

REVISITING THE FACTOR STRUCTURE OF THE COGNITIVE STYLE INDEX: EVIDENCE FROM INDONESIAN STUDENT SAMPLES

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Abstract. This study aimed to examine the factor structure of the Cognitive Style Index (CSI) within the Indonesian cultural context. After undergoing cultural and linguistic adaptation, a field test was conducted involving a total of 326 university students. The collected data were analyzed using Confirmatory Factor Analysis to test three models of the analytic–intuitive cognitive style: a unidimensional model (Model 1), a two-factor model with a higher-order factor (Model 2), and an uncorrelated two-factor model (Model 3). Of the original 38 CSI items, only 20 had adequate factor loadings. The results supported Model 3 as the better-fitting model ($\chi^2(170) = 271.475$, $p < .001$; RMSEA = 0.053 [95% CI 0.041–0.064]; CFI = 0.916; SRMR = 0.057; TLI = 0.906; $\omega = 0.888$). Based on this, cognitive style measurement using CSI yields two separate scores, analytic and intuitive, for each individual. The study recommends adding new items, particularly for the intuitive dimension, to better reflect the characteristics of Asian populations, who tend to favor more intuitive and holistic thinking styles over analytical and formal ones. Furthermore, future development of cognitive style instruments should incorporate contemporary perspectives that view cognitive style as an adaptive function responding to environmental demands and challenges.

Keywords: cognitive styles, analytic, intuitive, test adaptation, factor structure, Indonesian students

INTRODUCTION

Cognitive style is a central concept in psychology, referring to an individual's characteristic way of processing information, thinking, and making decisions. This concept has been widely applied in diverse contexts, including learning, leadership, and organizational decision-making (Kozhevnikov et al., 2014). Unlike intelligence or intellectual ability, cognitive style is regarded as reflecting cognitive preferences that individuals employ when confronted with complex situations. Consequently, the valid and reliable measurement of cognitive style is essential for understanding individual differences in both academic and professional contexts. One of the most widely used instruments for measuring cognitive style is the Cognitive Style Index (CSI), developed by Allinson and Hayes (1996).

The CSI was designed to distinguish between two poles of thinking style: analytic and intuitive. Individuals with an analytic style tend to adopt systematic, logical, and evidence-based approaches to decision-making, whereas those with an intuitive style rely more on experience, feelings, and holistic perceptions (Allinson & Hayes, 1996). The CSI has been employed in various countries and disciplines, including business, education, and organizational psychology. Several studies have shown that individuals' cognitive styles may vary depending on their job level within an occupation, cultural context, and personality types. In a study involving measurement using the

CSI, the higher a person's job level and seniority, the lower their CSI score, indicating a greater tendency toward intuition (Sadler-Smith et al, 2003). Individuals from Asian cultural backgrounds tend to think more intuitively and holistically compared to those from European cultures, which emphasize analytical and formal thinking (Nichols, 2025). In terms of personality, individuals high in conscientiousness tend to be more analytical (Cuneo et al., 2018).

Nevertheless, despite its extensive application, the factor structure of the CSI remains a matter of debate in the scholarly literature. A fundamental question is whether the CSI is unidimensional or comprises two distinct factors (analytic and intuitive). To date, there has yet to be a conclusive answer. The unidimensional model used by Allinson and Hayes (1996) to measure the analytical–intuitive dimension along a single continuum was challenged by Hodgkinson and Sadler-Smith (2003), who demonstrated a bidimensional model in which analysis and intuition are treated as separate dimensions. Meanwhile, a seminal study by Backhaus and Liff (2007) on a sample of American college students indicated that the CSI tends to yield a single dominant factor, representing a general dimension of cognitive style. However, this finding was influenced by the use of heterogeneous item parceling, which may obscure the underlying multidimensional structure.

A subsequent study by Armstrong and Qi (2016) demonstrated that when items are parceled homogeneously (based on theoretical dimensions), a unifactorial structure emerges more clearly and coherently. Methodological issues related to item parceling represent a critical concern in research on the construct validity of the CSI. As Little et al. (2013) argued, inappropriate use of item parcels can produce misleading outcomes in confirmatory factor analysis (CFA), including oversimplifying models that are inherently complex. Armstrong and Qi (2016) emphasized that a more theoretically grounded and methodologically sound approach to item grouping can reveal a more accurate and meaningful structure. Therefore, the validation of the CSI requires careful consideration of both statistical and theoretical aspects to avoid oversimplifying the complexity of human thinking styles.

Beyond technical considerations in analysis, cultural and linguistic factors also have significant implications for the interpretation of CSI items. The instrument was originally developed within a American cultural context; thus, when applied in countries with different cultural norms, languages, and educational systems, shifts in meaning may occur (Peterson et al., 2017). Cross-cultural studies have demonstrated that cognitive style is not entirely universal but is shaped by social and cultural environments (Nisbett et al., 2001). In Eastern contexts, particularly Indonesia, preferences for contextual and relational thinking often dominate over the Western analytic style, which emphasizes logic and individualism. Consequently, it is necessary to evaluate whether the cognitive style construct in the CSI remains valid when applied in countries such as Indonesia.

To date, validation studies of the CSI in Eastern student populations, particularly in Indonesia, remain scarce. The absence of robust empirical data from this region undermines the generalizability of prior CSI research findings. Local validation becomes even more crucial given that the CSI is frequently utilized in student selection, training, and leadership development within higher education institutions across Indonesia. With the increasing use of the CSI in Indonesian research and educational practice, there is a pressing need for a comprehensive, theory-based structural evaluation of the instrument. Such an evaluation must address not only reliability but also the clarity of the underlying factorial structure. CFA represents the most appropriate method for testing the fit between theoretical models and empirical data within specific cultural contexts (Brown, 2015). Through CFA, researchers can explicitly examine whether data from Indonesian

students support a one-factor model, a two-factor model, or alternative structures that may be more empirically appropriate.

The present research is expected to make significant contributions in two areas: first, by strengthening the methodological foundation for testing the construct validity of the CSI outside Western contexts; and second, by providing empirical evidence that can inform the development of instruments or educational interventions more sensitive to local cultural contexts. Thus, the findings of this study are intended to be not only academically valuable but also practically relevant, particularly in the domains of student leadership development, psychological assessment, and learning design based on thinking styles.

In light of this background, the present study aims to re-examine the factor structure of the Cognitive Style Index in a sample of Indonesian students using CFA. Specifically, it seeks to address two key questions: Can the two-factor CSI structure identified in prior research be replicated in the Indonesian student context? Do cultural and linguistic contexts influence how respondents understand and respond to CSI items? By answering these questions, the study aims to enrich the cross-cultural cognitive style literature and provide a robust scientific foundation for the application of the CSI in Indonesia.

METHODS

This study aims to adapt the 38 items of the Cognitive Style Index (CSI) (Allison & Hayes, 2012) into the Indonesian language through a cultural and linguistic adaptation procedure. According to the guidelines of the International Test Commission (2017), test adaptation involves systematic steps to ensure that the adapted version demonstrates equivalent validity and reliability to the original version. This process begins with: (1) an analysis of cultural and linguistic appropriateness, (2) translation using the back-translation method, (3) local contextual adjustment, (4) preliminary pilot testing, and (5) psychometric analysis to examine factor structure, reliability, and validity.

Back-translation was conducted involving two translators and a translation review team. First, the items in the original version were translated into Indonesian by the first translator. Subsequently, the Indonesian version was translated back into English by the second translator. The results of both translations were then reviewed by the translation review team to examine semantic equivalence to the original version and to make lexical adjustments where discrepancies were found.

Following the completion of the translation process, the items were presented in an online questionnaire and administered to two samples of respondents ($N = 36$, $N = 75$, and $N = 215$). The field test stage involves a sample of students from diverse academic programs and extracurricular organizational backgrounds to ensure variability in the thinking styles under investigation. Such diversity is crucial in ensuring that the findings accurately reflect the real variation within the Indonesian student population. The field test results were then subjected to psychometric analysis, focusing on reliability and factor structure using Confirmatory Factor Analysis (CFA). All analyses were conducted in JASP (JASP team, 2024).

RESULTS AND DISCUSSION

The original version of the CSI consists of 38 items and is presented as a self-report questionnaire with a multiple-choice response format of “true,” “uncertain,” and “false,” scored 2, 1, and 0, respectively. Cognitive style is operationalized as “an individual’s preferred way of gathering, processing, and evaluating data” (Allison & Hayes, 2012, p. 2), namely: analytic and

intuitive. These two preferences are modeled as opposite poles of a single dimension, indicating that an individual's cognitive style can fall at any point along the continuum. A higher score indicates a stronger tendency toward analytic thinking, whereas a lower score reflects a stronger intuitive inclination (Allison & Hayes, 2012).

The results of the first pilot study ($N = 36$) indicated that the Indonesian version of the CSI demonstrated adequate reliability ($\alpha = 0.703$). However, an issue of construct underrepresentation (Furr, 2011) was identified. Of the 38 items, only 15 passed the selection criteria, and almost all unfavorable items, which are intended to measure intuitive tendencies, failed to meet the item-total correlation criterion ($r > 0.30$). Based on these findings, and to increase data variability, the researchers modified the response format to a 7-point Likert scale and re-administered the CSI items to a larger sample ($N = 75$). Although the second pilot study yielded improved internal consistency ($\alpha = 0.810$), the problem of construct underrepresentation persisted, with nearly all intuitive items being eliminated.

This issue led the researchers to suspect a wording effect, defined as the influence of differences in wording (phrasing or style) in test items on how respondents interpret and answer them, regardless of the items' substantive meaning (Kılıç et al., 2025; Zeng et al., 2020). As a result, items tended to cluster based on the positive-negative polarity of responses, producing a spurious factor that did not represent the intended construct. To address this, the researchers simplified the wording of stimulus statements to make them easier for respondents to understand. A subsequent pilot study was conducted with $N = 215$ respondents. Using the collected data, the researchers examined reliability and factor structure through EFA and CFA, comparing three models: a unidimensional CSI (Model 1), a multidimensional CSI with a second-order factor (Model 2), and a multidimensional CSI with uncorrelated dimensions (Model 3).

The results showed that both Model 2 and Model 3 exhibited good fit indices. However, in Model 2, the factor loadings for the two dimensions were relatively low (Factor 1 = -0.274 , Factor 2 = 0.215). Given the very low inter-factor correlation ($r = -0.132$), the Model 2 hypothesis was not supported by the data. Model 3 initially did not achieve an acceptable model fit. The researchers applied modifications based on the modification indices, removing cross-loading items (I16, A28, A15, I24) and selecting only one item from each pair of items with residual covariance (A3, A5, and I18). A re-specified CFA yielded a model that met the fit criteria. Therefore, Model 3 was deemed the most suitable for measuring cognitive style.

Table 1. CFA Results of the Comparison of Cognitive Style Measurement Models

	Model 1	Model 2	Model 3
χ^2 , df, p	2149.789; 665; $p < .001$	271.005; 168; $p < .001$	271.475; 170; $p < .001$
RSMEA, CI 95%, p	0.102; [0.097-0.107]; $p < 0.00$	0.053; [0.041-0.065]; $p = 0.307$	0.053; [0.041-0.064]; $p = 0.342$
CFI	0.480	0.941	0.916
SRMR	0.121	0.056	0.057
TLI	0.451	0.903	0.906
Omega reliability			
Factor 1	0.527	0.870	0.869
Factor 2		0.768	0.768
Total		0.843	0.888
Second-order		0.011	

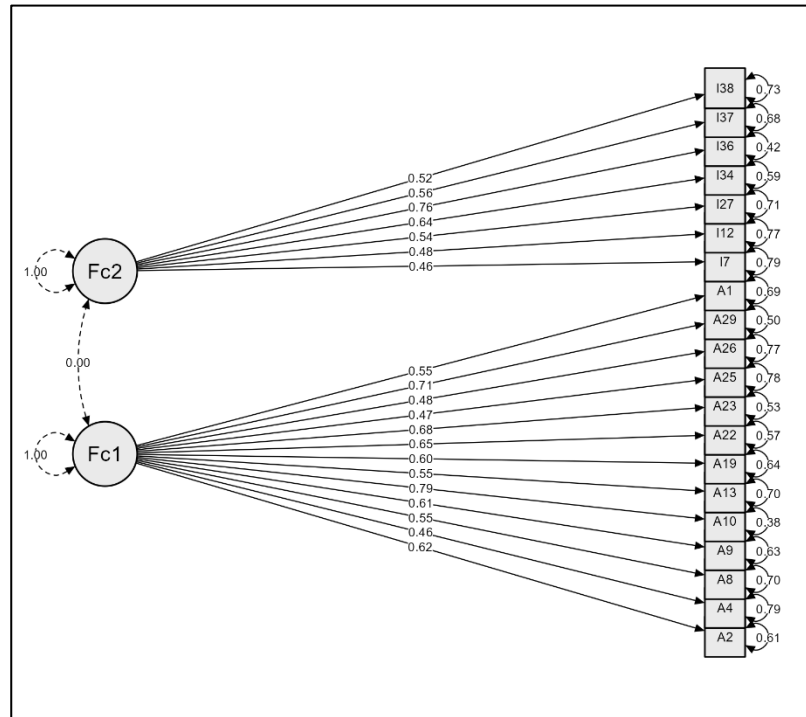


Figure 1. CFA Diagram of Model 3

Out of the initial pool of 32 items, 20 items passed the selection process, comprising 13 items that assessed the analytical aspect and 7 items that assessed the intuitive aspect. The Analytic factor encompasses dimensions such as Rational, Focusing, Cognitive Complexity, Analytic, Clarity, Systematic, Reflective, Rigour, Passive, and Converger. These items emphasize decision-making based on logic, in-depth analysis, orderliness, comprehensive consideration, and meticulous attention to detail. In contrast, the Intuitive factor encompasses dimensions such as Scanning, Active, Impulsive, Sensing, Intuition, and Field-Dependent. These items highlight spontaneity, creative thinking, comfort with new ideas, and a tendency to avoid excessive analysis.

Table 2 presents each item along with the corresponding measurement model parameter estimates and corrected item–total correlations (r_{i-x}). The estimated values represent the factor loading of each item in the measurement model, ranging from 0.573 to 1.062. These values indicate the strength of the association between the items and the construct being measured; most items exhibit loadings above 0.60, suggesting good contribution to their respective factors. The corrected item–total correlations indicate the extent to which each item is consistent with the overall scale, ranging from 0.401 to 0.724. Values above 0.30 are generally considered adequate, indicating that all items meet the criteria for internal consistency.

Table 2. Indonesian version Cognitive Style Index items

Factor	Code	Items	Dimension	Estimate	r_{i-x}
Analytic	A1	<i>Pengambilan keputusan harus berdasarkan logika.</i>	Rational	0.643	0.522
	A2	<i>Saya perlu mempelajari masalah secara rinci.</i>	Focusing	0.635	0.568

	A4	<i>Saya sulit bekerja dengan orang yang bertindak tanpa pikir panjang.</i>	Cognitive complexity	0.628	0.439
	A8	<i>Saya paham masalah lewat analisis, bukan intuisi.</i>	Analytic	0.620	0.506
	A9	<i>Saya menjaga rutinitas kerja.</i>	Clarity	0.696	0.558
	A10	<i>Saya suka kerja yang logis dan bertahap.</i>	Systematic	0.831	0.724
	A13	<i>Jika ada waktu, saya pertimbangkan semua sisi.</i>	Reflective	0.573	0.503
	A19	<i>Saya teliti sebelum menyimpulkan.</i>	Rigour	0.652	0.571
	A22	<i>Saya ambil waktu untuk mempertimbangkan semua hal.</i>	Reflective	0.697	0.597
	A23	<i>Saya cocok dengan orang yang tenang dan berpikir.</i>	Passive	0.830	0.618
	A25	<i>Orang menilai saya sebagai pemikir logis.</i>	Rational	0.589	0.450
	A26	<i>Saya butuh teori untuk paham fakta.</i>	Sensing	0.601	0.458
	A29	<i>Saya selesaikan masalah satu bagian dulu.</i>	Converger	0.749	0.658
Intuitive	I7	<i>Saya lebih suka memindai laporan daripada membacanya rinci.</i>	Scanning	0.694	0.401
	I12	<i>Lebih baik ceroboh daripada diam teratur tanpa aksi.</i>	Active	0.759	0.418
	I27	<i>Saya cocok kerja dengan orang spontan.</i>	Impulsive	0.715	0.474
	I34	<i>Saya lebih suka langsung bertindak daripada terlalu menganalisis.</i>	Impulsive	0.885	0.557
	I36	<i>Rencana formal sering malah menghambat.</i>	Innovator	1.062	0.649
	I37	<i>Saya lebih nyaman dengan ide daripada data.</i>	Intuition	0.742	0.484
	I38	<i>Terlalu banyak analisis bikin saya mandek.</i>	Field dependent	0.754	0.409

This study examines the dimensionality or internal structure of the Cognitive Style Index (CSI). After comparing several models of cognitive style measurement, both unidimensional and bidimensional, the data from Indonesian samples fit better with a bidimensional model, in which analytical and intuitive preferences are uncorrelated (an uncorrelated bidimensional model). Furthermore, of the original 38 CSI items, only 20 consistently demonstrated clear factor loadings on either the analytical (13 items) or intuitive (7 items) dimension. Both dimensions showed good reliability, indicating that the instrument is sufficiently reliable for measuring both analytical and intuitive tendencies.

The findings contribute to the ongoing discussion regarding the factor structure of the CSI by supporting the position of Hodgkinson and Sadler-Smith (2003) and Hodgkinson et al. (2009), who argued that cognitive style is best understood as a bidimensional construct. Moreover, the

finding that analytical and intuitive dimensions are uncorrelated aligns with the meta-analysis by Wang et al. (2017). This challenges the unitary model promoted by Allinson and Hayes (1996), the original developers of the CSI, who conceptualized cognitive style as a continuum ranging from analysis to intuition, implying that individuals can only be predominantly analytical or intuitive. Recent perspectives suggest that analytical and intuitive capacities are better viewed as two distinct, independent scales, since individuals may be high (or low) on both. Consequently, scoring procedures should separate analytical and intuitive items and avoid item parceling, which may obscure the distinction between dimensions.

According to Wang et al. (2017), maintaining a unidimensional view may lead to erroneous conclusions about the nature of cognitive style and its relationship with general information processing. Cross-cultural research does not support the existence of a strong preference for one cognitive style accompanied by a markedly low preference for the other (Lacko et al, 2025). The bidimensional model is more consistent with dual-process theories, which propose that humans process information through two distinct systems: intuitive (fast, automatic; System 1) and analytical (slow, deliberate; System 2). The dual-process model has demonstrated cross-cultural validity (Wittmann et al., 2009) and reflects the notion that cognitive styles function as adaptive patterns in response to the external world and changing environmental demands. While these thinking processes are contrasting, they coexist within individuals and can be used flexibly, an ability referred to as cognitive versatility. Individuals with cognitive style versatility demonstrate the capacity to use more than one cognitive style alternately, depending on the situation, and are able to process a wider range of information and perspectives simultaneously (Aggarwal et al., 2023). The capacities for analytical and intuitive thinking are not antagonistic or mutually exclusive; rather, they are interdependent (Keller & Sadler-Smith, 2019).

In this current study, the intuitive dimension comprised fewer items, indicating that the intuitive items in the original CSI were less effective in capturing the intuitive thinking among the Indonesian sample. Asian individuals are known to exhibit a more intuitive and holistic thinking style, which is experience-based, relational, and dialectical—distinct from the European tendency toward analytic thinking, which relies more heavily on formal logic and rule-based reasoning (Ma-Kellams, 2020). Intuitive thinking involves holistic reasoning, wherein individuals attend to the overall context and the relationships among objects as well as between objects and their surrounding field, and seek a middle ground between conflicting perspectives (Norenzayan et al., 2002). These dimensions are less apparent in the CSI, which characterizes intuitive thinking with indicators such as a tendency to engage in scanning and perceive information globally, a preference for simplicity, risk-taking, active and impulsive behavior, innovation, and a lower tolerance for incongruity.

For the purposes of exploratory research in Indonesia, the CSI validated through this study is sufficiently reliable as an Indonesian-language version of the instrument. However, to describe the characteristics of Indonesian thinking styles, it is necessary to develop an instrument that accommodates a more current perspective that analytic and intuitive cognitive styles are not mutually exclusive opposites, but rather two dimensions that can coexist in various combinations. This approach enables a more flexible and contextual measurement of cognitive styles, capturing the diversity of thinking strategies within the Indonesian cultural context, which tends to reflect the holistic, relational, and dialectical thinking styles commonly observed among Asian populations. Therefore, continued research is needed to explore culturally rooted conceptualizations of thinking styles. The present study is not without limitations, particularly due to the homogeneous characteristics of its respondents, who were predominantly university

students. In the future, the Indonesian version of the CSI should include additional items that reflect intuitive thinking styles and be validated across more diverse populations.

CONCLUSION

This study examined the dimensionality or factor structure of the CSI among a sample of Indonesian university students and found that a two-factor uncorrelated model fit the data better than a unidimensional model. Based on a sample from the Indonesian cultural context, only 20 CSI items showed clear factor loadings, even after linguistic simplification and adaptation. This suggests that the understanding of CSI items is not uniform and is likely influenced by both cultural and linguistic factors. The study recommends that CSI items be analyzed separately according to their analytical and intuitive-linguistic dimensions. Furthermore, CSI measurement produces two separate scores, analytical and intuitive, for each individual. A person may score high on both dimensions or low on both. This should be taken into account by researchers planning to use the CSI in future studies. Furthermore, it is also recommended to add more items, particularly for the intuitive dimension, considering that Indonesians are culturally closer to Asian than European traditions. In the future, studies on the conceptualization of analytical and intuitive thinking styles should be conducted as a foundation for developing a more culturally appropriate cognitive style instrument for Indonesians. Future research may also integrate more recent perspectives that view cognitive style as adaptive and as an integral component of an individual's cognitive versatility.

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