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# Examining the dimensional structure and factorial validity of the Bar-On Emotional Quotient Inventory in a sample of male athletes

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ABSTRACT

*Objectives:* Research examining how emotional intelligence (EI) relates to the performance of athletes has been conducted using various EI measures including the Bar-On Emotional Quotient Inventory (EQ-i; Bar-On, 1997), but no one has investigated the factor structure of the EQ-i in the area of sport psychology. The current study explored the dimensional structure and factorial validity of the EQ-i in a sample of male athletes.
*Design:* Confirmatory factor analysis was used to examine Bar-On's (1997, 2004) model of emotional–social intelligence and the 1-5-15 dimensional structure which underpins the EQ-i.
*Method:* A total sample of 706 male athletes from various sports and competing at the national age group level through to the professional level of competition completed the EQ-i.
*Results:* Confirmatory factor analyses demonstrated that the 1-5-15 dimensional structure was a poor fit for the data. A re-specification of the model representing the best fit for the data was a 1-4-15 dimensional structure. The factorial validity of the individual subscales was also examined at the item level using confirmatory factor analysis. Thirteen of the 15 subscales showed close, reasonably good, or mediocre fit for the data.
*Conclusion:* Further construct validation of Bar-On's model and measure is required. Sport psychologists administering the EQ-i in applied practice should consider using the EQ-i subscales rather than referring back to the 1-5-15 dimensional structure.



A small number of researchers have presented reasonable rationale and evidence for the construct of emotional intelligence (EI) in sport. How EI is relevant to performance in sport was initially presented by Meyer and Fletcher (2007). More recently, Stanimirovic and Hanrahan (2010) suggested the potential for EI measures to predict criteria important to professional sport. The relationship between EI and the performance of athletes has been empirically tested in a sample of male professional cricket players (Crombie, Lombard, & Noakes, 2009) and male professional hockey players (Perlini & Halverson, 2006). The results provided preliminary support for the use of EI in professional sport samples as both a positive and negative predictor of performance outcomes specific to the sport. The evidence for the EI–performance relationship in collegiate baseball was not significant (Zizzi, Deaner, & Hirschhorn, 2003). A recent intervention study conducted by Crombie, Lombard, and Noakes (2011) showed how EI can be enhanced in a sample of elite cricketers with systematic training and development compared to a control group.

If EI measures are to be used in applied research and professional practice with athletes and potentially coaches, independent studies to evaluate the psychometric rigour of EI measures in sport are necessary. Measures used to test the EI–performance relationship in sport included the EI Scale (EIS; Schutte et al., 1998), Mayer–Salovey–Caruso EI Test Version 2 (MSCEIT; Mayer, Salovey, & Caruso, 2002), and the Bar-On Emotional Quotient Inventory (EQ-i; Bar-On, 1997). To date, the only psychometric investigation of any EI measure in sport was conducted by Lane et al. (2009) using the EI Scale. The current study explored the dimensional structure and factorial validity of the EQ-i (Bar-On, 1997) in a sample of male athletes.

The EQ-i was developed by Bar-On (1997) to better understand and facilitate psychological wellbeing and is based on the model of emotional–social intelligence (Bar-On, 2006). The model is theoretically linked to Darwinian concepts that recognise the importance of emotional expression for survival and adaptation. Ultimately, being emotionally and socially intelligent means to

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effectively manage personal, social, and environmental change by realistically and flexibly coping with the immediate situation, solving problems, and making decisions (Bar-On, 2006). The five key components of the model include (a) the ability to recognise, understand, and express emotions and feelings; (b) the ability to understand how others feel and relate with them; (c) the ability to manage and control emotions; (d) the ability to manage change, adapt, and solve problems of a personal and interpersonal nature; and (e) the ability to generate positive affect and be self motivated. The Bar-On model provides the theoretical basis for the EQ-i and the EQ-i measures the five key components and the 15 related competencies and skills.

Based on the EQ-i technical manual (Bar-On, 1997) it is generally assumed that the dimensional structure of the EQ-i is 1-5-15 (a general latent factor or total EQ, five first-order latent factors or composite scales, and 15 observed variables or subscales; see Fig. 1). Ongoing research specifically evaluating the psychometric properties of the EQ-i is essential because it is already the most widely used measure of EI. Perlini and Halverson (2006) used the composite scales of the EQ-i and related the factors to various performance outcomes that may be considered representative of job performance and career success in the National Hockey League (NHL) such as total points scored in the participants' careers to date, number of games played in the participants' careers to date, draft ranking, and years since the draft. Intrapersonal management (defined as self-awareness and self expression), and general mood (defined as self-motivation) were significantly related to career NHL games played ($\beta$-values .29 and −.30, respectively) after number of years experience was accounted for in the analyses. The contribution of EQ-i factors to relevant criteria in professional sport is preliminary, but certainly, requires further investigation.

The factorial validity of the EQ-i has been examined using confirmatory factor analysis (CFA) and exploratory factor analysis (EFA). Using general population samples, an EFA using varimax rotation was conducted by Bar-On (1997) to assess the factorial structure of the EQ-i. Thirteen factors with Eigen values greater than 1.0 emerged from the data. The results clearly did not justify the 15 primary scales that Bar-On (1997) included in the EQ-i. Nevertheless, CFA conducted by Bar-On suggested that the 15-factor model was a better fit than the 13-factor model. A second CFA removed items from five subscales. Bar-On (2004) later presented a 10-factor model with the five removed subscales acting as facilitators that positively influence emotionally and socially intelligent behaviour. A CFA to determine the revised model has not yet been published by Bar-On.

Palmer, Manocha, Gignac, and Stough (2003) showed that the 1-5-15 model was a reasonably good fitting model using a general population sample. EFA using principal axis factoring was then conducted and the scree test and parallel analysis suggested that six factors should be extracted from the data set. The results demonstrated the plausibility of a general factor of EI and six primary factors with 13 of the original EQ-i subscales retained. Livingstone and Day (2005) demonstrated that the proposed EQ-i five-factor model was a poor fit for the data using a military sample. EFA using principal components analyses was then conducted to examine the structure of the EQ-i. The scree plot indicated the presence of three factors. Arteche, Chamorro-Premuzic, Furnham, and Crump (2008) examined the EQ-i using a sample from a private organisation and the results revealed a non-fitting model. EFA using principal components analyses and Varimax rotation was performed to investigate a more appropriate structure of the EQ-i. Inspection of the scree plot suggested a four-factor structure, as opposed to the original five higher-order factors proposed by Bar-On (1997).

To date, CFA has failed to confirm the 1-5-15 multi-factor model that underpins the Bar-On EQ-i (see Fig. 1 for a conventional higher-order model of the EQ-i). However, none of these investigators have used direct hierarchical modelling (a.k.a., nested factor modelling), which is a multi-factor modelling technique that has been demonstrated to yield superior model fit in comparison to the more conventional higher-order modelling strategy. When using conventional higher-order model solutions, a Schmid–Leiman transformation (Schmid & Leiman, 1957) should be applied because it provides a less ambiguous interpretation of the nature and strength of both the general factor and group level covariance. A limitation of the Schmid–Leiman transformation is that there is no established method for determining the statistical significance of the transformed factor loadings. Gignac (2007) also highlighted that another limitation of the higher-order model is that complete mediation by lower order factors is assumed. It may not be realistic

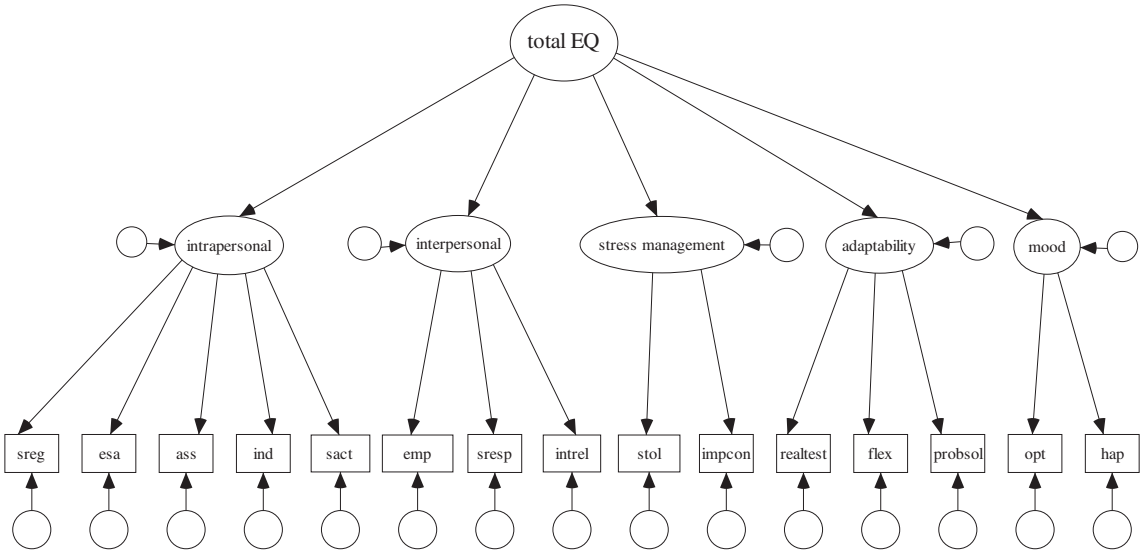


**Fig. 1.** Depiction of a higher-order model for the EQ-i. sreg – self-regard; esa – emotional self-awareness; ass – assertiveness; ind – independence; sact – self-actualisation; emp – empathy; sresp – social responsibility; intrel – interpersonal relationships; stol – stress tolerance; impcon – impulse control; realtest – reality testing; flex – flexibility; probsol – problem solving; opt – optimism; hap – happiness.