Is there a link between the volume of physical exercise and emotional intelligence (EQ)?

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Abstract

Emotional intelligence (EQ) was linked to sport participation. We report two studies in which we tested the link between exercise volume, defined as weekly hours of exercise, and EQ. Volunteers (n=64 and n=84) completed the Wong and Law Emotional Intelligence Scale. In Study I, significant correlations between exercise volume and *use*- and *regulation-of-emotions* prompted us to use *a posteriori* grouping into high- and low exercise-volume groups. The former exhibited better *use-of-emotions* than the latter (p=.007, d=.87). In Study II, using *a priori* grouping, we replicated the finding from Study I (p=.001, d=.78), and the groups also differed in "*self-emotions appraisal"* (p=.05, d=.44) and total EQ (p=.017, d=.54). Since the items measuring the *use-of-emotions* involve motivational aspects of the EQ, we posit that this dimension is "naturally" linked to exercise volume. Our findings also suggest that *self-emotions appraisal* and the overall EQ are linked to greater volumes of exercise. These results should provide an incentive for longitudinal studies in this area.

Key words: athlete, emotions, sport, training, weekly exercise

Is there a link between the volume of physical exercise and emotional intelligence (EQ)?

Emotional intelligence (known in the literature as "EQ" for Emotional Quotient) was defined as: "*the ability to engage in sophisticated information processing about one's own and others' emotions and the ability to use this information as a guide to thinking and behaviour*." (Mayer, Salovey, & Caruso, 2008, p. 503). This definition may link EQ to sport and exercise involvement in which complex sets of information need to be quickly processed while learning, practicing or training, and while interacting with others in the game or contest situations.

Higher volumes of exercise involve a greater frequency of using the principal constituents of EQ, which influence the ways in which individuals cope with challenges, and see- and present themselves not only in sport, but also in the daily life activities including work and relationship with others (Boyatzis, Goleman, & Rhee, 2000). While the situation-specific relative importance of the constituents of the EQ may vary, there are some key core components that are especially influenced by the regularly sustained sporty lifestyle (Figure 1). These are: (a) Self-Awareness, including Emotional Self-awareness, Accurate Self-assessment, and Self-confidence – heavily involved in sport-skill acquisition, practicing, and competition; (b) Self-Management, including Achievement Orientation, Adaptability, Initiative, Trustworthiness, Conscientiousness, and Self-control – key psychological factors linked to success in sport (Gill, 2000); (c) Social Awareness, including Empathy, Service Orientation, and Organizational Awareness - important in co-active and interactive sports, and especially in open-skills like combat sports (Szabo & Urbán, 2014); and (d) Social Skills, including Leadership, Influence, Communication, Developing Others, Change Catalyst, Conflict Management, Building Bonds, Teamwork and Collaboration - all crucial in team-sports (Boyatzis et al., 2000). The continuous observation, use, and application of these key constituents can lead to the development of the EQ (Boyatzis, 2007).

Insert Figure 1 about here

In a number of studies, higher EQ in athletes was associated with better performance in sports (Laborde, Dosseville, & Allen, 2015), including baseball (Zizzi, Deaner, & Hirschhorn, 2003), cricket (Crombie, Lombard, & Noakes, 2009), and hockey (Perlini & Halverson, 2006). At a personal level, a higher EQ was positively linked to the application of various psychological skills in sport, including imagery and self-talk (Lane, Thelwell, Lowther, & Devonport, 2009). Further, a higher EQ was associated with pleasant emotional states before optimal performance, while a lower EQ was linked to negative emotional states prior to dysfunctional performance (Lane et al., 2010). Finally, evidence shows that athletes score higher on EQ than non-athletes (Costarelli & Stamou, 2009; Szabo & Urbán, 2014), that is attributed to athletic training in which participants need to recognize and control their own emotions and read and respond to opponents' or team-mates' emotions (Szabo & Urbán, 2014; Zizzi et al., 2003).

In discord with the trait view of EQ (i.e., Petrides, Pita, & Kokkinaki, 2007), exercise training-induced development of the EQ can only be explained in terms of models purporting the dynamic nature of the EQ (Goleman, 2006; Hillis, 2012). Differences in EQ between athletes and non-athletes appear to support the latter view. Further, the frequency of exercise was found to correlate positively with the EQ (Magnini, Lee, & Kim, 2011). In the current work, we expanded the athlete-non-athlete dichotomous research avenue by testing whether the volume of training could differentiate the habitual exercisers among themselves in terms of EQ. We hypothesized that higher weekly hours of exercise (i.e., greater amount of reliance on the constituents of the EQ) will be manifested in a greater EQ in the regularly physically active individuals. Such findings may then substantiate both the situation-mediated dynamic nature of EQ as well as the dose-response association (Figure 1) between the situation (exercise) and outcome (EQ).

Methods

Design

Study I was a pilot correlational work relying on a convenience sample of volunteers. Study II represented a cross-sectional design, also relying on an exercising convenience sample made up of volunteers. The research was approved by the Faculty's Research Ethics Committee.

Participants

All participants, in the two studies reported here, were active in sports or exercise for at least six months prior to the testing. Those who did not meet this criterion were excluded from the study. They all were volunteers, upper-middle class Caucasians, and spoke Hungarian as their mother tongue. Participants were either sports management, leisure-organizer, or health promotion first or second year students at a large metropolitan university. In Study I, 64 participants (34 men and 30 women) were tested. Their mean age was 19.88 (SD = 1.19) years, they reported exercising an average of 10.58 (SD = 5.88) hours per week.

In Study II, 84 participants (39 men and 45 women) were tested. Their mean age was 21.04 (SD = 1.13) years and 33 of them trained at least 7-hours per week (an average of one or more hours per day) while 51 of them trained less than 7-hours a week. Formal ethical clearance for this research was obtained in writing from the Faculty's Research Ethics Committee.

Measures

Study I. A demographic questionnaire was used to ask respondents their average weekly hours of purposeful (scheduled) physical activity or training, age, and gender. The *Wong and Law Emotional Intelligence Scale* (WLEIS - Wong & Law, 2002) is a 16-item questionnaire, which is rated on a five-point Likert scale. A larger score on each subscale represents a higher level of emotional intelligence. This tool was used for at least two reasons: 1) its simplicity and good psychometric properties (Wong & Law, 2002), and 2) it measures four dimensions of emotions directly relevant to sports and exercise: *self-emotional appraisal, others' emotional appraisal, use of emotions,* and *regulation of emotions* (Meyer et al., 2008). In the current inquiry, the psychometrically validated 14-item Hungarian version of the scale (WLEIS-HU) was used (Szabó, Kun, Urbán, & Demetrovics, 2011). The psychometric properties of this version are good, with internal reliabilities - of the four subscales - ranging from (Cronbach's α) 0.69 to 0.84.

Study II. This work was a replication of the main findings from the Study I. Participants were simply asked whether they exercised at least seven hours a week (yes = 33) or less (no = 51), as well as their age and gender before completing the 14-items WLEIS. The 7-hour cutoff and grouping value was chosen because that averages at least 60 minutes of exercise per day that approximates the World Health Organization's (WHO) recommendation for physical activity for the maximal health benefits in this age group (300 minutes of moderate-intensity aerobic physical activity and muscle strength training 2 or more times a week; WHO, 2010).

Procedure

In both studies the participants completed the demographic questions and the WLEIS-HU. The completion of the questionnaires was anonymous and took place in a classroom, in a silent, non-interactive environment. The researchers distributed the questionnaires to all students who met the criterion for participation (regular involvement in sports or physical activity for at least six months). Passive consent was obtained through the presentation of the consent form, which stated clearly that the *anonymous* completion of the questionnaires implies consent to taking part in the study. The completed questionnaires were collected by a student who shuffled- and handed them to the researchers. Out of all the distributed questionnaires, in both studies, only three were returned uncompleted, indicating that only three students did not consent to the participation. Data were coded and entered in SPSS (V. 21) files, then analyzed using the same software.

Results

Study I. Initial correlation analyses between the weekly hours of exercise and the four dimensions of EQ resulted in two statistically significant results: 1) *use of emotions* (r = .302, p = .006), and 2) *regulation of emotions* (r = .207, p =.05). Based on a G* Power post-hoc analyses (Faul, Erdfelder, Lang, & Buchner, 2007), the sample size had less than optimal, but acceptable power for the correlational analysis (1-β = 0.79). Next *a posteriori* grouping was performed by using the upper and lower third data dichotomization method suggested by Gelman and Park (2008) on the mean weekly hours of exercise to generate a high exercise-volume (n = 21) and a low exercise-volume (n = 21) group. Data were tested with a 2 (group) by 4 (dependent measures) multivariate analysis of variance covariance (MANOCOVA), using age as the covariate. This analysis yielded a statistically significant multivariate effect (Wilks' Lambda = .722, F (4, 36) = 3.43, p = .017, effect size: partial ETA squared (η_p^2) = .278, power (1-β) = 0.81). The covariate (age) was statistically not significant. This multivariate effect was explained by a statistically significant group difference in the *use of emotions* (F (1, 39) = 6.85, p = .013, η_p^2 = .149, and Cohen's d = 0.87), with the high exercise-volume group scoring higher (mean = 17.14. SD = 1.68) than the low exercise-volume group (mean = 15.24, SD = 2.59). The total EQ and three other dimensions of the EQ were statistically not significantly different between the high- and low exercise-volume groups.

Study II. Data gathered in this study were analyzed with a 2 (group: > 7- and < 7 hours of exercise per week) by 2 (gender) by 4 (dependent measures) multivariate analysis of covariance (MANOCOVA) using age as the covariate. This analysis yielded two statistically significant multivariate main effects; one for exercise volume groups (Wilks' Lambda = .803, F (4, 76) = 4.65, p = .002, η_p^2 = .197, power (1-β) = 0.94) and the other for gender (Wilks' Lambda = .757, F (4, 76) = 6.11, p < .001, η_p^2 = .243, power = 0.98). The covariate (age) was statistically not significant. Follow up tests revealed that the multivariate effect was due to statistically significant group differences in the *use of emotions* (F (1, 79) = 10.09, p = .002, η_p^2 = .113) and *self-emotional appraisal* (F (1, 79) = 5.51, p = .021, η_p^2 = .065, Table 1). In this study, the total EQ scores also differed statistically significantly between the two exercise-volume groups (F (1, 82) = 5.91, p = .017, η_p^2 = .067, Table 1).

Insert Table 1 about here

Follow up of the gender differences, showed than men and women differed from each other in others' emotional appraisal (F (1, 79) = 5.30, p = .024, η_p^2 = .063) with women scoring higher than men (12.02±1.87 vs. 11.03±1.94) and in regulation of emotions (F (1, 79) = 6.08, p = .016, η_p^2 = .071) with women scoring lower than men (12.76±2.40 vs. 14.05±2.52). However, the two genders did not differ in their overall EQ scores.

Discussion

The results support the hypothesis of the work. In Study I, two significant, but relatively weak, correlations between the self-reported weekly exercise-volume and two dimensions of EQ, specifically the *use of emotions* and *regulation of emotions* were found. Nevertheless, based on the coefficients of determination, the weekly exercise-volume shared 9.1% and 4.3% of variance with these measures that warranted the further investigation via high- and low exercise-volume grouping. While dichotomization is often criticized in the literature (e.g., Irwin & McClelland, 2003), recent re-evaluations show that the practice proves to be robust and reliable (Iacobucci, Posavac, Kardes, Schneider, & Popovich, 2015a, 2015b). Further, we used the method suggested by Gelman and Park (2008), that may be the most reliable means of dichotomization. The results showed that only the *use of emotions* dimension of the EQ was higher in the high exercise-volume group in contrast to the low exercise-volume group. These findings provided scanty support for the hypothesis that the weekly exercise volume makes a difference in EQ. However, the large effect size obtained for the group differences in the *use of emotions* suggests that intense athletic training may foster greater skills in using one's emotions. These findings agree with the results of Magnini et al. (2011) showing a positive link between exercise frequency and EQ.

Since the dichotomization used in Study I could involve a loss of 10%–20% of efficiency (Gelman & Park, 2008), we conducted Study II with a larger sample size using *a priori* grouping on the basis of reported weekly exercise. The results revealed that overall EQ was higher in those respondents who exercise seven or more hours per week in contrast to those who exercised less. This overall effect was due to higher scores on *use of emotions* and *self-emotional appraisal* in the former group. Whilst the separation of the groups on the latter variable was only moderate as indicated by the effect size, the group differences in the *use of emotions* was substantiated by a relatively high effect size (Table 1). This finding then replicated the results obtained in Study I and re-affirmed that higher volumes of weekly exercise training are associated with greater perceived skills of using emotions.

However, before jumping to the conclusion that avid exercisers score higher on certain dimensions of EQ, we should stress the point made in a recent report (Libbrecht, Beuckelaer, Lievens, & Rockstuhl, 2014) that the "*use of emotions*" subscale of the WLEIS may measure - at least to some extent - motivation and self-efficacy. The statements on this subscale include: 1) "*I* *always set goals for myself and then try my best to achieve them*.", 2) "*I always tell myself I am a competent person.*", 3) "*I am a self-motivated person.*", and 4) "*I would always encourage myself to try my best.*". Such motivations-oriented measures appear to be associated with the level of exercise involvement (Owen, Astell-Burt, & Lonsdale, 2013). Indeed, those working out longer hours each week, or each day, may express greater self-perceived motivation and practice-based self-efficacy, which is then a "natural" (expected) explanation for the noted large differences on the *use of emotions* between the high- exercise-volume and low exercise-volume groups. Therefore, future work should measure motivation alongside EQ to establish the overlap between the two constructs.

As far as the observed group difference in the *self-appraisal of emotions* and total EQ is concerned, the results of the current work may expand past suggestions that sports participation may foster the development of EQ (Szabo & Urbán, 2014; Zizzi et al., 2003) in that the training volume may be a mediating factor in this effect. However, causal inferences cannot be made from this study. While it may be unlikely that high- and low- exercise-volume groups differ in EQ at the start of their sport participation, a causal relationship between the benefits of exercise training and EQ could only emerge from longitudinal research. The here noted group difference in the total EQ was due to the differences in two of its components, namely the *use of emotions* and *self-appraisal of emotions*. While the former also differentiated high- and low exercise volumes groups in Study I, the latter only emerged in Study II that could be linked to a larger sample size.

Although gender was included in the analyses to examine a possible gender by exercise volume interaction in EQ, the focus of this work was *not* on gender differences. The observed differences in Study II were specific to the *others' appraisal of emotions* and *regulation of emotions*, but no overall gender differences were disclosed in the EQ. These findings agree with past reports showing certain gender differences in EQ (Brackett, Mayer, & Warner, 2004; Kaur, 201) and also with those that did not disclose gender differences in EQ (Castro-Schilo & Kee, 2010; McKinley et al., 2014). However, gender differences in the athletic population were not studied to date. The only study addressing the issues indirectly (Costarelli & Stamou, 2009), has disclosed some gender differences in some aspects of the EQ, in line with the current results, but due to low male representation in the sample the authors warn for the careful interpretation in the data. Indeed, gender differences in EQ in athletes or committed exercisers is a separate issue that warrants special attention with consideration to culture, age, social and educational status, and athletic level, as well as athletic experience.

While the research question has been answered in the current work, some limitations of the two studies should be noted. First, which is rather a delimitation than limitation, is that if regular exercise indeed fosters the development of the EQ, the past history, or previous exercise experience, may be a mediating factor that was not measured in the current work. Since exercise frequency is also positively linked to EQ (Magnini et al., 2011), future studies should define exercise volume in terms of both frequency and duration, and if possible intensity of workouts, as based on objective and subjective (perceived effort) measures. Further, the disclosed findings were obtained from regularly exercising Hungarian university students. The generalizability of these findings is subject to further research with a wider age group and cultural spectrum. Finally, the dichotomization used in Study I and the 7 hours per week cutoff point adopted in the *a priori* grouping in Study II may be subject to criticism, alongside the athletic or leisure status of the exerciser. Therefore, in future cross-sectional studies, exercise experience (years), competition status and level, social class, education level, and possibly the type of sport (team or individual) ought to be examined jointly to better understand the here observed link between the weekly exercise volume and EQ. In the interim, the relatively robust findings, emerging from the two studies reported here, showing that higher and lower exercise-volume groups differ on the motivation and self-efficacy centered "*use of emotions"* dimension of EQ, should provide researchers an incentive to further study the link between exercise behavior and EQ in longitudinal investigations.

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Table 1.

Means and standard deviations (SD) in five measures of emotional intelligence (EQ) in the two groups in Study II (total n = 84). The effect sizes (Cohen's d) are also shown for the statistically significant group-differences.

	> 7 hours of exercise training group	*< 7 hours of exercise training group*	*Effect size, Cohen's d*
Total EQ	54.00 (6.13)	50.84 (5.60)	.54
Self-emotional appraisal	11.91 (1.97)	11.06 (1.93)	.44
Others' emotional appraisal	11.88 (2.01)	11.35 (1.91)	-
Use of emotions	16.79 (2.15)	15.06 (2.28)	.78
Regulation of emotions	13.42 (2.94)	13.37 (2.62)	-

Figure 1.

Constiuents of the EQ dynamically used in sports, forming a model on which greater volume of sport and exercxise participation may be associated with greater EQ.