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## **The Discovery and Evolution of the Big Five of Personality Traits: A Historical Review**

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### **ABSTRACT**

The Big Five construct of personality traits is a taxonomy of five higher-order personality traits that are believed to be responsible for people's differences and is considered the world's most researched and used personality construct to date. The paper proposes that the construct's robustness and universal appeal were gained not by accident but by design. The Big Five has a long historical foundation behind it, even dating back to ancient times. Its robustness is a product of various research methods and advanced quantitative techniques and analyses by generations of researchers across history. In addition, the numerous cross-cultural research streams conducted around The Big Five construct add to its perceived universality. The construct's openness to incorporate findings from allied sciences such as neuroscience and genetics also contribute to its robustness and continuing evolution as a construct that may help advance our understanding of human personality and behavior.

**Keywords:** Big Five; Personality Traits; Personality Psychology; Trait Theory; Fivefactor Model; Human Behavior.

### **INTRODUCTION**

The author's primary research interest in personality traits, arguably the basic building blocks of human personality strengths, has inspired this paper. There have been many conceptualizations around the strengths construct. However, in this paper, strength is construed as the ability to produce a near-perfect performance consistently on a specific task and believed to be composed of a person's innate talents and the investments a person makes in acquiring skills, knowledge, and abilities (Hodges &

Clifton, 2004; Rath, 2007). Further, Hodges and Clifton (2004) characterized “innate talents” as *naturally recurring* and cannot be acquired like skills, knowledge, or abilities to emphasize the stable nature of talent. The relationship between traits and talent (i.e., naturally recurring and stable) is apparent from this definition. As such, this paper posits that personality traits are indeed the building blocks of talent and, consequently, of strengths themselves.

However, just like the strengths construct, there have also been many conceptualizations around personality traits which is problematic. One personality construct called, The Big Five (TB5), considered the world’s most researched and used personality trait construct (John et al., 2008), is used to solve the problem mentioned above. Thus, this paper will focus on understanding the TB5 construct by conducting historiography, a research methodology used to examine the academic conversations and trends that have taken place around a particular topic and analyze why such trends have developed the way they did. As such, this paper aims to provide a historical review of the significant findings and research streams that have led to the discovery, development, and continued evolution of TB5. The paper first defines the TB5 construct and associated terms (e.g., traits, facets, trait theory, etc.), then provides the inherent connection of TB5 to trait theory to personality psychology and elucidates the relevance of the TB5 construction contributing to the study of human nature.

The paper hypothesizes that the TB5 model has become a robust personality trait construct because of its long historical foundations and constant evolution. Its origin and development were shaped and influenced by various research methods and cutting-edge quantitative tools employed by generations of researchers. Additionally, the construct’s openness to incorporating findings from allied sciences such as neuroscience, genetics, and behavioral epigenetics contributes to its robustness. Five significant research periods on TB5 are discussed: its origin story, discovery and development, hiatus in research, renaissance and dominance, and continued evolution. The paper discusses the recent trends and future directions around the TB5 construct that further define and shape TB5 research and inquiry and ends with a summary and conclusion and the study’s limitations and areas for further exploration.

## **DEFINITIONS, CONSTRUCTS, AND ASSOCIATED THEORIES**

McCrae (2011) argued that understanding human nature must include the perspective of trait theory, i.e., an approach to the study and measurements of human personality (Nolen-Hoeksema *et al.*, 2014). Trait theory is part of the broader field of personality psychology, i.e., the study of the whole person by identifying unique and enduring patterns of thoughts, feelings, and behaviors and revealing the mechanisms underlying those patterns, as well as determining how people’s personalities develop and change over time (Nofhleet *et al.*, 2011).

Since the birth of trait theory in the 1930s, the term “trait” has been conceptualized in many ways. However, for the reason of parsimony, this paper adopts McCrae’s (2018) most recent definition of traits as biologically-based dispositions that help shape a person’s distinctive adaptation to life, and thus, lead to relatively consistent patterns of thoughts, feelings, and actions over time. This view on the trait’s stable nature is consistent with genetic research and developmental science findings. It has been quantified that as much as 80% of the trait variance is steady across the entire adult lifespan (Coffman & GonzalezMolina, 2002; Terracciano *et al.*, 2006). TB5 is a taxonomy of five higher-order personality traits that are believed to be responsible for people’s differences: Openness to experience, Conscientiousness,

Extraversion, Agreeableness, and Neuroticism (i.e., the OCEAN or CANOE traits; Goldberg, 1993; McCrae & John, 1992). The term “big” in “Big Five” does not mean that there is intrinsic greatness in these traits, nor does it mean that personality can be reduced to these five traits. Instead, “big” was used to imply that each of these traits is extremely broad. Also, each trait has many distinct, more specific personality characteristics called facets (see Table 1 for definitions; John & Srivastava, 1999; Costa & McCrae, 1985; McCrae & John, 1992). TB5 is considered the world’s most researched and used personality traits measure because of its cross-cultural universality, temporal stability, and predictive validity (John *et al.*, 2008).

**TABLE 1**  
**Big Five Traits and their Facets (Sub-traits)**

<b>Neuroticism</b>	<b>Extraversion</b>	<b>Openness to experience</b>	<b>Agreeableness</b>	<b>Conscientiousness</b>
Anxiety	Warmth/ Kindness	Fantasy/Imagination	Trust (in Others)	Competence/ Self-efficacy
Hostility/Anger	Gregariousness	Aesthetics/ Artistic Interest	Straightforwardness/ Morality	Order(liness)/ Organizing
Depression	Assertiveness	Feelings/ Emotionality	Altruism	Dutifulness/ Sense of duty/Obligation
Self-consciousness	Activity (Level)/Lively Temperament	Actions/ Adventurousness/ Exploration	Compliance/ Cooperation	Achievement Striving
Impulsiveness/ Immoderation	Excitement Seeking	Ideas/Intellectual Interest/Curiosity	Modesty	Self-discipline/ Willpower
Vulnerability to Stress/Fear/ Learned helplessness	Positive Emotion/ Cheerfulness/ Vivacity	Values/ Psychological liberalism/Tolerance to ambiguity	Tendermindedness/ Sympathy	Deliberation/ Cautiousness

**Note:** Adapted from Costa and McCrae (1985), John and Srivastava (1999), and McCrae and John (1992). *Extraversion*: preferred personal interactions and mood states that are more intensely experienced; *Agreeableness*: concerns interpersonal orientation; *Conscientiousness*: related to impulse control, discipline, and persistence; *Neuroticism*: associated with levels of personal adjustment and emotional instability, mainly regarding self-perception self-esteem and the way the individual responds to emotional distress; and, *Openness to experiences*: associated to the tolerance and appreciation of new ideas and experiences.

## **METHOD AND DESIGN**

In this paper, a bibliometric method (i.e., a research method using quantitative analysis to describe patterns of publications within a particular field or body of literature) called *historiography* was used to uncover the origin story and determine the significant milestones of the TB5 construct development. As a tool, historiography shows a field's growth over time by mapping the most critical primary research and citing other primary documents. The results are then used to examine the academic conversations and trends that have taken place around a particular topic and analyze why such trends have developed the way they did.

The study used the Web of Science database and CitNetExplorer ver. 1.0.0, a software tool for visualizing and analyzing citation networks of scientific publications (<https://www.citnetexplorer.nl/>) in developing historiography. Once the data file from the Web of Science database was generated, it was imported to the CitNetExplorer software for the visual generation of the historiography. Non-matching cited references with a minimum of 10 citations were included. This historiography represents the top 500 most cited articles (from 1937 to 2017) around the topic of "Big Five" across the field of psychology, including personality, social, general, applied, developmental, and industrialorganizational psychology. Keywords used included Big Five, Five-factor model, Five-factor Theory, Big 5, and personality traits. Figure 1 shows the completed historiography of the TB5 construct for this paper.

## **FINDINGS AND DISCUSSION**

The above historiography informed the segmentation of the TB5 construct's significant historical milestones into five periods, each shaped by and built upon a succession of influential researchers, and further discussed below.

### **PERIOD I [ANCIENT TIMES TO THE 1930S]: THE ORIGIN STORY AND SETTING THE FOUNDATION**

Historically, the origin story of the study of personality traits is believed to have started from ancient times. In particular, this was when Hippocrates conceptualized his four temperament types (i.e., sanguine, phlegmatic, choleric, and melancholic), which scholars later mapped to corresponding TB5, e.g., sanguine with emotional stability and extraversion (Musek, 2017). Several millennia later, Sir Francis Galton gave birth in 1884 to a novel approach of investigating and developing a comprehensive taxonomy of personality traits by analyzing the English language called lexical hypothesis (Shrout & Fiske, 1995).

The lexical approach, one of the historical paths that helped in discovering the TB5, was later used by trait research pioneers Gordon Allport and Henry Odbert. They compiled more than 4,500 adjectives from the 1925 edition of Webster's New International Dictionary they believed were descriptive of observable and relatively stable traits (Allport & Odbert, 1936).

The undertaking lead Allport and Odbert to initially group traits into three categories: cardinal (i.e., traits that dominate and shape a person's behavior), central (i.e., traits found to some degree in every person), and secondary traits, which are situational. Their pioneering work would later serve as a foundation for the extension of their trait research in the 1940s and the eventual discovery and conceptualization of the original TB5 construct.

## PERIOD II [THE 1940S TO LATE 1960S]: DISCOVERY OF THE ORIGINAL BIG FIVE AND CONSTRUCT DEVELOPMENT

This period in the development of TB5 was marked by the use of more advanced statistical tools and analyses as well as the concurrent use of another methodology (i.e., questionnaire approach) in addition to the lexical approach, which put the development of TB5 construction steroids. Continuing on the pioneering works of Allport and Odbert, Raymond Cattell took the original 4,500+ trait words the original researchers used and narrowed them down to 171 traits by retaining the adjectives and eliminating synonyms in the original list (Bagby *et al.*, 2005).

Catell used the lexical method and employed the questionnaire or survey method, which was the other historical path that leads to the discovery of TB5, by constructing a questionnaire based on these lexical factors. A hundred of his “knowledgeable acquaintances” self-rate themselves on how characteristic or uncharacteristic these traits were in describing their personality (Johnson, 2017). Catell then used advanced quantitative techniques such as Pearson correlations and factor analysis with oblique rotation to allow an overlap of factors, which resulted in the narrowing down of factors from 171 to 12. He added four more factors that he thought were necessary for his model, which eventually became Cattell’s 16PF (Cattell, 1949).

Table 2 shows that Cattell’s 16PF contains what trait scholars consider the original TB5 cluster of traits: Introversiion/Extroversion, Low/High Anxiety, Receptivity/ Toughmindedness, Accommodation/ Independence, and Lack of Restraint/Self-control. Since its first publication in 1949, the 16PF inventory has been revised four times by Cattell (i.e., 1956, 1962, 1968, and 1993), reflecting the refinements he made in his model and inventory.

**TABLE 2**  
**CATTELL'S 16PF AND THE ORIGINAL BIG FIVE**

	Factor	Descriptors	
A	Warmth	Reserved	Outgoing
B	Reasoning	Less Intelligent	More Intelligent
C	Emotional Stability	Affected by feelings	Emotionally stable
E	Dominance	Humble	Assertive
F	Liveliness	Sober	Happy-go-lucky
G	Rule Consciousness	Expedient	Conscientious
H	Social Boldness	Shy	Venturesome
I	Sensitivity	Tough-minded	Tender-minded
L	Vigilance	Trusting	Suspicious
M	Abstractedness	Practical	Imaginative
N	Privateness	Straightforward	Shrewd
O	Apprehension	Self-Assured	Apprehensive
Q1	Openness to Change	Conservative	Experimenting
Q2	Self-Reliance	Group-dependent	Self-sufficient
Q3	Perfectionism	Self-conflict	Self-control
Q4	Tension	Relaxed	Tense

*Note.* Adapted from Cattell (1949).

Fiske (1949) published the results of the factor analysis he did on Cattell's (1949) work. However, this time, he used a different rotation technique that resulted in relatively independent rather than overlapping factors, which eventually led him to report only five factors instead of 16 (i.e., Social Adaptability, Conformity, Emotional Control, Inquiring Intellect, and Confident Self-expression; Fiske, 1949). In a further analysis, Tupes and Christal (1961/1992) carried forward this research from a different perspective by reanalyzing the data from Fiske's (1949) study and that of Cattell's (1949) samples using orthogonal, rather than oblique rotation, as Cattell used initially. Their new analysis found five higher-order factors (i.e., similar to Fiske's findings), which they later labeled as Surgency, Agreeableness, Dependability, Emotional Stability, and Culture (Tupes & Christal, 1961/1992). A couple of years later, Norman (1963) successfully replicated Tupes and Christal's research on a different data set using the same orthogonal rotation factor analysis but re-labeled some of Tupes and Christal's (1961/1992) original TB5 labels (e.g., Surgency to Extroversion and Dependability to Conscientiousness; Norman, 1963). Norman (1967) repeated Allport and Odbert's approach using the third edition of Webster's New International Dictionary in subsequent research. However, he did not perform factor analysis, which would later be done by Goldberg (1990) after the so-called "decade of doubt" in personality research history.

### **PERIOD III [THE LATE 1960S TO 1970S]: THE DECADE OF DOUBT AND HIATUS IN RESEARCH**

During this period, personality psychology critiques virtually stopped the publication of trait research for more than ten years (i.e., "the decade of doubt; Digman, 1996), which created a paradigm crisis in the field of personality psychology. The controversy was mainly precipitated when Mischel (1968) proposed that situation trumps traits using the situation-behavior argument. In other words, behavior is primarily driven by a given situation, not by personality traits (e.g., a person does A under situation X but does B under situation Y). This proposition also meant that the assumption that individuals act in consistent ways across different situations (since traits are believed to be stable) is fiction (McAdams, 2009). Another contributing factor to this decade of doubt in trait research was Bandura's (1977) theory of reciprocal determinism, which argues that personal characteristics and the social environment influence a person's behavior. In other words, human behaviors and personalities are developed over time by their experiences, not just by traits. In other words, human behaviors and personalities are developed over time by their experiences, not just by traits (Nzuanke and Ajimase, 2014).

### **PERIOD IV [1980S TO 1990S]: RENAISSANCE AND DOMINANCE**

Amidst the continued assault on personality psychology's basic paradigm in Period III, trait research nonetheless continued, albeit silently and cautiously. In the 1980s, Lewis Goldberg extended Norman's (1967) work when he readministered Norman's trait terms to a sample of university students. Goldberg asked the students to self-rate themselves against these traits for this study instead of asking others to rate them. Although the 1980s saw an improvement in the climate of trait research publication, the results of Goldberg's factor analysis, which produced the

familiar five-factor structure (which he termed as “big five”), were only published in 1990 (Goldberg, 1990). In a separate undertaking, Digman and Takemoto-Chock (1981) re-examined Cattell’s (1949) computations and found some clerical errors in Cattell’s correlation matrices. After correcting the mistakes, Digman and Takemoto-Chock (1981) found a striking convergence toward the then familiar five-factor structure, which was later echoed by Goldberg (1990). Goldberg (1992) then turned to the development of marker scales for the five factors (i.e., Extraversion, Agreeableness, Conscientiousness, Emotional Stability, and Intellect), given that previous research and validations have proven that the five-factor model seemed to be a robust construction.

Goldberg and Digman’s lexical research had an enormous impact on the full-scale renaissance of five-factor research through the use of personality questionnaires or survey methods spearheaded by Hogan, Costa, and McCrae (Johnson, 2017). The mid-1980s to 1990s saw new personality inventories such as the Hogan Personality Inventory (HPI; Hogan, 1985), based on the five factors described by Norman’s (1963) study. On the other hand, Costa and McCrae (1976) conducted a cluster analysis of Cattell’s (1949) 16PF items. They found out that Neuroticism and Extraversion were standard dimensions in personality research, while Openness to experience was rarely discussed in the literature (Johnson, 2017). This realization propelled Costa and McCrae (1976) to develop the NEO Inventory (NEO-I) released in 1978 and later revised to NEO Personality Inventory in 1985 (NEO PI; Costa & McCrae, 1985). Costa and McCrae took into account Goldberg and Digman’s findings that show that Agreeableness and Conscientiousness are two important domains that should be incorporated in their inventory. By doing so, Costa and McCrae integrated both lexical and questionnaire approaches in mainstream trait research (Johnson, 2017) and, at the same time, gave birth to the modern TB5 construct. In 1992, Costa and McCrae published the second revision of their inventory, the NEO PI-R, which included six facets for each factor or 30 facets in total.

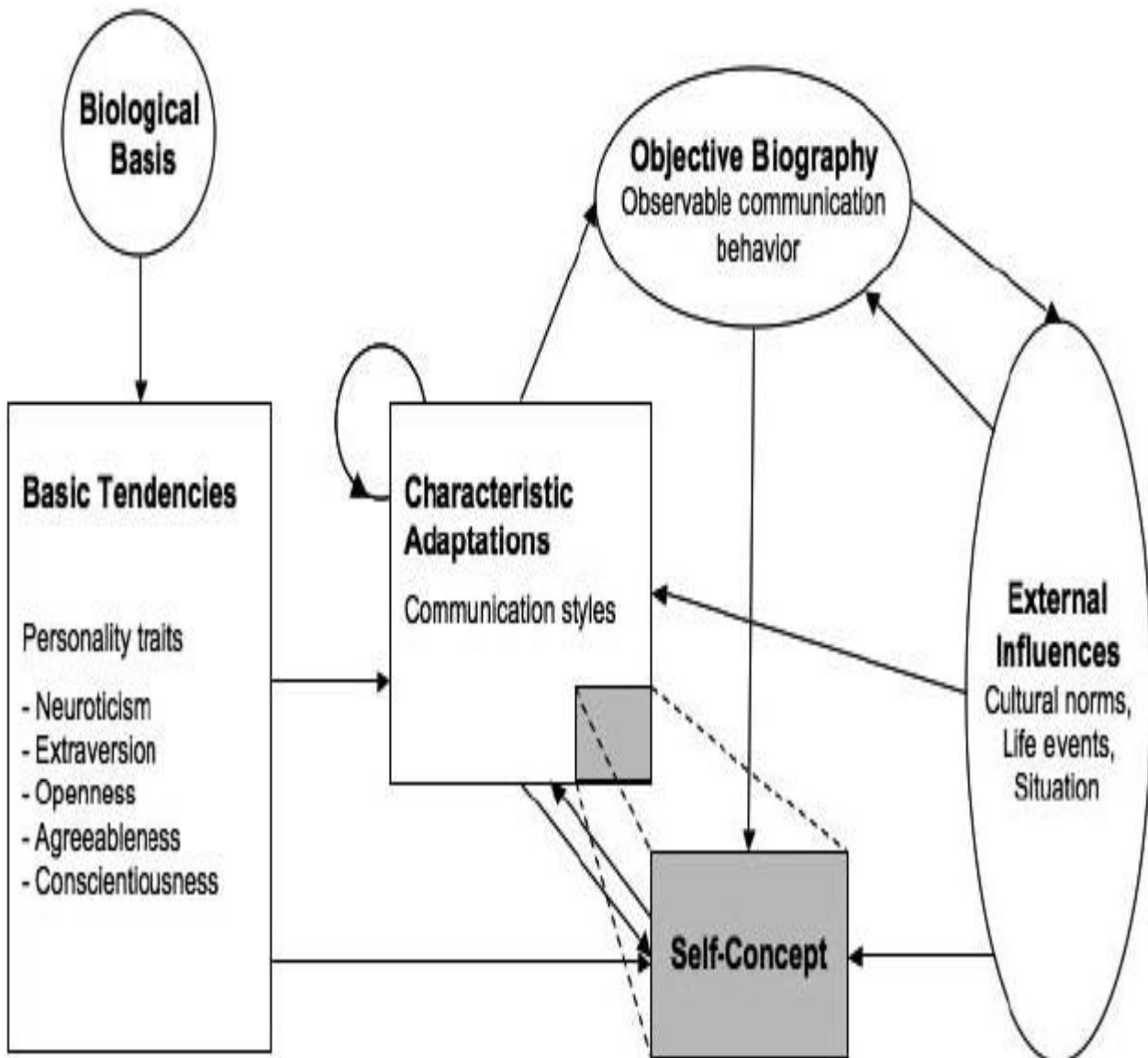
With the publication of NEO PI (Costa & McCrae, 1985) and its subsequent revisions to NEO PI-R (Costa & McCrae, 1992), their TB5 questionnaire quickly became the most influential and popular inventory that uses the TB5 model because of its high validity and reliability as an instrument. Further, because of observed cross-cultural equivalency between NEO PI-R five factors and their facets (McCrae & Terracciano, 2005), it reinforced the perceived universality of the TB5 construct. Trait scholars consider NEO PI-R the “gold standard” against which any other measure could be compared (Muck *et al.*, 2007).

## **PERIOD V: CONTINUED PROGRESS AND EVOLUTION FROM 2000 TO 2015.**

Refinements in the NEO PI-R inventory continued in the new millennium. In 2005, McCrae and Costa published the third and current version of their instrument called NEO PI-3, which they claim has much-improved readability. The revised inventory can now be used for younger populations or adults with lower educational levels (McCrae *et al.*, 2005). However, one of the criticisms against the TB5 construct is that it is not based on any underlying theory and a mere empirical finding from factor analyses (Block, 1995). In response, McCrae and Costa (2008) introduced the Five-Factor Model of Personality Theory (FFT; see Figure 2 for a visual presentation of the FFT) to serve as an overarching theory that incorporates not only the TB5

construct but also addresses the biological, contextual, and environmental factors that influence personality and behaviors that Mischel, Bandura, and others have previously raised against trait theory of personality.

**FIGURE 2**  
**THE FIVE-FACTOR THEORY PERSONALITY SYSTEM**



*Note.* Boxes indicate core components, ellipses are peripheral components, and arrows show the direction of causal processes. Adapted from McCrae & Costa (2008).

An interesting branch in the evolutionary tree of the TB5 construct appeared in the early 2000s when Paulhus and Williams (2002) conceptualized the dark triad (DT) traits (i.e., Machiavellianism, Narcissism, and psychopathy; see Table 3 for trait definitions). Subsequent research by Furnham et al. (2013) has shown that the TB5 construct has significant relationships with the DT as a whole (i.e., negatively correlated with Agreeableness and Conscientiousness) and with each of the DT



traits themselves (e.g., Narcissism is positively correlated with the achievement facet of Conscientiousness). This finding suggests that Costa and McCrae's inventory can be used to measure DT traits. However, LeBreton et al. (2018) cautioned that TB5-related inventories might provide different accuracy levels in measuring DT traits and suggested that a stand-alone measure of the DT traits may provide the most direct and reliable measures of DT traits.

**TABLE 3**  
**DARK TRIAD AND LIGHT TRIAD TRAITS AND DEFINITIONS**

Dark Triad Traits	Light Triad Traits
Machiavellianism, i.e., exploitation and deceit	strategic Kantianism, i.e., treating people as ends unto themselves
Narcissism, i.e., importance	entitled self- Humanism, i.e., valuing the dignity and worth of everyone
Psychopathy, cynicism, and impulsivity	i.e., callousness, Faith in Humanity, i.e., believing in the fundamental goodness of humans

**Note:** Adapted from Paulhus and Williams (2002) and Kaufman et al. (2019).

Another stream of research from the TB5 theory in the mid-2000s discovered a sixth factor when TB5 research was extended to other cultures and languages (Ashton et al., 2004; Nzuanke and Ogbadu, 2018). In doing these studies, researchers noticed a sixth factor that kept appearing in the analysis, which they labeled as the Honesty-Humility trait. Forensic investigations using more powerful computers later revealed that this sixth trait was indeed "hiding" in the earlier lexical studies in the English language done by TB5 pioneers. This sixth trait discovery gave birth to the HEXACO (Honesty-Humility, Emotionality, Extraversion, Agreeableness, Conscientiousness, and Openness to experience) model of personality structure (Ashton, 2018). However, the HEXACO model has not caught up yet to the level of TB5's popularity in usage mainly because the Honesty-Humility trait has not always consistently been replicated by other researchers (e.g., some have identified another sixth factor while others have identified more than six factors; Thalmayer et al., 2011). Table 4 provides a comparative summary of the significant streams of theories, research methods used, and researchers responsible for the evolution and development of the TB5 construct across history.

**Table 4**  
**Evolution of the Big Five Construct in Terms of Factors/Traits**

	<b>I. Origin and Foundation (~1930s)</b>		<b>II. Discovery and Development (1940s-1960s)</b>				<b>III. Hiatus (Late 1960s-1970s)</b>
<b>Period</b>	<b>Hippocrates</b>	<b>Allport &amp; Odbert (1936)</b>	<b>Cattell's 16PF (1949)</b>	<b>Fiske (1949)</b>	<b>Tupes &amp; Christal (1961)</b>	<b>Norman (1963)</b>	<b>Mischel (1968) &amp; Bandura (1977)</b>
<b>Method</b>	—	Lexical	Lexical/ Questionnaire	Lexical	Lexical/ Questionnaire	Lexical	—
<b>Factors/ Traits</b>	Sanguine	Cardinal	Introversion/ Extroversion	Social adaptability	Surgency	Extroversion	—
	Phlegmatic	Central	Anxiety	Conformity	Agreeableness	Agreeableness	—
	Choleric	Secondary	Receptivity/ Toughness	Emotional control	Dependability	Conscientiousness	—
	Melancholic		Accommodation / Independence	Inquiring intellect	Emotional stability	Emotional stability	—
			Lack of Restraint/ Self-control	Confident self-expression	Culture	Culture	—

#### IV. Renaissance and Dominance (1980s-1990s)

Digman & Takemoto-Chock (1981); Goldberg (1990)	Hogan's HPI (1985)	Costa & McCrae (1978 - 2005)		
		NEO-I (1978)	NEO PI (1985)	NEO PI-R (1992) & NEO PI-3 (2005)
Lexical	Questionnaire	← Lexical/Questionnaire →		
Extraversion	Sociability	Neuroticism	Neuroticism	Neuroticism + Facets
Agreeableness	Likeability	Extraversion	Extraversion	Extraversion + Facets
Conscientiousness	Prudence	Openness to experience	Openness to experience	Openness to experience + Facets
Emotional stability	Adjustment		Agreeableness	Agreeableness + Facets
Intellect	Intellectance		Conscientiousness	Conscientiousness + Facets

#### V. Continued Progress and Evolution (2000-2019)

Paulhus & Williams' (2002) Dark Traits	Ashton et al.'s (2004) HEXACO	Kaufman et al.'s (2019) Light Triad
Questionnaire	Lexical	Questionnaire
Machiavellianism	Humility-Honesty	Kantianism
Narcissism	Emotionality	Humanism
Psychopathy	Extraversion	Faith in humanity
	Agreeableness	
	Conscientiousness	
	Openness to experience	

*Notes.* Comparative summary of the significant streams of theories and researchers responsible for developing the Big Five construct across history. Adapted from Allport & Odbert (1936), Cattell (1949), Fiske (1949), Tupes & Christal (1961), Norman (1963), Digman-Takemoto-Chock (1981), Goldberg (1990), Hogan (1985), Costa & McCrae (1978, 1985, 1992, & 2005), Paulhus & Williams (2002), Ashton et al. (2004), and Kaufman et al. (2019)

## RECENT TRENDS AND FUTURE DIRECTIONS

One of the most recent research streams that came out from the foundations of TB5, DT, and HEXACO models is Kaufman et al.'s (2019) concept of the light triad (LT). LT is posited as the polar opposite of DT in that LT represents a set of characteristics of people who have a loving and beneficent orientation toward others (i.e., called "everyday saints") and theorized to be composed of Kantianism, Humanism, and Faith in Humanity (see Table 3 for trait definitions). Kaufman et al. (2019) demonstrated that LT is not only distinct from the inverse of the DT traits, TB5's Agreeableness trait, and HEXACO's Honesty-Humility trait, but LT can likewise predict positive and negative outcomes better than TB5's Agreeableness trait and HEXACO's Honesty-Humility trait. LT is undeniably a new field of inquiry that researchers can dive into to jointly explore the malevolent (dark) and beneficent (light) sides of human nature and personalities. Advances in other fields of science are also helping in advancing TB5 research and inquiry. In recent years, contributions from allied sciences such as neuroscience, genetics, and even behavioral epigenetics have made significant discoveries in shaping and influencing TB5 research. For example, Riscelliet al. (2017) found evidence that anatomical variability (e.g., cortical thickness and folding, surface area, etc.) in prefrontal cortices is related to TB5 traits, which suggests that they may be linked to high-level socio-cognitive skills and may have the ability to modulate core affective responses and behaviors.

From genetic science, most recent twin studies, which calculated the mean percentage for heritability for each of the TB5 traits, found out that heritability did broadly influence the TB5 traits (i.e., the genetic influence was estimated to be 57% for Openness to experience, 49% for Conscientiousness, 54% for Extraversion, 42% for Agreeableness, and 48% for Neuroticism; Bouchard & McGue, 2003). Behavioral epigenetics is an evolving science that seeks to understand how the expression of genes can be influenced by experiences and the environment to produce individual differences, including personality (Bagot & Meany, 2010). These epigenetic changes can influence the growth, structure, and function of neurons in the brain, significantly influencing one's personality and behavior (Miller, 2010).

However, establishing definitive links between TB5 traits and genetics is still a work-in-progress as the findings from other research streams are inconsistent and inconclusive. For example, Persson et al. (2000) found some evidence for an association between NEO PI-R facets (Costa & McCrae, 1992) and polymorphism (i.e., the occurrence of two or more different forms or phenotypes in the population of a species) in the tyrosine hydroxylase gene, which regulates the normal functioning of the nervous system. Unfortunately, another study could not confirm this finding (Tochigi et al., 2006), indicating that there is still much work to be done.

## CONCLUSION: SUMMARY OF DISCUSSION

This paper presented a historical review of the development of the TB5 construct, the world's most researched and used human personality trait theory and construct to date (John et al., 2008). The paper used a bibliographic method called historiography to trace the origin story of the construct from ancient times and to describe how the construct quickly developed in modern times across five significant periods:

1. Origin and Foundation (Ancient times to 1930s);
2. Discovery and Development (the 1940s to 1960s);
3. Hiatus (the late 1960s to 1970s);

4. Renaissance and Dominance (the 1980s to 1990s); and, 5. Continued Progress and Evolution (the 2000s to 2019).

These periods were defined and marked by using more advanced research techniques (e.g., lexical hypothesis, survey method, etc.) and statistical analyses (e.g., correlation analysis, factor analysis, etc.) by generations of researchers and scientists across cultures and contexts. The advances in research methodology and tools helped develop the TB5 construct as we know it today. However, true to its origins and developmental process, TB5 continues to evolve in theory and practice. The continued evolution of the TB5 construct and the expansion of the TB5 research to embrace other domains of science are imperative in advancing our understanding of human personality and behavior necessary for optimal human functioning.

## **IMPLICATIONS**

Unlike other constructs, which generally start from a particular theory or conceptualization, TB5's development was not typical. Only after a considerable period and iterations by generations of researchers, a theory was eventually developed (i.e., FFT) by its leading proponents (i.e., McCrae & Costa, 2008). FFT serves as an overarching theory that incorporates not only the TB5 construct but also addresses the biological, contextual, and environmental factors that influence personality and behaviors. The obvious implication is that the TB5 developmental process showed that knowledge creation and theory-building could be made by design, not by accident. They can also deviate from the usual steps and processes of the scientific method, providing researchers and scientists another venue to create and advance the body of knowledge of a research domain or any topic of interest.

## **LIMITATIONS AND AREAS FOR FURTHER EXPLORATION**

The primary limitation of this study is that it only used one database (i.e., Web of Science) to develop the study's historiography. The decision to use the Web of Science database was made because it is considered one (if not the best) of the top databases and repository of academic articles across all domains of science and research, especially that of studies in management and organizations. However, other researchers are encouraged to use other top databases such as Scopus, Google Scholar, ResearchGate, Academia.edu, and the like.

Another limitation of the study is the historical reach of the Web of Science database, which only extends as far as the 1900s and onward. Thus, other academic articles earlier than 1900 were naturally excluded from the historiography, which explains why the first period mentioned in this paper covered a significantly more extended period (i.e., ancient times to 1930s) compared to the succeeding four periods of TB5 development. Future researchers may also want to explore other databases that have articles published earlier than the 1900s.

Finally, the study only considered the top 500 highly cited articles during the search period (i.e., the 1930s to 2017). This decision was made to effectively manage the amount of data and information by prioritizing highly cited articles. As a result, only five high-level periods of TB5 development were developed from this study. Other researchers

may want to expand this research by considering the top 1000 highly cited articles. This additional research may break down the five postulated periods into more periods or sub-periods, giving more detail and understanding the TB5 development process.

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