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## The place of emotional intelligence in the ‘intelligence’ taxonomy: Crystallized intelligence or fluid intelligence factor?

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### Abstract

Despite over two decades of research, the construct of emotional intelligence (EI) remains elusive as recent researchers debate whether it can be considered a new form of ‘intelligence’ that fulfils the standard of an intelligence construct. The main objective of this study is to assess the place of emotional intelligence within the existing major factors of intelligence, particularly fluid intelligence (gf) and crystallized intelligence (gc). Second, it investigated the convergent validity of emotional intelligence when correlated with general cognitive intelligence (g). The Shipley-2 IQ test and the WEIS performance-based EI test were administered to 422 respondents. The results from the confirmatory factor analyses utilizing structural equation modelling (SEM) revealed that emotional intelligence does not adequately fit the intelligence taxonomy. Meanwhile, the relatively small EI/g correlation revealed that the WEIS is not a pure ability measure. Therefore, more research and the development of new EI measures are required to determine whether EI has an intelligence component.

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### 1. Introduction

Merging the term emotion and intelligence to form a single construct was both novel and relatively strange to psychologists and researchers in the 1990s [1]. The term ‘emotional intelligence’ was initially coined by the American psychologists Peter Salovey and John D. Mayer. The pioneers of emotional intelligence posited that problem solving and wise decision making require both thought and feelings or logic and intuition. They further asserted that certain individuals possess the ability to carry out sophisticated information processing of emotions to with and use emotions as a guide for thinking and behaving more effectively than others [1], [2]. Some of the questions triggered by the introduction of the concept include whether emotional intelligence really exists and if so, is it a new domain of human cognitive intelligence, does it develop in ways similar to cognitive ability, does it meet the standard of general intelligence, and is it empirically measurable? Despite certain uncertainties regarding this

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newly minted construct, it has nevertheless enriched the discussion on intelligence by emphasizing the importance of intelligence in succeeding in life in the 21<sup>st</sup> century.

The ‘big idea’ behind the initial emergence of emotional intelligence as a construct is that success in life and work depends on more than just the basic intellectual abilities measured by IQ tests [3], [4], [5], [1]. Possessing a high IQ is not sufficient to determine one’s success in work and life, as there are personal qualities other than traditional intelligence that are more important for success. A growing number of psychologists are becoming increasingly interested in research on emotional intelligence because of the notion that cognitive intelligence is narrowly defined and accounts for only a portion of the variance in outcomes [3]. The initial notion that there are personal qualities other than traditional intelligence that are more important for success was also prompted by the publication of Goleman’s [6] best-selling trade book, “Emotional intelligence: Why it can matter more than IQ?”. The book caught the eye of the media, the general public, and researchers as it detailed its discovery of a connection between emotional competencies and prosaic behaviour.

### 1.1. The major factors of intelligence: Fluid intelligence and crystallized intelligence

Among the early works on human intelligence is the concept of a general factor of intelligence. This idea was proposed by Charles Spearman, an English Psychologist who argued that all cognitive ability tests share something in common and scores on all these tests are positively correlated [7]. The idea that disparate ability test scores reflect a single general cognitive ability led Spearman to coin the term *g* factor [7]. His student, Raymond B. Cattell, agreed with Spearman’s general factor of intelligence, and paved the way for the concepts of crystallized versus fluid intelligence. Cattell posits that the general intelligence ‘*g*’ can be split into two discrete factors that are crystallized intelligence (*gc*) and fluid intelligence (*gf*) [8], [9]. These two abilities mutually interact and work together to produce overall individual intelligence, and is known as the Cattell-Horn *Gf-Gc* intelligence model. Crystallized intelligence (*gc*: acquired acculturated knowledge) assesses an individual’s breadth and depth of general knowledge and knowledge of a culture like verbal communication. On the other hand, fluid intelligence (*gf*: innate reasoning ability) requires the ability to think logically, reason, form concepts and solve problems in novel situations [8], [9], [10].

Several years later, the Cattell-Horn *Gf-Gc* dichotomy was expanded with the identification of a few additional abilities. Over time, additional factors like Short-Term Acquisition and Retrieval (SAR or *Gsm*), Visual Intelligence (*Gv*), Auditory Intelligence (*Ga*), Long-Term Storage and Retrieval (TSR or *Glr*), Cognitive Processing Speed (*Gs*), Correct Decision Speed (CDS), Quantitative Knowledge (*Gq*) and Reading/writing ability (*Grw*) were added to the model. It now consists of nine broad factors [11], [12], [13], [14]. Although the theory continued to be called the ‘extended *Gf-Gc* theory’, the nine broad abilities were treated as equal, and not part of any hierarchical structure [15]. By the time Horn expanded his research on the factors of intelligence, Carroll [16], [17] on the other hand, conducted an in-depth, comprehensive survey of factor-analytic studies on the factors of intelligence and identified factors similar to those in Cattell-Horn’s model with fluid intelligence and crystallized intelligence as major factors of intelligence.

In 1999, the “Cattell-Horn-Carroll” (CHC) theory of cognitive intelligence emerged as a result of an amalgamation of Cattell-Horn’s [18], [19] extended *Gf-Gc* theory and Carroll’s [16] three-stratum model of intelligence [20]. The most salient difference between the Cattell-Horn and Carroll’s model is the level of stratum; while Cattell-Horn model has only two stratum, Carroll’s model has three stratum or levels of abilities. For Cattell-Horn, stratum II refers to the ‘broad abilities’ (i.e. fluid intelligence, crystallized intelligence, visual Intelligence, Auditory Intelligence, Cognitive Processing Speed intelligence, etc.) that are positively intercorrelated. Stratum I refers to the ‘narrow abilities’ composed of approximately 70 fairly specific abilities associated with each of the broad abilities [13]. In contrast, Carroll’s stratum I and stratum II are also similar to Cattell-Horn model, but include a stratum III ability; a higher-order general intelligence factor (‘*g*’ factor) [16], [21]. In the CHC model of cognitive abilities, the general intelligence factor (*g*) is positioned at the apex of the hierarchy of the three stratum model; stratum I (narrow abilities), stratum II (broad abilities) and stratum III (general intelligence) [22]. As the CHC intelligence taxonomy is grounded on the empirical psychometrics theory of intelligence, it is considered the most comprehensive and empirically supported framework available for understanding the structure of human cognitive abilities [15], [23].

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