Learning and Individual Differences 61 (2018) 77–86

Contents lists available at ScienceDirect

Learning and Individual Differences

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

The relation of physical self-perceptions of competence, goal orientation, and optimism with students' performance calibration in physical education

Athanasios Kolovelonis*, Marios Goudas

Department of Physical Education and Sport Science, University of Thessaly, 421 00 Karies, Trikala, Greece

ARTICLE INFO

Keywords:
Absolute accuracy
Self-regulated learning
Overconfidence
Self-efficacy
Basketball shooting

ABSTRACT

Two studies were conducted to examine associations between students' calibration accuracy with their self-perceptions of competence (i.e., global self-worth, sport competence, perceived competence, and self-efficacy), goal orientation, and dispositional optimism and pessimism. Participants were 138 (study 1) and 236 (study 2) fifth and sixth grade students. An index of absolute accuracy of performance prediction was calculated based on students' predicted and actual performance in a basketball shooting test. Person-related factors were measured with self-reported questionnaires. Results showed no associations between absolute accuracy and students' global self-worth, sport competence, optimism and pessimism (study 1) while students' absolute accuracy was associated with their task orientation, self-efficacy, and perceived competence (study 2). An overconfidence effect was also found in both studies. These results were discussed with reference to previous evidence and views of calibration research in academic, sport, and physical education domains. Interactions between person-related factors and calibration and their effects on the development of students' self-regulated learning of sport skills in physical education were also highlighted.

1. Introduction

Examining cognitive aspects of sport performance has a long tradition in sport psychology. For example, involvement in physical education has been positively associated with students' academic learning (Pesce, Faigenbaum, Goudas, & Tomporowski, 2017). Moreover, self-regulated learning can positively affect sport performance (e.g., Kolovelonis, Goudas, Hassandra, & Dermitzaki, 2012) while metacognitive activity has been related with sport involvement (e.g., Theodosiou & Papaioannou, 2006). Considering that personal characteristics (i.e., self-confidence) are associated with expert athletic performance (Durand-Bush & Salmela, 2002) examining sport performance with respect to metacognitive factors is of great interest.

Efklides (2011) has suggested reciprocal interactions of metacognition, motivation, and affect at two levels of functioning of self-regulated learning. The person level involves interactions between trait-like characteristics such as motivation (e.g., goal orientations) and self-concept while the Task X Person level involves events during task execution and feedback from monitoring used for controlling or regulating learning. Metacognitive feelings and estimates (e.g., judgments of learning) before, during, or after task involvement enhance students' awareness for learning and performance (Efklides, 2011). In this sense, performance judgments are considered metacognitive in nature resulting from conscious processing related to instructions, task characteristics, and metacognitive knowledge of using effective strategies (Efklides, 2009). Metacognitive judgments and performance are related. For example, feelings of difficulty were negatively associated with feelings of correctness in math (Dermitzaki & Efklides, 2003) while students' basketball shooting performance was positively related with their feelings of correctness and negatively with feelings of difficulty (Goudas, Dermitzaki, & Kolovelonis, 2017). However, information derived from metacognitive processes should be accurate for effective self-regulated learning.

1.1. Defining and understanding calibration

A way to view students' monitoring accuracy is calibration, which is the degree of correspondence between judged and actual performance (Keren, 1991). This correspondence can be viewed as absolute (i.e., absolute match of judged and actual performance) or relative accuracy (i.e., discrimination of performance across items) (Schraw, 2009). These types of accuracy were low correlated (Maki, Shields, Wheeler, & Zacchilli, 2005) suggesting that they reflect different aspects of monitoring both important for self-regulated learning (Dunlosky & Thiede, 2013). Absolute accuracy measured as a difference score between judged and actual performance is mostly used in educational contexts

* Corresponding author.
E-mail addresses: akolov@pe.uth.gr (A. Kolovelonis), mgoudas@pe.uth.gr (M. Goudas).

https://doi.org/10.1016/j.lindif.2017.11.013
Received 14 October 2016; Received in revised form 12 November 2017; Accepted 17 November 2017

(Chen & Rossi, 2013). In fact, a common research paradigm involves students in judging their performance and comparing their judgments with an objective measure of performance. If judgments are close to actual performance students are well calibrated. Judgments can be provided before (prediction) or after performance (postdiction), at local (item-by-item) or at global (set of items) level. Research in academics has followed this paradigm measuring absolute accuracy as a difference score using predictions at global level (Bol, Hacker, Walck, & Nunnery, 2012; Muis, Winne, & Ranellucci, 2016; Pieger, Mengelkamp, & Bannert, 2016).

1.1.1. Calibration of performance in sport tasks

The present studies focused on calibration in terms of the absolute value of the difference between predicted and actual performance at global level. This paradigm has been used in educational contexts (see Section 1.1.) and fits properly to the peculiarities of sport tasks. Immediate feedback (i.e., knowledge of results) is often available after sport performance (e.g., a soccer player can see if his shot was successful). Thus, students' judgments usually take the form of predictions which are considered a useful measure of online monitoring (Griffin, Wiley, & Salas, 2013). An alternative paradigm used postdictions excluding external feedback by involving students in dart-throwing over the top of a screen to hit a target lying in the floor behind it (Gasser & Tan, 2005). However, this paradigm lacks ecological validity while the internal feedback produced during performance (Schmidt & Wrisberg, 2008) and environmental cues revealing students' successfulness may interfere with students' judgments of performance making the interpretation of the results difficult.

The use of a single global judgment (i.e., successful shots out of 10) rather than judgments specific to each trial is considered more appropriate for sport tasks because prediction for each trial or set of trials may be affected by the knowledge of the results of the previous trials or set of trials (Avugos, Bar-Eli, Ritov, & Sher, 2013). Possible confounds may be also caused if an underconfidence with practice effect (i.e., shift from overconfidence to underconfidence after the first set of trials; Finn & Metcalfe, 2008) or improvements in accuracy due to experiencing the test (Thiede, Redford, Wiley, & Griffin, 2012) would emerge if a set of trials would used. Moreover, for sport tasks such as basketball shooting, it is more important for students to be well-calibrated regarding the status of their overall performance (e.g., predicting the number of successful shots in a test) instead of predicting if each specific shot will be successful because this awareness at global level can involve them in effective goal setting and self-regulated their learning (Zimmerman, 2000).

1.2. Research evidence

Calibration research in the academic domain has shown that students are often inaccurate in judging their performance with a tendency to overconfidence (e.g., Chen, 2003). Moreover, high performers are usually more accurate with a tendency to underconfidence and low performers usually overestimate their performance (e.g., Hacker, Bol, & Bahbahani, 2008). Calibration accuracy was positively associated with executive functioning, and positive feelings, beliefs, and motivation related to mathematics (Fernández, Kroesbergen, Pérez, González-Castro, & Gonzalez-Pienda, 2015) and with performance gains in mathematics (Rutherford, 2017).

In sport settings only a few studies have examined athletes' calibration. For example, golfers were well calibrated on easier tasks but overconfident on more difficult tasks (Fogarty & Else, 2005), recreational basketball players were overconfident regarding their shooting performance (McGraw, Mellers, & Ritov, 2004), and undergraduate psychology students were poorly calibrated in dart-throwing (Gasser & Tan, 2005). In physical education, students overestimated their basketball dribbling (Kolovelonis, Goudas, & Dermitzaki, 2012b) and chest-pass (Kolovelonis & Goudas, 2012) performance while no differences in calibration were found between students who practiced dribbling receiving feedback and setting goals and control group students (Kolovelonis, Goudas, Dermitzaki, & Kitsantas, 2013).

1.3. Factors associated with performance calibration

Some research has focused on factors related to students' calibration including feedback (Labuhn, Zimmerman, & Hasselhorn, 2010), guidelines and group working for practicing calibration (Bol et al., 2012), attributions (Hacker et al., 2008), and fluency (Pieger et al., 2016). Dinsmore and Parkinson (2013) found that students based their judgments on personal factors (i.e., prior knowledge), task characteristics (i.e., item difficulty), or guessing. Although these studies have provided some evidence regarding factors related to students' calibration, the picture is incomplete and the miscalibration is still not well understood (Dinsmore & Parkinson, 2013).

Considering that metacognitive judgments might reflect stable trait-like properties (Pieschl, 2009) individual differences in calibration might be explained by person related characteristics. For example, self-perceptions are involved in self-regulated learning (Dermitzaki & Efklides, 2000) and may be used for forming predictions of performance (Job & Klassen, 2012). Efklides (2011) suggested that trait-like characteristics (e.g., self-concept) interacting with forms of metacognition (e.g., judgments of learning) may affect students' predictions of performance. It has been also suggested that judgments are generated by both experience-based and theory-based cues (Koriat, Nussinson, Bless, & Shaked, 2008) including students' beliefs regarding achievement and competence. Such person-related factors including aspects of self-perceptions of competence, goal orientations, and dispositional optimism are relevant to the purposes of the present studies and are reviewed next.

1.3.1. Self-perceptions of competence and performance calibration

Various aspects of self-perceptions of ability at global (e.g., self-esteem), subdomain (e.g., sport competence), context specific (e.g., perceived competence in physical education), or task specific (e.g., self-efficacy) level have been studied in sport and physical education as distinct constructs and were involved in these studies.

1.3.1.1. Global self-worth and sport competence. Self-esteem or self-worth (i.e., individuals' feelings about their own value) has been used to explain human behavior (Harter, 1999). It is considered hierarchical and multidimensional in nature with general and more stable perceptions at the apex and domain or task specific and more changeable perceptions at the lower levels of hierarchy (Fox, 1997). In fact, global self-worth is composed of people's self-perceptions in different domains (e.g., physical, academic) which in turn may be differentiated in subdomain self-perceptions (Fox, 1997). For the physical domain four self-perceptions (i.e., sport competence, physical condition, body attractiveness, and physical strength) have been identified (Fox & Corbin, 1989). Sport competence represents perceptions for ability, learning, and confidence regarding sport skills (Fox & Corbin, 1989) and is the most relevant for the aims of this study.

Self-perceptions of ability represent beliefs about what one can achieve or know and thus, students may be based on such perceptions to judge their performance (Stone, 2000). Students' confidence for their answers in cognitive tasks was influenced by self-concept and competence (Kröner & Biermann, 2007) while metacognitice experiences (i.e., estimate of solution correctness) were influenced not only by task characteristics but also by self-concept (Efklides & Tsiora, 2002). This evidence suggested that self-perceptions may be used as a basis of performance judgments especially when cues related to task are not available (Kröner & Biermann, 2007). However, to our knowledge, no study has examined associations between self-perceptions and calibration in physical education. Thus, expanding previous research, students' calibration accuracy was examined with respect to their global self-

worth and subdomain physical self-perceptions of sport competence (Fox & Corbin, 1989).

1.3.1.2. Perceived competence in physical education. Perceived competence represent students' context specific (i.e., physical education) perceptions of competence and may be considered a component of the broader construct of sport competence which represents perceptions of competence for more general sport environments (Fox & Corbin, 1989). Perceived competence is usually measured by students rating their competence compared to their classmates (Nicholls, 1989). That is, they are formed based on social comparisons using representation of others' competence, are considered metacognitive in nature (Efklides, 2011), and may be associated with judgments' accuracy. Considering that social comparison is present in educational settings it would be interested to examine if students' perceived competence based on social comparison in the context of physical education is associated with the accuracy they predict their performance.

1.3.1.3. Self-efficacy. Self-efficacy is a powerful motivational factor in self-regulation (Zimmerman, 2000) and has been positively related with setting higher goals, use of self-regulatory strategies (Schunk & Pajares, 2009), and self-recording (Zimmerman & Kitsantas, 1996). Self-efficacy is conceptually different to calibration reflecting beliefs regarding performance in a specific task whereas calibration highlights the discrepancy between judged and actual performance in this task. In fact, self-efficacy and calibration was low correlated (Chen & Zimmerman, 2007). However, the cyclical model of self-regulation (Zimmerman, 2000) posits reciprocal influences among forethought (e.g., self-efficacy), performance (e.g., metacognitive monitoring), and self-reflection (e.g., performance judgments) processes. In fact, students who increased their calibration they also increased their self-efficacy (Nietfeld, Cao, & Osborne, 2006). Thus, examining self-efficacy and calibration relations would further inform the dynamic interactions of processes involved in self-regulated learning in physical education.

1.3.2. Goal orientations and performance calibration

Based on the personal meaning individuals assign to perceived success and failure, two main goal orientations have been identified: task and ego (Duda, 2001). Task-oriented students define success in terms of mastering skills, self-improvement, and effort investment, and feel competent when they achieve such goals. Ego-oriented students tend to compare their performance with their peers' performance or a norm and feel successful when they outperform others. Task orientation is associated with adaptive outcomes including greater persistence, effort, and intrinsic motivation, whereas ego orientation with greater competitiveness and anxiety (Duda, 2001). This study viewed goal orientations as general predispositions. However, contextual factors (e.g., learning environment) or students' beliefs for the fixedness or malleability of their competences may affect this tendency (Dweck & Molden, 2005).

Goal orientations are related to self-regulation and metacognition (Efklides, 2011). Task-oriented students focusing on mastering skills may be engaged in metacognitive processes (e.g., self-monitoring) whereas ego-oriented students focusing on outperforming others may be not (Pintrich, 2000; Vrugt & Oort, 2008). Calibration in terms of illusions of knowing was related positively with task and negatively with ego orientation (Kroll & Ford, 1992) and mastery and performance-approach goals predicted students' calibration (Wahlstrom, 2001). Muis et al. (2016) provided mixed results for calibration and goal orientations associations while goal orientations and monitoring accuracy was not correlated in university (Zhou, 2013) and elementary (Roebers, Krebs, & Roderer, 2014) students. These mixed results call for further research examining relations between monitoring accuracy and goal orientations (Chen & Rossi, 2013). In sport, one research to our knowledge examined this issue showing that high-performance oriented volleyball players were more confident in their judgments and high-mastery oriented players were better calibrated (Chao, 2014). The classic task and ego orientations approach (Duda, 2001) was adopted due to the exploratory nature of this study in physical education and concerns for adolescents' capacity to distinguish approach and avoidance goals (Roeser, 2004).

1.3.3. Optimism, pessimism, and performance calibration

Dispositional optimism is a personality-trait construct that may be involved in self-regulation and calibration (Scheier & Carver, 1992). Optimism is an expectancy for successful outcomes in various situations whereas pessimism for negative. These expectancies are relatively stable and associated with psychological and physical adjustment. Optimism was positively related with adaptive strategies (e.g., seeking support), a tendency for confidence and persistence (Scheier & Carver, 1992), and higher levels of subjective well-being (Forgeard & Seligman, 2012). In sport, optimism in contrast with pessimism was positively related with the use of coping strategies (Grove & Heard, 1997), athletic performance (Gordon, 2008), and school and sport satisfaction (Gaudreau, Gunnell, Hoar, Thompson, & Lelièvre, 2015).

Calibration research has not paid attention in dispositional optimism and pessimism (Grove & Heard, 1997). Hilton, Regner, Cabantous, Charalambides, and Vautier (2011) found no correlation between optimism and overconfidence but they found that positive illusions predicted miscalibration in a probability evaluation task (i.e., students evaluated the probability that their answer was correct) but not in an interval production task (i.e., students stated confidence intervals for their correct responses). Wolfe and Grosch (1990) found a positive correlation of optimism with confidence but not with the accuracy of psychology students' predictions in decision making tasks. Considering the lack of respective research in physical education, relations between optimism, pessimism, and calibration were explored in this study.

1.4. The present studies

Calibration research in physical education is limited. Thus, these studies aimed to fill this gap examining calibration in authentic physical education settings (Bol & Hacker, 2012). Such research should provide evidence for enhancing learning of sport skills (Pieschl, 2009) because accurate monitoring is essential for enabling students in effective cycles of self-regulated learning (Chen & Rossi, 2013). Further research regarding factors related with students' calibration is also warranted (Dinsmore & Parkinson, 2013) especially in physical education highlighting individual variations in calibration accuracy and informing interventions for enhancing calibration in sport tasks. Person related factors (e.g., perceptions of competence, goal orientations) interacting with aspects of metacognition (Efklides, 2011) may be involved in the formation of performance judgments (Koriat et al., 2008) explaining variations in students' calibration (Job & Klassen, 2012). Moreover, both general and specific aspects of competence beliefs should be considered (Schunk & Zimmerman, 2006). Thus, two studies were conducted sharing the common aim of exploring associations between calibration and person related factors in physical education. The first study examined calibration with respect to students' general self-perceptions of competence (i.e., self-worth, sport competence) and trait-like characteristics (i.e., optimism and pessimism) while the second study examined calibration with respect to context (i.e., perceived competence) or task specific (i.e., self-efficacy) self-perceptions of competence and motivational constructs (i.e., goal orientations) related to context-specific self-perceptions. These self-perceptions, although conceptually different, were measured with items shared common words and notions. By conducting two studies for general and context-specific self-perceptions, possible influences between students' answers across items of different questionnaires were avoided and the total number of items in each study was kept low. In both studies gender

effects on calibration were examined as this issue is unexplored in physical education while in academics the results seems to be mixed (e.g., Chen, 2003; Gutierrez & Price, 2017).

1.4.1. Research questions and hypotheses

The following research questions were addressed: Is accuracy of performance predictions associated with (a) global self-worth and sport competence, (b) optimism and pessimism (study 1), (c) goal orientations, (d) perceived competence and self-efficacy (study 2), (e) gender (study 1 and 2)?

Associations between person-related factors and accuracy of performance predictions were hypothesized. Self-perceptions of competence may function for students as a general rule of thumb for their performance in a specific task affecting their performance predictions (Job & Klassen, 2012). Global self-worth, subdomain sport competence, context specific perceived competence in physical education, and task specific self-efficacy include knowledge that students have about their skills and abilities (Kröner & Biermann, 2007). Context specific measures of competence beliefs rather than the more general ones may predict achievement better (Schunk & Zimmerman, 2006). Thus, it was expected that self-perceptions of competence would significantly predict students' accuracy of performance predictions with self-perceptions closer to the context (i.e., perceived competence) and the task at hand (e.g., self-efficacy) compared to more general self-perceptions (e.g., self-worth, sport competence) to have a stronger association with calibration accuracy. Regarding goal orientations, task-oriented students are likely to process material deeply, self-monitor seeking awareness of their learning (Pintrich, 2000), and thus to be well-calibrated (Stone, 2000). Ego-oriented students focusing on demonstrating ability may increase their predictions of performance to be consistent with this goal, thereby resulting in miscalibration (Kroll & Ford, 1992). Thus, it was expected that students' accuracy of performance predictions would be positively related with task and negatively with ego orientation. Associations between dispositional optimism, pessimism and accuracy of performance predictions were also envisaged without setting a specific hypothesis due to the lack of respective research in physical education. No specific hypothesis was stated for gender differences in calibration accuracy due to previous mixed results.

2. Study 1

2.1. Method

2.1.1. Participants

Participants were 138 students (*M*age = 11.39, *SD* = 0.59, 62 boys and 76 girls) who attended two fifth grade (20 boys and 23 girls) and four sixth grade (42 boys and 53 girls) physical education classes from two elementary schools located in a middle-sized city in central Greece. Most students (over 90%) were Greeks with a medium social-economic status. Students were beginners in basketball having experienced an 8-lesson basketball course during their regular school physical education classes in fifth and sixth grades.

2.1.2. Measures

2.1.2.1. Basketball shooting test. A modified shooting accuracy test consisted of 8 shots from the distance of the 2.5 m in front of the basket without time limit was used (Pojskić, Šeparović, & Užičanin, 2011). The number of successful shots was each student's score in this test. Satisfactory test-retest reliability (intraclass correlation coefficient = 0.92) has been reported for this test (Pojskić et al., 2011).

2.1.2.2. Predictions of shooting performance. Prior to the shooting test students responded to the question: "How many shots out of 8 will be successful from the distance of 2.5 meters in the following test?" Students' answers were their score in predictions of shooting performance.

2.1.2.3. Accuracy of performance predictions. The absolute value of the difference between predicted and actual shooting performance resulted in the index of accuracy of performance prediction which reflects the magnitude of calibration error. Values closer to zero in this index indicate higher accuracy of performance prediction (Schraw, 2009). The positive and negative values of the difference scores (i.e., bias scores) were used for indicating the direction of calibration. The index of accuracy of performance prediction was based on single-item measures at global level, and thus reliability was not calculated. Concerns regarding the reliability of difference score have also been raised (e.g., Hattie, 2013). However, the discrepancy between predicted and actual performance is the core of the notion of calibration (Hattie, 2013) while empirical evidence has suggested that reliability of difference scores can reach satisfactory level (Stankov & Crawford, 1996). Indeed, reliability of absolute measures of accuracy depends both on the reliability of component scores (i.e., predicted and actual performance) and the correlation between these components with high correlation implying low reliability of the difference scores (Stankov & Kleitman, 2008). In the present studies, correlations between predicted and actual performance were generally low to moderate (see Sections 2.2 and 3.2) while satisfactory test-retest reliability has been reported for the shooting test. Moreover, single-item measures with clear and unambiguous purpose for the respondent and clear experiential focus, as was the question regarding prediction of performance used in these studies can provide valid indicators of the state being investigated (Ainley & Patrick, 2006).

2.1.2.4. Global self-worth. The global self-worth subscale (six items; $\alpha = 0.63$) of the Greek version (Kolovelonis, Mousouraki, Goudas, & Michalopoulou, 2013) of the Children and Youth Physical Self-Perception Profile (CY-PSPP; Whitehead, 1995) was used. Students responded on a 4-point rating scale written in a "structural alternative format". First, students had to decide which of two statements relating to how they feel in specific situations was related to them and then to indicate whether the statement they selected was "really true for me" or "sort of true for me".

2.1.2.5. Sport competence. The sport competence subscale (six items; $\alpha = 0.54$) of the Greek version (Kolovelonis et al., 2013) of the CY-PSPP (Whitehead, 1995) was used. Students responded using the same 4-point rating scale described above.

2.1.2.6. Optimism and pessimism. The Life Orientation Test-Revised (LOT-R) (Scheier, Carver, & Bridges, 1994) was used. The original items were translated into Greek by the authors and back-translated by two other bilingual persons. The back-translated questionnaire was compared to the original and minor modifications were applied. The resulting items were given to two fifth and two sixth grade students to comment regarding item comprehension. Minor modifications were applied and the final questionnaire was administrated to students participated in this study. The LOT-R consists of three items that reflect an optimistic outlook (e.g., "I always look on the bright side of things"; $\alpha = 0.51$), three items reflecting a pessimistic outlook (e.g., "If something can go wrong for me, it will"; $\alpha = 0.68$), and four filler items unrelated to the measure (e.g., "I enjoy my friends a lot"). Students responded on a 5-point Likert-type scale (0 = strongly disagree, 4 = strongly agree). Confirmatory factor analysis performed on the data of present study revealed that the two factor solution of the LOT-R had a better fit compared to one factor solution (see Section 2.2). Thus, two scores for each student, one for optimism and one for pessimism were calculated. Higher scores indicated higher optimism or pessimism respectively.

2.1.3. Research design

A cross-sectional research design was involved using questionnaires in conjunction with a field experiment.

2.1.4. Procedure

Ethical approval was granted by the University Ethics Review Committee and permissions were obtained from schools' principals and physical education teachers. Students participated in the study voluntarily after a parental consent was secured. All students returned the parental consent. One week prior to the field experiment students completed the questionnaires (i.e., global self-worth, sport competence, and optimism) in their classrooms under the supervision of a research assistant. They were assured that their answers would be confidential and would not be used for their evaluation. The process of responding to the questionnaires including instructions given lasted approximately 30 min. The field experiment lasted approximately 10 min for each student and took place in the school outdoor basketball court during physical education lesson. To avoid social comparison effects, predicted and actual performance were measured at individual level and students were asked to avoid sharing or discussing their scores with their classmates. Students were told that the experiment included a shooting test consisted of 8 shots from the distaste of 2.5 m and its aim was the improvement of their shooting skill. Then, standing in the shooting position they were asked to predict their score in the basketball shooting test. After that, students were provided with oral instructions for the key elements of basketball shooting (i.e., “knees bent”, “wrist-elbow vertically”, “elbow stretches-wrist bends”), observed the experimenter's shooting demonstration, performed trial shots for a minute, and were tested in shooting.

2.1.5. Statistical analyses

The index of accuracy of performance prediction (i.e., absolute accuracy) served as a dependent variable in comparisons between genders and in correlational analysis (regression analysis was not performed in study 1 due to lack of significant correlations). Bias scores were used only for indicating the direction of students' predictions of performance because their use for comparing group means (Griffin et al., 2013) or in correlational analysis (Stankov, Lee, Luo, & Hogan, 2012) has been criticized. Effect sizes of Cohen's *d* (Cohen, 1988) were also calculated.

2.2. Results

2.2.1. Confirmatory factor analysis of the LOT-R

Two alternative factor structures of the Greek version of the LOT-R were tested: (a) the one factor solution and (b) the two factor solution. Confirmatory factor analysis showed an adequate model fit of the two-factor solution of the LOT-R, χ^2 (8) = 9.07, p = 0.336, NNFI = 0.967, CFI = 0.982, RMSEA = 0.032 (90% CI: 0.000–0.111). The CFI and NNFI indexes exceeded the 0.90 and RMSEA value was below 0.05 criterions indicating an adequate overall fit of the model to the data (Hu & Bentler, 1999). All items loaded on their designated factors (range 0.44–0.70, average factor loadings: 0.53). Correlation among latent factor was moderate (r: 0.53). The alternative one-factor solution model of the LOT-R did not fit well to the data, χ^2 (9) = 16.11, p = 0.064, NNFI = 0.805, CFI = 0.883, RMSEA = 0.079 (90% CI: 0.000–0.139).

2.2.2. Descriptives, correlations, and comparisons

Means, standard deviations, and correlations for all variables are presented in Table 1. Accuracy of performance prediction was significantly correlated with shooting performance but not with global self-worth, sport competence, optimism, and pessimism. Paired sample t-test showed that students reported significantly higher, t(137) = 5.87, $p < 0.001$, d = 0.58, predictions of performance (M = 4.28, SD = 1.89) compared to actual performance (M = 3.20, SD = 1.86). Boys compared to girls provided higher predictions of performance (M = 5.13, SD = 1.79 vs M = 3.59, SD = 1.69; t(136) = 5.18, $p < 0.001$, d = 0.88) and performed higher (M = 3.74, SD = 1.86 vs M = 2.75, SD = 1.74; t(136) = 3.23, p = 0.002, d = 0.55). However, no difference in accuracy of performance prediction between boys and girls was found, t(136) = 1.48, p = 0.142. Most students (n = 78) overestimated their performance while 33 students underestimated and 27 predicted accurately their performance.

3. Study 2

3.1. Method

3.1.1. Participants

Participants were 236 Greek students (Mage = 11.14, SD = 0.83; 116 boys, 120 girls) who attended five fifth grade (51 boys, 51 girls) and seven sixth grade (65 boys, 69 girls) physical education classes from six elementary schools located in a middle-sized city in central Greece. One class of 17 students failed to provide valid self-efficacy scores and thus analyses for self-efficacy involved 219 students. Students' characteristics involving ethnicity, social-economic status, and basketball experience were similar to study 1 students.

3.1.2. Measures

Measures of performance and predictions of performance in basketball shooting and the computation of accuracy indexes were identical to study 1.

3.1.2.1. Goal orientations. The Greek version (Papaioannou & Macdonald, 1993) of Task and Ego Orientation in Sport Questionnaire (Duda, Fox, Biddle, & Armstrong, 1992) was used. The questionnaire began with the stem “I feel most successful in physical education when…” followed by six task (α = 0.78; e.g., “I learn something that is fun to do”) and five ego (α = 0.84; e.g., “The others cannot do as well as me”) goal statements. Items were answered on a 5-point scale.

3.1.2.2. Perceived competence in physical education. Two items asking students to rate their competence in physical education compared to their classmates were used (i.e., “Compared to my classmates, I am better in physical education”, α = 0.90) (Goudas, Dermitzaki, & Bagiatis, 2000).

3.1.2.3. Self-efficacy. Students' self-efficacy for basketball shooting were assessed with four questions asked them to rate how certain they were in achieving a specific level of shooting performance (i.e., 2, 4, 6, and 8 successful shots out of 8). The form of the questions was the following: “How sure you are that you can make from the distance of 2.5 meters in front of the basket at least … 2/4/6/8 successful shots out of 8” (Bandura, 2006). Students responded on a scale ranging from 0 (not at all sure) to 100 (absolutely sure) gradually increasing by 10 points with additional marks for every 5 points. Student's self-efficacy score was the average of their responses to the four questions (α = 0.93).

3.1.3. Desing and procedure

Design and procedures similar to those described in the study 1 were followed. The self-efficacy questionnaire was completed after students provided their predictions for shooting performance.

3.1.4. Statistical analyses

Statistical analyses similar to those conducted in study 1 were used. A hierarchical multiple regression analysis was also conducted with students' scores in accuracy of performance predictions as the outcome variable. Students' self-efficacy and perceived competence were entered first, and task and ego orientations at the second step.

3.2. Results

3.2.1. Descriptives, correlations, and comparisons

Means, standard deviations, and correlations for all variables are presented in Table 2. Students' accuracy of performance prediction was

Table 1
Means, standard deviations, and correlations for all variables in study 1.

	M	*SD*	Correlations						
			1	2	3	4	5	6	7
1. Shooting performance	3.20	1.86	–						
2. Shooting prediction	4.28	1.89	0.33**	–					
3. Bias	1.09	2.18	− 0.57**	0.59**	–				
4. Accuracy	1.88	1.53	− 0.33**	0.43**	0.66**	–			
5. Global self-worth	3.27	0.59	0.13	0.13	0.01	0.07	–		
6. Sport competence	2.91	0.58	0.13	0.29**	0.14	0.12	0.55**	–	
7. Optimism	3.04	0.68	0.09	0.18*	0.08	0.05	0.33**	0.33**	–
8. Pessimism	1.38	0.86	− 0.04	− 0.18*	− 0.13	− 0.06	− 0.28**	− 0.27**	− 0.26**

* $p < 0.05$.
** $p < 0.01$.

significantly correlated with shooting performance, task orientation, perceived competence, and self-efficacy. Paired sample *t*-test showed that students' predictions of performance ($M = 4.15$, $SD = 1.84$) were significantly higher, $t(235) = 7.30$, $p < 0.001$, $d = 0.52$, compared to actual performance ($M = 3.07$, $SD = 2.27$). Boys compared to girls provided higher predictions of performance ($M = 5.03$, $SD = 1.64$ vs $M = 3.30$, $SD = 1.61$; $t(234) = 8.20$, $p < 0.001$, $d = 1.06$) and performed higher ($M = 3.62$, $SD = 2.31$ vs $M = 2.53$, $SD = 2.09$; $t(234) = 3.79$, $p < 0.001$, $d = 0.49$). However, no difference in accuracy of performance prediction between boys and girls was found, $t(234) = 1.01$, $p = 0.313$. Most students (n = 150) overestimated their performance while 53 students underestimated and 33 predicted accurately their performance.

3.2.2. Regression analysis

The hierarchical multiple regression showed that at step one, self-efficacy was a significant predictor of students' accuracy. Entering task and ego orientations in the second step, the model was significantly improved and task orientation served as a significant predictor whereas self-efficacy's contribution became nonsignificant (Table 3).

Table 3
Results of the hierarchical regression analysis in study 2.

Variable	*B*	*SE B*	*β*	R^2	ΔR^2
Step 1				0.051	0.051**
Self-efficacy	− 0.009	0.004	− 0.170*		
Perceived competence	− 0.144	0.119	− 0.091		
Step 2				0.087	0.036*
Self-efficacy	− 0.006	0.004	− 0.110		
Perceived competence	− 0.011	0.167	− 0.007		
Task orientation	− 0.446	0.154	− 0.215**		
Ego orientation	− 0.117	0.160	− 0.069		

* $p < 0.05$.
** $p < 0.01$.

4. Discussion

The number of students who predicted precisely their actual performance in both studies was small (i.e., 20% in the first and 14% in the second study). Most students miscalibrated their basketball shooting performance and the magnitude of this miscalibration at group level was large (i.e., average predicted performance was approximately 35% higher than actual performance in both studies). Consistent with previous findings in academic (Chen, 2003), sport (Fogarty & Else, 2005), and physical education (Kolovelonis et al., 2012b) settings this miscalibration had mainly the direction of overconfidence as 57% of students in the first and 63% in the second study predicted that their performance would be much higher than actually was. These studies showed that person related factors including students' goal orientations, self-efficacy, and perceived competence may explain individual differences in accuracy of predictions of basketball shooting performance. All results are discussed next with reference to previous findings and the role of calibration in self-regulated learning.

4.1. Calibration and self-perceptions of competence

Our hypotheses regarding associations between students' accuracy of performance predictions and their self-perceptions of competence were partially supported. In particular, as it was expected task specific self-perceptions (i.e., self-efficacy) had stronger association with calibration accuracy compared to more general self-perceptions (e.g., global self-worth). However, no associations with global self-worth and sport competence were found.

4.1.1. Global self-worth and sport competence

Contrary to our hypotheses, students' accuracy of performance predictions and their global self-worth and sport competence were not

Table 2
Means, standard deviations, and correlations for all variables in study 2.

	M	*SD*	Correlations						
			1	2	3	4	5	6	7
1. Shooting performance	3.07	2.27	–						
2. Shooting prediction	4.15	1.84	0.40**	–					
3. Bias	1.08	2.28	− 0.67**	0.41**	–				
4. Accuracy	2.07	1.44	− 0.40**	0.02	0.42**	–			
5. Task orientation	3.76	0.69	0.40**	0.13	− 0.30**	− 0.27**	–		
6. Ego orientation	2.96	0.85	0.20**	0.31**	0.06	− 0.11	− 0.02	–	
7. Perceived competence	2.76	0.90	0.32**	0.28**	− 0.10	− 0.18**	0.29**	0.67**	–
8. Self-efficacy	45.03	26.61	0.52**	0.44**	− 0.17*	− 0.21**	0.39**	0.21**	0.46**

* $p < 0.05$.
** $p < 0.01$.

associated. Self-concept and competence were related with similar to calibration constructs such as confidence judgments (Kröner & Biermann, 2007) and estimate of solution correctness (Efklides & Tsiora, 2002). Self-perceptions may be used for predicting performance especially when students have no access to cues related to task characteristics or other relevant cues (Kröner & Biermann, 2007). However, in the sport environment of this study students might form their judgments for basketball shooting using task specific cues which were available and easy to discern (e.g., shooting position) lowering thus the influence of general and stable self-perceptions (Kröner & Biermann, 2007; Schunk & Pajares, 2005). The lack of a correlation between global self-worth and prediction of performance seems to support this interpretation. However, sport competence was positively correlated with prediction of performance but not with actual performance. Thus, further research should explore reciprocal interactions between global or subdomain self-perceptions of competence, task characteristics, and calibration.

4.1.2. Perceived competence in physical education

Students who reported higher perceived competence were more accurate in predicting their performance. However, this correlation was small and perceived competence did not significantly predict calibration accuracy. Thus, context specific perceived competence in physical education might have some but weak association with the accuracy of performance prediction. Self-views in specific contexts (e.g., physical education) are likely to guide and inform behavior in this area (Schunk & Pajares, 2005). Involving in peer social comparison may also improve accuracy of self-assessments (Schunk & Pajares, 2009). Thus, self-perceptions of competence based on social comparison using representation of others' competence (i.e., items used to measure perceived competence in this study) are metacognitive in nature (Efklides, 2011) and may be related with the accuracy of performance judgments.

4.1.3. Self-efficacy

Consistent with our hypothesis and the hierarchical nature of physical self-perceptions (Fox & Corbin, 1989), self-efficacy was the stronger predictor of students' calibration accuracy, supporting views that self-efficacious students are involved in self-regulated learning and monitor their work efficiently (Schunk & Pajares, 2009). Self-efficacy reflects students' beliefs to achieve certain outcomes, is closely related to actual performance (Schunk & Pajares, 2009), and is formed mainly based on previous experience (Bandura, 1997) including thus information for students' past performance. In fact, self-efficacious students experiencing success in a task might become familiar with aspects of this task understanding what is required for successful performance and improving their accuracy (Schunk & Pajares, 2009).

Calibration is similar but conceptually different construct to self-efficacy. Self-efficacy comprises future-oriented judgments of competence (Schunk & Pajares, 2005) but calibration reflects the discrepancy between judged and actual performance. Consisted with this view and previous findings (Chen & Zimmerman, 2007) self-efficacy and calibration accuracy were low correlated in the present study. Moreover, the magnitude of correlation between prediction of performance and self-efficacy was double than the correlation between self-efficacy and accuracy of performance prediction. Considering Zimmerman's (2000) cyclical model of self-regulated learning associations between calibration accuracy and self-efficacy seem to be reciprocal. For example, Nietfeld et al. (2006) found that students who increased their calibration also increased, although modestly, their self-efficacy. Further research should explore reciprocal interactions between calibration accuracy and self-efficacy.

Students may also be biased when rated their self-perceptions of competence. Cole, Martin, Peeke, Seroczynski, and Fier (1999) found that compared to teachers' ratings boys reported higher and girls lower self-perceptions of academic competence. However, this issue was not considered in these studies which examined calibration with respect to the strength of self-perceptions. Regarding the strength of self-efficacy beliefs, although slightly higher self-efficacy can enhance future performance (Bandura, 1997), repeated overestimation can lead to continued failure and might negatively affect students' motivation to learn (Schunk & Pajares, 2005). All these issues should be further explored with respect to students' calibration.

4.2. Calibration and goal orientations

Consistent to our hypothesis task orientation was a significant predictor of students' accuracy of performance prediction. This results is consistent with findings in academics showing that task orientation was associated with confidence judgments (Kleitman & Gibson, 2011), illusion of knowing (Kroll & Ford, 1992), and calibration accuracy (Wahlstrom, 2001). Similarly, high-mastery oriented volleyball players were well calibrated (Chao, 2014). Task-oriented students focusing on mastering skills (Pintrich, 2000) are expected to process tasks deeply and to actively engage in metacognitive processes (Vrugt & Oort, 2008) and self-regulated learning (Wolters, Shirley, & Pintrich, 1996). Seeking for appropriate feedback to improve themselves and become aware of their learning (Pintrich, 2000) task-oriented students are likely to judge objectively their performance and thus to be well calibrated (Stone, 2000).

Contrary to hypothesis that ego-oriented students would be miscalibrated, ego orientation and accuracy of performance prediction were not correlated. Ego-oriented students tend to demonstrate ability and thus it was expected to provide higher predictions of performance (Kroll & Ford, 1992). However, they also seek to protect themselves from negative feedback regarding their superiority (Skaalvik, 1997) lowering thus their predictions. In fact, ego orientation and performance prediction were moderately correlated. However, this interpretation needs further examination involving more elaborated goal orientations frameworks compared to classic task and ego approach used in this study. Research using the trichotomus (Gonida & Leondari, 2011; Wahlstrom, 2001) or 2 × 2 model (Muis et al., 2016) showed complex association between calibration and the different types of goal orientations.

4.3. Calibration with respect to optimism and pessimism

This is the first study, to our knowledge, that examined associations between students' calibration and their dispositional optimism and pessimism. Optimism was initially viewed as a unidimensional construct in which optimism and pessimism lie at opposite ends of a single continuum (Scheier et al., 1994). However, consistent with recent evidence (e.g., Appaneal, 2012) the present results suggested that optimism and pessimism are two related but distinct constructs. Optimism was not related with the accuracy of performance prediction. Previous research has also shown that optimism was not correlated with accuracy (Wolfe & Grosch, 1990) suggesting that “an optimistic outlook tends to increase participants' tendency to express confidence in their responses without increasing the number of errors they make” (Hilton et al., 2011, p. 132). Indeed, optimists tend to interpret things in a positive way and are less likely to give up (Scheier & Carver, 1992), persist in achieving desired and attainable outcomes (Czech, Burke, Joyner, & Hardy, 2002), and use learning strategies (Peterson, 2000). Optimism has implications in self-regulation affecting the way students value success and react on obstacles towards achieving their goals (Scheier & Carver, 1992) and thus should be further involved in self-regulated learning research.

Similarly, pessimism and accuracy of performance prediction was not related. Considering that pessimists generally expect negative results (Peterson, 2000) one would expect that pessimistic students would report lower predictions of their performance resulting thus in miscalibration. However, a low negative correlation between prediction of performance and pessimism was found. It is possible that pessimists

may employ adaptive strategies to foster goal attainment to protect themselves against negative results (Gordon, 2008). Undoubtedly, associations between calibration and optimism and pessimism should be further explored.

4.4. Attributes of accurate students

Both studies showed a general overconfidence effect and only a few students were accurate in predicting their actual performance. These students reported higher levels of task orientation, self-efficacy, and perceived competence compared to miscalibrated students. Moreover, consistent with previous evidence (Hacker et al., 2008) higher performance was positively related with accuracy of performance prediction. All these are characteristics of self-regulated students who are aware of what they know or can do and thus they are well calibrated (Stone, 2000). Indeed, self-regulated students enter in learning situation with certain degrees of self-efficacy, focus on mastering their skills and improving themselves, and reach high levels of performance (Zimmerman, 2000). During task execution, these person related characteristics interact with students' experiences (e.g., metacognitive judgments) (Efklides, 2011) informing the learning process highlighting the need of controlling or regulating aspects of this process. The accuracy of this information is critical for enhancing students' awareness regarding learning and performance and thus contributing in self-regulated learning (Efklides, 2011). Research should further explore the characteristics of students who can accurately predict their performance involving in effective cycles of self-regulated learning (Chen & Rossi, 2013).

4.5. Practical implications, limitations, and future research

Considering that calibration is hard to change even after practice (Bol et al., 2012) the present results provided evidence for designing effective interventions to enhance students' calibration in physical education. These interventions should orientate students to master skills (Duda, 2001) by increasing awareness regarding learning process and the requirements of the tasks (Efklides, 2011). Task-related strategies such as goal setting and self-talk (Kolovelonis, Goudas, & Dermitzaki, 2012a) may contribute in this process enhancing students' self-regulated learning. Students should be also involved in successful experiences enhancing their self-efficacy (Schunk & Pajares, 2005) and informed regarding potential discrepancies between predicted and actual performance (Labuhn et al., 2010). Thus, students become well calibrated and more responsive to social feedback (Chao, 2014). For example, students who believe they can perform in high level but actually they cannot, they might believe that the feedback received from physical educators is useless undermining thus their performance. However, feedback is also vital for overconfident students because research has shown that even errors made with confidence can be corrected with feedback (Butler, Fazio, & Marsh, 2011).

Absolute accuracy was measured as a difference score between predicted and actual performance at global level. Although this paradigm has been widely used in academic settings and fits to the peculiarities of sport tasks, reliability for the single-item measure of accuracy could not be examined. Efklides (2006) has suggested that single-item measures can gain in rigor if they are combined with measures of other metacognitive experiences (e.g., feeling of knowing). Future research should adopt this approach to strength the use of the single-item measures of absolute accuracy which seem to be more appropriate for sport tasks compared to other alternatives (e.g., using set of shots) (Avugos et al., 2013). Despite concerns regarding reliability, the accuracy of metacognitive judgments is still important to investigate (Dunlosky & Thiede, 2013) as these judgments are considered useful on-line measures in the self-regulated learning research (Ainley & Patrick, 2006). For example, students who accurately predict their performance at global level can set challenging goals to drive effective cycles of self-regulated learning (Zimmerman, 2000).

The low internal consistency of the optimism and sport competence scales was also a limitation and thus, respective results should be treated with caution. Low internal consistency of optimism scale was also found in previous research and attributed to the small number of items of the scale (Appaneal, 2012). Regarding sport competence, previous evidence (Kolovelonis et al., 2013) has shown satisfactory internal consistency and thus the low consistency may be considered sample-specific. Although low consistency may attenuate the strength of associations examined (e.g., Appaneal, 2012), this may have little effect on the results of the present studies as correlations between accuracy of performance prediction and optimism or sport competence were close to zero. This study was correlational and cross sectional in nature and thus, no cause and effect relationships could be inferred by the results. Longitudinal studies should explore the dynamic interactions between person related factors and students' calibration. For example, it would be examined if enhancing students' task orientation through an intervention would improve their calibration. Moreover, examining reciprocal effects between calibration, self-perceptions of competence (i.e., self-efficacy) or other person related factors (i.e., types of personality) and the role of task-related characteristics (i.e., task difficulty) should shed light in the dynamic interactions between these factors and their effects on self-regulated learning (Zimmerman, 2000). Further, considering that self-regulated learning is associated with higher performance (Kolovelonis & Goudas, 2013) future studies should examine the dynamic and reciprocal interactions of improvements in calibration and achievement in physical education (e.g., Rutherford, 2017).

References

Ainley, M., & Patrick, L. (2006). Measuring self-regulated learning processes through tracking patterns of student interaction with achievement activities. *Educational Psychology Review, 18*, 267–286. http://dx.doi.org/10.1007/s10648-006-9018-z.

Appaneal, R. (2012). A confirmatory factor analysis of the Life Orientation Test-Revised with competitive athletes. *Research Quarterly for Exercise and Sport, 83*, 592–596. http://dx.doi.org/10.1080/02701367.2012.10599885.

Avugos, S., Bar-Eli, M., Ritov, I., & Sher, E. (2013). The elusive reality of efficacy-–performance cycles in basketball shooting: An analysis of players' performance under invariant conditions. *International Journal of Sport and Exercise Psychology, 11*, 184–202. http://dx.doi.org/10.1080/1612197X.2013.773661.

Bandura, A. (1997). *Self-efficacy: The exercise of control.* New York: Freeman.

Bandura, A. (2006). Guide for constructing self-efficacy scales. In F. Pajares, & T. Urdan (Eds.). *Self-efficacy beliefs of adolescents* (pp. 307–337). Greenwich, CT: Information Age.

Bol, L., & Hacker, D. (2012). Calibration research: Where do we go from here? *Frontiers in Psychology, 3*, 1–6. http://dx.doi.org/10.3389/fpsyg.2012.00229.

Bol, L., Hacker, D., Walck, C., & Nunnery, J. (2012). The effects of individual or group guidelines on the calibration accuracy and achievement of high school biology students. *Contemporary Educational Psychology, 37*, 280–287. http://dx.doi.org/10.1016/j.cedpsych.2012.02.004.

Butler, A., Fazio, L., & Marsh, E. (2011). The hypercorrection effect persists over a week, but high-confidence errors return. *Psychonomic Bulletin & Review, 18*, 1238–1244. http://dx.doi.org/10.3758/s13423-011-0173-y.

Chao, F. (2014). *Calibration and achievement goals in college volleyball.* George Mason University (Master thesis).

Chen, P. (2003). Exploring the accuracy and predictability of the self-efficacy beliefs of seventh grade mathematics students. *Learning and Individual Differences, 14*, 79–92. http://dx.doi.org/10.1016/j.lindif.2003.08.003.

Chen, P., & Rossi, P. (2013). Utilizing calibration accuracy information with adolescents to improve academic learning and performance. In H. Bembenutty, T. Cleary, & A. Kitsantas (Eds.). *Applications of self-regulated learning across diverse disciplines: A tribute to Barry J. Zimmerman* (pp. 263–297). Information Age: Greenwich, CT.

Chen, P., & Zimmerman, B. (2007). A cross-national comparison study on the accuracy of self-efficacy beliefs of middle-school mathematics students. *The Journal of Experimental Education, 75*, 221–244. http://dx.doi.org/10.3200/JEXE.75.3.221-244.

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Hillsdale, NJ: Lawrence Erlbaum.

Cole, D., Martin, J., Peeke, L., Seroczynski, A., & Fier, J. (1999). Children's over-and underestimation of academic competence: A longitudinal study of gender differences, depression, and anxiety. *Child Development, 70*, 459–473. http://dx.doi.org/10.1111/1467-8624.00033.

Czech, D., Burke, K., Joyner, A., & Hardy, C. (2002). An exploratory investigation of optimism, pessimism and sport orientation among NCAA Division I college athletes. *International Sports Journal, 6*, 136–145.

Dermitzaki, I., & Efklides, A. (2000). Aspects of self-concept and their relationship with

language performance and verbal reasoning ability. *American Journal of Psychology, 113*, 643–659. http://dx.doi.org/10.2307/1423475.
Dermitzaki, I., & Efklides, A. (2003). Goal orientations and their effect on self-concept and metacognition in adolescence. *Psychology: The Journal of the Hellenic Psychological Society, 10*, 214–227.
Dinsmore, D., & Parkinson, M. (2013). What are confidence judgments made of? Students' explanations for their confidence ratings and what that means for calibration. *Learning and Instruction, 24*, 4–14. http://dx.doi.org/10.1016/j.learninstruc.2012.06.001.
Duda, J. (2001). Achievement goal research in sport: Pushing the boundaries and clarifying some misunderstandings. In G. Roberts (Ed.). *Advances in motivation in sport and exercise* (pp. 129–182). Champaign, IL: Human Kinetics.
Duda, J., Fox, K., Biddle, S., & Armstrong, N. (1992). Children's achievement goals and beliefs about success in sport. *British Journal of Educational Psychology, 62*, 313–323. http://dx.doi.org/10.1111/j.2044-8279.1992.tb01025.x.
Dunlosky, J., & Thiede, K. (2013). Four cornerstones of calibration research: Why understanding students' judgments can improve their achievement. *Learning and Instruction, 24*, 58–61. http://dx.doi.org/10.1016/j.learninstruc.2012.05.002.
Durand-Bush, N., & Salmela, J. (2002). The development and maintenance of expert athletic performance: Perceptions of world and Olympic champions. *Journal of Applied Sport Psychology, 14*, 154–171. http://dx.doi.org/10.1080/10413200290103473.
Dweck, C., & Molden, D. (2005). Self-theories: Their impact on competence motivation and acquisition. In A. Elliot, & C. Dweck (Eds.). *Handbook of competence and motivation* (pp. 122–140). New York: The Guilford Press.
Efklides, A. (2006). Metacognitive experiences: The missing link in the self-regulated learning process. *Educational Psychology Review, 18*, 287–291. http://dx.doi.org/10.1007/s10648-006-9021-4.
Efklides, A. (2009). The role of metacognitive experiences in the learning process. *Psicothema, 21*, 76–82.
Efklides, A. (2011). Interactions of metacognition with motivation and affect in self-regulated learning: The MASRL model. *Educational Psychologist, 46*, 6–25. http://dx.doi.org/10.1080/00461520.2011.538645.
Efklides, A., & Tsiora, A. (2002). Metacognitive experiences, self-concept, and self-regulation. *Psychologia: An International Journal of Psychology in the Orient, 45*, 222–236. http://dx.doi.org/10.2117/psysoc.2002.222.
Fernández, T., Kroesbergen, E., Pérez, C., González-Castro, P., & Gonzalez-Pienda, J. (2015). Factors involved in making post-performance judgments in mathematics problem-solving. *Psicothema, 27*, 374–380. http://dx.doi.org/10.7334/psicothema2015.25.
Finn, B., & Metcalfe, J. (2008). Judgments of learning are influenced by memory for past test. *Journal of Memory and Language, 58*, 19–34. http://dx.doi.org/10.1016/j.jml.2007.03.006.
Fogarty, G., & Else, D. (2005). Performance calibration in sport: Implications for self-confidence and metacognitive biases. *International Journal of Sport and Exercise Psychology, 3*, 41–57. http://dx.doi.org/10.1080/1612197X.2005.9671757.
Forgeard, M., & Seligman, M. (2012). Seeing the glass half full: A review of the causes and consequences of optimism. *Pratiques Psychologiques, 18*, 107–120. http://dx.doi.org/10.1016/j.prps.2012.02.002.
Fox, K. (1997). *The physical self: From motivation to well-being.* Champaign, IL: Human Kinetics.
Fox, K., & Corbin, C. (1989). The physical self-perception profile: Development and preliminary validation. *Journal of Sport & Exercise Psychology, 11*, 408–430. http://dx.doi.org/10.1123/jsep.11.4.408.
Gasser, M., & Tan, R. (2005). Performance estimates and confidence calibration for a perceptual-motor task. *North American Journal of Psychology, 7*, 457–468.
Gaudreau, P., Gunnell, K., Hoar, S., Thompson, A., & Lelièvre, J. (2015). Optimism, pessimism, and coping in a dual-domain model of sport and school satisfaction. *Sport, Exercise, and Performance Psychology, 4*, 140–152. http://dx.doi.org/10.1037/spy0000032.
Gonida, E., & Leondari, A. (2011). Patterns of motivation among adolescents with biased and accurate self-efficacy beliefs. *International Journal of Educational Research, 50*, 209–220. http://dx.doi.org/10.1016/j.ijer.2011.08.002.
Gordon, R. (2008). Attributional style and athletic performance: Strategic optimism and defensive pessimism. *Psychology of Sport and Exercise, 9*, 336–350. http://dx.doi.org/10.1016/j.psychsport.2007.04.007.
Goudas, M., Dermitzaki, I., & Bagiatis, K. (2000). Predictors of students' intrinsic motivation in school physical education. *European Journal of Psychology of Education, 15*, 271–280. http://dx.doi.org/10.1007/BF03173179.
Goudas, M., Dermitzaki, I., & Kolovelonis, A. (2017). Self-regulated learning and students' metacognitive feelings in physical education. *International Journal of Sport and Exercise Psychology, 15*, 131–145. http://dx.doi.org/10.1080/1612197X.2015.1079791.
Griffin, T., Wiley, J., & Salas, C. (2013). Supporting effective self-regulated learning: The critical role of monitoring. In R. Azevedo, & V. Aleven (Eds.). *International handbook of metacognition and learning technologies* (pp. 19–34). New York: Springer. http://dx.doi.org/10.1007/978-1-4419-5546-3_2.
Grove, J., & Heard, N. (1997). Optimism and sport confidence as correlates of slump-related coping among athletes. *Sport Psychologist, 11*, 400–410. http://dx.doi.org/10.1123/tsp.11.4.400.
Gutierrez, A., & Price, A. (2017). Calibration between undergraduate students' prediction of and actual performance: The role of gender and performance attributions. *The Journal of Experimental Education, 85*, 486–500. http://dx.doi.org/10.1080/00220973.2016.1180278.
Hacker, D., Bol, L., & Bahbahani, K. (2008). Explaining calibration accuracy in classroom contexts: The effects of incentives, reflection, and explanatory style. *Metacognition and Learning, 3*, 101–121. http://dx.doi.org/10.1007/s11409-008-9021-5.
Harter, S. (1999). *The construction of the self: A developmental perspective.* New York: Guilford Press.
Hattie, J. (2013). Calibration and confidence: Where to next? *Learning and Instruction, 24*, 62–66. http://dx.doi.org/10.1016/j.learninstruc.2012.05.009.
Hilton, D., Regner, I., Cabantous, L., Charalambides, L., & Vautier, S. (2011). Do positive illusions predict overconfidence in judgment? A test using interval production and probability evaluation measures of miscalibration. *Journal of Behavioral Decision Making, 24*, 117–139. http://dx.doi.org/10.1002/bdm.678.
Hu, L., & Bentler, P. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling, 6*, 1–55. http://dx.doi.org/10.1080/10705519909540118.
Job, J., & Klassen, R. (2012). Predicting performance on academic and non-academic tasks: A comparison of adolescents with and without learning disabilities. *Contemporary Educational Psychology, 37*, 162–169. http://dx.doi.org/10.1016/j.cedpsych.2011.05.001.
Keren, G. (1991). Calibration and probability judgements: Conceptual and methodological issues. *Acta Psychologia, 77*, 217–273. http://dx.doi.org/10.1016/0001-6918(91)90036-Y.
Kleitman, S., & Gibson, J. (2011). Metacognitive beliefs, self-confidence and primary learning environment of sixth grade students. *Learning and Individual Differences, 21*, 728–735. http://dx.doi.org/10.1016/j.lindif.2011.08.003.
Kolovelonis, A., & Goudas, M. (2012). Students' recording accuracy in the reciprocal and the self-check styles in physical education. *Educational Research and Evaluation, 18*, 733–747. http://dx.doi.org/10.1080/13803611.2012.724938.
Kolovelonis, A., & Goudas, M. (2013). The development of self-regulated learning of motor and sport skills in physical education: A review. *Hellenic Journal of Psychology, 10*, 193–210.
Kolovelonis, A., Goudas, M., & Dermitzaki, I. (2012a). The effects of self-talk and goal setting on self-regulation of learning a new motor skill in physical education. *International Journal of Sport and Exercise Psychology, 10*, 221–235. http://dx.doi.org/10.1080/1612197X.2012.671592.
Kolovelonis, A., Goudas, M., & Dermitzaki, I. (2012b). Students' performance calibration in a basketball dribbling task in elementary physical education. *International Electronic Journal of Elementary Education, 4*, 507–517.
Kolovelonis, A., Goudas, M., Dermitzaki, I., & Kitsantas, A. (2013). Self-regulated learning and performance calibration among elementary physical education students. *European Journal of Psychology of Education, 28*, 685–701. http://dx.doi.org/10.1007/s10212-012-0135-4.
Kolovelonis, A., Goudas, M., Hassandra, M., & Dermitzaki, I. (2012). Self-regulated learning in physical education: Examining the effects of emulative and self-control practice. *Psychology of Sport and Exercise, 13*, 383–389. http://dx.doi.org/10.1016/j.psychsport.2012.01.005.
Kolovelonis, A., Mousouraki, M., Goudas, M., & Michalopoulou, M. (2013). Psychometric properties of the Greek version of the Children and Youth Physical Self-Perception Profile Questionnaire. *Advances in Physical Education, 3*, 158–164. http://dx.doi.org/10.4236/ape.2013.34026.
Koriat, A., Nussinson, R., Bless, H., & Shaked, N. (2008). Information-based and experience-based metacognitive judgments: Evidence from subjective confidence. In J. Dunlosky, & R. Bjork (Eds.). *A handbook of memory and metamemory* (pp. 117–136). New York: Psychology Press.
Kroll, M., & Ford, M. (1992). The illusion of knowing, error detection, and motivational orientations. *Contemporary Educational Psychology, 17*, 371–378. http://dx.doi.org/10.1016/0361-476X(92)90075-A.
Kröner, S., & Biermann, A. (2007). The relationship between confidence and self-concept. Towards a model of response confidence. *Intelligence, 35*, 580–590. http://dx.doi.org/10.1016/j.intell.2006.09.009.
Labuhn, A., Zimmerman, B., & Hasselhorn, M. (2010). Enhancing students' self-regulation and mathematics performance: The influence of feedback and self-evaluative standards. *Metacognition and Learning, 5*, 173–194. http://dx.doi.org/10.1007/s11409-010-9056-2.
Maki, R. H., Shields, M., Wheeler, A. E., & Zacchilli, T. L. (2005). Individual differences in absolute and relative metacomprehension accuracy. *Journal of Educational Psychology, 97*, 723–731. http://dx.doi.org/10.1037/0022-0663.97.4.723.
McGraw, A., Mellers, B., & Ritov, I. (2004). The affective cost of overconfidence. *Journal of Behavioral Decision Making, 17*, 281–295. http://dx.doi.org/10.1002/bdm.472.
Muis, K., Winne, P., & Ranellucci, J. (2016). The role of calibration bias and performance feedback in achievement goal regulation. *International Education Research, 4*, 14–36. http://dx.doi.org/10.12735/ier.v4i1p14.
Nicholls, J. (1989). *The competitive ethos and democratic education.* Cambridge, MA: Harvard University Press.
Nietfeld, J., Cao, L., & Osborne, J. (2006). The effect of distributed monitoring exercises and feedback on performance, monitoring accuracy, and self-efficacy. *Metacognition and Learning, 1*, 159–179. http://dx.doi.org/10.1007/s10409-006-9595-6.
Papaioannou, A., & Macdonald, A. (1993). Goal perspectives and purposes of physical education among Greek adolescents. *Physical Education Review, 16*, 41–48.
Pesce, C., Faigenbaum, A., Goudas, M., & Tomporowski, P. (2017). Coupling our plough of thoughtful moving to the star of children's right to play: From neuroscience to multi-sectoral promotion. In R. Meeusen, S. Schaefer, P. Tomporowski, & R. Bailey (Eds.). *Physical activity and educational achievement: Insights from exercise neuroscience* (pp. 247–274). London: Routledge.
Peterson, C. (2000). The future of optimism. *American Psychologist, 55*, 44–45. http://dx.doi.org/10.1037/0003-066X.55.1.44.
Pieger, E., Mengelkamp, C., & Bannert, M. (2016). Metacognitive judgments and disfluency – Does disfluency lead to more accurate judgments, better control, and better performance? *Learning and Instruction, 44*, 31–40. http://dx.doi.org/10.1016/j.

learninstruc.2016.01.012.
Pieschl, S. (2009). Metacognitive calibration - an extended conceptualization and potential applications. *Metacognition and Learning, 4*, 3–31. http://dx.doi.org/10.1007/s11409-008-9030-4.
Pintrich, P. (2000). The role of goal orientation in self-regulated learning. In M. Boekaerts, P. Pintrich, & M. Zeidner (Eds.). *Self-regulation: Theory, research, and applications* (pp. 451–502). San Diego, CA: Academic Press. http://dx.doi.org/10.1016/B978-012109890-2/50043-3.
Pojskić, H., Šeparović, V., & Užičanin, E. (2011). Reliability and factorial validity of basketball shooting accuracy tests. *Sport Scientific and Practical Aspects, 8*, 25–32.
Roebers, C., Krebs, S., & Roderer, T. (2014). Metacognitive monitoring and control in elementary school children: Their interrelations and their role for test performance. *Learning and Individual Differences, 29*, 141–149. http://dx.doi.org/10.1016/j.lindif.2012.12.003.
Roeser, R. (2004). Competing schools of thought in achievement goal theory? In M. L. Maehr, & P. Pintrich (Eds.). *Advances in motivation and achievement: Vol. 13. Motivating students, improving schools: The legacy of Carol Midgley* (pp. 265–299). New York: Elsevier.
Rutherford, T. (2017). Within and between person associations of calibration and achievement. *Contemporary Educational Psychology, 49*, 226–237. http://dx.doi.org/10.1016/j.cedpsych.2017.03.001.
Scheier, M., & Carver, C. (1992). Effects of optimism on psychological and physical well-being: Theoretical overview and empirical update. *Cognitive Therapy and Research, 16*, 201–228. http://dx.doi.org/10.1007/BF01173489.
Scheier, M., Carver, C., & Bridges, M. (1994). Distinguishing optimism from neuroticism (and trait anxiety, self-mastery, and self-esteem): A re-evaluation of the Life Orientation Test. *Journal of Personality and Social Psychology, 67*, 1063–1078. http://dx.doi.org/10.1037/0022-3514.67.6.1063.
Schmidt, R. A., & Wrisberg, C. A. (2008). *Motor learning and performance: A situation-based learning approach.* Champaign, IL: Human Kinetics.
Schraw, G. (2009). A conceptual analysis of five measures of metacognitive monitoring. *Metacognition and Learning, 4*, 33–45. http://dx.doi.org/10.1007/s11409-008-9031-3.
Schunk, D., & Pajares, F. (2005). Competence perceptions and academic functioning. In A. Elliot, & C. Dweck (Eds.). *Handbook of competence and motivation* (pp. 85–104). New York: The Guilford Press.
Schunk, D., & Pajares, F. (2009). Self-efficacy theory. In K. Wentzel, & A. Wigfield (Eds.). *Handbook of motivation at school* (pp. 35–53). New York: Routledge.
Schunk, D., & Zimmerman, B. (2006). Competence and control beliefs: Distinguishing the means and ends. In P. Alexander, & P. Winne (Eds.). *Handbook of research in educational psychology* (pp. 349–367). (2nd ed.). Mahwah, NJ: Lawrence Erlbaum.
Skaalvik, E. (1997). Self-enhancing and self-defeating ego orientation: Relations with task and avoidance orientation, achievement, self-perceptions, and anxiety. *Journal of Educational Psychology, 89*, 71–81. http://dx.doi.org/10.1037/0022-0663.89.1.71.
Stankov, L., & Crawford, J. (1996). Confidence judgments in studies of individual differences. *Personality and Individual Differences, 21*, 971–986. http://dx.doi.org/10.1016/S0191-8869(96)00130-4.
Stankov, L., & Kleitman, S. (2008). Processes on the borderline between cognitive abilities and personality: Confidence and its realism. In G. Boyle, G. Matthews, & D. Saklofske (Eds.). *The handbook of personality theory and testing* (pp. 541–555). Thousand Oaks, CA: Sage.
Stankov, L., Lee, J., Luo, W., & Hogan, D. (2012). Confidence: A better predictor of academic achievement than self-efficacy, self-concept and anxiety? *Learning and Individual Differences, 22*, 747–758. http://dx.doi.org/10.1016/j.lindif.2012.05.013.
Stone, N. (2000). Exploring the relationship between calibration and self-regulated learning. *Educational Psychology Review, 12*, 437–475. http://dx.doi.org/10.1023/A:1009084430926.
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. http://dx.doi.org/10.1016/j.psychsport.2005.10.002.
Thiede, K. W., Redford, J. S., Wiley, J., & Griffin, T. D. (2012). Elementary school experience with comprehension testing may influence metacomprehension accuracy among seventh and eighth graders. *Journal of Educational Psychology, 104*, 554–564. http://dx.doi.org/10.1037/a0028660.
Vrugt, A., & Oort, F. (2008). Metacognition, achievement goals, study strategies and academic achievement: Pathways to achievement. *Metacognition and Learning, 3*, 123–146. http://dx.doi.org/10.1007/s11409-008-9022-4.
Wahlstrom, D. (2001, April). The relationship between goal orientation and the calibration of performance expectations to performance feedback. *Paper presented at the Annual Meeting of the American Educational Research Association, Seattle, WA*.
Whitehead, J. (1995). A study of children's physical self-perceptions using an adapted physical self-perception profile questionnaire. *Pediatric Exercise Science, 7*, 132–151.
Wolfe, R., & Grosch, J. (1990). Personality correlates of confidence in one's decisions. *Journal of Personality, 58*, 515–534. http://dx.doi.org/10.1111/j.1467-6494.1990.tb00241.x.
Wolters, C., Shirley, L., & Pintrich, P. (1996). The relation between goal orientation and students' motivational beliefs and self-regulated learning. *Learning and Individual Differences, 8*, 211–238. http://dx.doi.org/10.1016/S1041-6080(96)90015-1.
Zhou, M. (2013). University student's goal profiles and metacomprehension accuracy. *Educational Psychology: An International Journal of Experimental Educational Psychology, 33*, 1–13. http://dx.doi.org/10.1080/01443410.2012.730325.
Zimmerman, B. (2000). Attaining self-regulation: A social-cognitive perspective. In M. Boekaerts, P. Pintrich, & M. Zeidner (Eds.). *Handbook of self-regulation* (pp. 13–39). San Diego, CA: Academic Press. http://dx.doi.org/10.1016/B978-012109890-2/50031-7.
Zimmerman, B., & Kitsantas, A. (1996). Self-regulated learning of a motoric skill: The role of goal setting and self-recording. *Journal of Applied Sport Psychology, 8*, 60–75. http://dx.doi.org/10.1080/10413209608406308.