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How Efficient are Emotional Intelligence Trainings: A Meta-analysis

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Abstract

This multilevel meta-analysis examines whether emotional intelligence (EI) can be enhanced through training and detects training effects' determinants. We identified 24 studies containing 28 samples aiming at increasing the individual-level of EI among healthy adults. The results revealed a significant moderate standardized mean change between pre and post measurement for the main effect of EI training, and a stable pre to follow-up effect. Additionally, the type of EI model, dimensions of the four branch model, dose and type of publication turned out to be significant moderators. The results suggest that EI trainings should be considered as effective interventions.

KEYWORDS: emotional intelligence, training, intervention, meta-analysis.

Introduction

EI has become a very important psychological construct within the last 10 years. There are a lot of meta-analyses stating the relevance of EI as it has been shown to be related to health (Martins, Ramalho, & Morin, 2010; Schutte, Malouff, Thorsteinsson, Bhullar, & Rooke, 2007) and subjective well-being (Sánchez-Álvarez, Extremera, & Berrocal, 2016). It is also associated with academic performance (Perera & DiGiacomo, 2013) and work performance (Joseph, Jin, Newman, & O'Boyle, 2015).

Due to these findings stressing the importance of EI in everyday life, recent years have brought an important growth in EI interventions. These interventions have different target groups, such as children and adolescents (Nélis, et al., 2011; Ruini et al., 2009), or managers and employees (Cherniss, Grimm & Liautaud, 2010; Slaski & Cartwright, 2003). In addition, these interventions are conducted in various contexts (educational, clinical, and organizational), and aim at various outcomes. So far, one review contains a meta-analysis that explored the effects of four EI interventions (Schutte, Malouff & Thorsteinsson, 2013). Schutte and colleagues concluded that EI interventions are promising and called for further exploration of interventions´ efficacy and utility.

The present study presents the first extensive meta-analysis on the efficacy of EI interventions. After a systematic literature review, we analyzed 28 samples from 24 studies aiming at increasing the level of EI through different EI interventions. Current theoretical approaches, models and interventions will be presented briefly. We will then provide meta-analytically derived results about the efficacy of the EI interventions and about moderating effects. Finally, findings will be discussed and suggestions for future research will be made.

Theoretical approaches to EI

The most common theoretical approaches to Emotional Intelligence (EI) in the literature are trait EI and ability EI approaches. The ability approach considers EI to be composed of

specific emotional abilities. One of the most acknowledged and scientifically rigorous ability models of EI is Mayer and Salovey's four branch model that distinguishes between Perceiving Emotions, Facilitating Thought, Understanding Emotions, and Managing Emotions (Mayer, Salovey, & Caruso, 2004). The trait EI approach, on the other hand, views EI as emotion-related dispositions, at a hierarchically lower position than personality traits that determine the way people behave in emotional situations (Petrides, Pita, & Kokkinaki, 2007).

Besides these two approaches, there are so-called mixed models of EI, such as Bar-On´s Emotional Social Intelligence (ESI) model (Bar-On, 2006) or Goleman´s model of emotional competences (Boyatzis, Goleman, & Rhee, 2000), which include other non-cognitive features like social skills, motivation, self-esteem or personality aspects. Finally, integrative models of EI attempt to reconcile and combine different theoretical approaches to EI. Integrative EI models are, for instance, Mikolajczak, Quoidbach, Kotsou and Nélis´s (2009) *tripartite model of EI*, Fiori´s (2009) *dual process approach to EI* or Joseph and Newman´s (2010) *Cascading Model of EI*. Independent from the theoretical approach or model, most of the EI experts agree that EI refers to measureable individual differences in experiencing and processing emotions and emotion-related information.

EI Trainings

Recent years brought an important increase in EI interventions. These interventions are set in different contexts and vary in terms of the theoretical models serving as the basis for the trainings, and several examples in the literature confirm that this is possible (e.g., Cherniss et al., 2010; Groves, McEnrue, & Shen, 2008; Kirk, Schutte, & Hine, 2011; Nélis, et al., 2011; Ruiz-Aranda, Salguero, Cabello, Palomera, & Fernández-Berrocal, 2012; Vesely, Saklofske, & Nordstokke, 2014). These interventions aim at improving different outcomes, such as life satisfaction, perceived health, stress reduction, emotional self-efficacy, mental health, quality of interpersonal relationships, and even employability (Dacre Pool & Qualter, 2012; Kirk, Schutte, & Hine, 2011; Kotsou, Nélis, Gregoire, & Mikolajczak, 2011; Nélis et al, 2011).The

first attempt to obtain an estimate of the effect size of EI trainings for adults through meta-analysis was made by Schutte et al. (2013), who took into account $m = 4$ experimental intervention studies with random assignment to intervention and control groups and comprised $o = 6$ effect sizes. The results of their findings yielded a moderate overall effect size for the impact of training on emotional intelligence ($g = 0.46$), yet their significance is limited due to the low number of studies.

Campo, Laborde, and Weckeman (2015) also conducted a review of studies that aimed at improving EI in adults. They concluded that the most promising results were obtained from the interventions designed on the Mikolajczak and colleagues' tripartite model of EI (Mikolajczak et al., 2009), not only for increasing the level of EI, but also for bringing positive changes in several other psychological variables.

These reviews give first hints that EI interventions developed on different theoretical backgrounds and conducted in different contexts can increase the level of EI. Nevertheless, Schutte et al.'s (2013) meta-analysis only included studies with random assignment to intervention and control conditions, which limited the number of studies to be included in the analysis. Above that, the last two years yielded several publications on new EI interventions. In the present work, a higher number of studies will be included ($m = 24$) in order to increase the analysis' statistical power and to be able to identify determinants of the efficacy of EI training.

Although there is still a lot of disagreement about the conceptual delimitation and definition of EI, many of the researchers in this field agree that some of the aspects of EI can be developed, which is supported by earlier research. We hypothesize that EI interventions will have a significant effect on increasing the level of EI (*Hypothesis 1*).

Moderators of Intervention Effects

Attitudes toward the plasticity of EI also depend on the theoretical model of EI. According to the trait EI perspective, EI is conceptually more similar to stable personality traits

(Petrides et al., 2007) and is, thus, more resistant to change. On the other hand, EI defined as an ability or set of abilities that can be learned and taught (Salovey & Mayer, 1990) gives more space for potential change and development. Moreover, mixed models suppose more components to be taken into account in a training, such as social skills or motivation, and these would probably be more difficult to train. Therefore, we hypothesize [Titre]that the effects of EI interventions will differ according to the kind of model underlying the intervention. In interventions based on ability models, the effects of EI trainings will be higher than in those based on trait and mixed models. (*Hypothesis 1a*).

Moreover, regarding the four branches of the Mayer and Salovey model (Mayer et al., 2004), it seems reasonable that Perceiving and Understanding Emotions might have a higher potential to be trainable than Facilitating Thought and Regulating Emotions. Understanding Emotions is associated with cognitive processing the most (MacCann, Joseph, Newman, & Roberts, 2014; Mayer, Salovey, Caruso, & Sitarenios, 2001; Roberts, Zeidner, & Matthews, 2001) and reflects accumulated emotion-related knowledge (Mayer, Caruso, & Salovey, 2016), while Perceiving Emotions reflects semantical or lexical knowledge (Lindquist, Gendron, Feldman Barrett, & Dickerson, 2014). On the other hand, Facilitating Thought and Regulating Emotions include motivational, emotional and cognitive factors (Mayer et al., 2001; Mayer et al., 2016), which makes them harder to train. For these reasons, EI trainings should be more effective for Perceiving and Understanding Emotions dimensions than for Facilitating Thought and Regulating Emotions dimensions (*Hypothesis 1b*).

Finally, because increasing the dose and duration of an intervention is one of the most important recommended practices for intervention success (Durlak, Weissberg, Dymnicki, Taylor, & Schellinger, 2011), we examined the duration of the training as a possible moderator of the intervention effects. For example, Sin, and Lyubomirsky (2009) found that duration of the interventions was a significant determinant of the positive psychology interventions' effectiveness, and that longer interventions were more beneficial for well-being. We

hypothesize that the dose of the training (defined as hours per week during which the training takes place) will have an effect on the extent of the efficacy of the training: The longer the EI intervention is, the higher its efficacy will be (*Hypothesis 1c*).

To summarize, this meta-analysis is the first one to investigate the efficacy of EI interventions in an extensive way. Detailed results are revealed by analyzing a sufficient number of studies, and by testing different moderators and control variables. Thereby a broader knowledge about optimizing the effects of EI interventions will be obtained.

Method

Inclusion and Exclusion Criteria

In order to only include studies that address the research questions outlined above, we defined the following inclusion and exclusion criteria for eligibility of studies: (a) an emotional intelligence training that is based on an empirically validated model of EI (psychometrically tested and validated model) took place in the course of the study. (b) EI was measured pre and post the training. (c) There had to be a control and an intervention group that are comparable. Contrary to Schutte et al's (2013) study, randomization to the experimental conditions is not one of the inclusion criteria in the present meta-analysis. Still, we will exclude studies that did not use control groups or whose control groups are not comparable with the experimental groups. We will control for randomization to intervention conditions by comparing effect sizes from randomized and non-randomized studies by moderator analysis. General quality of the study will also be analyzed as a control variable. Further, an additional analysis of randomized controlled trials only will be reported. (d) Data on the individual level had to be given or computable. (e) The EI measure had to be of good psychometric quality. (f) Participants had to be older than 16 years. Children might have higher plasticity of the brain (Campo et al., 2015), and there is evidence that children gradually acquire competence in understanding emotions and develop this competence until adulthood (Widen, 2013). The efficacy of EI trainings for children therefore cannot be compared to those for adults, as there might be a higher change in

the latent variable in children, which is not due to the training, compared to adults. Additionally, participants had to be (g) mentally and physically healthy, and (h) non-delinquents. Previous studies showed that people with health-related problems or diseases might suffer from increased emotional distress, and these health problems might cause negative emotional reactions (Yalcin, Karahan, Ozcelik, & Igde, 2008). In addition, Adetunji, Soezin, and Margaret (2015) showed that offenders have lower levels of EI and might have lower levels of emotional competences. Therefore, EI training might have a different effect in this context. Moreover, we excluded studies that report the same data as in any study that had been published before.

Literature Search

The search term ("emotional intelligence" OR "emotional competenc*" OR „emotional interven*") AND (interven* OR train* OR program*) yielded 1,672 results from the databases PsychInfo, PsyCritiques, and PsycArticles, of which titles and abstracts were scanned. The search was limited to studies published in the English language. In addition, we checked studies cited by reviews on the topic (e.g., Campo et al., 2015; Schutte et al., 2013) and searched for studies citing these reviews. The database search in combination with the forward and backward search lead to $m = 97$ studies that were shortlisted and checked for eligibility in detail. The overall literature search resulted in $m = 24$ studies containing $k = 28$ samples fitting our criteria.

Coding

A coding scheme was developed based on Cochrane Collaboration standards (Higgins & Green, 2011). Besides study, sample, and intervention characteristics, the relevant moderators defined in the hypotheses and control variables were added to the scheme. Variables indicating the quality of the study were also included (Higgins & Green, 2011) and used to form a quality index. All variables included in the coding scheme and their explanations are presented in the appendix.

One of the authors coded all of the studies. In case of tentativeness, coding decisions were discussed between the authors. If necessary information was missing, authors of the eligible studies were contacted and missing information was inserted.

Extraction of Effect Sizes

Effect sizes were calculated based on means (*M*), standard deviations (*SD*), and correlations (r) as follows: Firstly, standardized mean changes (*SMC*s) between pre and post measurements were computed for the experimental and control groups separately, for each outcome by means of the formula:

$SMC_{pre-post} = \frac{M_{pre} - M_{post}}{\sqrt{(SD_{pre}^2 + SD_{post}^2 - 2r_{pre-post}SD_{pre}SD_{post})}}$ (Cooper, Hedges, & Valentine, 2009). Because $r_{pre\text{-}post}$, which is the correlation between pre and post measurement, was not reported in any of the eligible studies, it was necessary to estimate it. We used $r_{pre\text{-}post} = .50$, which can be considered rather conservative. Secondly, standardized mean changes ($SMC_{pre\text{-}post}$) between experimental and control groups were calculated as the difference between $SMC_{cg:pre\text{-}post}$ and $SMC_{eg:pre\text{-}post}$. Thirdly, we corrected $SMC_{pre\text{-}post}$ and their variances for lack of reliability by using Cronbach's alpha (α) and by the formula of Hunter and Schmidt (2004). For 67% of the outcomes, α was given. For these, the mean α was 0.80 and we used this value if α was not given by the study. These corrected $SMC_{pre\text{-}post}$ outcome values compare pre to post changes between experimental and control groups.

The same calculations were conducted for follow-up measurements: We calculated $SMC_{pre\text{-}fu}$ (as the difference between $SMC_{cg:pre\text{-}fu}$ and $SMC_{eg:pre\text{-}fu}$) and $SMC_{post\text{-}fu}$ (as the difference between $SMC_{cg:post\text{-}fu}$ and $SMC_{eg:post\text{-}fu}$) and corrected them for reliability.If outcomes on the level of the EI dimensions were reported, we extracted effect sizes on the dimension-level as required for moderator analyses regarding differences between dimensions. If these were not given, effect sizes were computed for overall EI outcomes.

Analysis

Analyses were run with the program *R* (R Core Team, 2015) and the package *metafor* (Viechtbauer, 2010). Because a lot of studies report several measures or differentiate between dimensions of EI as outcome variables, there were dependencies between the outcomes from the studies. If several outcomes are reported for the same sample, it is necessary to control for this dependency by *robust variance estimation* (RVE; Cooper et al., 2009). Thus, we applied random effect models that take into account the correlations between outcomes stemming from one sample. The correlation between outcomes was estimated as $r_{dim} = .40$ (e.g., Petrides, 2009; Mayer, Salovey, Caruso, & Sitarenios, 2003).

In order to test the hypotheses and control for further potential moderating effects, we conducted several moderator analyses and meta-regressions. Two-sided *p*-values are reported and an alpha level of .05 was used. Beforehand, we analyzed correlations between moderators and conducted *Q*-tests that, if significant, justified random effects and moderator analyses. However, due to the heterogeneity of interventions, random effects are necessary because of theoretical assumptions as well.

Publication bias was analyzed by funnel plots and Egger tests (Egger, Smith, Schneider, & Minder, 1997) and, if necessary, the trim and fill method was applied (Cooper et al., 2009). Unfortunately, a univariate random effects model that does not account for dependencies between outcomes had to be used to control for publication bias, because these methods are not yet implemented for multilevel meta-analyses in metafor. To our knowledge, there is no other program or R package that is able to check for publication bias in random effects meta-analysis when RVE is applied. For this reason, an analysis based on the univariate model regarding publication bias seemed plausible.

Sensitivity analyses tested for differences in the size of the resulting effect size *SMC* due to the choice of correlations and reliabilities if they were not given. We chose to set the correlations between pre, post and follow-up measurements to $r = .50$ for our analyses. In order to account for differences in results due to this choice, the correlations were set to $r = .30$ and r

= .70. For each choice of correlation, resulting SMCs were compared. The correlations between outcome variables were set to r_{dim} = .40 in the analysis reported above. We compared our results to those resulting from r_{dim} = .20 and r_{dim} =.80. In the same way, reliabilities that were set to α = .80 if not reported by the studies were set to α = .70 and α = .90 for the sensitivity analysis. We inspected differences in SMCs when all of the estimates were changed at the same time.

Results

Sample, Intervention, and Study Characteristics

This meta-analysis is based on *k* = 28 samples from *m* = 24 studies, and the overall sample size was *N* = 1,986. The sample consisted of 64.03% females, and the mean age was 26.59 years (*min* = 18.00, *max* = 43.00). Studies were published between 2006 and 2016. Most of the samples were from studies published in peer-reviewed magazines (78.57%; *k* = 22), 17.86% (*k* = 5) were from theses or dissertations, and 0.04% (*k* = 1) were research papers published by a university.

On average, the EI trainings consisted of 6.09 sessions that lasted 2.57 hours each. The average training had a dose of 4.46 hours per week. A fixed schedule was given in 92.86% (*k* = 26) of studies, and 35.29% (*k* = 17) defined individual goals for participants. Diary writing was administered for 42.68% (*k* = 12), and 25.00% (*k* = 7) had personal coaches. Feedback was given for 35.71% (*k* = 10) of the samples, and in the majority of the cases (82.14%, *k* = 23) the trainings were both experience-based (skill practice by role-plays or in actual life, reflective writing, talking about emotions) and theory-based (lectures, group discussions, story analyzing, video vignettes, reading texts, case studies, workbook exercises, tests).

Six different EI models were observed serving as the basis for the trainings. Those that were used mostly were Mayer and Salovey´s four branch model (Mayer et al., 2004; 64.29%, *k* = 18; ability model), and Bar-On's ESI model (Bar-On, 2006; 17.86%, *k* = 5; mixed model). Besides these, two interventions used Swinburne Emotional Intelligence Model (Palmer & Stough, 2001, see Gignac, 2010; 7.14%, *k* = 2; mixed model), and one intervention was based

on Petrides and Furnham's Trait Emotional Intelligence model TEIQue (Petrides, Furnham, & Frederickson, 2004; 3.6%, k = 1; trait model). Finally, the EI model of the Collaborative for Academic, Social, and Emotional Learning (CASEL, Jennings & Greenberg, 2009; 3.6%, k = 1; ability model) and the model of Bisquerra and Pérez-Escoda (2007; 3.6%, k = 1; trait model) served as a basis for one intervention each.

The EI measures applied were diverse as well, as we observed 18 different measures from the k = 28 samples, of which the most frequently used ones were the Mayer-Salovey-Caruso Emotional Intelligence Test (MSCEIT; o = 26, k = 8), the TEIQue (o = 10, k = 8), and the EQ-i (o = 13, k = 5). Self-report measures were used in k = 8 samples (o = 57), peer-report measures in k = 5 samples (o = 7), and ability measures in k = 7 samples (o = 20). The average time interval between pre and post measurement was 2.06 months with a range from 45 minutes to 9 months. Follow-up measurements were conducted on k = 7 (25%) samples only, with an average time interval of 4.06 months between the end of the training and the follow-up measurement (*min* = 6.83 days, *max* = 12.73 months).

Main Training Effect

Hypothesis 1. Training had a moderate effect on emotional intelligence. The multilevel random-effects meta-analysis of k = 28 samples and o = 84 outcomes resulted in an overall effect size of $SMC_{pre\text{-}post}$ = 0.51 with a 95% confidence interval of [0.41, 0.60] (all confidence intervals reported are 95% confidence intervals). The standard deviation of the effect size was τ = 0.17. The corresponding forest plot is shown in Figure 1. The overall training effect is significantly different from zero (p < .001), thus, hypothesis 1 is supported.

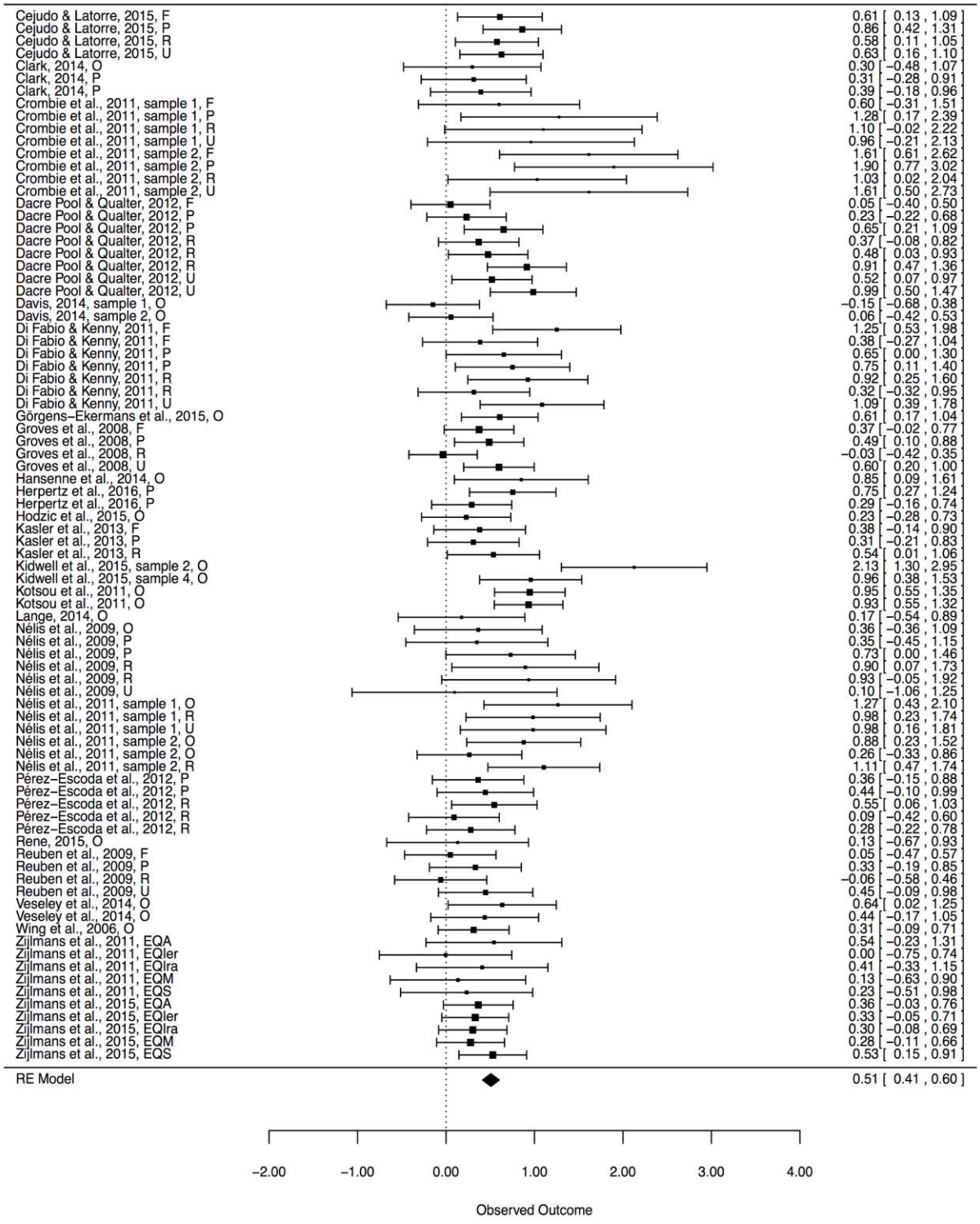
Cejudo & Latorre, 2015, F 0.61 [0.13 , 1.09]
Cejudo & Latorre, 2015, P 0.86 [0.42 , 1.31]
Cejudo & Latorre, 2015, R 0.58 [0.11 , 1.05]
Cejudo & Latorre, 2015, U 0.63 [0.16 , 1.10]
Clark, 2014, O 0.30 [−0.48 , 1.07]
Clark, 2014, P 0.31 [−0.28 , 0.91]
Clark, 2014, P 0.39 [−0.18 , 0.96]
Crombie et al., 2011, sample 1, F 0.60 [−0.31 , 1.51]
Crombie et al., 2011, sample 1, P 1.28 [0.17 , 2.39]
Crombie et al., 2011, sample 1, R 1.10 [−0.02 , 2.22]
Crombie et al., 2011, sample 1, U 0.96 [−0.21 , 2.13]
Crombie et al., 2011, sample 2, F 1.61 [0.61 , 2.62]
Crombie et al., 2011, sample 2, P 1.90 [0.77 , 3.02]
Crombie et al., 2011, sample 2, R 1.03 [0.02 , 2.04]
Crombie et al., 2011, sample 2, U 1.61 [0.50 , 2.73]
Dacre Pool & Qualter, 2012, F 0.05 [−0.40 , 0.50]
Dacre Pool & Qualter, 2012, P 0.23 [−0.22 , 0.68]
Dacre Pool & Qualter, 2012, P 0.65 [0.21 , 1.09]
Dacre Pool & Qualter, 2012, R 0.37 [−0.08 , 0.82]
Dacre Pool & Qualter, 2012, R 0.48 [0.03 , 0.93]
Dacre Pool & Qualter, 2012, R 0.91 [0.47 , 1.36]
Dacre Pool & Qualter, 2012, U 0.52 [0.07 , 0.97]
Dacre Pool & Qualter, 2012, U 0.99 [0.50 , 1.47]
Davis, 2014, sample 1, O −0.15 [−0.68 , 0.38]
Davis, 2014, sample 2, O 0.06 [−0.42 , 0.53]
Di Fabio & Kenny, 2011, F 1.25 [0.53 , 1.98]
Di Fabio & Kenny, 2011, F 0.38 [−0.27 , 1.04]
Di Fabio & Kenny, 2011, P 0.65 [0.00 , 1.30]
Di Fabio & Kenny, 2011, P 0.75 [0.11 , 1.40]
Di Fabio & Kenny, 2011, R 0.92 [0.25 , 1.60]
Di Fabio & Kenny, 2011, R 0.32 [−0.32 , 0.95]
Di Fabio & Kenny, 2011, U 1.09 [0.39 , 1.78]
Görgens−Ekermans et al., 2015, O 0.61 [0.17 , 1.04]
Groves et al., 2008, F 0.37 [−0.02 , 0.77]
Groves et al., 2008, P 0.49 [0.10 , 0.88]
Groves et al., 2008, R −0.03 [−0.42 , 0.35]
Groves et al., 2008, U 0.60 [0.20 , 1.00]
Hansenne et al., 2014, O 0.85 [0.09 , 1.61]
Herpertz et al., 2016, P 0.75 [0.27 , 1.24]
Herpertz et al., 2016, P 0.29 [−0.16 , 0.74]
Hodzic et al., 2015, O 0.23 [−0.28 , 0.73]
Kasler et al., 2013, F 0.38 [−0.14 , 0.90]
Kasler et al., 2013, P 0.31 [−0.21 , 0.83]
Kasler et al., 2013, R 0.54 [0.01 , 1.06]
Kidwell et al., 2015, sample 2, O 2.13 [1.30 , 2.95]
Kidwell et al., 2015, sample 4, O 0.96 [0.38 , 1.53]
Kotsou et al., 2011, O 0.95 [0.55 , 1.35]
Kotsou et al., 2011, O 0.93 [0.55 , 1.32]
Lange, 2014, O 0.17 [−0.54 , 0.89]
Nélis et al., 2009, O 0.36 [−0.36 , 1.09]
Nélis et al., 2009, P 0.35 [−0.45 , 1.15]
Nélis et al., 2009, P 0.73 [0.00 , 1.46]
Nélis et al., 2009, R 0.90 [0.07 , 1.73]
Nélis et al., 2009, R 0.93 [−0.05 , 1.92]
Nélis et al., 2009, U 0.10 [−1.06 , 1.25]
Nélis et al., 2011, sample 1, O 1.27 [0.43 , 2.10]
Nélis et al., 2011, sample 1, R 0.98 [0.23 , 1.74]
Nélis et al., 2011, sample 1, U 0.98 [0.16 , 1.81]
Nélis et al., 2011, sample 2, O 0.88 [0.23 , 1.52]
Nélis et al., 2011, sample 2, O 0.26 [−0.33 , 0.86]
Nélis et al., 2011, sample 2, R 1.11 [0.47 , 1.74]
Pérez−Escoda et al., 2012, P 0.36 [−0.15 , 0.88]
Pérez−Escoda et al., 2012, P 0.44 [−0.10 , 0.99]
Pérez−Escoda et al., 2012, R 0.55 [0.06 , 1.03]
Pérez−Escoda et al., 2012, R 0.09 [−0.42 , 0.60]
Pérez−Escoda et al., 2012, R 0.28 [−0.22 , 0.78]
Rene, 2015, O 0.13 [−0.67 , 0.93]
Reuben et al., 2009, F 0.05 [−0.47 , 0.57]
Reuben et al., 2009, P 0.33 [−0.19 , 0.85]
Reuben et al., 2009, R −0.06 [−0.58 , 0.46]
Reuben et al., 2009, U 0.45 [−0.09 , 0.98]
Veseley et al., 2014, O 0.64 [0.02 , 1.25]
Veseley et al., 2014, O 0.44 [−0.17 , 1.05]
Wing et al., 2006, O 0.31 [−0.09 , 0.71]
Zijlmans et al., 2011, EQA 0.54 [−0.23 , 1.31]
Zijlmans et al., 2011, EQler 0.00 [−0.75 , 0.74]
Zijlmans et al., 2011, EQIra 0.41 [−0.33 , 1.15]
Zijlmans et al., 2011, EQM 0.13 [−0.63 , 0.90]
Zijlmans et al., 2011, EQS 0.23 [−0.51 , 0.98]
Zijlmans et al., 2015, EQA 0.36 [−0.03 , 0.76]
Zijlmans et al., 2015, EQler 0.33 [−0.05 , 0.71]
Zijlmans et al., 2015, EQIra 0.30 [−0.08 , 0.69]
Zijlmans et al., 2015, EQM 0.28 [−0.11 , 0.66]
Zijlmans et al., 2015, EQS 0.53 [0.15 , 0.91]
RE Model 0.51 [0.41 , 0.60]
−2.00
−1.00
0.00
1.00
2.00
3.00
4.00
Observed Outcome

Figure 1. Forest plot for $SMC_{pre\text{-}post}$. Effect sizes per EI dimension and sample, their 95% confidence intervals and weight of each study (represented by the thickness of the lines and boxes) for the main training effects comparing pre to post changes between experimental and control groups are illustrated. The meta-analytically computed average effect of $SMC_{pre\text{-}post}$ = 0.51 is displayed by the diamond-shaped figure at the bottom of the plot. (O = overall EI, P = perceiving emotions, F = facilitating thinking with emotions, U = understanding emotions, R = regulating emotions, EQIra = intrapersonal, EQIer = interpersonal, EQS = stress, EQA = awareness, EQM = mood)

Hypothesis 1a. The three most common kinds of models, which are ability versus mixed versus trait models of EI were compared. For ability models, we found an effect of $SMC_{pre\text{-}post}$ = 0.60 [0.48, 0.71], whereas the effect for mixed models was $SMC_{pre\text{-}post}$ = 0.31 [0.12, 0.50] and $SMC_{pre\text{-}post}$ = 0.31 [-0.04, 0.66] for trait models. Hence, trainings that are based on an ability model show significantly higher effects than trait models (p = .017), which supports Hypothesis 1a. This random effect model is based on k = 28 and o = 84 (τ = 0.16).

Hypothesis 1b. A significant moderating effect of the EI dimensions from the Mayer and Salovey model (Mayer et al., 2004) was found. The moderator analysis based on k = 16 samples and o = 55 outcomes showed a significant difference between the training effects of the dimensions Understanding Emotions ($SMC_{pre\text{-}post}$ = 0.69 [0.48, 0.91]) and Facilitating Thought ($SMC_{pre\text{-}post}$ = 0.42 [0.21, 0.63]; p = .038) in a random effects model (τ = 0.15). There were no significant differences between the other dimensions. Hence, hypothesis 1b was partially supported.

Hypothesis 1c. Meta-Regression supported hypothesis 1c, as the dose of the training had an impact on the size of the training effect (b_{dose} = 0.03 [0.01, 0.05], p = .006). The random effects analysis is based on k = 27 samples and o = 80 outcomes (τ = 0.15). Thus, if the dose of the training is increased by one more hour per week, the resulting effect size of the training grows by 0.03.

Control Variables. We controlled for the influence of the type of publication by applying a random effects model (k = 28, o = 84, τ = 0.15) comparing papers published in peer-reviewed magazines with theses. This was a significant moderator. Peer-reviewed articles showed a significantly higher effect size ($SMC_{pre\text{-}post}$ = 0.57 [0.47, 0.67]) than theses ($SMC_{pre\text{-}post}$ = 0.12 [-0.15, 0.40]; p =.003). We did not find any influence of the other control variables.

Publication bias. A significant publication bias was found for the univariate model $SMC.uni_{pre\text{-}post}$ = 0.52 [0.44, 0.59] (p < .001, τ = 0.19) as indicated by the funnel plot (see Figure 2) and a significant Egger test (p < .001). According to the trim and fill method, k = 11 samples should be added on the left side of the funnel plot accounting for asymmetry. The overall effect would then decrease to $SMC.uni_{pre\text{-}post}$ = 0.46 [0.38, 0.54] (p < .001; τ = 0.26). Because the univariate model is not the appropriate one, as dependencies between outcomes are not accounted for, these results have to be treated with caution. Unfortunately, we cannot give an exact estimate of the correct effect size based on the multilevel model. Still, the true effects should be considered smaller than $SMC_{pre\text{-}post}$ = 0.51 because of publication bias.

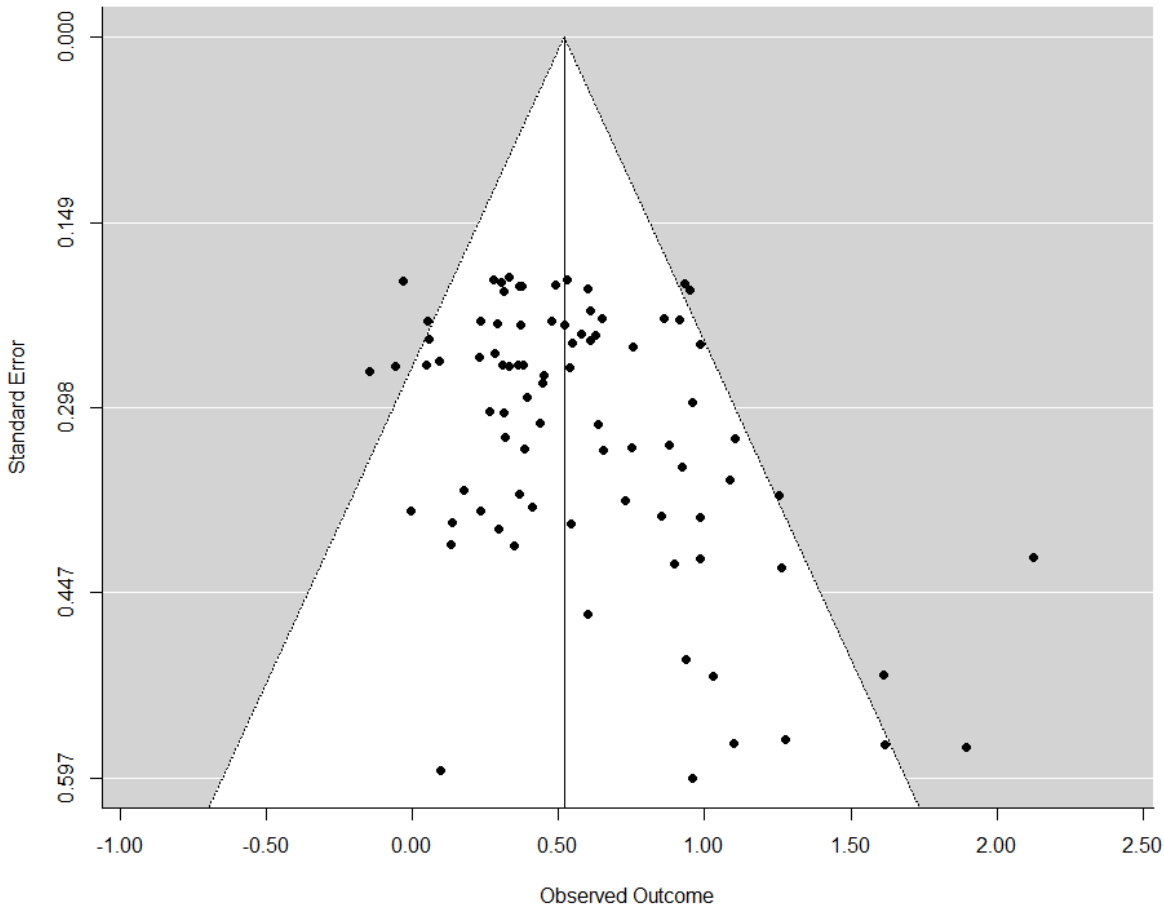

Figure 2. Funnel plot that indicates publication bias for the main effect of training by its asymmetry. Effect sizes from the single EI dimensions comparing pre to post changes between experimental and control groups are plotted as observed outcomes against standard errors. On the lower left side, a few effect sizes are missing for the plot to be symmetric.

Follow-up Effects

Out of the overall k = 28 samples, in k = 7 samples, follow-up measurements were conducted, which resulted in o = 16 follow-up outcomes. If we take only follow-up studies into account, we find a pre to post effect of $SMC_{pre\text{-}post}$ = 0.62 [0.43, 0.81] (p < .001; τ = 0.14). Comparing pre to follow-up, the effect remained at $SMC_{pre\text{-}fu}$ = 0.55 [0.33, 0.77] (p < .001; τ = 0.23), which was supported by a zero effect from post to follow-up ($SMC_{post\text{-}fu}$ = -0.06 [-0.21, 0.09], p = 0.47; τ = 0.00). We did not conduct moderator analyses due to the low number of samples, and we did not find a publication bias for the follow-up effects.

Randomized Controlled Trials (RCTs)

Moderator analyses showed no significant effect between samples that are randomly assigned to experimental and control groups and those that are assigned quasi-randomly or in any other way. Yet, a separate meta-analysis was conducted for RCTs only (Higgins & Green, 2011). A pre-post effect of SMC_{RCTs} = 0.50 [0.38, 0.66] is found for k = 10 samples and o = 24 outcomes (p < .001; τ = 0.14). We did not conduct moderator analyses due to the low number of samples. For the same reason, we could not evaluate follow-up effects of RCT studies (k = 3).

For RCTs, publication bias was significant based on a univariate model ($SMC.uni_{RCTs}$ = 0.57 [0.38, 0.76], p < .001; τ = 0.35) as indicated by a significant Egger test (p < .001). The trim and fill method suggests to add k = 6 studies, which would lead to a decrease of the effect to SMC_{RCTs} = 0.39 [0.14, 0.66] (p = .003; τ = .62). The results have to be treated with caution as they rely on the univariate and not the appropriate multilevel model. An effect smaller than SMC_{RCTs} = 0.50 should be assumed.

Sensitivity Analysis

We conducted a sensitivity analysis for the main effects sizes reported above. Results are shown in Table 1. Variations of correlations between outcome variables and reliabilities accounted for marginal differences in results, whereas the choice of correlations between pre, post and follow-up measurements should not be neglected.

Table 1.

Results from Sensitivity Analysis

	$SMC_{pre\text{-}post}$			$SMC_{pre\text{-}fu}$			$SMC_{post\text{-}fu}$		
	$r_{pre\text{-}post}$			$r_{pre\text{-}fu}$			$r_{post\text{-}fu}$		
	.30	.50	.70	.30	.50	.70	.30	.50	.70

	α	r_{dim}								
Main Analysis	.70	.20	0.42	0.49	0.61	0.57	0.68	0.88	-0.05	-0.05	-0.07
		.40	0.41	0.48	0.60	0.46	0.55	0.72	-0.05	-0.06	-0.07
		.60	0.41	0.47	0.59	0.56	0.67	0.88	-0.05	-0.06	-0.07
	.80	.20	0.44	0.51	0.62	0.57	0.68	0.88	-0.04	-0.05	-0.07
		.40	0.44	**0.51**	0.61	0.46	**0.55**	0.72	-0.05	**-0.05**	-0.07
		.60	0.44	0.51	0.61	0.56	0.67	0.88	-0.05	-0.06	-0.07
	.90	.20	0.42	0.49	0.62	0.57	0.68	0.88	-0.04	-0.05	-0.07
		.40	0.41	0.48	0.60	0.46	0.55	0.72	-0.05	-0.06	-0.07
		.60	0.41	0.47	0.59	0.56	0.67	0.88	-0.05	-0.06	-0.07
RCTs	.70	.20	0.25	0.28	0.33	-	-	-	-	-	-
		.40	0.31	0.36	0.45	-	-	-	-	-	-
		.60	0.25	0.28	0.33	-	-	-	-	-	-
	.80	.20	0.62	0.70	0.84	-	-	-	-	-	-
		.40	0.43	**0.50**	0.62	-	-	-	-	-	-
		.60	0.62	0.70	0.85	-	-	-	-	-	-
	.90	.20	0.25	0.28	0.33	-	-	-	-	-	-
		.40	0.31	0.36	0.45	-	-	-	-	-	-
		.60	0.25	0.28	0.33	-	-	-	-	-	-

Note. $r_{pre\text{-}post}$, $r_{pre\text{-}fu}$, $r_{post\text{-}fu}$ = correlations between pre, post and follow-up measurements; α = Cronbach's alpha; r_{dim} = correlations between EI dimenions; values reported in the text are printed boldly.

Discussion

This meta-analysis aimed at expanding previous findings about the efficacy of EI interventions and at determining important moderators of the intervention effects. After a systematic review of the literature, 24 studies (containing 28 samples) that fulfilled the inclusion criteria were meta-analyzed. The results yielded a moderate overall effect size for the impact of EI training of $SMC_{pre\text{-}post} = 0.51$ and the effect did not differ when we considered only RCTs ($SMC_{RCTs} = 0.50$). This result supports the previous findings by Schutte et al. (2013) confirming that trainings increase EI. Nevertheless, trainings that are based on ability EI models showed significantly higher effects than mixed or trait EI models. In addition, training effects of Mayer and Salovey's (Mayer et al., 2004) Understanding Emotions dimension were significantly higher that the training effects of the dimension Facilitating Thought. Finally, the analysis of the follow-up effects showed that the effect remained at $SMC_{pre\text{-}fu} = 0.55$, suggesting that the positive changes in EI due to interventions remain over time. Still, because of a significant publication bias, the true effects should be considered slightly lower than 0.51. Nevertheless, the obtained results contribute to the existing knowledge about EI and EI development, and provide suggestions and guidelines for future interventions.

From a theoretical standpoint, much has been discussed about plasticity of EI and whether it can be learned and developed. The obtained results show that specific interventions improve EI. However, the intensity of this improvement depends on the theoretical background of the interventions. The results confirm that it is easier to develop ability EI and related explicit knowledge than trait EI. The possibility for increasing EI is inherent to the ability based EI models. What the present study's results imply is the idea about different operating levels of EI. We consider that the trainings analyzed in this study tap into what is denominated as declarative knowledge, factual information about emotions, and emotional abilities, not the actual skills to use this information (Anderson & Schunn, 2000). The idea about EI as a "multi-level" construct is not new. Fiori (2009) proposed to differentiate automatic from conscientious

processes in emotional abilities. Micolajczak et al (2009) suggested distinguishing between emotional knowledge, abilities, and dispositions. Therefore, both, individual differences in EI and the differences in training effects might be best understood by considering the different operating levels of EI.

Moreover, the obtained results showed that trainings influence Understanding Emotions more than Facilitating Thought. Understanding Emotions has been shown to be most highly related with crystallized intelligence (MacCan et al., 2014), implying again that these trainings focused on increasing the explicit knowledge, enhancing the awareness about different emotional abilities or aspects of EI, not on how they actually respond in every-day situations.. In Joseph and Newman's (2010) cascading model of EI, the ability to understand emotions is conceptualized as accumulated knowledge structures, and positioned as a pre-condition for the ability to regulate emotions. This means that managing and maintaining the desired affective states requires a high level of emotional understanding, or in other words, enough accumulated (declarative) knowledge about how emotions change over time, how they differ, and which emotions are the most appropriate ones depending on the situation. Hence, in order to translate this knowledge into practice (to enhance the procedural knowledge) and in order for it to have observable benefits, repetitive and longer trainings are needed.

Future Research

Numerous interventions did not include control groups and we found ten studies that were RCTs. Follow-up measurements were conducted on seven samples only, and three RCTs conducted follow-up measurements. Here, moderator analyses were not possible due to the low number samples. Results from RCTs provide valuable information about intervention efficacy and allow rigorous empirical comparison of the results, which is why this experimental design is strongly recommended for future research. The lack of follow-up measurements significantly limits the examination of the intervention effects. Follow-up measurement is one of the

important criteria for evaluating trainings (Kirkpatrick, 1996), and we would certainly encourage researchers in the field to consider including them in their future interventions.

Furthermore, the obtained results indicated a strong influence of the type of publication on the effects of intervention and a publication bias was found as well. These findings shed a different light on the moderate training effect of $SMC_{pre\text{-}post} = 0.51$, because unpublished studies and non-peer-reviewed articles might show lower effects than published ones. As there were no differences between the quality of theses and peer-reviewed articles, the reason for this finding could be that big effects are published more easily. This might contribute to conveying a biased picture regarding the efficacy of EI interventions and we believe that non-significant results should also be published or at least be available more easily.

Finally, the most effective interventions were those that focused on enhancing specific emotional abilities, as conceptualized in Mayer and Salovey's (Mayer et al., 2004) four branch model (Crombie et al., 2011; Kidwell et al., 2015; Nélis et al., 2011). These interventions were carried out in different target groups and had different formats and durations, but all used a workshop approach with group discussions and interactive participation. This is useful for those who plan to develop future EI interventions.

Besides the suggestions derived from the results of the current meta-analysis, we propose some additional guidelines for EI interventions. One goal should be identifying specific individual differences and situational factors that might determine the effects of the interventions. It is most probable that not everyone will benefit from EI trainings in the same way. Schutte and colleagues (2013) suggest exploring cognitive styles as a possible determinant of the intervention effects. In addition, some previous studies mention positive relations between openness to experience and training proficiency (Barrick & Mount, 1991; Dean, Conte, & Blankenhorn, 2006). As Barrick and Mount (1991) argue, being curious, imaginative and having a wider range of interests has been associated with positive attitudes towards learning and higher motivation for the training process.

Detecting the specific groups or populations that can benefit from the interventions should be another aim. Exploring the factors in work, family or social contexts that can help people benefit the most from interventions should be the focus of future research. Schutte et al. (2013) mention family relationships, social-network context or the nature of the population as potentially important situational factors for optimizing the training effects. Moreover, entire professions or groups might suffer more from the negative effects of stress or increased emotional labour (Daus & Ashkanasy, 2005). Some attempts at enhancing EI among particularly vulnerable professions such as teachers or social workers, and vulnerable populations, such as the unemployed have been made (Grant, Kinman, & Alexander, 2014; Hodzic, Ripoll, Bernal, & Zenasni, 2015; Vesely et al., 2014). Still, future interventions should try to detect more vulnerable groups and adapt the trainings considering the specific situational factors and needs of those groups.

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Appendix

Table A1

Coded Variables and their Explanations

Category	Variable	Explanation
	authors	names of authors
	n.EG	sample size experimental group
	n.CG	sample size control group
Training Characteristics	time pre-post	time between pre and post measurement in hours
	time pre-fu	time between pre and follow-up measurement in hours
	number	total number of sessions administered
	duration	duration of single session in hours
	schedule	0 = training followed a fixed schedule; 1 = schedule differed between participants
	model	model that is used to define EI
	mode	0 = experience-based; 1 = theory-based
	techniques	techniques to convey theory, e.g. lectures, or to practice experience, e.g. role plays

	group vs. individual	0 = trainings were conducted in a group; 1 = trainings were conducted individually
	feedback	0 = no feedback; 1= feedback at least once
	diary	0 = no diary; 1 = participants had to write a diary
	goals	0 = no individual goals; 1 = individual goals were formulated for participants
	instrument	name of the EI instrument
	reliability	Cronbach's alpha of instrument
Moderators	ability vs. trait model	model that training is based on: 0 = ability model ; 1 = trait model ; 2 = mixed model
	dimensions	O = overall EI; P = perceiving; F = facilitating thought; U = understanding; R = regulating; EQIra = intrapersonal; EQIer = interpersonal; EQS = stress; EQA = awareness; EQM = mood
	dose	intervention hours per week
Control Variables	gender	percentage of females in the original sample
	age	average age of the original sample
	occupation	0 = student; 1 = part-time workers; 2 = full-time workers; 3 = unemployed; 4 = mixed
	motivation	0 = none; 1 = course credit/money; 2 = special reward
	country	country of investigation
	year	year of publication
	type publication	0 = published in peer-reviewed magazine; 1 = thesis; 2 = other

	rating	0 = self-rated EI; 1 = peer-rated EI
	CG activities	0 = passive; 1 = waiting list; 2 = placebo
	randomization	0 = fully randomized; 1 = quasi-randomized; 2 = not randomized
	dropout	number of people that did not take part in post measurement in relation to pre measurement
Risk of Bias (Higgins & Green, 2011)	sequence	method to generate allocation sequence
	concealment	method to conceal allocation sequence
	blinding	methods to blind participants
	incomplete	completeness of the reported outcome data
	other	any other concerns about bias
	bias	risk of bias index: one point for every of the five categories without concerns, these are added