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Mayer–Salovey–Caruso Emotional Intelligence Test (MSCEIT/MEIS) and overall, verbal, and nonverbal intelligence: Meta-analytic evidence and critical contingencies

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A B S T R A C T

Emotional intelligence (EI) has been widely used in psychological, managerial, and educational research. Among all the measures, MSCEIT (and its earlier version MEIS) has been widely used to assess EI ability. However, there is little systematic research regarding its relationship with overall, verbal, and nonverbal intelligence. The current research fills this gap in the literature by meta-analyzing the correlations between overall MSCEIT/MEIS and overall, verbal, and nonverbal intelligence. Additionally, the current research identified four critical contingencies: the type of an instrument for intelligence assessment, the study population, the average age of a sample, and the female percentage of a sample.

1. Introduction

Emotional intelligence (EI), defined as the ability to recognize, use, understand, and manage emotions (Salovey & Mayer, 1990), has received explosive attention since the 1990s. It can facilitate sociopsychological functioning in various contexts (Joseph & Newman, 2010; Mayer, Roberts, & Barsade, 2008). EI (as an ability) is inherently related to intelligence, which refers to a hierarchy of mental ability (Carroll, 1993). Mayer et al. (2008) argued that EI is parallel to verbal, perceptual-organizational, and broad-visualization intelligence (p. 510). Verbal intelligence refers to "the ability to reason about words and the use of acquired verbal knowledge to promote such reasoning" (Mayer et al., 2008, p. 511). Considering that EI (as an ability) is claimed to be more closely related to verbal intelligence than nonverbal intelligence (Brody, 2004; MacCann, Roberts, Matthews, & Zeidner, 2004), I categorize intelligence into overall (both verbal and nonverbal), verbal, and nonverbal intelligence.

The most common ability-based measure of EI is the Mayer–Salovey–Caruso Emotional Intelligence Test (MSCEIT) (Mayer, Salovey, & Caruso, 2002) and its earlier version MEIS. Because EI is a form of intelligence, its relation to other forms of intelligence has been examined and discussed. For example, Mayer et al. (2008) claimed that overall MSCEIT/MEIS is positively correlated with verbal intelligence ($r \approx .36$) and is less correlated with other forms of intelligence ($.10 \leqslant r \leqslant .20$) (p. 518). Yet these claims have not been rigorously tested. More systematic research on the moderators for the overall MSCEIT/MEIS-intelligence relationship is also needed for a more nuanced understanding of this relationship (e.g., Schulte, Ree, & Carretta, 2004; Van Rooy & Viswesvaran, 2004). Accordingly, the current research seeks to fill this gap by meta-analyzing previous findings. In doing so, the current research advances knowledge and facilitates the consensus building on this topic (Chan & Arvey, 2012) with "statistically valid conclusions" (O'Fallon & Butterfield, 2005, p. 405).

2. Hypotheses

EI entails both crystallized (largely verbal) components that require emotion knowledge accumulated over time and fluid (largely nonverbal) components that require reasoning; "crystallized emotional abilities may include knowing whether an emotion regulation strategy is effective, and fluid emotional abilities may include implementing that strategy effectively in a real, emotionally evocative situation" (Côté, 2010, p. 129). Therefore, overall MSCEIT/MEIS should be correlated with overall, verbal and nonverbal intelligence.

Hypothesis 1. Overall MSCEIT/MEIS is positively correlated with (a) overall, (b) verbal, and (c) nonverbal intelligence.

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The type of instruments for intelligence assessment should affect the relationship between overall MSCEIT/MEIS and intelligence. Intelligence tests are specifically designed to assess intelligence, whereas standardized/admission tests (e.g., Frey & Detterman, 2004) are designed to assess academic ability rather than merely intelligence. Therefore, standardized/admission tests have noise in intelligence assessment, attenuating the overall MSCEIT/MEIS-intelligence relationship.

Hypothesis 2. The relationships between overall MSCEIT/MEIS and (a) overall, (b) verbal, and (c) nonverbal intelligence are stronger when intelligence tests are used to assess intelligence than when standardized/admission tests are used to assess intelligence.

The study population (just university students versus otherwise) can also affect the overall MSCEIT/MEIS-intelligence relationship. University students are a common study population and yet they are systematically different from other populations (Henrich, Heine, & Norenzayan, 2010; Henry, 2008). University students "are concentrated at the upper levels of educational background" and "have been carefully preselected for having unusually adept cognitive skills" (Sears, 1986, p. 521) rather than EI ability. Therefore, the variance of university students' intelligence scores is constrained whereas the variance of their MSCEIT/MEIS overall scores is less so. Accordingly, the overall MSCEIT/MEIS-intelligence relationship is more likely to be attenuated in samples of just university students than in other samples (see Hunter & Schmidt, 1990; Hunter, Schmidt, & Le, 2006 regarding range restriction).

Hypothesis 3. The relationships between overall MSCEIT/MEIS and (a) overall, (b) verbal, and (c) nonverbal intelligence are weaker in study samples of just university students than in other samples.

3. Method

3.1. Sample

By (1) using the terms *MSCEIT*, *MEIS*, *cognitive ability*, *cognitive intelligence*, *mental intelligence*, *IQ*, *emotional intelligence*, and *EI* in search engines including ABI/Inform, EBSCO (PsycINFO, Academic Search Premier, etc.), Google Scholar, and ProQuest (Dissertations and Theses) and (2) using the references in four meta-analysis publications (Harms & Credé, 2010; Joseph & Newman, 2010; Van Rooy & Viswesvaran, 2004; Van Rooy, Viswesvaran, & Pluta, 2005), I identified 62 correlations between overall MSCEIT/MEIS and intelligence reported in 53 study samples (46 papers) and included them in the final sample. Noteworthy, the final sample excluded studies using (nonstandardized) GPA as the only measure of intelligence.

3.2. Analysis

All correlations were corrected for attenuation (Hunter & Schmidt, 1990) and were converted to Fisher's *z*s for calculation of error statistics (Lipsey & Wilson, 2001). Over half of the included papers failed to report the internal consistency of either MSCEIT/MEIS or intelligence measures, which could cause biased estimation of internal consistency based on the meta-analytic sample. Therefore, I used internal consistency statistics reported in previous test manuals to correct attenuation for the papers that failed to report internal consistency, despite some caution of doing so (Crocker & Algina, 1986).

The meta-analysis was conducted using MIX Pro 2.0 (Bax, Yu, Ikeda, Tsuruta, & Moons, 2006). Effect sizes were weighted by their inverse variances (Cohn & Becker, 2003). No considerable outlier was detected using the exclusion sensitivity assessment and plot (Bax et al., 2006). I coded (without ambiguity) each instrument for intelligence assessment as either an intelligence test or a standardized/admission test and each study sample as either entailing just university students or otherwise.

In estimating the main effects, I used random-effects models when the assumption of sample homogeneity was violated (indicated by a significant Q) and fixed-effects models when the assumption of sample homogeneity was empirically confirmed (indicated by a nonsignificant Q) (Erez, Bloom, & Wells, 1996). Random-effects models allow for inferences to studies with different participants and measures than those in the sample (Hedges & Vevea, 1998). Because Q has low power when the number of studies and sample sizes within the studies are small (Huedo-Medina, Sánchez-Meca, Marín-Martínez, & Botella, 2006), I also included the inconsistency statistic I^2 [=100% × (Q-df)/Q] with a larger value indicating more sample heterogeneity. To correct for publication bias, I adopted Duval and Tweedie's (2000) trim-and-fill method to produce the publication-bias-adjusted estimates if necessary. The estimated Fisher's z was converted back to r for interpretation with the corresponding 95% confidence interval (CI) indicating statistical significance only when zero was excluded in the CI. In estimating the moderating effects, I used fixed-effects models (Hedges & Olkin, 1985). A significant between-group homogeneity statistic (Q_b) indicated a significant moderating effect.

4. Results

4.1. Main effects

Overall MSCEIT/MEIS was positively correlated with overall ($\bar{r}_c = .30$), verbal ($\bar{r}_c = .26$), and nonverbal intelligence ($\bar{r}_c = .23$) (see Table 1). Therefore, Hypotheses 1a–1c were supported. When intelligence tests were used, overall MSCEIT/MEIS was positively correlated with overall ($\bar{r}_c = .33$), verbal ($\bar{r}_c = .26$), and nonverbal intelligence ($\bar{r}_c = .27$). When standardized/admission tests were used, overall MSCEIT/MEIS was positively correlated with overall ($\bar{r}_c = .21$) and verbal intelligence ($\bar{r}_c = .28$) but not significantly correlated with nonverbal intelligence ($\bar{r}_c = .05$). When study samples entailed just university students, overall MSCEIT/MEIS was positively correlated with overall ($\bar{r}_c = .26$), verbal ($\bar{r}_c = .21$), and nonverbal intelligence ($\bar{r}_c = .17$). In other study samples, overall MSCEIT/MEIS was also positively correlated with overall ($\bar{r}_c = .36$), verbal ($\bar{r}_c = .39$), and nonverbal intelligence ($\bar{r}_c = .36$).

Table 2 shows the estimated correlations (corrected for attenuation, and if needed, also publication bias using the trim-and-fill method) between overall MSCEIT/MEIS and intelligence assessed with specific instruments. Overall MSCEIT/MEIS was not significantly correlated with intelligence assessed with Quickie Test Battery verbal ($\bar{r}_c = .12$) or SAT math ($\bar{r}_c = .05$), but positively correlated, ranging from .24 to .40, with intelligence assessed with other instruments including Raven Advanced Progressive Matrices, Raven Standard Progressive Matrices, SAT verbal, Shipley Institute of Living Test, Wechsler Adult Intelligence Scale verbal, and Wonderlic Personnel Test.

4.2. Moderating effects

4.2.1. Instrument type

The type of instruments for intelligence assessment moderated the relationships between overall MSCEIT/MEIS and overall ($Q_b = 7.41$, $p < .01$) and nonverbal intelligence ($Q_b = 53.66$, $p < .001$) but not the relationship between overall MSCEIT/MEIS and verbal intelligence ($Q_b = .95$, $p = .33$) (see Table 1), supporting Hypotheses 2a and 2c but not Hypothesis 2b.

Table 1
Estimated correlations between overall MSCEIT/MEIS and overall, verbal, and nonverbal intelligence and the moderating effects of the type of instruments for intelligence assessment and the study population.

	Main effect								Moderating effect [b]
	k	*n*	$\bar{r}_c$	95% CI ($\bar{r}_c$)	$\bar{r}_{c,tf}$	95% CI ($\bar{r}_{c,tf}$)	Q	I^2 (%)	Q_b
Overall intelligence measure	22	3846	.30[a]	[.25, .35]	–	–	56.79***	63.02	
Instrument type									7.41**
Intelligence test	16	2399	.33	[.29, .36]	.31	[.28, .35]	22.49	33.30	
Standardized/admission test	6	1447	.21[a]	[.08, .33]	–	–	27.29***	81.68	
Study population									6.42*
Just university students	13	1994	.26[a]	[.20, .32]	–	–	22.22*	45.99	
Other	9	1852	.36[a]	[.27, .44]	–	–	28.14***	71.57	
Verbal intelligence measure	20	3551	.26[a]	[.16, .36]	–	–	192.61***	90.14	
Instrument type									.95
Intelligence test	14	2376	.26[a]	[.12, .38]	–	–	146.57***	91.13	
Standardized/admission test	6	1175	.28[a]	[.11, .44]	–	–	45.21***	88.94	
Study population									45.94***
Just university students	14	2517	.21[a]	[.08, .34]	–	–	141.34***	90.80	
Other	6	1034	.39[a]	[.29, .48]	–	–	13.42*	62.73	
Nonverbal intelligence measure	20	3587	.23[a]	[.14, .32]	–	–	138.59***	86.29	
Instrument type									53.66***
Intelligence test	16	3170	.27[a]	[.17, .36]	–	–	110.12***	86.38	
Standardized/admission test	4	417	.05	[-.05, .15]	–	–	7.20	58.35	
Study population									25.31***
Just university students	14	1716	.17[a]	[.06, .27]	–	–	68.64***	81.06	
Other	6	1871	.36[a]	[.22, .50]	–	–	43.78***	88.58	

Note for Tables 1 and 2. $\bar{r}_c$ represents the estimated correlation corrected for attenuation. $\bar{r}_{c,tf}$ represents the estimated correlation corrected for attenuation and, if needed, also publication bias (using the trim-and-fill method). CI represents confidence interval. An I^2 of 75% or above usually indicates large sample heterogeneity, 50% or so moderate sample heterogeneity, and 25% or below low sample heterogeneity (Higgins, Thompson, Deeks, & Altman, 2003).

[a] The correlation was estimated using a random-effects model.
[b] Q_b was calculated using a fixed-effects model.
* $p < .05$.
** $p < .01$.
*** $p < .001$ (two-tailed).

Table 2
Estimated correlations between overall MSCEIT/MEIS and intelligence assessed with specific instruments.

	k	*n*	$\bar{r}_c$	95% CI ($\bar{r}_c$)	$\bar{r}_{c,tf}$	95% CI ($\bar{r}_{c,tf}$)	Q	I^2 (%)
Instrument for overall intelligence assessment								
Shipley institute of living test	3	532	.35	[.28, .43]	.32	[.25, .38]	1.26	.00
Wonderlic personnel test	12	1826	.32	[.28, .36]	.32	[.26, .38]	19.55	43.72
Instrument for verbal intelligence assessment								
Quickie test battery verbal	3	425	.12[a]	[-.06, .30]	–	–	6.77*	70.45
SAT verbal	6	1175	.28[a]	[.11, .44]	–	–	45.21***	88.94
Wechsler adult intelligence scale verbal	3	325	.40[a]	[.12, .62]	–	–	12.54**	84.06
Instrument for nonverbal intelligence assessment								
Raven advanced progressive matrices	4	1538	.30[a]	[.17, .42]	.24[a]	[.09, .38]	13.34**	77.51
Raven standard progressive matrices	4	574	.29[a]	[.00, .53]	–	–	36.75***	91.84
SAT math	4	417	.05	[-.05, .15]	–	–	7.20	58.35

[a] The correlation was estimated using a random-effects model.
* $p < .05$.
** $p < .01$.
*** $p < .001$ (two-tailed).

4.2.2. Study population

Studies using samples of just university students produced smaller relationships between overall MSCEIT/MEIS and overall ($Q_b = 6.42$, $p < .05$), verbal ($Q_b = 45.94$, $p < .001$), and nonverbal intelligence ($Q_b = 25.31$, $p < .001$) than studies using other samples (see Table 1), supporting Hypotheses 3a–3c.

4.2.3. Average age and female percentage

Although I did not hypothesize the moderating effects of the average age and female percentage of a study sample on the relationship between overall MSCEIT/MEIS and intelligence, they could be important moderators (e.g., Schulte et al., 2004). Therefore, I performed weighted-least-squares (WLS) regression (Steel & Kammeyer-Mueller, 2002) and corrected standard errors and *z* scores (Lipsey & Wilson, 2001) to explore these two factors' potential moderating effects. Both variables were normally distributed, indicated by the non-significant Kolmogorov–Smirnov *z*s. The average age had positive moderating effects on the relationships between overall MSCEIT/MEIS and overall ($b = .005$, corrected $SE = .002$, $z = 2.04$, $p < .05$), verbal ($b = .019$, corrected $SE = .004$, $z = 4.83$, $p < .001$), and nonverbal intelligence ($b = .007$, corrected $SE = .002$, $z = 3.13$, $p < .01$). To rule out the alternative explanation that these moderating effects were caused by range restriction, I performed WLS regression without the samples of just university students. I found that the average age of a sample still had positive moderating effects on the relationships between overall MSCEIT/MEIS and overall ($b = .006$, corrected $SE = .003$, $z = 2.33$, $p < .05$) and verbal intelligence ($b = .012$, corrected $SE = .006$, $z = 1.99$, $p < .05$), but not the relationship between overall MSCEIT/MEIS and nonverbal intelligence ($b = .003$, corrected $SE = .003$, $z = .98$,

$p = .33$), suggesting that range restriction should not explain the moderating effects of the average age of a study sample. In contrast, the female percentage of a study sample had a negative moderating effect only on the relationship between overall MSCEIT/MEIS and verbal intelligence ($b = -.28$, corrected $SE = .08$, $z = -3.67$, $p < .001$).[1]

5. Discussion

The current research shows that, indeed, MSCEIT/MEIS has been widely used in psychological, managerial, and educational research during the past few decades. The meta-analytic evidence indicates that the estimated correlation between overall MSCEIT/MEIS and verbal intelligence (.26) was much smaller than what Mayer et al. (2008) claimed (.36) whereas the estimated correlation between overall MSCEIT/MEIS and nonverbal intelligence (.27) was larger than what Mayer et al. (2008) claimed (between .10 and .20). Consistent with the claim that EI entails both crystallized and fluid components (Côté, 2010), overall MSCEIT/MEIS was positively correlated with overall, verbal, and nonverbal intelligence, except when standardized/admission tests were used to assess nonverbal intelligence.

The type of instruments for intelligence assessment is a critical contingency for the correlations between overall MSCEIT/MEIS and overall and nonverbal intelligence. Standardized/admission tests (versus intelligence tests) attenuated the correlations. The study population is a critical contingency for the correlations between overall MSCEIT/MEIS and overall, verbal, and nonverbal intelligence. Studies using samples of just university students, in comparison to studies using other samples, produced attenuated correlations. Because of the range restriction problem in the samples of just university students as hypothesized, the meta-analytical correlations are likely to be underestimates of the true values. Thus, researchers should justify their choice of instruments for intelligence assessment as well as study populations in future research on EI.

Additionally, the average age of a study sample strengthened the relationships between overall MSCEIT/MEIS and overall, verbal, and nonverbal intelligence. Instead of being statistical artifacts of range restriction, these interesting findings suggest the increasing convergence of various forms of intelligence with age. It raises questions regarding the (co-)development of EI and intelligence. Future research can address these critical questions with primary data. Consistent with Schulte et al. (2004), gender was also a key moderator. Specifically, the gender composition of a study sample only influenced the relationship between overall MSCEIT/MEIS and verbal intelligence, suggesting that the convergence of overall EI ability and verbal intelligence may be stronger among men than among women. This interesting result urges for investigations of sex differences in overall EI ability, verbal intelligence, their relationships, and their associated brain regions (e.g., Jaušovec & Jaušovec, 2005).

Finally, studies using instruments for overall intelligence assessment such as Shipley Institute of Living Test and Wonderlic Personnel Test had similar findings regarding the relationship between overall MSCEIT/MEIS and intelligence. However, studies using different instruments for verbal intelligence assessment generated different associations with overall MSCEIT/MEIS and intelligence, and so did studies using different instruments for nonverbal intelligence assessment. These findings suggest that, there are variances among instruments for intelligence assessment. Depending on research questions and study constraints, researchers should carefully choose one or more instruments for intelligence assessment.

Because MSCEIT/MEIS is just one measure of EI, any conclusion regarding EI drawn from the present research entails the risk of confounding measure-specific variances with construct variances. Therefore, caution is needed in generalizing the current findings to other measures of EI and in particular trait-based measures of EI. Yet MSCEIT/MEIS is among the very few ability-based measures of EI that assess the *overall* EI ability and was developed based on the Four-Branch Model (see Mayer et al., 2008). Therefore, to a large extent, the current research speaks to research on EI ability (not trait EI).

[1] I also found that studies using MSCEIT produced a smaller relationship between overall MSCEIT and overall ($Q_b = 3.72$, $p = .05$) and verbal intelligence ($Q_b = 20.81$, $p < .001$) than studies using MEIS. Specifically, the estimated relationship between overall MSCEIT and overall intelligence ($n = 20$, $\bar{r}_c = .29$) was smaller than that between overall MEIS and overall intelligence ($n = 2$, $\bar{r}_c = .35$), and the estimated relationship between overall MSCEIT and verbal intelligence ($n = 18$, $\bar{r}_c = .24$) was smaller than that between overall MEIS and verbal intelligence ($n = 2$, $\bar{r}_c = .39$). Only one study in the meta-analytic sample for nonverbal intelligence used MEIS. Therefore, a moderator analysis could not be performed for nonverbal intelligence.

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