson, & Eklund, 2004; Bakker, Oerlemans, Demerouti, Slot, & Ali, 2011). Flow is recognized as a psychological factor having the potential to facilitate athletic performance. In fact, from a theoretical point of view, several reasons might explain a link between better athletic performance and flow. For example, "during flow individuals do not worry about failure and instead experience a high sense of control" (Schüler, & Brunner, 2009, p. 168). In addition, Bakker et al. (2011) argued that when in flow, people are concentrating intensely, and they invest all available energy resources.

Interestingly, up to now, researchers focused largely on factors affecting the occurrence of flow (Kaufman, Glass, & Arnkoff, 2009; Elbe, Strahler, Krustrup, Wikman, & Stelter, 2010; Lindsay, Ian, & Thomas, 2005; Swann, Keegan, Piggott, & Crust, 2012) rather than the relationship between flow and performance. Moreover, the existing literature examining the link between flow and performance yields conflicting results despite similar theoretical reasons for a positive relationship between flow and performance. Some studies have provided support for the argument suggesting that flow is performance enhancing in nature (Bakker, Oerlemans, Demerouti, Slot, & Ali, 2011; Jackson, Thomas, Marsh, & Smethurst, 2001). However, in other studies, flow has not been found to be associated with performance (Schüler, & Brunner, 2009; Janson, Archer, & Norlander, 2005; Stoll, & Lau 2005). Therefore, inconsistent research findings suggest that the flow-performance relationship is problematic and further research is needed for a better understanding of the flow-performance association in sports.

In addition, the current literature regarding the flow-performance association reveals several problems. First, as stated by Kimiecik, and Stein, (1992) there is a clear need to investigate the flow in relation to objective performance outcomes. Second, there were difficulties with the methods used to determine athletes' flow experiences in studies aiming to explore the relationship between flow and performance. For example, Schüler and Brunner (2009) examined the effect of flow on performance via retrospective recall in a marathon race where athletes' consume their physical and psychological resources until burnout. Thus, retrospective recall may not be an appropriate method to determine athletes' flow experiences, at least for certain competitions. In other studies (Stavrou, Jackson, Zervas, & Karteroliotis, 2007) researchers used the Flow State Scale (Jackson, & Marsh, 1996), which was developed to assess athletes' experiences of flow for a specific event. However, less is known regarding the effect of athletes' predispositions toward flow on performance. Therefore, the effect of athletes' predispositions to flow deserves careful examination.

Another problematic issue in flow research, as suggested by Jackson, Thomas, Marsh, and Smethurst (2001), is the lack of information regarding the psychological antecedents of flow. Because psychological differences may potentially facilitate or inhibit flow, it might be worthwhile to examine psychological antecedents of flow. In this respect, due to the effect of personality traits on emotional states and arousal, an association between personality and the flow experience may be expected. For example, the trait of neuroticism within the Five-Factor Model of personality has been shown to be associated with higher physiological arousal and cognitive anxiety (Binboga, Guven, Çatıkkas, Bayazit, & Tok, 2012), which is the antithesis of flow (Csikszentmihalyi, 1990). Therefore, it is logical to expect a negative relationship between flow and neuroticism. Contrary to neuroticism, it can be argued that conscientiousness might be a personality trait that facilitates the flow experience due to the ability of conscientious individuals to cope with stress (Bartley, & Roesch, 2011; D'Zurilla, Maydeu-Olivares, & Gallardo-Pujol, 2011; Kaiseler, Polman, & Nicholls, 2012). In the light of the research findings cited above, it can be argued that personality traits may facilitate or inhibit the experience of flow.

An additional line of reasoning that supports a link between flow and personality concerns the role played by personality traits in the attention process. As personality traits may play an important role in the attention process, it might be quite logical to suggest that personality traits, extraversion in particular, may facilitate the experience of flow, which requires a high level of ability to control attention (Csikszentmihalyi, 1990) and to give undivided attention to the task (Goleman, 1995). Previously, it has been suggested that in a demanding psychomotor task requiring a high level of attention and attentional filtering, extraverts may be expected to demonstrate superior performance (Szymura, & Necka, 1998). Therefore, extraversion can be considered a personality trait with the potential to facilitate the occurrence of flow and thus, superior performance.

The trait of emotional intelligence might be another construct that can facilitate the experience of flow. From a theoretical point of view, it can be argued that the defining features of an emotional intelligence trait, such as managing one's emotions (Petrides, & Furnham, 2003), self-control, ability to motivate oneself (Goleman, 1995), and ability to regulate emotions (Mayer, & Salovey, 1997) overlap considerably with flow. Therefore, the trait of emotional intelligence may be a psychological construct potentially associated with the flow experience.

The present study aimed to examine the relationships between performance in a race car driving simulation, personality, emotional intelligence, and flow. Because car racing requires a high level of concentration, emotional control, and perceptual motor skills, flow may have an important effect on performance during a race car driving simulation against time. After his pole position victory in the 1988 Monaca Grand Prix Qualification, the legendary Formula 1 driver, Ayrton Senna stated that "… suddenly I realized that I was no longer driving consciously. I was driving it by a kind of instinct, only I was in a different dimension" (Williams, 1999, p. 99). Senna's statement describing his mental state during the qualifying race provides support for the assumption that the flow experience may facilitate car-racing performance. The secondary purpose of the study was to examine whether personality and emotional intelligence could be psychological correlates of flow.

Based on theoretical reasons and research findings, it was hypothesized that flow should be related to better performance (shorter time to complete a lap) in a race car driving simulation. In addition, the Five-Factor personality trait of extraversion should also be related with better performance in driving simulation. Further, personality traits together with the dimensions of emotional intelligence should predict flow.

METHOD

Participants

Individuals, having at least 2 years' experience with driving simulation, from a local gaming community were invited to take part in the study. 30 males ranging in age from 18 to 25 [23.5 (2.11), mean (*SD*)] accepted to participated the study. Participants were required to abstain from the use of any medications that may affect nervous system function and have no acute or chronic neuromuscular disease or psychiatric disorders.

The Short Form of the Five-Factor Personality Inventory

The Short Form of the Five-Factor Personality Inventory, developed by Tatar (2005) comprises 85-items using a five point Likert-type scale to assess the five main personality traits: neuroticism, extraversion, openness to experience, agreeableness, and conscientiousness. The inventory's manual provides evidence for the reliability and validity of the inventory.

The Schutte Emotional Intelligence Scale

The Schutte Emotional Intelligence Scale, developed by Schutte et al. (1998), revised by Austin, Saklofske, Huang, and McKenney (1998), and adapted for the Turkish population by Tatar, Tok, and Saltukoglu (2011) was used to measure emotional intelligence. The scale contains 41 items; and generates an overall EI score, as well as scores for three subscales: regulation of emotion, appraisal of emotion, and utilization of emotion. Regulation of emotion measures the extent to which people report being able to control their own and others' emotions; utilization of emotion measures the extent to which people report being able to use emotions in solving problems; and appraisal of emotions measures the extent to which people report being able to identify their own and others' emotions. Austin et al. (1998) provided evidence for the construct validity of the first two factors and the full scale's internal reliability.

The Dispositional Flow Scale

The Dispositional Flow Scale, developed by Jackson, and Eklund (2004) and adapted into Turkish by Asci, Cağlar, Eklund, Altintas and Jacson (2007), was used to measure participants' predispositions to flow. The scale features 36 items that require a response using a five-point Likert-type scale. The Dispositional Flow Scale measures nine theorized dimensions of flow: challenge-skill balance, action-awareness merging, clear goals, unambiguous feedback, concentration on the task at hand, sense of control, loss of self-consciousness, time transformation, and autotelic experience.

Driving Simulation

A Sony PlayStation 3 (PS3), equipped with a Gran Turismo 5 racing game, and a Samsung 82 cm HD TV were used to create a realistic driving experience. Participants drove the car with a Logitech G27 Racing Wheel, as well as its accelerator and brake. In order to standardize the experimental conditions, the following race settings were implemented and used by all participants: Tsukuba Circuit and Arta Garia 08 race car, automatic transmission, super soft racing tires, steering assist, and force feedback. As stated by Edmonds, Tenenbaum, Mann, Johnson, and Kamata, (2008) such a set up "consisting of advanced processors, software, and hardware brings realism to the gaming experience, which has made this particular unit useful as a training device for race-car drivers."

Task

Participants were required to complete two separate time trials in the absence of other competitors. Participants were instructed to do their best to drive as fast as possible. Each time a trial consisted of 3 laps with a 3-minute rest period between time trials. Participants' performances were determined by means of time to complete the 3 laps. Performance times were displayed and recorded automatically by the PS3. Lap times were also recorded manually by the experimenter. Participants' best time trial was recognized as the actual performance.

Statistical Analyses

Pearson product-moment correlation coefficients and regression analyses were performed in order to analyze the experimental data. The SPSS version 11.0 software package was used for statistical analyses.

RESULTS

Relationships Between Flow, Personality, and Emotional Intelligence, with Performance

Pearson product-moment correlation coefficients were calculated in order to examine the relationships between flow, personality, the trait of emotional intelligence, and driving performance. As shown in Table 1, driving performance was negatively and significantly related to the flow dimensions of challenge-skill balance, clear goals, concentration on task, sense of control, and autotelic experience, which means that these flow dimensions were associated with faster lap times during the driving simulation. Of the Five-Factor personality traits, only extraversion was significantly related to faster lap times. None of the emotional intelligence dimensions was significantly related to driving performance.

Table 1. The Relationship between Flow Experience, Personality, Emotional Intelligence and Driving Performance

	Chal-Skill Balance	Action Awareness	Clear Goals	Unambiguous Feedback	Concentration on Task	Sense of Control	Loss of Self-Conscious	Time Transform	Autotelic Experience	Driving Performance
Driving Performance	-.38*	-.23	-.40*	-.20	-.46*	-.43*	-.13	-.10	-.55**	-
Extraversion	.44*	.37*	.39*	.21	.24	.41*	.06	-.01	.33	-.60**
Agreeableness	.16	-.10	.15	.06	.40*	.40*	-.32	.04	.17	-.04
Conscientiousness	.48**	.44*	.53**	.29	.62**	.62**	.15	.08	.25	-.07
Neuroticism	-.30	-.28	-.34	.-17	-.28	-.47**	-.27	.00	-.18	-.08
Openness	.38*	.18	.52**	.29	.33	.43*	.18	-.02	.33	-.21
Regulation of Emotions	.45*	.49**	.46*	.19	.51**	.55**	.29	.03	.37*	-.17
Utilization of Emotions	.10	.01	.01	.19	-.04	-.09	-.26	.29	-.03	-.26
Appraisal of Emotions	.31	.34	.46*	.22	.25	.42*	.20	-.36	.17	-.18

*p<.05, **p<.01

In order to test whether the flow dimensions, together with the Five-Factor personality traits, and the trait of emotional intelligence could significantly predict variation in driving performance, a stepwise regression analyses was conducted. In the resulting final model, only extraversion, autotelic experience, and utilization of emotions significantly explained variations in driving performance ($R^2 = 0.60$; $F(3, 26) = 12.99$, $p = .001$).

Table 2. Predictive Ability of Flow Experience, Personality, and Emotional Intelligence to Driving Performance

Independent Variables	B	β	t	R	R^2
Extraversion	-2.97	-.53	-3.94	.77	.60
Autotelic Experience	-.45	-.39	-2.98		
Utilization of Emotions	-.28	-.31	-2.49		
Constant	87.39		20.34		

Relationships Between Flow and Personality

In regards to flow and personality, there were several significant relationships. As be indicated in Table 1, the flow dimension of sense of control was positively related to extraversion, agreeableness, conscientiousness, and openness, and negatively related to neuroticism. In addition, the flow domains of challenge-skill balance and clear goals were positively related to extraversion, conscientiousness, and openness. Action awareness was positively related to extraversion and conscientiousness. Concentration on task was only positively related to agreeableness and conscientiousness. Finally, the other flow dimensions of unambiguous

feedback, loss of self-consciousness, time transformation, and autotelic experience were not significantly related to personality traits.

Relationships Between Flow and Emotional Intelligence

The emotional intelligence dimension of regulation of emotions was positively and significantly related to challenge-skill balance (r = .45), action awareness (r = .49), clear goals (r = .46), concentration on task (r = .51), sense of control (r = .55), and autotelic experience (r = .37). No relationship was observed between utilization of emotions and flow. Appraisal of emotions was only significantly related to clear goals (r = .46) and sense of control (r = .42).

Predictive Ability of Personality and Emotional Intelligence for Flow Dimensions

As presented in Table 2, stepwise regression analyses indicated that different combinations of personality and emotional intelligence could significantly predict several dimensions of flow. Thus, conscientiousness and extraversion explained a significant amount of variance in challenge-skill balance (R^2 = .39; F(2, 27) = 8.57, p = .001). Conscientiousness together with openness could also explain a significant amount of variance in clear goals (R^2 = .43; F(2, 27) = 10. 16, p = .001). Moreover, conscientiousness alone could explain a significant amount of variance in concentration on task (R^2 = .38; F(1, 28) = 17.41, p = .001). Among the emotional intelligence dimensions, only regulation of emotions explained variance in action awareness (R^2 = .24; F(1, 28) = 9.02, p = .006) and autotelic experience (R^2 = .13; F(1, 28) = 4.18, p = .047).

Table 3. Predictive Ability of Personality, and Emotional Intelligence to Flow Experience Dimensions

Independent Variables	B	β	t	R	R^2
			Challenge–Skill Balance		
Conscientiousness	1.67	.44	2.91		
Extraversion	1.98	.40	2,67	.62	.39
			Action Awareness		
Regulation of Emotions	.22	.49	3.00	.44	.24
			Clear Goals		
Conscientiousness	1.48	.41	2.76	.65	.43
Openness	1.96	.40	2.66		
			Concentration on Task		
Conscientiousness	3.44	.62	4.17	.62	.38
			Autotelic Experience		
Regulation of Emotions	.151	.37	2.08	.36	.13

DISCUSSION

In the present study, flow was examined as a predictor of performance in a car-racing task. This study also aimed to determine possible psychological correlates of flow, namely personality and emotional intelligence traits.

Among the flow dimensions, autotelic experience was the strongest predictor of performance in the driving task. In the current study, the trait version of the Flow Scale was used which may aid in understanding the autotelic personality (Jackson, Kimiecik, Ford, & Marsh, 1998). Therefore, it can be argued that underlying facets of the autotelic personality may provide a logical basis for the link between the autotelic experience dimension of the Flow Scale and performance in the experimental task used in this study.

In this respect, Csikszentmihalyi (1990) considers the ability to control stimulus inclusion or exclusion one of the most important features of the autotelic experience. As the experimental task used in this study required an extreme level of concentration and the ability to filter (or exclude) irrelevant stimuli, the results of the present study provide support for the link between performance and the attention related features of the autotelic personality. Therefore, based on the results observed in this study it can be argued that a predisposition to autotelic experience may facilitate performance in attentionally demanding tasks.

Csikszentmihalyi (1990) considers intrinsic motivation as the other essential feature of the autotelic personality. Thus, autotelic experience should occur in intrinsically rewarding activities, done for their own sake, and where attention is not focused on their consequences. Consequently, an experimental task that provides an opportunity to drive a high performance car without risk, which can be highly enjoyable, may foster the occurrence of autotelic experience, which in turn facilitates performance in the driving task.

Extraversion was revealed as another significant predictor of performance in the driving task. The theoretical reason explaining the link between faster lap times and extraversion is related to the cortical arousal level of extraverts. According to Eysenck (1967), extraverts are less cortically aroused and seek to raise their arousal level. Accordingly, extraverts are expected to perform better in demanding tasks (Szymura, & Necka, 1998). Hence, driving a high performance car may provide the additional excitation they are seeking. However, it must be noted that there is strong evidence demonstrating that the effect of extraversion on performance may depend entirely on situational factors.

Predictions regarding the flow-personality association were partially supported. Different combinations of the Five-Factor traits could significantly predict variations in flow, indicating that certain personality traits may lead to predispositions to experience flow. In this respect, extraversion could only predict the challenge-skill balance. It seems that driving a performance car against time, which can stimulate a higher level of excitation, leads to the occurrence of challenge-skill balance in extraverts. Further, psychological characteristics such as self-confidence and assertiveness, which are necessary for the balance of challenge and skill, are also sub facets of extraversion (Matthews, Deary, & Whiteman, 2003). Therefore, extraverted individuals may have a higher predisposition to experience challenge-skill balance, at least in certain demanding activities.

Conscientiousness was found to be another significant predictor of challenge-skill balance. The first line of reasoning supporting this association concerns the features of conscientiousness. Highly conscientious individuals are persistent, self-disciplined, achievement-oriented, organized, attentive, persistent, and focused on obtaining good results (Chamorro-Premuzic & Furnham, 2004; Furnham, Chamorro-Premuzic & McDougall, 2002) and thus, have confidence to achieve better lap times in a driving simulation, and seem predisposed to experience a balance of challenge and skill.

The second line of reasoning for the association between conscientiousness and challenge-skill balance is related to highly conscientious individuals' responses to stress, which can facilitate the occurrence of flow. In previous studies, it has been demonstrated that conscientious individuals tend to choose problem-focused coping strategies, which may lead these individuals to cope better with stress (Bartley, & Roesch, 2011). Moreover, Kaiseler, Polman, and Nicholls (2012) found conscientiousness to be associated with higher perceived stress control. Finally, Nater, Hoppmann, and Klumb (2010) found high levels of conscientiousness to be associated with reduced systemic cortisol concentrations. Therefore, due to their ability to cope with stress, conscientious individuals should be considered more predisposed to experience a challenge-skill balance. Although, this study is exploratory in nature, in a previous study by Ullen et al. (2012), conscientiousness was also found to predict flow in everyday life. Furthermore, Ullen et al. (2012) suggested that high conscientiousness involves emotional and motivational mechanisms that make an individual engage in flow promoting activities.

Conscientiousness was also found to be a significant predictor of the clear goals dimension of flow. It seems that hardworking, motivated, and goal-directed conscientious individuals are more prone to experience flow when the goals are clear.

Despite recent research findings (Ullen et al., 2012; Ross, & Keiser, 2014) indicating the lack of association between flow and openness, openness could predict the clear goals dimension of flow in this study. The two studies cited above examined the relationship between flow and personality in everyday life. However, in the current study the same relationship was examined in a very specific activity in a limited time period. These contradictory results clearly indicate that the relationship between personality and flow may depend on the context. Therefore, in future studies researchers should consider the context for a better understanding of the flow-personality relationship.

The last flow dimension having an association with personality was concentration on task. Conscientiousness was the sole predictor of the concentration on task dimension of flow. Despite the lack of research findings examining the relationship between conscientiousness and the flow dimension of concentration on task, results from other fields of psychology provide support for such a relationship. In several recent studies, low conscientiousness has been found to be an important marker of attention deficit and hyperactivity disorder in children and adolescents (Martel, Nikolas, Jernigan, Friderici, & Nigg, 2010; Miller, Miller, Newcorn, & Halperin, 2008). However, it must be noted that in certain circumstances having more than one stimulus, conscientiousness may inhibit performance (Maclean & Arnell, 2010).

Among the emotional intelligence dimensions, only regulation of emotions predicted a small yet significant amount of variance in action awareness and autotelic experience. As

pleasure, intrinsic motivation, and the lack of anxiety are key elements of flow, individuals with well-developed emotional abilities who are less likely to be paralyzed by fear, hijacked by negative emotions, and strangled by anxiety (Seipp, 1991) may be more predisposed to experience to flow.

CONCLUSION

The results of the present study support the argument that flow may facilitate performance. However, it should be noted that the relationship between a particular trait and performance might be assessed by testing in the presence of a threat (Matthews, Deary, & Whiteman, 2003). In the present study, the driving task was executed virtually in the absence of other competitors. Thus, there was no real threat and the hedonic tone of arousal was possibly positive. Taken together, it can be argued that flow facilitates performance only in no-threat or pleasant conditions. In future studies, the flow-performance relationship should be examined in different settings.

REFERENCES

Asci, F. H., Cağlar, E., Eklund, R. C., Altintas, A., & Jacson, S. (2007). The adaptation study of Dispositional Flow State-2 and Flow State Scale-2. *Hacettepe Journal of Sport Sciences, 18*(4), 182-196.

Austin, E. J., Saklofske, D. H., Huang, S. H., & McKenney, D. (2004). Measurement of trait emotional intelligence: testing and cross-validating a modified version of Schutte et al.'s (1998) measure. *Personality and Individual Differences, 36*(3), 555–562.

Bakker, A. B., Oerlemans, W., Demerouti, E., Slot, B. B., & Ali, D. K. (2011). Flow and performance: A study among talented Dutch soccer players. *Psychology of Sport and Exercise, 12*(4), 442–450.

Bartley, C. E., & Roesch, S. C. (2011). Coping with Daily Stress: The Role of Conscientiousness. *Personality and Individual Differences, 50*(1), 79–83.

Binboga, E., Guven S., Catikkas, F., Beyazit O., & Tok, S. (2012). Psychophysiological Responses to Competition and the Big Five Personality Traits. J*ournal of Human Kinetics, 33*(1), 187-194.

Chamorro-premuzic, T., & Furnham, A. (2004). A possible model for understanding the personality – intelligence interface. *British Journal of Psychology, 95*(2), 249–264.

Csikszentmihalyi, M. (1990). Flow: The psychology of optimal experience. New York: Harper and Row.

D'Zurilla, T. J., Maydeu-Olivares, A., & Gallardo-Pujol, D. (2011). Predicting social problem solving using personality traits. *Personality and Individual Differences, 50*(2), 142–147.

Edmonds, W. a, Tenenbaum, G., Mann, D. T. Y., Johnson, M., & Kamata, A. (2008). The effect of biofeedback training on affective regulation and simulated car-racing performance: a multiple case study analysis. *Journal of Sports Sciences, 26*(7), 761–73.

Elbe, a-M., Strahler, K., Krustrup, P., Wikman, J., & Stelter, R. (2010). Experiencing flow in different types of physical activity intervention programs: three randomized studies. *Scandinavian Journal of Medicine & Science in Sports, 20*(1), 111–7.

Eysenck. H. J. (1967). *The Biological Basis of Personality*. Springfield, IL: Thomas.

Furnham, A., Chamorro-Premuzic, T., & McDougall, F. (2002). Personality, cognitive ability, and beliefs about intelligence as predictors of academic performance. *Learning and Individual Differences, 14*(1), 47–64.

Goleman, D. (1995). Emotional intelligence. New York: Bantam.

Jackson SA, & Eklund RC. (2004). The Flow Scales Manual. Morgantown, WV: Fitness Information Technology, Inc.

Jackson, S. A. (2001). Relationships between Flow , Self-Concept , Psychological Skills , and Performance. *Journal of Applied Sport Psychology, 13*(2), 129-153.

Jackson, S. A., & Marsh, H. W. (1996). Development and validation of a scale to measure optimal experience: The Flow State Scale. *Journal of Sport & Exercise Psychology, 18*(1), 17–35.

Jackson, S. A., Kimiecik, J. C., Ford, S., & Marsh, H.W. (1998). Psychological correlates of flow in sport. *Journal of Sport and Exercise Psychology, 20*(4), 358-378.

Jackson, S. a., Thomas, P. R., Marsh, H. W., & Smethurst, C. J. (2001). Relationships between Flow, Self-Concept, Psychological Skills, and Performance. *Journal of Applied Sport Psychology, 13*(2), 129–153.

Janson, L., Archer, T., & Norlander, T. (2005). Achievement of timing in the highest competitive level: the necessity of a "driving conviction". *Athletic Insight: Online Journal of Sport Psychology, 7*(2).

Kaiseler, M., Polman, R. C. J., & Nicholls, A. R. (2012). Effects of the Big Five personality dimensions on appraisal coping, and coping effectiveness in sport. *European Journal of Sport Science, 12*(1), 62–72.

Kaufman, K. A., Glass, C. R., & Arnkoff, D. B. (2009). Evaluation of Mindful Sport Performance Enhancement (MSPE): A

New Approach to Promote Flow in Athletes. *Journal of Clinical Sports Psychology, 3*(4), 334–356.
Kimiecik, J. C., & Stein, G. L. (1992). Examining flow experiences in sport contexts: conceptual issues and methodological concerns. *Journal of Applied Sport Psychology, 4*(2), 144-160.
Lindsay, P., Maynard, I., & Thomas, O. (2005). Effects of hypnosis on flow states and cycling performance. *The Sport Psychologist, 19*(2), 164-177.
Maclean, M. H., & Arnell, K. M. (2010). Personality predicts temporal attention costs in the attentional blink paradigm. *Psychonomic Bulletin & Review, 17*(4), 556–62.
Martel, M. M., Nikolas, M., Jernigan, K., Friderici, K., & Nigg, J. T. (2010). Personality mediation of genetic effects on Attention-Deficit/Hyperactivity Disorder. *Journal of Abnormal Child Psychology, 38*(5), 633–43.
Matthews, G., Deary, I. J., Whiteman, M. C. (2003). Personality Traits. Cambridge University, Cambridge.
Mayer, J. D., & Salovey, P. (1997). What is emotional intelligence. In P. Salovey, & D. Sluyter, Emotional development and emotional intelligence: *Educational implications (pp. 3-34). New York: Basicbooks, Inc.*
Miller, C. J., Miller, S. R., Newcorn, J. H., & Halperin, J. M. (2008). Personality characteristics associated with persistent ADHD in late adolescence. *Journal of Abnormal Child Psychology, 36*(2), 165–73.
Nater, U. M., Hoppmann, C., & Klumb, P. L. (2010). Neuroticism and conscientiousness are associated with cortisol diurnal profiles in adults-role of positive and negative affect. *Psychoneuroendocrinology, 35*(10), 1573–7.
Petrides, K. V. & Furnham, A. (2003). Trait Emotional Intelligence : Behavioural Validation in Two Studies of Emotion Recognition and Reactivity to Mood Induction. *European Journal of Personality, 17*(3), 39–57.
Ross, S. R., & Keiser, H. N. (2014). Autotelic personality through a five-factor lens: Individual differences in flow-propensity. *Personality and Individual Differences, 59*, 3-8.
Schüler, J., & Brunner, S. (2009). The rewarding effect of flow experience on performance in a marathon race. *Psychology of Sport and Exercise, 10*(1), 168–174.
Schutte, N. S., Malouff, J. M., Hall, L. E., Haggerty, D. J., Cooper, J. T., Golden, C. J., & Dornheim, L. (1998). Development and validation of a measure of emotional intelligence. *Personality and Individual Differences, 25(2)*, 167–177.
Seipp, B. (1991). Anxiety and academic performance: A meta-analysis. *Anxiety Research, 4(1)*, 46–53.
Stavrou, N. A., Jackson, S. A., Zervas, Y., & Karteroliotis, K. (2007). Flow experience and athletes' performance with reference to the orthogonal model of flow. *The Sport Psychologist, 21*(4), 438–457.
Stoll, O., & Lau, A. (2005). Flow-Erleben beim Marathonlauf – Zusammenhange mit Anfoderungspassung und Leistung. [Experiencing ''flow'' during a marathon. Associations with the fit between demand and ability]. *Zeitschrift für Sportpsychologie, 12*(3), 75–82.
Swann, C., Keegan, R. J., Piggott, D., & Crust, L. (2012). A systematic review of the experience, occurrence, and controllability of flow states in elite sport. *Psychology of Sport and Exercise, 13*(6), 807–819.
Szymura, B., & Necka, E. (1998). Visual selective attention and personality: An experimental verification of three models of extra version. *Personality and Individual Differences, 24*(5), 713–729.
Tatar, A. (2005). Çok boyutlu kişilik envanteri'nin madde-cevap kuramina göre kisa formunun geliştirilmesi ve psikometrik özelliklerinin incelenmesi [Development of the short form multidimensional personality inventory and examination of its psychometric properties according to item response theory]. (unpublished Doctoral dissertation). Ege University, Izmir.
Tatar, A., Tok, S., & Saltukoglu, G. (2011). Adaptation of the Revised Schutte Emotional Intelligence Scale into Turkish and Examination of its Psychometric Properties. *Bulletin of Clinical Psychopharmacology, 21*(4), 325-338.
Ullén, F., de Manzano, Ö., Almeida, R., Magnusson, P. K. E., Pedersen, N. L., Nakamura, J., Csíkszentmihályi, M., & Madison, G. (2012). Proneness for psychological flow in everyday life: Associations with personality and intelligence. *Personality and Individual Differences, 52*(2), 167–172.
Williams, R. (1999). The death of Ayrton Senna. New York: Penguin Books.