Development of a Chinese Emotional Intelligence Inventory and Its Association with Physical Activity

Gladys Shuk-fong Li, Wei Ting Li and Hsiu Hua Wang
Department of Athletic Sports, National Chung Cheng University
Taiwan

1. Introduction

This chapter aims to report the development of a Chinese Emotional Intelligence Inventory (CEII) that suits specifically to Taiwan society and culture; CEII items were created synthesizing the western and Chinese theoretical structure of emotional intelligence; next, we provided a detailed description of its psychometric properties, and finally, we examine the association of EI and physical activity for Taiwan university students.

1.1 Emotional intelligence and university students

Emotions, an integral and significant aspect of human nature and the motivation for behavior, has been recognized by psychology scholars as being an advanced topic of great significance; Emotional Intelligence is also a topic that has gained significant recognition from psychologists, scholars in education, management, and health studies over the past decade. emotional intelligence is concerned with understanding oneself and others, relating to people, and adapting to and coping more successfully in dealing with environmental demands (BarOn, 2002), and therefore, is an important indicator of future success in many aspects of life, including academic performance, career achievement (Saarni 1999; Goleman 1995; BarOn, 2002), and contributes to individual life satisfaction (Law, Wong, & Song, 2004).

Numerous studies have indicated that the ability to help predict academic performance and future achievements and success has given rise to why EI is critical for university students (Brackett, Mayer, and Warner, 2004; Bar-On, 1997; Parker, Summerfeldt, Hogan, & Majes, 2004). In their research, Parker, Summerfeldt, Hogan, and Majes (2004) conducted a study on 372 university students. They found that profound changes were experienced during the period between senior high school or college and university because of the influence of emotional intelligence and social abilities; a correlation was evident between these emotional and social factors and university students' future achievements and performances.

Nowadays, Taiwanese university students are often referred to as the "strawberry generation." This term implies that university students tend to display characteristics such

as low stress tolerance difficult to adjust to changing situation, and poor emotional management skills; and they tend to evade reality. The reason for such behaviors is that university students are experiencing the transitional phase between adolescence and adulthood; the self-inflicted or external stimulants that they experience cause changes in their intrinsic or extrinsic emotion and behavior. Since emotion is a part of human life, emotion is undoubtedly one of the most critical factors that significantly influence university students' daily lives and their social interactions. Therefore, it would be interesting in examining the emotional intelligence of university student in Taiwan.

1.2 What have been done in the past literature of emotional intelligence?

Currently, the definition and theoretical construct of emotional intelligence has not reached consensus to date. In the academia of international psychology, some scholars (Emmerling and Goleman, 2003; Shi & Wang, 2007) categorized the construct of EI into three main schools of theory, including ability, mixed model, or trait.; while the other scholars (Mayer, Salovey, & Caruso, 2000; Petrides & Furnham, 2000) reported that there are two dominant approaches to conceptualizing and measuring EI (Keele & Bell, 2007; Petrides & Furnham, 2000; Tett & Fox, 2006), including ability-based EI (Mayer, Salovey, & Caruso, 2000); and an alternative to ability EI, namely, trait EI (BarOn, 2002; Schutte et al., 1998), which are used interchangeably with the other EI models, such as socio-emotional, mixed, personal factors or as trait EI.

The first distinct concept of emotional intelligence from the literature is the 'ability' theory represented by Mayer-Salovey; as measured by Mayer, Salovey, Caruso Emotional Intelligence Test, MSCEIT; Mayer, Salovey, & Caruso, 2000). Mayer, Salovey, and Caruso (2000) defined emotional intelligence as the mental ability (ability EI) to perceive emotions; to recognize, use and regulate emotional, personal and social information in an adaptive way, and to use this information to guide one's thinking and actions (Mayer, Caruso, and Salovey, 1999). The second distinct conceptual framework of EI construct evolved is the multifactorial approach of 'traits' or 'personality' theory, represented by BarOn (BarOn, 2002), and Goleman (2001). Bar-On defined emotional intelligence as the emotional, personal, social, and survival dimensions of intelligence (BarOn, 2002); it concerned with understanding oneself and others, relating to people, and adapting to and coping with the immediate surroundings to be more successful in dealing with environmental demands; and he included the personality dimensions of impulse control, optimism, and stress tolerance…in the Bar-On emotional intelligence inventory (BarOn EQ-i).

The third perspective of emotional intelligence is proposed as the mixed models, which combine mental ability with personality characteristics such as optimism and well-being; this mixed models of EI conceptualized EI as a combination of cognitive, motivational, and affective constructs (Goleman, 2001).

Proposed a four-domain framework of emotional intelligence reflecting how an individual master the skills and competencies of Self-awareness, Self-Management, Social Awareness, and Relationship Management, Goleman (2001) stressed the critical distinction of this model that these skills and competencies could be learned, and allow individuals achieve greater effectiveness in the workplace. In sum, BarOn attempts to develop a general measure of social and emotional intelligence predictive of emotional well-being and adaptation, and

Mayer and Salovey seek to establish the validity and utility of a new form of intelligence, and Goleman put forward a theory that is specific to the domain of work performance based on social and emotional competencies (Emmerling & Goleman, 2003). In sum, the definition, theory, and the measurement of 'Emotional Intelligence (EI)' developed or adopted have been distinct and controversial among researchers, however, all theories within the EI research paradigm seek to understand how individuals perceive, understand, utilize and manage emotions in an effort to predict and foster personal effectiveness (Emmerling & Goleman, 2003).

The current literature available on the topic of emotional intelligence focuses on one or some of the following four research directions and objectives: (1) the effectiveness of different variables for predicting EI; (2) the determination of emotional intelligence scales and the verification of their reliability and validity; (3) the impact that EI has on academic or work performance, on health (including physical and mental health), and recently, on sport; and/or (4) the relationship between EI and other intelligence tests or other related studies. However, empirical studies and literature on EI rarely discuss its application. In fact, only when EI-induced abilities are cultivated and promoted can the significance and value of the topic of EI be truly demonstrated. If EI is the result of a series of interrelated capabilities developing and as advocated by human development theory that life experiences influence and enhance emotional intelligence (Wong, Foo, Wang, & Wong, 2007), then it is beneficial for us to investigate into the factors that affect the development of emotional intelligence.

As we currently know, life experiences already determined as predictors of EI include age (BarOn, 1997), gender, full-time parents, and parents' EI (Wong, Foo, Wang, & Wong, 2007) . Although two indicators of EI, age, and having a full-time parent implicate the nurture effects of experience, however, these variables, with its specific nature, couldn't be modified or acquired easily. If emotional intelligence could be nurtured or trained through certain life experiences, and use these experiences to design effective EI training program, thus, lead to the development of EI, the value of emotional intelligence could be magnified, Wong, Foo, Wang, & Wong (2007) suggested that other potential nurture effects should be examined in the future studies.

The studies of the association of EI and physical activity received attention recently (Adhia, Nagendra, & Mahadevan, 2010; Dietrich & Audiffren, 2011; Li, Lu, & Wang (2009). Dietrich & Audiffren, 2011 reported the underlying mechanisms of the relationship between EI and exercise, while Li, Lu, & Wang (2009) found that physical activity was one of the predictor variables of emotional intelligence. Nevertheless, the topic of how the experience of physical activity influences emotional intelligence and whether emotional intelligence could be mediator of physical activity behavior change, or directly leads to changes in exercise behavior has yet to be discussed.

1.3 Does emotional intelligence lead to changes in exercise behavior?

Engaging in regular physical activity (PA) which plays an essential role in enhancing physical fitness and health-related behavior, has become the prime health indicator (ACSM, 2009; Nieman, 1998; World Health Organization, 2004). However, the prevalence of inactivity among Taiwan college students has increased for the last decade; there are only 10.7% who exercise regularly enough to the recommended level that can reap the health

benefits (Lin et al. 2006), thus, those inactive may lead to adverse health consequences early in life (Racette et al. 2007). While Taymoori and Lubans (2008) suggested that the lack of knowledge regarding the mechanisms responsible for behavior change may explain the low levels of effectiveness in PA interventions among individuals, Dishman (2004) indicated that emotional changes related to exercise are an important part of exercise adherence. Thus, hypothesizing EI as a key component for the development of regular exercise behavior seems rationale.

The impact of emotional intelligence towards optimal health has been well documented. Through a comprehensive meta-analysis of the correlational studies of emotional intelligence and health, higher EI is linked with better health, thus, the value of EI as a plausible health predictor had been recognized (Martins, Ramalho, & Morin, 2010; Schutte, et. al. 2007). If EI might lead to changes in healthy behavior, hypothesizing a connection between EI and exercise behavior seems rational. However, emotional intelligence (EI) has received scant attention from researchers in the sport or exercise domain to date (Laborde, Brull, Weber, & Anders, 2011; Lu, Li, Hsu, & Williams, 2010), yet some researchers agreed that emotions are key to exercise and sport performance (Biddle, 2000; Laborde, Brull, Weber, & Anders, 2011; Vallerand & Blanchard, 2000). Vallerand & Blanchard (2000) suggested that emotional processes typically play an adaptive role in sport and exercise settings, high levels of emotional experience may facilitate participation in sport and exercise activities from both an intra- and an interpersonal perspective.

Recently, the studies of EI in the sport context began to receive some attention. Sizzi, Deaner,, & Hirschhorn (2003) indicated that an athlete must recognize one's emotions, as well as teammates' and opponents' emotions, in order to perform well in team sports. Moreover, Laborde, Brull, Weber, & Anders (2011) confirmed the link between EI and stress coping in athletes, Laborde, Brull, Weber, & Anders (2011) found that high trait EI athletes (handball players) experienced a lower increase of stress compared to their low trait EI counterparts, indicating trait EI may help athletes cope better with stress. In comparing the emotional intelligence, body image and disordered eating attitudes in combat sport athletes and non-athletes, Costarelli, & Stamou (2009) found the athletes having high emotional intelligence had higher emotional intelligence than non-athletes. While the impacts of EI in sport began to emerge, the empirical study of the association between physical activity and EI is scarce (Li, Lu, & Wang, 2009); to the best of our knowledge, the effects of EI on physical activity, and the importance of how physical activity plays an important role in enhancing emotional health of individuals has been overlooked in the past.

1.4 The effects of physical activity towards emotion

Some researchers strived to seek the linkage of exercise and emotional well-being, and reported the following emotional benefits that attribute to regular PA from the past studies (Reed, & Ones, 2006; Leith 2002; Kerr & Kuk 2001; Fox 1990; Biddle 2000; ASCM 2009). The effects of physical activity towards emotion include enhanced positive activated affect (Reed, & Ones, 2006) ; pleasant emotions (Kerr & Kuk 2001), positive mood, moderate anxiety-reduction effects (Biddle 2000), elevating their sense of happiness (Szabo 2003), and have higher score in optimistic levels (Kavussanu & Mcauley 1995), and increased in emotional intelligence (Adhia, Nagendra, & Mahadevan, 2010). Yet, very few empirical

studies have investigated the influence of physical activity or exercise participation on emotional intelligence (Li, Lu, & Wang, 2008). Not until recently has there been one empirical study investigate the impact of exercise participation on emotional intelligence. Adhia, Nagendra, & Mahadevan (2010) examined the impact of yoga on EI and managerial performance in managers from a business enterprise, and reported that yoga practice enhanced both of the EI and managerial performance in managers

1.5 Measurement of emotional intelligence

While currently no consensus exists on the definition and theoretical construct of EI, the suitability of various EI-measuring methods suffer from controversial debate (Keele and Bell, 2007). The main EI-measuring methods proposed by scholars include measurement by trait (EIS, Schutte), by a mixed approach: personality and ability (BarOn EQi, BarOn), by ability (intelligence and ability, Goleman), or by trait and personality (WLEIS, Wong and Law) (Shi and Wong, 2007). Moreover, indigenization is currently missing in EI construct adopted in Taiwan; The majority of existing research studies on EI in Taiwan tends to adopt Western EI concepts, theories, methodologies, and testing instruments in a haphazard and even irrational manner, and ignores the significance and heterogeneity of Chinese culture. (Yang, 2004), Yang further stated that to establish and adopt the concept of indigenization, and apply indigenized methodologies and instruments in empirical research studies designed for Chinese people is needed for revealing a true emotional culture for Taiwan Chinese.

1.5.1 Theoretical framework for developing Chinese Emotional Intelligence Inventory (CEII)

Psychology scholars in Taiwan indicated that Chinese society adopts the thinking of Confucianism, Taoism, and Buddhism. Our society is particularly influenced by Confucianism; hence, the social orientation of Chinese culture is based on the Confucian concept of "interdependent self-construal," which emphasizes the connection between social relationships and our dependence on other people. By contrast, Western countries are strongly influenced by humanism and people in Western countries tend to display self-orientation largely based on individualism with an emphasis on self-independence (Yang, 2004). Modern Chinese people now adopt a mixture of self-orientation and social-orientation in their concept of self. For example, Yang (2004) asserted that people in Taiwan and Hong Kong currently adopt a way of life that is both self- and society-orientated. Over time they have developed "composite self" behavior. This type of psychological behavior now exists in the Chinese cognitive system and people's composite selves coexist and interact.

This research uses the four-factor theory of the Chinese self proposed by Yang (2007) as a reference to discuss whether we can use the concept of self-esteem as a medium to integrate and build a systematic model of emotion for an emotion theory more applicable to Taiwanese people. The four-factor theory of the Chinese self proposed by Yang (2007) suggests that the majority of people in Chinese societies (including Taiwanese people) demonstrate both "traditional self" (socially-oriented self that focuses on the collective and relationships) and "modern self" (individually-oriented self) traits and behaviors. The

combined self-concept type is referred to as the "traditional-modern bicultural self." Thus, Yang suggested that the four-factor theory of the Chinese self be used as the basis for designing scales related to the concept of self. Such scales include the basic individually-oriented self emotion scale and socially-oriented self emotion scale.

Having summarized the concepts and definitions of EI proposed by various scholars, we realize that EI can occur on a "personal" and "interpersonal" level. In this study, the emotional intelligence inventory designed for Taiwanese university students incorporated the preceding EI theories suggested by Emmerling and Goleman (2003); and adopted the concept of "individually-oriented self" and "socially-oriented self" in the "four-factor theory of the Chinese self" proposed by Yang (2004). This research categorizes university students' ability to integrate emotion during intrapersonal and social interaction into four main concepts; we developed a scale for measuring university students' EI. The proposed scale comprises four main dimensions: "Cognition and understanding of self-emotion," "Application and management of self-emotion," "Cognition and understanding of social interaction," and "Application and management of social interaction". Regarding social interaction, this research not only discusses the relationship between interpersonal EI, but it also incorporates life, external environment, and academic factors into the design of the scale questions. Using the construct of social interaction, this study presents a more extensive discussion of EI and university students' cognition, understanding, application, and management abilities under the influence of the social environment. Each of the four concepts is described below:

Cognition and understanding of self-emotion

This refers to university students' ability to recognize and understand their emotions, and whether they can realize changes in their emotions. For example, their ability to identify the delight, anger, sorrow, and happiness they experience, to determine whether they feel happy or sad, and to understand whether their emotions have changed.

Application and management of self-emotion

This refers to university students' ability to appropriately manage their emotions and avoid the adverse influence of negative emotions. For example, their ability to adopt solutions when negative emotions arise, controls their emotions, and remains upbeat despite experiencing adverse situations.

Cognition and understanding of social interaction

This refers to university students' ability to recognize other people's emotions, understand changes in their own emotions in certain environments, and identify the external factors that influence their emotions.

Application and management of social interaction

This refers to university students' interpersonal communication skills and ability to interact with others and emotionally cope with external changes in their environment (situational changes, such as to their education, personal relationships, friendships, and family). For example, whether they can remain composed under stress, have healthy interactions with others, and appropriately show empathy to other's emotions.
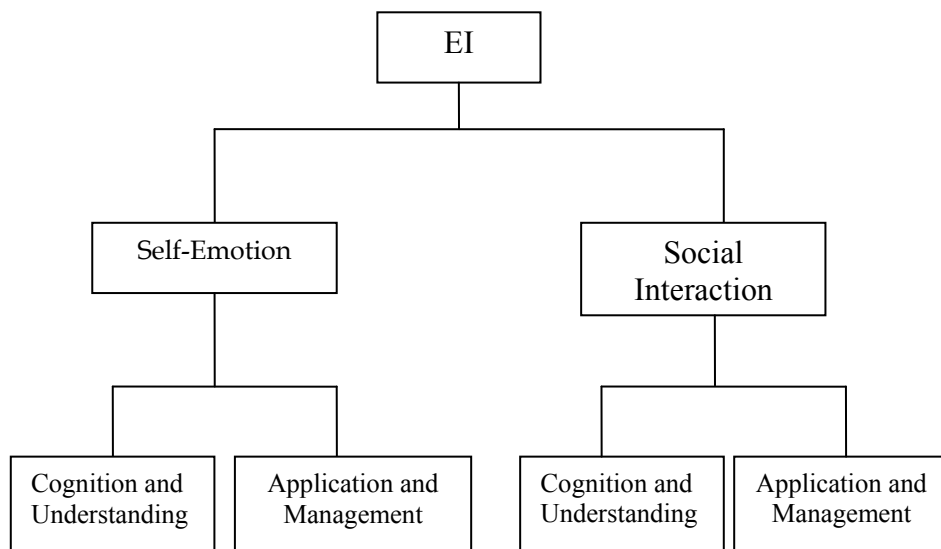
Fig. 1. Theoretical framework for the Chinese Emotional Intelligence Scale (CEII)

1.6 Significance of this research

In summary, this study does not directly adopt the theories and methodologies used in previous studies by Western scholars; instead, this study demonstrates sufficient indigenous compatibility and is conducted from the perspective of indigenous psychology and exercise science. Since the topic of emotional intelligence and physical activity has not yet been empirically examined, as an exploratory effort, this study attempts to examine a possible nurture factor, physical activity, in the development of EI. Therefore, the objective of this research is to develop an instrument that is easy to use, suitable, valid, and reliable for measuring emotional intelligence of Taiwan Chinese university students, and furthermore, to explore the associations of emotional intelligence and physical activity by utilizing this emotional intelligence Inventory.

1.7 Research objectives

This research has two main objectives:

- To develop a Chinese Emotional Intelligence Inventory (CEII) with good reliability and validity that is appropriate for university students,
- To explore the relationship of physical activity and emotional intelligence.

2. Method

2.1 Participants

In the pilot test, the student respondents included 613 university students, and 50 university students were selected to be tested again 1-week later to obtain the test-retest

reliability. For the official test, we selected eight national and private universities in Northern, Central, and Southern and eastern part of Taiwan using a cluster and convenience sampling approach. This study distributed 100 questionnaires to each of the selected universities, for a total of 800 questionnaires. Then, 743 completed questionnaires (92.88 %) were collected; of these, 727 questionnaires were valid (for a validity rate of 97.85 %). Student participants were asked to fill in self-response questionnaires including Chinese Emotional Intelligence Inventory and self-report containing sections on demographic characteristics, and physical activity questionnaire. The description of the student participating is shown in Table 1.

Variable	Group	N	%
Gender	male	269	37.0
	female	458	63.0
Grade	freshman	216	29.7
	sophomore	185	25.4
	Junior	212	29.2
	Senior	101	13.9
	Fifth Year	13	1.8
Total		**727**	**100**

Table 1. Gender and Grade of the student participants

2.2 Measurement

2.2.1 Chinese Emotional Intelligence Inventory

Based on the theoretical framework for the Chinese Emotional Intelligence Inventory mentioned above, this research designed a Chinese Emotional Intelligence Inventory for Taiwan university students. 108 items for the initial questionnaire was derived in reference to the four main dimensions: "cognition and understanding of self-emotion," "application and management of self-emotion," "cognition and understanding of social interaction," and 'application and management of social interaction." Content validity of EQ items were obtained through consultation and verification of a focus group including emotional experts and relevant scholars, we then modified and deleting those ambiguous or non self-explanatory items by obtaining feedback from 50 university students who answered the questions, 96 items were finally obtained for the empirical research. We employed a six-point Likert scale for the responses to each item; 1, denotes "strongly disagree", 2 denotes "disagree", 3 denotes "somewhat disagree", 4 denotes "slightly agree", 5 denotes "agree", to 6 denotes "strongly agree" for positively or negatively-keyed items.

2.2.2 Physical activity

We adopted the physical activity formula used by Fox (1999) to measure the level of exercise participation, subjects were asked to recollect the exercise they performed within the past seven days, and the information was recorded under "exercise participation" in the section of demographic background. Exercise participation is measured by the multiplication of weekly exercise frequency, the duration of how long they exercise, and the intensity of the exercise (according to the Ratings of Perceived Exertion, RPE). The calculation formula is:

Exercise Participation = Frequency × (Average Intensity + Duration). The higher the score for exercise participation, the more the subject involved and engaged in exercise. The scoring method is described as follow:

Exercise intensity

This is measured using the rating instrument devised by Borg (1983), namely the Ratings of Perceived Exertion (RPE). RPE measures the level of perceived lethargy On 15 levels (from 6-20) here, numerals are used to represent the intensity of the exercise as perceived by subjective cognition. The result obtained by comparing the perceived intensity and actual intensity indicated by the heart rate can be used as the basis for calculating exercise intensity if the two results are consistent (Hoeger and Hoeger, 2002).

Exercise frequency

This is the number of times a student exercises per week. 1 denotes one or no exercise sessions per week, whereas 5 denotes five or more exercise sessions per week. The larger the number, the more frequently the student exercises.

Exercise duration

This is the average continuous duration of time spent exercising excluding breaks. 1 denotes a duration of 0 to 15 min for each session, whereas 5 denotes a duration of 61 min or over for each session. The larger the number, the longer the student exercises each session.

For example, if the average intensity indicated by the RPE scale is 10, the subject perceives the exercise to be fairly moderate; a frequency of 3 means the subject exercises 3 times or more per week; and duration of 3 means the subject exercises for an average of 31 to 45 min per session. Given the formula, the exercise participation of the particular subject is: 3× (10+3) = 39.

2.3 Procedure

For the pilot test, we tested the reliability and validity of the initial Chinese Emotional Intelligence Inventory on a sample of 613 university students using exploratory factor analysis. 50 students selected from sample participants completed the Chinese Emotional Intelligence Inventory one week after the first test in order to obtain the test-retest reliability of the proposed inventory. We also analyzed the criterion-related validity of the proposed inventory using WLEIS developed by Wong and Law (2002). 100 students were selected from the participants to fill in the Wong and Law's Emotional Intelligence Scale (WLEIS) (Wong & Law, 2002), this allowed us to determine the concurrent validity of the Chinese emotional intelligence inventory. We used the analytical results from the pilot test to adjust and finalize the official scale items which comprised 16 positively phrased items and 6 negatively phrased items. A higher test score indicates better emotional intelligence.

On the verification stage, by using a cluster and convenience sampling approach, we distributed the resulting 22-items official Chinese Emotional Intelligence Inventory and self-report containing sections on demographic characteristics, and physical activity categories to students at eight national and private universities in Northern, Central, Southern, and Eastern Taiwan, and collected 727 valid questionnaires.

2.4 Data analyses

Being aware of the imperativeness of having a reliable, valid, and sound measuring instrument, the statistical analysis was performed utilizing SPSS for Windows 15.0 and AMOS 7.0. We conducted an exploratory factor analysis (EFA) to obtain the construct validity of the scale; and Confirmatory factor analysis (CFA) to assess the goodness of fit of the hypothetical measurement model of Chinese Emotional Intelligence Inventory, and to verify whether the scale conforms to the theoretical framework. This approach was used to develop an established and consistent emotional intelligence scale for university students, so that this measure can be used as a suitable measuring instrument in future studies. The majority of the scholars suggest using the absolute fit measure (including χ^2, GFI, RMR, SRMR, and RMSEA), incremental fit measure (including AGFI, CFI, NFI, RFI, and IFI), and parsimony goodness of fit (including PNFI, AIC, and χ^2/df) for goodness-of-fit measures (Jöreskog & Sörbom, 1993). Of the proposed measures, χ^2 may be affected by the sample size and, therefore, precaution should be taken when using it. Considering this potential situation, we prioritized other indices and approaches less susceptible to sample size and model complexity. These indices include GFI, RMR, RMSEA, AGFI, CFI, NFI, and χ^2/df. Lastly, Pearson product moment correlation coefficient was used to examine the relationship between university students' emotional intelligence and their levels of physical activity.

3. Results

3.1 Exploratory factor analyses

We used exploratory factor analysis to obtain the construct validity of the scale. Item analysis was conducted to determine the level of difficulty and to discriminate item that cannot reflect the response level of different test subjects. We extracted the factors using principle axis factoring, and then performed Promax oblique rotations to better explain factor loading. Based on this process, we retained items with item loading value higher than 0.4. After seven rotations, we obtained 22 items comprising two scales, four factors. In total, the four factors accounted for 48.74 % of the explained variance of emotional intelligence. The factors were labeled as "cognition and understanding of self-emotion" (6 items), "application and management of self-emotion (6 items)", "cognition and understanding of social interaction" (5 items), and "application and management of social interaction (5 items)". Please refer to Table 2 for the results for the factor analysis of the Chinese Emotional Intelligence Inventory.

3.1.1 Internal consistency

We used Cronbach's α to determine for internal consistency, to examine whether the questions in the same subscales actually test the same category of emotional intelligence; the *a* value of the subscale factors and the entire scale were between .78 and .86, and the Cronbach's α for the whole inventory was .89. As shown in Table 4, internal consistency reliability is adequate for the whole scale and 4 subscales (range = .74 - .87). See table 3. Test-retest reliability was employed to obtain the coefficient of stability which assesses the consistency of the testing results on the same group of test subjects using the same measuring instrument obtained over time, the test-retest reliability in this study was *r* = .73 (*p < .05*).

No.	Question	Factor			
		1	2	3	4
6	I deal with the majority of issues with an optimistic attitude.	.810			
13	I am an optimistic person.	.781			
9	I can face challenges and difficulties with an optimistic mindset.	.740			
3	I am able to maintain a positive mood most of the time.	.721			
4	I am able to maintain a good mood regardless of whether I am in a positive or negative situation.	.645			
2	I can rid myself of unpleasant feelings.	.518			
10	I actively console others when they are sad.		.839		
7	I actively show my concern for others when they encounter difficulties or adverse situations.		.795		
8	I try to calm others when they are experiencing anger.		.708		
21	I like to help other people relieve stress or manage their emotional issues.		.575		
18	I can appreciate the feeling when my friends feel sad.		.522		
11*	I do not manage unexpected situations well.			.656	
1*	I have no patience for complicated issues.			.621	
12*	I do not wish to try when I encounter unfamiliar things.			.603	
5*	When under stress, I feel choosing to avoid the issue is easier than choosing to face it.			.587	
20*	I am dissatisfied with myself, yet I do not know how to change the situation.			.571	
14*	I do not know how to identify my true emotions.			.570	
16	I constantly encourage myself to overcome difficulties.				.857
15	When I encounter difficulties, I focus all my energy and effort to resolve them.				.635
22	When I encounter difficulties, I try to figure out the solutions.				.633
19	I strive to achieve my objectives.				.617
17	When other people show little faith in what I do, I actually become more motivated.				.609
	Eigenvalues	7.16	2.30	1.92	1.33
	Explained variance accounted for (%)	30.36	8.05	6.34	3.99
	Total explained variance	48.74			

Note: * questions are negatively phrased items

Table 2. Factor loadings pertaining to the Chinese Emotional Intelligence Inventory

Subscale (item no.)	Item number	a
Cognition and understand of self-emotion (6)	1, 5, 11, 12, 14, 20	.74
Application and management of self-emotion (6)	2, 3, 4, 6, 9, 13	.87
Cognition and understand of social interaction (5)	15, 16, 17, 19, 22	.84
Application and management of social interaction (5)	7, 8, 10, 18, 21	.83
Self-emotion (12)	1, 2, 3, 4, 5, 6, 9, 11, 12, 13, 14, 20	.84
Social Interaction (10)	7, 8, 9, 10, 15, 16, 17, 18, 19, 21, 22	.86
Total scale (22-items)		.89

Table 3. Internal consistency of the whole scale and subscales of the CEII (n = 727)

3.1.2 Concurrent validity

For the criterion-related validity, we employed the Wong and Law Emotional Intelligence Scale (WLEIS) designed by Wong and Law (2002) to obtain the concurrent validity of the proposed Chinese emotional intelligence inventory. The correlation between CEII and WLEIS was $r = .51$ ($p < .05$), and the correlation coefficients of the four subscale to WLEIS ranged $r = .22 - .43$ ($p < .05$) indicating a satisfied concurrent validity. See table 4.

	EI total	Self Cogn Understanding	Self Apply & Man	Social Cogn & Understanding	Social Apply & Man
WLEIS total	.506*	.223*	.423*	.350*	.427*

P < .05

Table 4. Correlations of the CEII and WLEIS

In summary, the results of the exploratory factor analysis successfully to support the 4-factor structure of the Chinese emotional intelligence inventory. As a result, the official scale comprised 16 positively phrased items and 6 negatively phrased items.

3.2 Structure validity

We conducted confirmatory factor analysis (CFA) on the 22 item to examine the structure validity of Chinese emotional intelligence inventory. The four-factor model fit well. These results meet the criteria for goodness of fit indices (>.90) and root mean square residual (RMR < .05), which means that the Chinese emotional intelligence Inventory contain a four-factor structure in Taiwan Chinese university students sample. See table 4 and Fig. 2, and. As shown in Fig. 1, the scale developed in this research contains two main latent variables, namely "self-emotion" and "social interaction." These two variable categories each comprise two first-order latent factors, including "cognition and understanding", and "application and management" that made up four factors.

For the scores of the Chinese emotional intelligence inventory to display a normal distribution, the skewness should be smaller than ±3.0 and the kurtosis should be smaller than ±8.0 (Pedhazur & Schmelkin,1991). Our analysis confirmed that all the factor and scale values in the inventory fell between the required critical values, meaning they demonstrated a normal distribution and were fit for use in confirmatory factor analysis. As Table 5 demonstrate, the goodness of fit shown by the index values of the hypothetical measurement model, RMR=.038, GFI=.937, AGFI=.922, NFI=.917, CFI=.946, RMSEA=.047, and $\chi^2/df=2.637$, are all within the acceptable range (Jöreskog & Sörbom, 1993). Therefore, the hypothetical measurement model adopted by this research requires no adjustment. The university student emotional intelligence scale devised by this study is proven to conform to the theoretical model and possess good construct validity. Therefore, we can conclude that this scale is appropriate for future studies when measuring emotional intelligence of university students.
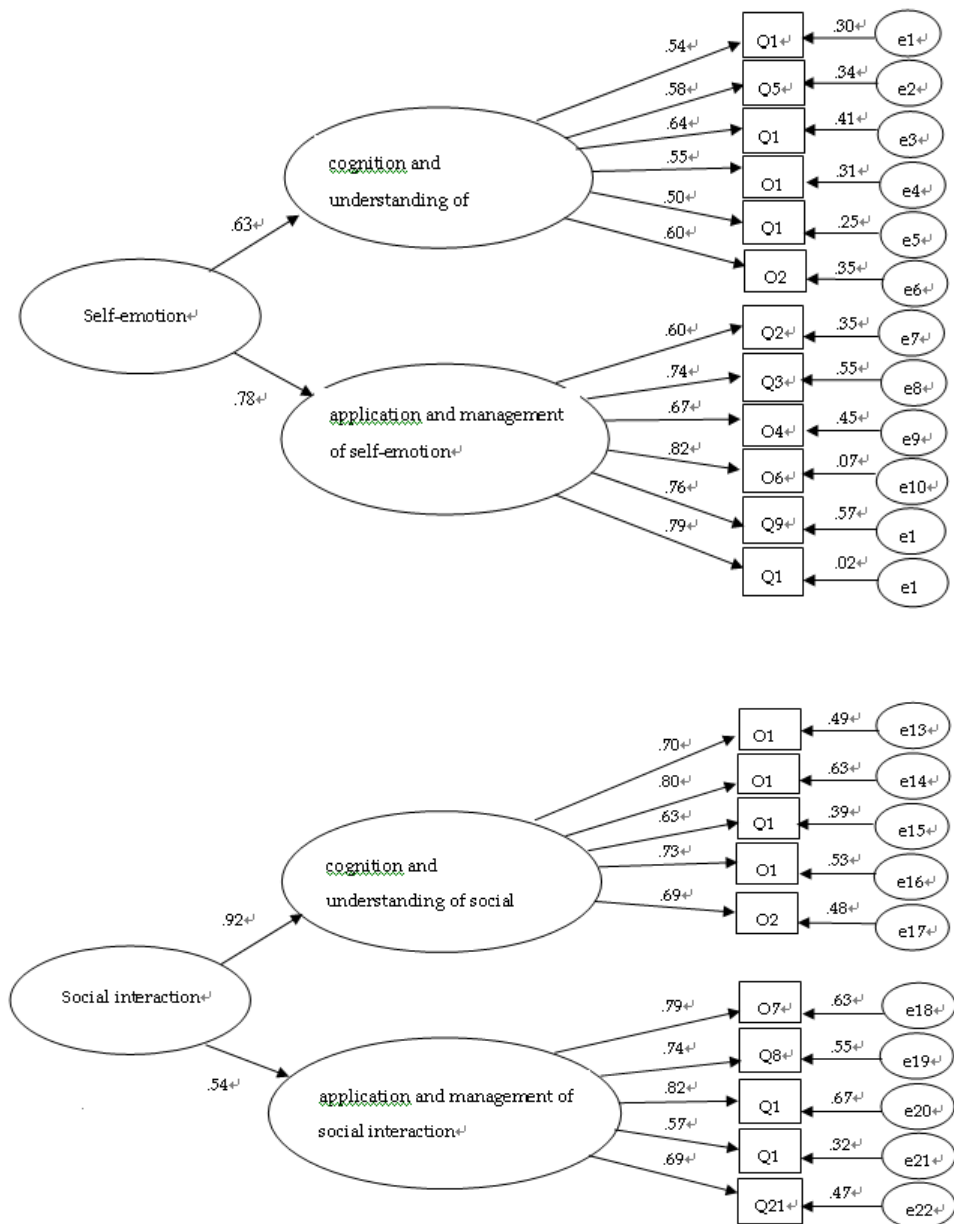
Fig. 2. Second order four-factor model of Chinese Emotional Intelligence Inventory (CEII)

Test Statistic	Index	Result	Criteria	Result
Absolute Fit Measure	GFI	.937	>.90	Accept
	RMR	.038	<.05, better if <.025	Accept
	RMSEA	.047	Excellent if <.05, good if between .05 and .08	Accept
Incremental Fit Measure	AGFI	.922	>.90	Accept
	CFI	.946	>.90	Accept
	NFI	.917	>.90	Accept
Parsimony Goodness of Fit	χ^2/df	2.637	1.0 - 3.0	Accept

Table 5. Summary of the Confirmatory Factor Analysis Result of the four-factor model of CEII

3.3 The association of emotional intelligence and physical activity

Pearson product moment correlation coefficient was performed to examine the relationship of emotional intelligence and physical activity. The results indicated that significant ($p < .05$) associations were found between physical activity and total emotional intelligence score ($r = .145, p < .05$), subscale score of self-emotion ($r = .112, p < .05$), subscale score of social interaction ($r = .156, p < .05$), and 3 factors, including "Application and management of self-emotion" ($r = .162, p < .05$) "Cognition and understanding of social interaction," ($r = .101, p < .05$), and "Application and management of social interaction ($r = .164, p < .05$)"; indicating a low to moderate positive association between physical activity and emotional intelligence.

	EI Total	Self Emotion	Social Interaction	Self-cognition	Self-management	Social-cognition	Social-management
Physical Activity	.145*	.112*	.156*	.023	.162*	.101*	.164*

$p < .05$

Table 6. Correlations of emotional intelligence and physical activity

4. Discussion

In this chapter, we attempted to describe the development of a Chinese Emotional Intelligence Inventory (CEII) that suited specifically to Taiwan society and culture. The result of the current study provided support for the reliability and validity of Chinese emotional intelligence inventory; the psychometric features of the Chinese emotional intelligence Inventory supported its feasibility as a research instrument to measure emotional intelligence appropriately for Taiwan Chinese university students. The results of confirmatory factor analysis of the CEIII verify the four-factor structure of the theoretical framework we previously proposed, that incorporated the preceding western EI theories and the concept of "individually-oriented self" and "socially-oriented self" in the "four-factor theory of the Chinese self" proposed by Yang (2004). The correlation between total

emotional intelligence scores and the scores of four subscales of CEII and WLEIS were positive. The results showed that higher scores on general emotional intelligence, as measured by CEII, were substantially associated with higher scores on the WLEIS, demonstrating good concurrent validity for CEII in a Taiwan Chinese university student population. In summary, the CEII was shown to possess good psychometric properties. In order to enhance the explanatory power of CEII, further research is required to establish the norm and validate the instrument.

The second purpose in this study was to examine the association of CEII and physical activity for university students in Taiwan. There has been very few study on the association between physical activity and emotional intelligence in the past, only recently has there been two empirical studies linking emotional intelligence to exercise participation (Adhia, Nagendra, & Mahadevan, 2010; Li, Lu & Wang, 2009). In our study, a positive relationship was found between physical activity and emotional intelligence, indicating that the more physical activity participation the university students have, the higher their emotional intelligence. The finding of our study are in line with the finding from the other studies (Adhia, Nagendra, & Mahadevan, 2010; Li, Lu, & Wang, 2009) that yoga exercise enhanced both of the emotional scores in managers, Adhia, Nagendra, & Mahadevan (2010) further explained that yoga provides a means to de-stress individuals and improve personal satisfaction, also help them to disengage from the negative role and unhappy involvement one has created for oneself, moreover, becoming more self-aware, self-regulated, and with a proper perspective of life and various relationships through yoga practice might lead to the enhancement of EI.

In an attempt to explore the associations of physical activity and emotional intelligence in Taiwan college students, Li, Lu, & Wang (2009) found that College students who reported a recommended level of physical activity scored significantly higher than insufficient and inactive counterparts in emotional intelligence; and physical activity was found to be one of the predictor variables towards emotional intelligence. Li, Lu, & Wang (2009) concluded that exercise participation or physical activity might be an effective way for the enhancement of emotional health in college students.

Several plausible mechanisms for PA effects on emotional consequences have been identified (Dietrich & Audiffren, 2011; Carron et al. 2003; Biddle & Mutrie, 2001); including having higher level of self-perception and body image through improvements in physical fitness or weight loss that resulted from exercise (Fox 2000); attaining positive emotions by changing in self-esteem due to mastering new exercise skills, or from an increased sense of intra-personal control (Biddle, 2000). In explaining the underlying neurobehavioral mechanism of how exercise could be beneficial towards emotions, Dietrich & Audiffren (2011) presented an evolutionary model of reticular-activating hypofrontality model of acute exercise; Dietrich & Audiffren (2011) noted that exercise first engages arousal mechanisms in the reticular-activating system by releasing a number of neurotransmitters (mainly norephinephine, dopamine, and serotonin) which shed positive effect on emotion; then secondly, since exercise motion demands enormously on motor, sensory, and autonomic structures of exercised individuals, thus, deactivate the higher-order functions of the prefrontal cortex by decreasing neural activity, thus, might help exercisers to mitigate the negative and unhelpful emotions. The study from Dietrich & Audiffren (2011) gave rationale support to the connection of exercise and EI from a neuroscience perspective.

There are, however, two limitations in our research. First, this study is cross-sectional in design; therefore, inferring causal relationships of physical activity towards emotional intelligence enhancement should not be feasible. Furthermore, all the data in this research were collected in Taiwan universities; we still don't know whether our finding could expand generalization into university population from other culture, and we also don't know if Chinese emotional intelligence inventory can be used in other cultures, or even for the entire Chinese population, for substantial discrepancy still exists between Oriental and Western prototypes of ideal cultures (Yang, 2004) .Therefore the cross-cultural validity of this Chinese emotional intelligence inventory needs further verification.

Recommendations for future study are suggested as follow:

- Conducting a comparative study and/or cross-cultural validity study using Chinese emotional intelligence inventory among different Chinese communities (such as Hong Kong, China, Macao, and Taiwan)
- We recommend that future studies explore the relationship between EI and physical activity using path analysis. If correlation exists between their paths then use structural equation modeling to verify the direct and indirect effects of exercise participation on EI. Through this approach (using SEM to verify the direct and indirect effects of exercise on EI, or the impact of EI on physical activity), the research findings will be even more valuable. These are all imperative exploratory research topics that require further investigation.
- If predictions regarding the effect of exercise participation on emotional intelligence can be inferred, then research studies concerning emotional intelligence and physical activity will be highly applicable and practical. To enhance the explanatory power of Chinese emotional intelligence inventory, the construction of norm models for university students are necessary.
- We suggest that the scale proposed by this research be applied in a more holistic manner in future studies. Not only can the scale be used to assess and understand the emotional intelligence of university students, it can also be used to discuss a range of different background variances, such as explaining the heterogeneity between different genders, years of study, schools and colleges, and family structures.

5. Conclusions

In this study, the psychometric features of the Chinese emotional intelligence Inventory supported its feasibility as a research instrument to measure EI appropriately in Taiwan Chinese university students. All statistical indexes, coefficients, and values indicated that the 4-factor, 22 items Chinese Emotional Intelligence Inventory was a reliable and valid measure for physical activity study in Chinese settings. In sum, whether EI ability can be learned through physical activity participation? Or Whether EI can influence physical activity participation are still the research topics that need constant effort, our study provided a useful reference for future studies.

6. References

ACSM (2009). *ACSM's resource manual for guidelines for exercise testing and prescription*, (6th ed.). Baltimore, MD: Williams & Wilkins.

Adhia, H., Nagendra, H. R., Mahadevan, B. (2010). Impact of adoption of yoga way of life on the emotional intelligence of manager, IIMB Management Review, 22, 32-41.

BarOn, R. (2002). *BarOn Emotional Quotient Inventory: Technical Manual*. North Tonawanda, NY: Multi-Health Systems.

Bar-On, R., Maree, J. G., & Elias, M. J. (2007). *Educating People to Be Emotionally Intelligence*. Westport Connecticut, London: Praeger. ISBN-13: 978-0-275-99363-4

Biddle, S. J. H. (2000). Exercise, emotions, and mental health. In Y. L. Hann (ed). *Emotions in sport*. Human Kinetics, Champaign, IL, pp 267-292. ISBN 0-88011-879-2

Biddle, S. J. H., & Mutrie, N. (2001). *Psychology of Physical Activity: Determinants, well-being and interventions*. New York, NY: Routledge.

Birkeland, M. S., Torbjorn, T., & Wold, B. (2009). A longitudinal study of the relationship betweenleisure-time physical activity and depressed mood among adolescents, Psychology of Sport and Exercise, 10, 25-34.

Borg, G. (1983). Perceived exertion: A note on history and method. *Medicine and Science in Sport and Exercise, 5*, 90-93.

Brackett, M., Mayer, J. D., & Warner, R. M. (2004). Emotional intelligence and its relation to everyday behaviour, *Personality and Individual Differences*, *36*(6), 1387-1402.

Carron, A.V., Hausenblas, H. A., Estabrooks, P.A. (2003). *The psychology of physical activity.* New York, NY: McGraw-Hill Higher Education,.

Costarelli, V., & Stamou, D. (2009). Emotioanl intelligence, body image and disordered eating attitudes in combat sport athletes, Journal of Exercise Science and Fitness, 7(2), 104-111.

Dishman, R. K. (1997). The norepinephrine hypothesis. In W. P. Morgan (ed.). *Physical activity and mental health*, pp 199-212.Washington, DC : Taylor & Francis.

Dishman, R. k., Washburn, R. A., & Health, G. W. (2004). *Physical activity epidemiology*. Champaign, IL: Human Kinetics.

Dietrich, A., & Audiffren, M. (2011). The reticular-activating hypofrontality (RAH) model of acute exercise. Neuroscience and Biobehavioral Reviews, 35(6), 1305-1325.

Emmerling, R. J., & Goleman, D. (2003). *Emotional intelligence: Issues and common misunderstandings.* Retrieved Jun 16, 2011 from The Consortium for Research on Emotional intelligence in Organizations web site:
https://www.talentsmart.com/media/uploads/pdfs/EI_Issues_And_Common_ Misunderstandings.pdf

Fox, K. R. (1999). The influence of physical activity on mental well-being. Public Health and Nutrition, 2(3), 411-418.

Fox, K. R. (2000). The effects of exercise on self-perceptions and self-esteem. In S. J. Biddle, K. R. Fox, S. H .Boutcher (eds.). pp 88-117. *Physical activity and psychological well-being*. New York, NY: Routledge..

Goleman, D. (1995). Emotional intelligence: Why it can matter more than IQ. Bantam, NY: Books.

Goleman, D. (2001). Emotional intelligence: Issues in paradigm building. In C. Cherniss & D. Goleman (Eds.), The emotionally intelligent workplace, pp. 13-26. San Francisco, LA: Jossey-Bass.

Hoeger, W. W. K., & Hoeger, S. A. (2002). *Principles and Labs for Fitness and Wellness (6th ed.)*. Belmont, CA: Wadsworth.

Jöreskog, K., & Sörbom, D. (1993). *LISREL 8: Structural equation modeling with the SIMPLIS common language.* Hillsdale, NJ: Lawrence Erlbaum Association Publishers.

Kafetsios, K. (2004). Attachment and emotional intelligence abilities across the life course, *Personality and Individual Differences, 37*(1), 129-145.

Kavussanu , M., & McAuley, E. (1995). Exercise and optimism: Are highly active individuals more optimistic. *Journal of Sport and Exercise Psychology,* 17, 246-58.

Keele, S. M., & Bell, R. C. (2007). The factorial validity of emotional intelligence: An unresolved issue. *Personality and Individual Differences, 44*(2), 487-500.

Kerr, J. H., & Kuk, G. (2001). The effects of low and high intensity exercise on emotions, stress and effort. *Psychology of Sport and Exercise,* 2, 173-186.

Kerr, J. H., Wilson, G. V., Svebak, S., & Kirkcaldy, B. D. (2006) Matches and mismatches between telic dominance and type of sport: Changes in emotions and stress pre- to post-performance. *Personality and Individual Differences, 40*, 1557-1567.

Leith, L. M. (2002). *Foundations of exercise and mental health*. Morgantown, WV: Fitness Information Technology,.

Laborde, S., Brull, A., Weber, J., & Anders, L. S. (2011). Trait emotional intelligence in sports: A protective role against stress through heart rate variability? *Personality and Individual Differences, 51*, 23-27.

Law, K. S., Wong, C. S., & Song, L. J. (2004). The construct and criterion validity of emotional intelligence and its potential utility for management studies, Journal of applied Psychology, 89(3), 483-496.

Li, G. S. F., Lu, F. J. H., & Wang, H. H. (2009). Exploring the relationships of Physical Activity, Emotional Intelligence, and health in Taiwan college students, Journal of Exercise Science and Fitness, 7(1), 55-63.

Lin, M. S., Lee, C. H., & Miu, P. R. (2006). Exercise habit and health-related physical fitness in college students participating in physical education class. *National Changhua University of Education Bulletin of Physical Education,* 6, 302-310.

Lu, F. J. H., Li. G. S. F., Hsu, E. Y. W., & Williams, L. (2010). Relationship between athletes' emotional intelligence and precompetitive anxiety, *Perceptual and Motor Skills, 110*(2), 1-16.

Martins, A., Ramalho, N., & Morin, E. (2010). A comprehensive meta-analysis of the relationship between emotional intelligence and health. Personality and Individual Differences, 49(6), 554-564.

Mayer, J. D. & Salovy, P. (1990). *Emotional intelligence and the self-regulation of affect.* Englewood Cliffs, NJ: Prentice-Hall.

Mayer, J. D. & Salovy, P. (1993). The intelligence of emotional intelligence. *Intelligence, 17,* 433-442.

Mayer, J. D., & Salovey, P. (1997). What is emotional intelligence. Emotional development and emotional intelligence: Educational implications. New York, NY: Basic Books.

Mayer, J. D., Salovy, P., & Caruso, D. R. (2002). *Mayer-Salovey-Caruso Emotional Intelligence Test (MSCEIT) Users Manual.* Toronto, Canada: MHS Publishers.

Mayer, J. D., Caruso, D. R., & Salovy, P. (1999). Emotional intelligence meets traditional standards for an intelligence. Intelligence, 27, 267-298.

Nieman, D. C. (1998). *Exercise-health connection*. Champaign, IL: Human Kinetics.

Palmer, B. R., Manocha, R., Gignac, G., & Stough, C. (2003). Examining the factor structure of the Bar-On Emotional Quotient Inventory with an Australian general population sample. *Personality and Individual Differences, 35,* 1191-1210.

Parker, J. D. A., Summerfeldt, L. J., Hogan, M. J., & Majeski, S. A. (2004). Emotional intelligence and academic success: examining the transition from high school to university. Personality and Individual Differences, 36, 163-172.

Pedhazur, E. J., & Schmelkin, L. P. (1991). Measurement, design, and analysis: An integrated approach. Hillsdale, NJ: Lawrence Erlbaum.

Petrides, K. V., & Furnham, A. (2000). On the dimensional structure of emotional intelligence. Personality and Individual Differences, 29, 313-320.

Racette, S. B., Deusinger, S. S., Strube, M. J., Highstein, G. R., & Deusinger, R. H. (2007). Changes in weight and health behaviors from freshman through senior year of college. *Journal of Nutrition Education and Behavior,* 40, 39-42.

Reed, J., & Ones, D. S. (2006). The effect of acute aerobic exercise on positive activasted affect: A meta-analysis, *Psychology of Sport and Exercise, 7,* 477-514.

Saarni, C. (1999). The development of emotional competence. New York, NY: Guilford

Schutte, N. S., Malouff, J. M., Thorsteinsson, E. B., Bhullar, N., & Rooke, S. E. (2007). A meta-analytic investigation of the relationship between emotional intelligence and health. *Personality and Individual Differences, 42*(6), 921-933.

Shi, J., & Wang, L. (2007). Validation of emotional intelligence scale in Chinese university students. *Personality and Individual Differences, 43, 377-387.*

Szabo, A (2003). The acute effects of humor and exercise on mood and anxiety. *Journal of Leisure Research, 35,* 152-162.

Taylor, C. B., Coffey, T., Berra, K., Iaffaldano, R., Casey, K., & Haskell, W. L. (1984). Seven day activity and self-report compared to a direct measure of physical activity. *American Journal of Epidemiology, 120,* 818-824.

Taymoori, P., & Lubans, D. R. (2008). Mediators of behavior change in two tailored physical activity interventions for adolescent girls. Psychology of Sports and Exercise, 9, 605-619.

Tett, R. P., & Fox, K. E. (2006). Confirmatory factor structure of trait emotional intelligence in student and worker samples, Personality and Individual Differences, 41, 1155-1168.

Vallerand, R. J., & Blanchard, C. M. (2000). The study of emotion in sport and exercise: Historical, definitional, and conceptual perspectives. In Y. L. Hann (ed). *Emotions in sport*. Human Kinetics, Champaign, IL, pp 3-38. ISBN 0-88011-879-2

Wong, C. S., & Law, K. S. (2002). The effects of leader and follower emotional intelligence on performance and attitude: An exploratory study. *Leadership Quarterly, 13,* 243-274.

Wong, C. S., Foo, M. D., Wang, C. W., & Wong, P. M. (2007). The feasibility of training and development of EI: An exploratory study in Singapore, Hong Kong and Taiwan. *Intelligence, 35*, 141-150.

World Health Organization (2004). *Global strategy on diet, physical activity and health.* Available from
http://www.who.int/dietphysicalactivity/publications/facts/pa/en/index.html
(Date accessed: Aug 15, 2011)

Yang, K. S. (2004). Chinese Self theory analysis and empirical research: From socially-oriented and self-oriented viewpoints. *Indigenous psychology Research, 22*, 11-80.

Zizzi, S. J., Deaner, H. R., & Hirschhorn, D. K. (2003). The relationship between emotional intelligence and performance among college baseball players. Journal of Applied Sport Psychology, 15, 262-269.
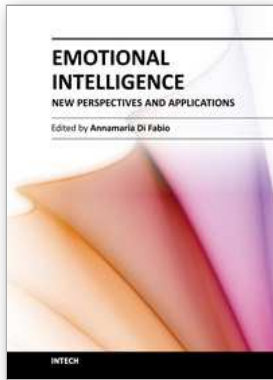
Emotional Intelligence - New Perspectives and Applications

Edited by Prof. Annamaria Di Fabio

Emotional intelligence is an emerging construct for applied research and possible interventions, both in scholastic, academic and educational contexts, organizational contexts, as well as at an individual level in terms of people's well-being and life satisfaction. From the presented contributions, it emerges how this volume is characterized by an interest to give an international overview rich of stimuli and perspectives for research and intervention, in relation to a promising variable of current interest, such as emotional intelligence. The goal is that this book further contributes to the affirmation of a particularly promising variable, such as emotional intelligence, which requires a greater interest and attention in both research and application field.

How to reference

In order to correctly reference this scholarly work, feel free to copy and paste the following:

Gladys Shuk-fong Li, Wei Ting Li and Hsiu Hua Wang (2012). Development of a Chinese Emotional Intelligence Inventory and Its Association with Physical Activity, Emotional Intelligence - New Perspectives and Applications, Prof. Annamaria Di Fabio (Ed.), ISBN: 978-953-307-838-0, InTech, Available from: http://www.intechopen.com/books/emotional-intelligence-new-perspectives-and-applications/development-of-a-chinese-emotional-intelligence-scale-and-its-association-with-physical-activity

INTECH
open science | open minds