

Dealing with stress during tennis competition. The association of approach- and avoidance-coping with metacognition and achievement goal theory perspectives.

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Abstract

The present study investigated the relations between different forms coping during tennis competition, with players' metacognitive processes during training, their achievement goals and their perceptions about the motivational climate coaches create. Two hundred and twenty six ($n = 226$) national level Greek tennis players (105: male, 118: female, 4: did not declare gender), aged 15.21 ± 2.32 with 6.8 ± 2.68 years of tennis experience participated the study. The results of a series of regression analyses revealed that metacognition during tennis training contributed to the explanation of a significant amount of variance of all the approach-coping forms that were examined. Mastery goal was also a significant predictor of the variance of two approach-coping forms whereas it was negatively related with two of the avoidance-coping forms. Performance goals and climates were positively related with the avoidance-coping forms. These findings indicate that metacognitive thinking in training and mastery goals and climates should be endorsed in tennis because they support the use of approach-coping behaviours in stressful situations during competition.

Key words: tennis, coping, stress, metacognition, achievement goal theory

Introduction

Through the whole of a competition event there are a lot of times in which athletes at every level and every sport, have not only to overcome physical fatigue but also to deal with psychological pressure and possible unpleasant emotions. The athletes' cognitive and behavioural responses during depressing match situations are described in psychology literature as "coping" processes. Effective coping has been proven that can help athletes reduce anxiety and maintain high levels of performance by affecting positively their motivation, concentration and attention (Lazarus, 2000). Therefore, research regarding effective coping has been a main topic in the field of sport psychology (for an extensive review see: Nicholls and Polman, 2007).

A theoretical framework that has been used broadly for the study of coping responses in sports is the "approach/avoidance" model (Roth & Cohen, 1986), which discriminates athletes' cognitive and behavioural coping strategies in approach- and avoidance-coping strategies. Approach-coping aims to help athletes understand and control the situation which produces pressure, whereas avoidance-coping demonstrates athletes' consciously efforts to reduce the significance of the problem and disengage from the source which generates the pressure (Anshel, 2001).

The question if there is a function of coping which always produces better results cannot be completely answered since coping effectiveness relies upon individual differences (Bebetsos & Antoniou, 2003; Calmeiro, Tenenbaum, & Eccles, 2014; Hammermeister & Damon, 2004; Rogowska & Kusnierz, 2012) and individuals' perceptions about the particular situation. According to athletes' opinion, both approach- and avoidance-coping strategies can be useful on diminishing the pressure which they often meet in sport competition (Kim & Duda, 2003). In general, avoidance-coping is usually most effective in cases where individuals feel that they do not have control on the situation and additionally judge that further effort will not bring any profit (Carver, Scheier, & Weintraub, 1989). For instance, it was found that avoidance-coping was the most suitable form of coping for athletes who had to deal with the stress generated during long-term rehabilitation from an injury (Carson & Polman, 2010) and for sports officials who had to deal with the pressure which is often caused by the spectators, the athletes, or the team officials during a competition event (Kaisidis-Rodafinos, Anshel, & Porter, 1997).

Currently, it is widely accepted that the effectiveness of every coping response should not be judged only by considering results but in cooperation with its long-term results (Hatzigeorgiadis & Chroni, 2007a; Nicholls & Polman, 2007). As for this, many researchers support the notion that the habitual repetition of avoidance-coping forms during competition could lead athletes to maladaptive behaviours and can reduce their levels of motivation and/or to misplace their interest and enjoyment about the sport (Carver, Scheier, & Weintraub, 1989; Hatzigeorgiadis & Chroni, 2007a; Kim & Duda, 2003; Mullen & Suls, 1982). Therefore, they suggest that

trainers and coaches have to create the suitable conditions which reinforce their athletes to adopt more often approach-coping in the direction of encouraging adaptive outcomes in the long-term.

Since coping is a conscious and continuous transaction between the person and the environment, several variables (*personality dispositions, environmental-situational characteristics*) contribute to the way an athlete prefers to cope with stressful events (Anshel, 1996; Ntoumanis & Biddle, 2000). According to Lazarus, (1991) individuals' coping preferences depend on the goals which they try to attain in a particular situation. Based on this assumption, sport psychologists examined different coping forms within the context of social-cognitive theory of achievement (Ames, 1992; Dweck & Legget, 1988; Nicholls, 1989). This model, which has been proven very applicable in sport and exercise psychology, suggests that in achievement settings like sports, there are two primary types of orientations which rely on how people perceive and evaluate their competence: "performance-" or "ego-orientation" and "mastery-" or "task-orientation". Existing research in sport and physical activity settings established that these two different orientations, are originated by individual differences (Duda & Nicholls, 1992) and environmental factors (Seifriz, Duda, & Chi, 1992) producing different motivational and behavioural outcomes. Extending the value of this model, lot of research has been done regarding the effects of the environment on the motivation of sport and physical activity participants. In particular, following this approach, the participants' perceptions about the psychological climate of the environment were also classified in "perceptions of performance-" and of "mastery-motivational climate" (Duda, 2001; Ntoumanis, & Biddle, 1999; Papaioannou, Marsh, & Theodorakis, 2004).

Expanding the first version of achievement goal theory, Elliot (1999) distinguished both mastery- and performance- dimensions in approach- and avoidance- dimensions introducing a 2X2 framework of achievement goals: mastery-approach, mastery-avoidance, performance-approach and performance-avoidance goals. This model's applicability in sport settings has been examined mainly by using the three out of the four dimensions, excluding the mastery-avoidance goal because the remaining three goals are considered as the most common goals in most achievement settings (Elliot & Thrash, 2001; Elliot & Conroy, 2005)*. Accordingly, following this framework's definitions, the climate of an environment can be described as mastery, performance-approach or performance-avoidance motivational climate (Cury, Da Fonseca, Rufo, & Sarrazin, 2002; Conroy, Kaye, & Coatsworth, 2006).

Research regarding the relationships of coping with achievement goals and motivational climates following the dichotomous framework (Ames, 1992; Dweck & Legget, 1988; Nicholls, 1989) revealed that athletes with high levels of mastery-orientation or athletes who perceived the motivational climate of their environment as mastery-orientated demonstrated more adaptive coping behaviours such as persistence, planning, goal-setting, positive self-talk, seeking for advice or guidance and less behavioural disengagement. On the contrary, athletes with high levels of performance-orientation or who perceived the motivational climate of their environment as performance-orientated exhibited dysfunctional coping behaviours like low levels of effort, negative self-talk and behavioural disengagement (Harwood, Keegan, Smith, & Raine, 2015).

The results of the studies which were based on Elliot's (1999) trichotomous framework were in the same vein regarding mastery and performance-avoidance goals. In sum, it was indicated that mastery-goals and mastery-motivational climates facilitate positive motivational and behavioural outcomes whereas, performance-avoidance goals or motivational climates were linked with amotivation and maladaptive behaviours like problem focused coping (Conroy, Cassidy, & Elliot, 2008; Ommundsen, 2004; Papaioannou, Tsigilis, Milosis, & Kosmidou, 2007a; 2007b; Papaioannou, Simou, Kosmidou, Milosis, & Tsigilis, 2009; Yeatts & Lochbaum, 2013) showing that Elliot's hierarchical model can serve in the prediction of an athlete's behaviour during competition.

Regarding performance-approach goals, several scientists suggest that any research findings concerning them should be interpreted with carefulness. In particular they point out that the interpretation of such findings sometimes leads to equivocal conclusions thus, they claim that performance-approach goals may result positive outcomes in performance under suitable conditions. This could be very often met in certain domains like competitive sports where normative evaluation, which is a central point of the performance dimension, is extremely prevalent since winning by overcoming the others is the desirable outcome (Elliot & Conroy, 2005; Elliot & Moller, 2003; Harwood, Cumming, & Hall, 2003; Lochbaum & Gottardy, 2015; Midgley, Kaplan & Middleton, 2001). Overall, the above-mentioned studies widely showed that personal dispositions and environmental factors underlie and affect one's preference of coping with stressful situations highlighting that cognition is a determinant which influences actual performance in competitive sports.

The present study

Whereas "most sports entail some form of cognitive load" (Elliot & Conroy, 2005, p. 23) nowadays in sport settings, there is a growing research interest on the topic of metacognition (Brick, et al., 2018; Dail, 2014; MacIntyre, et al., 2014), a high-order cognitive construct which helps individuals to monitor, control, and

* A case of mastery-avoidance goal is often met in elderly people during aging, a period in which they gradually lose their physical and mental abilities (Elliot and Thrash²³), or in former elite athletes trying to remain in good physical state or trying not doing worse in comparison with what they had succeed in the past (Elliot and Conroy²⁴).

regulate their cognitions and emotions to meet the demands of a task or a goal. Metacognition is broadly defined as 'an individual's knowledge of, and control over his or her cognitions' (Flavell, 1979) and in other words it could be described as a second-order (*meta-level*) cognitive system which is responsible for monitoring and reflecting upon first-order (*object-level*) cognitive processes. This meta-level system receives information from the object-level system and continually adapts individuals' mental activity in order to help them perform complex cognitive tasks (Buratti & Allwood, 2015). According to several researchers, there are two main components of metacognition: knowledge about cognition and regulation of cognition (Flavell, 1979; Brown, 1987; Brown, Bransford, Ferrara, & Champione, 1983; Jacobs & Paris, 1987; Otero & Campanario, 1992). Knowledge of cognition consists of three sub-processes: declarative knowledge, procedural knowledge and conditional knowledge. Declarative knowledge refers to knowledge about the self and about personal strategies. Procedural knowledge refers to knowledge about how to use these strategies, and conditional knowledge refers to knowledge about when and why to use these strategies. Regulation of cognition includes mental activities which aim to regulate cognition such as information processing, planning, monitoring, evaluation and other cognitive strategies.

Most of the knowledge regarding metacognition comes mainly from research findings in educational settings (e.g. Hacker, Dunlosky, & Graesser, 1998; Mevarech & Fridkin, 2006; Salatas Waters & Schneider, 2010; Vrugt & Oort, 2008; Young & Fry, 2008). As for example, metacognitive skilfulness was found to be positively linked with reading comprehension (Veenman & Beishuizen, 2004), transfer of learning (Ford, Smith, Weissbein, Gully, & Salas, 1998), use of deep processing study strategies, high exam scores (Vrugt & Oort, 2008), critical thinking (Ku & Ho, 2010) and negatively linked with learning disabilities (Sideridis, Morgan, Botsas, Padeliadu, & Fuchs, 2006).

Currently there is not enough knowledge regarding the role of metacognition in the field of competitive sports and physical exercise in general. The existing relevant studies examined mainly relations between students' metacognitive processes during physical education classes and motivation variables, while others examined various aspects of metacognition related with high-skilled performance in competitive sports.

In an early work in physical education (Ommundsen, 2003), found a positive relation between metacognitive/elaboration strategies with students' perception that ability is modifiable, which is a preoccupation of mastery-orientation. Accordingly, Theodosiou and Papaioannou (2006) revealed positive relations between metacognitive processes with task-orientation and with the perception of a mastery-motivational climate. Moreover, they noticed that metacognition played an important role in students' intention for out-of-school physical activity and additionally that served as a mediator of the positive effects of task-orientation and of mastery climate on students' intention for sport involvement.

Other studies (Digelidis, Chatzipanteli, Papaioannou, & Theodosiou, 2011; Papaioannou, Theodosiou, Pashali, & Digelidis, 2012), explored whether different teaching styles affect students' metacognition during motor-skill learning. Student-centered teaching styles (Mosston & Ashworth, 1986), which involve pupils more actively in the decision-making processes of the lesson, were found to be very effective as they allow more space for self-regulation and consequently activate students' metacognitive processes during the lesson. Similar were the results of another study in physical education where it was found that a tactical-focus teaching approach, which emphasizes learning through modified games, positively affected students' intrinsic motivation and their metacognitive processes during physical education (Chatzipanteli, Digelidis, Karatzoglidis, & Dean, 2016). Chatzipanteli and Digelidis (2011) went further and proved that metacognition helped pupils improve their performance accuracy of volleyball service suggesting that higher levels of metacognitive thinking can have positive effects not only on cognitive tasks but also in physical activities.

Additional support to this notion has been recently provided also by other scientists who propose metacognitive frameworks which describe cognitive processes during endurance activities and demonstrate how metacognition helps athletes focus their attention, control their thoughts and regulate their effort during competition (Brick, MacIntyre, & Campbell, 2014; Brick, MacIntyre, & Campbell, 2016; Brick, Campbell, Sheehan, Fitzpatrick, & MacIntyre, 2018). In fact, it is worth noting that high-skilled middle-distance runners report very frequent use of internal-focused thoughts during competition and high levels of strategic knowledge which help them focus their attention, monitor their running pace, judge their performance, and choose the appropriate race strategy (Nietfeld, 2003). A lot of researchers (e.g. Iglesias, García-González, García-Calvo, León, & Del Villar, 2010; McPherson, & Thomas, 1989; Thomas & Thomas, 1994; Wrisberg & Pein, 1990), support the notion that expert athletes in comparison to novice athletes, do not only possess better motor and physical abilities but also, they use their knowledge and thoughts in a different and more elaborate way during sport performance. From this point of view, expertise in sports can be described also by differences in cognitive processes thus, metacognition as a coordinating function of humans' cognition is considered very important in sport performance (MacIntyre, et al., 2014).

Whereas to our knowledge there is lack of studies investigating the role of metacognition in athletes' coping with stressful events, the aim of the present study was to examine possible links of metacognition with different forms of coping during tennis competition, taking into account players' goal-orientations and their perceptions about the coaching climate. The uncovering of the contribution of more cognitive variables to stress management can be proved essential for tennis players since existing research findings indicate that low levels of

anxiety are linked with success in tennis (Terry, Cox, Lane, & Karageorghis, 1996; Filaire, Alix, Ferrand, & Verger, 2009). For the assessment of players' achievement-goals and of their perceptions about the motivational climate, the Elliot's (1999) framework was used. In particular, following related literature suggestions, it was hypothesized that high levels of metacognitive activity during tennis practice and mastery involvement will be positive predictors of players' approach- forms of coping, which are considered adaptive forms of coping. In contrast, low levels of metacognitive activity during practice and performance-avoidance involvement will be positive predictors of players' avoidance- forms of coping which in the long term are considered maladaptive forms of coping. An exploratory approach was decided regarding possible relations of performance-approach involvement with metacognition and the two different forms of coping. The reason for this is that all the aforementioned studies linking metacognition with achievement goals and motivational climates used the dichotomous framework of goal orientations (Ames, 1992; Dweck & Legget, 1988; Nicholls, 1989). Currently, Elliot's (1999) framework of achievement goals is used more often by scientists because it offers them the chance to gain a more detailed knowledge about the nature and the effects of performance-goals. Going into detail, Elliot and Conroy (2005, p. 22) suggest that, in this expanded achievement-goals model, "some performance goals (i.e. performance-approach goals) can have a positive effect on achievement-relevant processes and outcomes, whereas ego/performance goals are nearly exclusively cast in a negative light in the dichotomous model". Further support on this notion comes from a number of researchers who claim that performance goals can be adaptive for certain people and in certain situations when they are combined with high mastery goals (Elliot & Moller, 2003; Midgley, Kaplan, & Middleton, 2001). In fact, existing research (Duda, 1989; Papaioannou, Bebetos, Theodorakis, Christodoulidis, & Kouli, 2006) confirm that athletes can be high in both task- and ego-orientation and that it is possible to demonstrate adaptive outcomes, because they can shift to 'mastery-orientated behaviours' in cases which they feel that they are not able to exhibit their abilities (Whitehead, Andree, & Lee, 2004). For these reasons a definite hypothesis about the relations of performance-approach goal with anyone of the two forms of coping and with metacognition was not pre-defined.

Method

Participants and procedure

Two hundred and twenty-six (105 male, 118 female and 4 did not declare their gender) national level tennis players volunteered to participate in the study. The players were 15.21 (± 2.32) years old with 6.8 (± 2.68) years of tennis experience.

They players were informed that 'the aim of the study was to investigate how tennis players deal with stressful situations during competition, taking into account the way they think during tennis training, personality aspects and team characteristics'. They were asked to recall a stressful situation during tennis competition in the past and having in mind their reactions to answer the questionnaire. In compliance with institutional ethics committee procedures they were ensured that their answers would be kept confidential and that the data coming from them will be used only for the purposes of the study. For players less than 18 years old, consent of agreement by their escorts was requested. The data were collected during national level tennis tournaments.

Measures and instruments

Coping strategies. The Coping in Competition Questionnaire (CIC) was employed to assess coping strategies during competition (Hatzigeorgiadis, 2006; Hatzigeorgiadis & Chroni, 2007b). The instrument consists of 24 items which refer to six coping strategies. Three of them refer to approach-coping (effort increase, planning, and self-talk), while the other three of them refer to avoidance-coping (mental disengagement, behavioural disengagement, and denial).

The questionnaire has been used successfully in previous studies (Hatzigeorgiadis, 2006; Hatzigeorgiadis & Chroni, 2007b) giving evidence of acceptable validity and reliability. Participants responded the questionnaire using a 5-point Likert scale ($1 = \text{not at all}$, $5 = \text{very much}$). Confirmatory analysis revealed adequate goodness-of-fit indices for the six-factor model of the questionnaire ($\chi^2 = 468.43$; $df = 237$; $RMSEA = .066$; $SRMR = .058$).

Metacognition. In order to capture overall metacognitive activity during training, the short version of the Metacognitive Processes in Physical Education Questionnaire (MPIPEQ) modified for training situation, was administered. MPIPEQ is an enriched and adapted version for physical education of the Metacognitive Awareness Inventory (MAI) (Schraw & Dennison, 1994) which is based on Brown's (Brown, 1987) framework. Its construct validity and reliability has been tested in previous studies (Theodosiou & Papaioannou, 2006; Theodosiou, Papaioannou, & Mantis, 2005; Theodosiou, Mantis, & Papaioannou, 2008). The short version of this instrument has been used in a previous study giving also evidence about its validity and reliability (Papaioannou, et al., 2012). Responses were given on 5-point Likert scale ($1 = \text{never}$, $5 = \text{always}$). Confirmatory analysis revealed sufficient goodness-of-fit indices for this one-factor model ($\chi^2 = 59.83$; $df = 27$; $RMSEA = .073$; $SRMR = .055$).

Achievement goals. Participants responded a 24 item questionnaire assessing four dispositional goals: mastery (6 items), performance-approach (6 items) and performance-avoidance (6 items) and social approval (6 items). Responses were given on 5-point Likert scale ($5 = \text{strongly agree}$, $1 = \text{strongly disagree}$). The scale has been also used in previous studies which supported its validity and reliability (Papaioannou, et al., 2009).

Confirmatory analysis revealed marginal goodness-of-fit indices for this four-factor model (*chi square* = 587.00; *df* = 246; *RMSEA* = .078 *SRMR* = .075). Although data concerning social approval goal were worthy to explore, the dropout of this subscale was decided in order not to increase the length and the complexity of this article.

Perceptions of coach's emphasis on goals. A short version of the Perceptions of Teacher's Emphasis on Goals Questionnaire (Papaioannou, et al., 2007a; 2007b), modified for tennis training and game situations was used to assess coach's emphasis on different dispositional goals. For the same reasons mentioned above we excluded the data coming from the coach's emphasis on social approval goal scale thus, a 12-item scale was used to assess coach's emphasis on mastery (4 items), performance-approach (4 items) and performance-avoidance (4 items) achievement goals. Responses were given on 5-point Likert scale (5 = *strongly agree*, 1 = *strongly disagree*). The results of the confirmatory factor analysis of this model were not satisfactory (*chi square* = 131.46; *df* = 51; *RMSEA* = .084 *SRMR* = .098). However, taking into account: (a) that the instrument has been used successfully in previous studies showing excellent factor structure, convergent and predictive validity (Papaioannou, et al. 2007a), (b) the expectable relationships of the motivational climate subscales with achievement goals subscales and metacognition subscale (Table 1), (c) the acceptable alpha reliabilities for the two climate subscales (Table 1), and (d) the fact that the main focus of this study was not the inspection of the factor structure of this scale, it was decided to use the data coming from this instrument to have a view about the association of different motivational climates with coping during competition.

Results

Cronbach alpha coefficients are presented in table 1. Almost all scales demonstrated adequate internal consistency - except *denial* (.61) and *performance-approach motivational climate* (.68) scales. However, for the same reasons mentioned above it was also decided to keep these scales for the main set of analyses.

Scale scores were computed for all subscales. The results of the correlation analysis (Table 1) indicated that metacognitive activity during tennis training was positively correlated with the three approach-coping scales, with mastery goal and with mastery motivational climate. Moreover, it was negatively correlated with behavioural disengagement, performance-avoidance goal and performance-avoidance climate scales. As it was expected mastery goal scale was positively correlated with the three forms of approach-coping and with mastery motivational climate. In addition, it was negatively correlated with two of the three avoidance-coping scales (behavioral disengagement and denial) and with performance-avoidance goal and climate. Performance-approach goal was positively correlated with performance-avoidance goals, both approach- and avoidance-performance climates and with self-talk, denial, and mental disengagement scales.

Accordingly, performance-avoidance goal was positively correlated with the three performance-avoidance forms of coping with performance-approach goal and with both performance climates whereas, it was negatively correlated with effort-increase scale. The highest positive correlation was demonstrated between behavioral disengagement and denial scales (.54) and the highest negative correlation between effort-increase and behavioral disengagement scales (-.55).

Table 1. Correlations between metacognition, different forms of coping, achievement goals coaching motivational climates and Cronbach's α on the diagonal

	<i>Approach-coping</i>			<i>Avoidance-coping</i>			<i>Achievement goals</i>			<i>Motivational climates</i>			
	1	2	3	4	5	6	7	8	9	10	11	12	13
.Metacognition	.77												
2.Effort-increase	.49**	.82											
3. Self-talk	.46**	.53**	.84										
4. Planning	.46**	.51**	.50**	.78									
5.Behavioural disengagement	-.18*	-.55**	-.16*	-.20**	.74								
6. Denial	-.04	-.34**	-.08	-.10	.54**	.61							
7.Mental disengagement	-.10	-.10	.16*	.08	.29**	.30**	.73						
8. Mastery	.43**	.47**	.35**	.31**	-.27**	-.24**	-.11	.82					
9. erformance-approach	.04	-.04	.16*	-.03	.04	.14*	.22**	-.03	.84				
10. erformance-avoidance	-.27**	-.22**	-.07	-.12	.24**	.19**	.21**	-.38**	.29**	.83			
11.Mastery climate	.28**	.20**	.13	.23**	-.06	-.13	-.14*	.50**	-.03	-.29**	.74		
12. erformance-approach climate	.09	.08	.05	-.01	-.09	.07	.25**	.03	.46*	.15*	-.13*	.68	
13. erformance-avoidance climate	-.19**	-.18**	-.07	-.19**	.18**	.19**	.18**	-.33**	.27**	.55**	-.35**	.23**	.82

** Correlation is significant at the 0.01 level, * Correlation is significant at the 0.05 level

A series of regression analyses following the 'stepwise' procedure was used to examine whether metacognition, achievement goals and coaching motivational climates could predict the different forms of coping during competition. To ensure that there was not multicollinearity between the independent variables the

variance inflation factor (VIF) was calculated. VIF values close to 1 show that multicollinearity does not affect the predictive value of the independent variables (Field, 2009, p. 224). The results of the regression analyses are presented in table 2.

Table 2. Stepwise regression analyses of different forms of coping during competition

Step	Depended Variable	Independed Variables	R ²	SE	R ² Ch	F Ch	β	Sig	VIF
<i>Effort-increase</i>									
1		Mastery goal	.233	.71	.233	52.84**	.48	.000	1.000
2		Mastery goal	.322	.67	.089	22.64**	.34	.000	1.221
		Metacognition					.33	.000	1.221
<i>Self-Talk</i>									
1		Metacognition	.195	.84	.195	42.22**	.44	.000	1.000
2		Metacognition	.234	.82	.039	8.82*	.43	.000	1.003
		Performance-approach goal					.19	.003	1.003
3		Metacognition	.269	.81	.035	8.29*	.34	.000	1.243
		Performance-approach goal					.20	.002	1.004
		Mastery goal					.21	.005	1.240
<i>Planning</i>									
1		Metacognition	.201	.73	.201	42.95**	.45	.000	1.000
2		Metacognition	.223	.72	.022	4.85*	.42	.000	1.033
		Performance-avoidance climate					-.15	.029	1.033
<i>Behavioral disengagement</i>									
1		Mastery goal	.078	.72	.078	14.38**	-.28	.000	1.000
2		Mastery goal	.108	.71	.030	5.72*	-.22	.006	1.132
		Performance-avoidance goal					.18	.018	1.132
<i>Denial</i>									
1		Mastery goal	.073	.70	.073	13.60**	-.27	.000	1.000
2		Mastery goal	.098	.69	.025	4.85*	-.22	.004	1.098
		Performance-avoidance climate					.16	.029	1.098
<i>Mental disengagement</i>									
1		Performance-approach climate	.118	.82	.118	23.18**	.34	.000	1.000
2		Performance-approach climate	.152	.81	.034	6.94*	.31	.000	1.042
		Performance-avoidance goal					.19	.009	1.042

SE: Standard Error, R² Ch: R² Change, F Ch: F change, β: Standardized Beta, VIF: Variance Inflation Factor, ** p<.001, *p<.05

To begin with approach-coping forms, the proposed models explained the 32.2%, 26.9% and 22.3% of the total variance of coping effort, self-talk and planning respectively. Overall, a substantial amount of variance of all the approach-coping forms was explained by metacognitive activity during training. In addition, mastery goal explained a considerable amount of variance of effort-increase and a small but significant amount of variance of self-talk. A significant amount of variance of self-talk was also explained by performance-approach goal. Eventually, a small but unique contribution of performance-avoidance climate on the prediction of planning was noticed. However, the negative beta score for this variable confirmed the inverse relationship between the two variables which was firstly noticed in the correlation analysis.

Regarding avoidance-coping forms, the three proposed models for behavioral disengagement, denial and mental disengagement explained 10.8%, 9.8% and 15.2% of their variance respectively. The significant inverse relationship of mastery goal with behavioral disengagement and with denial, forced mastery goal to be the dominant predictor of these two dependent variables. A small but significant contribution of performance-avoidance goal on the explanation of the variance of behavioral disengagement and of performance-avoidance climate on the explanation of the variance of denial was also noticed. Finally, performance-approach climate and performance-avoidance goal were found to be the only predictors of mental-disengagement.

Discussion

The present study examined the relationships of different forms of coping during tennis competition with players' metacognitive thinking during training, their achievement goal dispositions and their perceptions regarding the motivational environment structured by their coaches. The results suggested that players' levels of metacognitive thinking during training, their achievement goal dispositions and the motivational climate their coaches create, influence their coping preferences during competition.

In detail, the correlation coefficients revealed a direct positive relation of metacognition with all the approach-coping forms and a low negative relation with behavioral disengagement. Additionally, it was found that metacognition contributed to the explanation of a significant amount of variance of the three approach-coping forms, confirming clearly the research hypothesis of the present study. These findings are in line with previous studies in educational settings (Ford, et al., 1998; Veenman, Kerseboom, & Imthorn, 2000; Vrugt & Oort, 2008) which suggest that high levels of metacognitive thinking are linked with the use of self-regulation and deep processing strategies or lower levels of anxiety. Relative to avoidance-coping, approach-coping is considered a more adaptive response, especially in the long-term (Carver, Scheier, & Weintraub, 1989; Hatzigeorgiadis & Chroni, 2007; Kim & Duda, 2003; Mullen & Suls, 1982) as it prompts athletes to face the stressful situation and to apply the suitable strategies to reduce the negative emotions caused by stress.

As far as how metacognition contributes to coping responses, the following assumptions can be made. According to existing literature (Lazarus & Folkman, 1987; Nicholls & Polman, 2007) primary and secondary appraisals are essential elements of coping with a stressful encounter. Primary appraisals involve the identification-classification of the cognitions and emotions which derive from a stressful situation. This identification-classification configures individuals' perceptions about the situation (whether it is harmful, threatening, challenging or benefiting) and relies clearly on metacognitive processes since it handles first-order thoughts and feelings. Secondary appraisals involve assessment of whether the situation could be changed and detection of the most suitable coping option, cognitive procedures which are also dominated by second-order thinking. Moreover, research evidence regarding the general or domain specific nature of metacognition in educational settings suggests that, although the observed metacognitive activity of humans' may be different in specific domains, the underlying metacognitive processes of these actions share the same components. Consequently, it seems that all people possess a personal repertoire of general metacognitive skills which they can apply effectively through practice in new situations (Veenman, Elshout, & Meijer, 1997; Veenman, Van Hout-Wolters, & Afflerbach, 2006). The findings of the present study follow these lines of research whereas it was noticed that there was a direct relationship between metacognition during training and all approach- forms of coping during tennis competition. Hence, it can be assumed that the high levels of metacognitive thinking during training helped athletes to get familiar with the ability to control their thoughts and behaviours and to acquire self-regulation skills which in turn, influenced their coping preferences during competition. As a matter of fact, coping researchers share the same notion as they suggest that human beings who have positive experiences on coping with their problems and overcome them, are much less possibly than others to appraise encounters as threatening but instead to appraise them as challenging and therefore to apply coping strategies to solve them (Lazarus & Folkman, 1987).

The findings regarding achievement goals are in line the notion of Lazarus (1991) who claims that the goals which individuals try to attain in a particular situation influence their final coping preferences. Also, they are in accordance with previous studies regarding achievement goal theory and coping (Harwood, Cumming, & Hall, 2003; Ntoumanis, Biddle, & Haddock, 1999; Pensgaard & Roberts, 2003) which indicate that high mastery-orientated individuals who perceive that they are engaged in environments that emphasize personal improvement are more likely to demonstrate adaptive coping responses which help them to overcome difficulties and stressful situations (Harwood, Cumming, & Fletcher, 2004; Ntoumanis, Biddle, & Haddock, 1999; Pensgaard & Roberts, 2003). Further support to this comes from the finding that mastery-orientation was a negative predictor of two of the avoidance-coping strategies which demonstrates clearly that players with high-mastery orientation are not likely to use avoidance- forms of coping. In agreement with previous studies, our results highlight the importance of mastery-orientation and its reinforcement in sport settings. High mastery-orientated athletes value personal progress itself, they are intrinsically motivated, they face difficulties as challenging and they adopt more frequently self-regulatory cognitions and behaviours to deal with their problems during competition (Gano-Overway, 2008; Harwood, Cumming, & Fletcher, 2004; Ommundsen, 2003; Theodosiou & Papaioannou, 2006). Environments which emphasize mastery-involvement appear to create the necessary substratum for mastery-orientated individuals to operate completely and to emerge the adaptive behaviours which derive from their achievement goal dispositions.

Although expected, the relationships of performance-involvement with the avoidance-coping forms, do not allow robust conclusions due to the low values that were noticed. In general they are in line with the opinion of other researchers (Elliot & Church, 1997; Elliot & Conroy, 2005) who claim that performance-avoidance goal seems to be the worst mode of achievement goals for individuals' motivation and self-regulation. In the present study performance-avoidance goal was linked with avoidance-coping forms which in common do not refer to optimal functioning supporting the aforementioned. Whereas performance-avoidance has to do mainly with the prevention of a negative outcome, it frequently produces adverse effects on any kind of task that requires mental processes and concentration and it is connected with anxiety, self-concerns and distraction. This may be proven very crucial during sports competition, particularly in cases where athletes have to deal with stressful situations and to apply strategies which involve cognitive load (Elliot & Conroy, 2005) therefore, performance-avoidance goal is not considered as a valuable form of motivation widely.

Regarding the relations of performance-approach goal with the different coping forms, low but significantly positive correlations were revealed with self-talk, denial and mental disengagement scales. Almost null relations were noticed between performance-approach goal and all the rest approach- and avoidance-coping forms. Moreover, there was a small but significant contribution of performance-approach goal on the explanation of the variance of self-talk, together with metacognition and mastery-goal. These results partly support the notion that performance-approach and mastery goals can silently coexist (Elliot & Moller, 2003) and may produce positive outcomes especially in structures like sports in which normative evaluation is dominant (Elliot & Conroy, 2005). However, the absence of any relation that was noticed between performance-approach goal and metacognition probably indicates that performance-approach goal contributes on the prediction of self-talk through a different function which does not require the use of metacognitive thinking. In fact, existing research findings in sport settings regarding performance-approach goal and its possible outcomes' also confirm that it has a more complicated relation with them and underscore the need for more research to understand its

underlying processes (Lochbaum, et al., 2017; Lochbaum & Gottardy, 2015; Van Yperen, Blaga, & Postmes, 2014). Up until now it has been proven that gender, age (Lochbaum & Gottardy, 2015), perceived competence (Elliot & Conroy, 2005) and autonomous or controlled motivation (Gaudreau & Braaten, 2016) are variables that can serve as direct or indirect moderators of performance goals' outcomes. However, despite these important findings the results of our study show that there are other hypotheses that should be examined in the future.

The pattern of the relations that were noticed between the motivational climates created by tennis coaches and players' coping preferences revealed the advantages of mastery-climate in comparison to performance-approach and -avoidance climates. The positive links between mastery-climate and all approach-coping forms and metacognition and the low but significant opposite relation with mental disengagement demonstrates the benefits of this form of motivational climate. It appears that structures which emphasize personal improvement and self-referenced criteria of success create the essential substratum for metacognitive thinking helping by this way players to understand and to control possible stressful situations during competition. Interestingly, performance-approach climate was related only with mental disengagement and was the dominant predictor of its variance together with performance-avoidance goal. Hence it can be assumed that environments which emphasize social comparison and the outperforming of the others are the most unpleasant for individuals who try not to exhibit poor performance, as they do not try to deal with the stressful situation and improve their effectiveness but they try not to think about it instead. Consistent with the literature (Conroy, Kaye, & Coatsworth, 2006; Ommundsen, 2004; Papaioannou, et al., 2007b) performance-avoidance climate was proved to be positively linked with all the avoidance-coping strategies and negatively related with metacognition, effort-increase and planning. Moreover it had a low but significant contribution on the explanation of denial and a similar but opposite contribution on the explanation of the variance of planning. It appears that when coaches reinforce social comparison by emphasizing the requirement not to perform poorer than the others probable do not help their athletes to learn how to reflect actively on a stressful situation but instead they drive them to adopt behaviours which are not considered adaptive in contemporary sport psychology.

The present study is not free from limitations. The study revealed links between different stress coping strategies and personality dispositions, environmental characteristics and cognitive processes. However, these links do not allow us to pose clear suggestions about cause-effect relationships. The inadequate goodness-of-fit indexes of the motivational climate scale could also raise questions about the questionnaire's validity. Nevertheless, it could be advocated that the expected correlations of this instrument's subscales with the other variables partly compensate this weakness. Finally, whereas the results of the present study are based on self-report data, it carries all the advantages and disadvantages of self-report measures (Paulhus & Vazire, 2007). Regarding coping in particular, the accuracy of recalling a stressful event always raise threats which have to be taken into account, because many people do not, or they are not able to provide detailed information about it after a long time period. However, whereas the direct recording of a coping response is not always possible, lot of knowledge on this area comes from self report data and researchers have to rely on them taking into account this limitation (Smith, Leffingwell, & Ptacek, 1999).

Conclusion

Overall, the results of present study demonstrated that there are links between players' metacognitive thinking in training and the strategies they use to cope with pressure during tennis competition and gives rise for new research in this field. Moreover, the present results confirmed existed research findings in the field of achievement goal theory which suggest that mastery-goals and climates are linked with deep processing cognitions and approach-coping. Future studies could incorporate other methods of data collection, such as observations or case studies to help scientists to gain new knowledge about the psychological processes which underlie coping behaviour. Furthermore, by performing interventions aiming to affect athletes' metacognitive thinking during training (e.g. Dail, 2014), their achievement goal dispositions and their perceptions about the motivational climate, sport psychologists will be able to discover the exact cause-effect relationships of these variables with coping in tennis competition and in sport settings generally.

References

- Ames, C. (1992). Achievement goals and the classroom motivational climate. In D. H. Schunk & J. L. Meece (Eds.), *Student perceptions in the classroom* (pp. 327-348). Hillsdale, NJ: Lawrence Erlbaum Associates.
- Anshel, M. H. (1996). Coping styles among adolescent competitive athletes. *Journal of Social Psychology, 136*, 311-323.
- Anshel, M. H. (2001). Qualitative validation of a model for coping with acute stress in sports. *Journal of Sport Behavior, 24*, 223-246.
- Bebetsos, E., & Antoniou, P. (2003). Psychological skills of Greek badminton athletes. *Perceptual and Motor Skills, 97*, 1289-1296.
- Brick, N. E., MacIntyre, T. E., & Campbell, M. J. (2014). Attentional focus in endurance activity: New paradigms and future directions. *International Review of Sport and Exercise Psychology, 7*(1), 106-134.

- Brick, N. E., MacIntyre, T. E., & Campbell, M. J. (2016). Thinking and action: A cognitive perspective on self-regulation during endurance performance. *Frontiers in Physiology*, 7, 159. doi: 10.3389/fphys.2016.00159
- Brick, N. E., Campbell, M. J., Sheehan, R. B., Fitzpatrick, B. L., & MacIntyre, T. E., (2018). Metacognitive processes and attentional focus in recreational endurance runners, *International Journal of Sport and Exercise Psychology* X, XXX-XXX DOI: 10.1080/1612197X.2018.1519841
- Brown, A. (1987). Metacognition, executive control, self-regulation and other more mysterious mechanisms. In F. Weinert, & R. Kluwer (Eds.), *Metacognition, motivation and understanding* (pp. 65-116). Hillsdale: Erlbaum.
- Brown, A. L., Bransford, J. D., Ferrara, R. A., & Champione, J. C. (1983). Learning, remembering, and understanding. In J. H. Flavell & E. M. Markman (Eds.), *Handbook of child psychology* (4th ed., Vol. 3, pp. 77-166). New York: Wiley.
- Buratti, S., & Allwood, C. M. (2015). Regulating metacognitive processes-support for a meta-metacognitive ability. In A. Pena-Ayala (Eds.), *Metacognition: Fundaments, applications, and trends*. Cham, SWI: Springer International Publishing.
- Calmeiro, L., Tenenbaum, G., & Eccles, D.W. (2014). Managing pressure: patterns of appraisals and coping strategies of non-elite and elite athletes during competition. *Journal of Sport Sciences*, 32(19), 1813-1820.
- Carson, F., & Polman, R. C. J. (2010). The facilitative nature of avoidance coping within sports injury rehabilitation. *Scandinavian Journal of Medicine and Science in Sports*, 20, 235-240.
- Carver, C. S, Scheier, M. F., & Weintraub, J. K.(1989). Assessing coping strategies: A theoretically based approach. *Journal of Personality and Social Psychology*, 56, 267-283.
- Chatzipanteli, A., & Digelidis, N. (2011). The influence of metacognitive prompting on students' performance in a motor skills test in physical education. *International Journal of Sports Science and Engineering*, 5(2), 093-098.
- Chatzipanteli, A., Digelidis, N., Karatzoglidis, C., & Dean, R. (2016). A tactical-game approach and enhancement of metacognitive behaviour in elementary school students. *Physical Education and Sport Pedagogy*, 21(2), 169-184.
- Conroy, D. E., Cassidy, C. M., & Elliot, A. J. (2008). Prospective relations between 2X2 achievement goals and the quality of sport training. *Revue internationale de psychologie sociale*, 1(21), 109-134.
- Conroy, D., Kaye, M., & Coatsworth, D. (2006). Coaching climates and the destructive effects of mastery-avoidance achievement goals on situational motivation. *Journal of Sport & Exercise Psychology*, 28, 69-92.
- Cury, F., Da Fonséca, D., Rufo, M., & Sarrazin, P. (2002). Perceptions of competence, implicit theory of ability, perception of motivational climate, and achievement goals: A test of the trichotomous conceptualization of endorsement of achievement motivation in the physical education setting. *Perceptual and Motor Skills*, 95(1), 233-244.
- Dail, T. K. (2014) Metacognition and Coaching: How to Develop a Thinking Athlete, *Journal of Physical Education, Recreation and Dance*, 85(5), 49-51, DOI: 10.1080/07303084.2014.897577
- Digelidis, N., Chatzipanteli, A., Papaioannou, A., & Theodosiou, A. (2011). Teaching styles, task-involving motivational climate and metacognitive activity: an intervention plan in PE classes. *Proceedings of the 3th FEPSAC European Sport Psychology Congress-Sport and Exercise Psychology: Human Performance, Well-Being and Health*. Madeira island-Portugal. ISBN: 978-972-98090-2-6
- Duda, J. (1989). Goal perspectives, participation and persistence in sport. *International Journal of Sport Psychology*, 20, 42-56.
- Duda, J. L. (2001). Achievement goal research in sport: Pushing the boundaries and clarifying some misunderstandings. In G.C. Roberts (Ed.), *Advances in motivation in sport and exercise* (pp. 129-182). Champaign, IL: Human Kinetics.
- Duda, J. L., & Nicholls, J. G. (1992). Dimensions of achievement motivation in schoolwork and sport. *Journal of Educational Psychology*, 84, 290-299.
- Dweck, C. S., & Legget, E. (1988). A Social-Cognitive Approach to Motivation and Personality. *Psychological Review*, 95(2), 256-273.
- Elliot, A. (1999). Approach and avoidance motivation and achievement goals. *Educational Psychologist*, 34, 169-189.
- Elliot, A. J., & Church, M. A. (1997). A hierarchical model of approach and avoidance achievement motivation. *Journal of Personality and Social Psychology*, 72, 218-232.
- Elliot, A. J., & Conroy, D. E. (2005). Beyond the dichotomous model of achievement goals in sport and exercise psychology. *Sport & Exercise Psychology Review*, 1(1), 17-25.
- Elliot, A. J., & Moller, A. C. (2003). Performance-approach goals: good or bad forms of regulation? *International Journal of Educational Research*, 39, 339-356.
- Elliot, A. J., & Thrash, T. (2001). Achievement goals and the hierarchical model of achievement motivation. *Educational Psychology Review*, 13(2), 139-156.
- Field, A. (2009). *Discovering statistics using IBM SPSS* (3rd eds.). London, UK: Sage.

- Filaire, E., Alix, D., Ferrand, C., & Verger, M. (2009). Psychophysiological stress in tennis players during the first single match of a tournament, *Psychoneuroendocrinology*, *34*, 150-157.
- Flavell, J. H. (1979). Metacognition and cognitive monitoring: a new area of cognitive-developmental inquiry. *American Psychologist*, *34*, 906-911.
- Flavell, J.H. (1987). Speculations about the nature and development of metacognition. In F. Weinert & R. Kluwe (Eds.), *Metacognition, motivation, and understanding* (pp. 21-29). Hillsdale, NJ: Erlbaum.
- Ford, K. J., Smith, E. M., Weissbein, D. A., Gully, S. M., & Salas, E. (1998). Relationships of goal orientation, metacognitive activity, and practice strategies with learning outcomes and transfer. *Journal of Applied Psychology*, *83*(2), 218-233.
- Gano-Overway, L. (2008). The effect of goal involvement on self-regulatory processes. *International Journal of Sport and Exercise Psychology*, *6*, 132-156.
- Gaudreau, P., & Braaten, A. (2016). Achievement goals and their underlying goal motivation: does it matter why sport participants pursue their goals? *Psychologica Belgica*, *56*(3), 244-268.
- Hacker, D. J., Dunlosky, J., & Graesser, A. C. (1998). *Metacognition in educational theory and practise*. Mahwah, NJ: Lawrence Erlbaum Associates.
- Hammermeister, J., & Damon, B. (2004). Gender differences in coping with endurance sport stress: Are men from Mars and women from Venus? *Journal of Sport Behavior*, *27*(2), 148-164.
- Harwood, C. G., Keegan, R. G., Smith, J. M. J., & Raine, A. S. (2015). A systematic review of the intrapersonal correlates of motivational climate perceptions in sport and physical activity. *Psychology of Sport and Exercise*, *18*, 9-25.
- Harwood, C., Cumming, J., & Fletcher, D. (2004). Motivational profiles and psychological skills use within elite youth sport. *Journal of Applied Sport Psychology*, *16*(4), 318-332.
- Harwood, C., Cumming, J., & Hall, C. (2003). Imagery use in elite youth sport participants: Reinforcing the applied significance of achievement goal theory. *Research Quarterly for Exercise and Sport*, *74*(3), 292-300.
- Hatzigeorgiadis, A. (2006). Approach and avoidance coping during task performance in young men: the role of goal attainment expectancies. *Journal of Sport Sciences*, *24*, 299-307.
- Hatzigeorgiadis, A., & Chroni, S. (2007a). Pre-competition anxiety and in-competition coping in experienced male swimmers. *International journal of sports science and coaching*, *2*, 181-189.
- Hatzigeorgiadis, A., & Chroni, S. (2007b). Development and validation of the Coping in Competition Questionnaire. *Proceedings, 12th European Congress of Sport Psychology* (p. 332), Halkidiki, Greece.
- Iglesias, D, García-González, L, García-Calvo, T, León, B, & Del Villar, F. (2010). Expertise development in sport: contributions under cognitive psychology perspective. *Journal of Human Sport & Exercise*, *5*(3), 462-475.
- Jacobs, J., & Paris, S. (1987). Children's metacognition about reading. Issues in definition, measurement, and instruction. *Educational Psychologist*, *22*, 255-278.
- Kaisidis-Rodafinos, A., Anshel, M. A., & Porter, A. (1997). Personal and situational factors that predict coping strategies for acute stress among basketball referees. *Journal of Sports Sciences*, *15*, 427-436.
- Kim, M. S., & Duda, J. L., (2003). The Coping Process: Cognitive Appraisals of Stress, Coping Strategies, and Coping Effectiveness. *The Sport Psychologist*, *17*, 406-423.
- Ku, K. Y. L., & Ho, I. T. (2010). Metacognitive strategies that enhance critical thinking. *Metacognition and Learning*, *5*(3), 251-267.
- Lazarus, R.S. (1991). *Emotion and Adaptation*. New York: Oxford University Press.
- Lazarus, R. S. (2000). How emotions influence performance in competitive sports. *The Sport Psychologist*, *14*, 229-252.
- Lazarus, R. S., & Folkman, S. (1984). *Stress, appraisal and coping*. New York: Springer.
- Lazarus, R. S., & Folkman, S. (1987). Transactional theory and research on emotions and coping. *European Journal of Personality*, *1*, 141-169.
- Lochbaum, M., & Gottardy, J. (2015). A meta-analytic review of the approach-avoidance achievement goals and performance relationships in the sport psychology literature. *Journal of Sport and Health Science*, *4*, 164-173.
- Lochbaum, M., Jean-Noel, J., Pinar, C., & Gilson, T. (2017). A meta-analytic review of Elliot's (1999) Hierarchical Model of Approach and Avoidance Motivation in the sport, physical activity, and physical education literature. *Journal of Sport and Health Science*, *6*, 68-80.
- MacIntyre, T. E., Igou, E. R., Campbell, M. J., Moran, A. P., & Matthews, J. (2014). Metacognition and action: a new pathway to understanding social and cognitive aspects of expertise in sport. *Frontiers in Psychology*, *5*, 1155. doi:10.3389/fpsyg.2014.01155
- McPherson, S. L., & Thomas, J. R. (1989). Relation of knowledge and performance in boys' tennis: Age and expertise. *Journal of Experimental Child Psychology*, *48*, 190-211.
- Mevarech, Z., & Fridkin, C., (2006). The effects of IMPROVE on mathematical knowledge, mathematical reasoning and meta-cognition. *Metacognition and Learning*, *1*, 85-97.

- Midgley, C., Kaplan, A., & Middleton, M. (2001). Performance-approach goals: Good for what, for whom, under with circumstances, and at what cost? *Journal of Educational Psychology*, 93(1), 77-86.
- Mosston, M., & Ashworth, S. (1986). *Teaching physical education* (4th ed.). New York: Mcmillan.
- Mullen, B., & Suls, J. (1982). The effectiveness of attention and rejection as coping styles: a meta-analysis of temporal differences. *Journal of Psychosomatic Research*, 26, 43-49.
- Nicholls, J. G. (1989). *The competitive ethos and democratic education*. Cambridge, MA: Harvard University Press.
- Nicholls, A. R., & Polman, R. C. J. (2007). Coping in sport: A systematic review. *Journal of Sport Sciences*, 25(1), 11-31.
- Nietfeld, J. L. (2003). An examination of metacognitive strategy use and monitoring skills by competitive middle distance runners. *Journal of Applied Sport Psychology*, 15, 307-320
- Ntoumanis, N., & Biddle, S. (1999). A review of motivational climate in physical activity. *Journal of Sport Sciences*, 17, 643-665.
- Ntoumanis, N., & Biddle, S. J. (2000). Relationship of intensity and direction of competitive anxiety with coping strategies. *The Sport Psychologist*, 14, 360-371.
- Ntoumanis, N., Biddle, S. J. H., & Haddock, G. (1999). The mediating role of coping strategies on the relationship between achievement motivation and affect in sport. *Anxiety, Stress, & Coping*, 12(3), 299-327.
- Ommundsen, Y. (2003). Implicit theories of ability and self-regulation strategies in physical education classes. *Educational Psychology*, 23(2), 141-157.
- Ommundsen, Y. (2004). Self-handicapping related to task and performance-approach and avoidance goals in physical education. *Journal of Applied Sport Psychology*, 16(2), 183-197.
- Otero, J., & Campanario, J. (1992). The relationship between academic achievement and metacognitive comprehension monitoring ability of Spanish secondary school students. *Educational and Psychological Measurement*, 52, 419-430.
- Papaioannou, A., Bebetos, E., Theodorakis, Y., Christodoulidis, T., & Kouli, O., (2006). Causal relationships of sport and exercise involvement with goal orientations, perceived competence and intrinsic motivation in physical education: A longitudinal study. *Journal of Sport Sciences*, 24(4), 367-382.
- Papaioannou, A., Kosmidou, E., Tsigilis, N., & Milosis, D. (2007a). Measuring perceived motivation climate in physical education. In J Liukkonen (Eds.), *Psychology for physical educators, Vol. 2*. Champaign, IL: Human Kinetics.
- Papaioannou, A., Marsh, H., & Theodorakis, Y. (2004). A multilevel approach to motivational climate in physical education and sport settings: An individual or group level construct? *Journal of Sport & Exercise Psychology*, 26, 90-118.
- Papaioannou, A., Simou, T., Kosmidou, E., Milosis, D., & Tsigilis, N. (2009). Goal orientations at the global level of generality and in physical education: Their association with self-regulation, affect, beliefs and behaviours. *Psychology of Sport and Exercise*, 10, 466-480.
- Papaioannou, A., Theodosiou, A., Pashali, M., & Digelidis, N. (2012). Advancing task involvement, intrinsic motivation and metacognitive regulation in physical education classes: The self-check style of teaching makes a difference. *Advances in physical education*, 2, 110-118.
- Papaioannou, A., Tsigilis, N., Milosis, D., & Kosmidou, E. (2007b). Measuring Perceived Motivational Climate in Physical Education. *Journal of Teaching in Physical Education*, 26, 236-259.
- Paulhus, D. L., & Vazire, S. (2007). The self-report method. In R. W. Robins, R.C. Fraley, & R.F. Kruger (Eds.), *Handbook of research methods in personality psychology* (pp. 224-239). New York: Guilford.
- Pensgaard, A. M., & Roberts, G. C. (2003). Achievement goal orientations and the use of coping strategies among Winter Olympians. *Psychology of Sport and Exercise*, 4, 101-116.
- Rogowska, A., & Kusnierz, C. (2012). Coping of judo competitors in the context of gender, age, years of practice and skill level. *Journal of Applied Sport Psychology*, 24, 445-464.
- Roth, S., & Cohen, L. J. (1986). Approach, avoidance and coping with stress. *American Psychologist*, 41(7), 813-819.
- Salatas Waters, H., & Schneider, W. (2010). *Metacognition, strategy use and instruction*. New York: Guilford Press.
- Schraw, G., & Dennison (1994). Assessing metacognitive awareness. *Contemporary Educational Psychology*, 19, 460-475.
- Seifriz, J., Duda, J. L., & Chi, L. (1992). The relationship of perceived motivational climate to achievement-related affect and cognitions in basketball. *Journal of Sport & Exercise Psychology*, 14, 375-391.
- Sideridis, G. D., Morgan, P. L., Botsas, G., Padeliadu, S., & Fuchs, D. (2006). Predicting LD on the basis of motivation, metacognition, and psychopathology: A ROC analysis. *Journal of Learning Disabilities*, 39(3), 215-229.
- Smith, R. E., Leffingwell, T. R., & Ptacek, J. T. (1999). Can people remember how they coped? Factors associated with discordance between same-day and retrospective reports, *Journal of Personality and Social Psychology*, 76(6), 1050-1061.

- Terry, P. C., Cox, J. A., Lane, A. M., & Karageorghis, C. I. (1996). Measures of Anxiety among Tennis Players in Singles and Doubles Matches. *Perceptual and Motor Skills*, 83(2), 595-603.
- Theodosiou, A., & Papaioannou, A. (2006). Motivational climate, achievement goals and metacognitive activity in physical education and exercise involvement in out-of-school settings. *Psychology of Sport and Exercise*, 7, 361-379.
- Theodosiou, A., Mantis, K. & Papaioannou, A. (2008). Student self-reports of metacognitive activity in physical education classes. Age-group differences and the effect of goal orientations and perceived motivational climate. *Educational Research and Reviews* 3(12), 353-364.
- Theodosiou, A., Papaioannou, A., & Mantis, K. (2005). Factor structure and discriminant validity of the metacognitive processes in physical education questionnaire. *Scientific Annals of Psychological Society of Northern Greece*, 3, 91-118. [In Greek].
- Theodosiou, A., Papaioannou, A., Pashali, M., & Digelidis, N. (2012). Advancing task involvement, intrinsic motivation and metacognitive regulation in physical education classes: The self-check style of teaching makes a difference. *Advances in Physical Education*, 2(3), 110-118.
- Thomas, K. T., & Thomas, J. R. (1994). Developing expertise in sport: The relation of knowledge and performance. *International Journal of Sport Psychology*, 25, 295-312.
- Van Yperen, N. W., Blaga, M., Postmes, T. (2014). A meta-analysis of self-reported achievement goals and nonself-report performance across three achievement domains (work, sports, and education). *PLOS ONE*, 9(4): e93594. doi:10.1371/journal.pone.0093594
- Veenman, M. V. J., & Beishuizen, J. J. (2004). Intellectual and metacognitive skills of novices while studying texts under conditions of text difficulty and time constraint. *Learning and Instruction*, 14, 621-640.
- Veenman, M. V. J., Elshout, J. J., & Meijer, J. (1997). The generality vs domain-specificity of metacognitive skills in novice learning across domains. *Learning and Instruction*, 7(2), 187-209.
- Veenman, M. V. J., Kerseboom, L., & Imthorn, C. (2000). Test anxiety and metacognitive skillfulness: Availability versus production deficiencies. *Anxiety, Stress, & Coping*, 13(4), 391-412.
- Veenman, M. V. J., Van Hout-Wolters, B. H. A. M., & Afflerbach, P. (2006). Metacognition and learning: conceptual and methodological considerations. *Metacognition and learning*, 1, 3-14.
- Vrugt, A., & Oort, F. J. (2008). Metacognition, achievement goals, study strategies and academic achievement: pathways to achievement. *Metacognition and Learning*, 30, 123-146.
- Whitehead, J., Andree, K. V., & Lee, M. J. (2004). Achievement perspectives and perceived ability: how far do interactions generalize in youth sport? *Psychology of Sport and Exercise*, 5, 291-317.
- Wrisberg, C. A., & Pein, R. L. (1990). Past running experience as a mediator of attentional focus of male and female recreational runners. *Perceptual and Motor Skills*, 70, 427-432.
- Yeatts, P. E., & Lochbaum, M. (2013). Coping in sport: A test of Elliot's Hierarchical Model of Approach and Avoidance Motivation. *Kinesiology*, 45(2), 186-193.
- Young, A., & Fry, J. D. (2008). Metacognitive awareness and academic achievement in college students. *Journal of the Scholarship of Teaching and Learning*, 8(2), 1-10.