



Whole Trait Theory: An integrative approach to examining personality structure and process[☆]

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ABSTRACT

Whole Trait Theory (WTT) was developed as an integrative model of traits that incorporates mechanisms of differential reaction to situations. Providing an explanatory account to the Big 5 (defined in terms of density distributions of personality states) creates two parts to traits, an explanatory part and a descriptive part. WTT proposes that the explanatory side of traits consists of social-cognitive mechanisms. These two parts of traits should be recognized as distinct entities that are nevertheless joined into whole traits. This review provides an overview of WTT, discusses new directions for considering WTT in personality development, the possible application of WTT to non-Big 5 traits, and possibilities for interventions based on insights from WTT.

The main purpose of this review is to provide an introductory overview of Whole Trait Theory (WTT; [Fleeson & Jayawickreme, 2015](#); [Jayawickreme & Fleeson, 2017](#)). WTT is an approach to personality that provides a unique account of how traits translate into daily behavior that explains both personality structure and process. Specifically, WTT distinguishes between the descriptive and explanatory aspects of traits as separate aspects of the *whole* trait. The explanatory aspect of a trait involves the cognitive–affective–motivational system that shape information processing in specific situations and, subsequently cause the patterns of emotion and behavior captured by the descriptive aspect of the trait. The descriptive aspect of traits is defined here as momentary enactments of a specific personality trait density distributions of those personality states over time or. By integrating both the social-cognitive and trait approaches, WTT unites two basic approaches to personality into a single model.

Traits have been defined in many ways in the history of personality ([Fleeson, 2017](#)). Two prominent views define traits as 1) descriptions of people's thoughts, feeling and behaviors; and as 2) explanations for why people think, feel and act the way they do. In this article, we provide an account of how these approaches are integrated in WTT. We then discuss WTT in relation to developmental mechanisms and its potential application to non-Big Five traits and highlight some possibilities for interventions.

1. Whole Trait Theory as an integrative account of trait and social cognitive approaches to personality

WTT proposes breaking apart traits into two elements with the goal of integrating two central approaches to personality—the social cognitive approach and the trait approach. Both approaches have independently made important advances in understanding personality ([Fleeson & Jayawickreme, 2018](#)). The social cognitive approach has at its foundation the insight that behavior appears to be inconsistent ([Cervone, 2005](#); [Hartshorne & May, 1928](#); [Mischel, 1968](#); [Mischel & Peake, 1982](#)). Given this apparent inconsistency, social-cognitive variables would be a better indicator of individual differences, as opposed to describing individuals with broad trait terms. In other words, individuals will differ in the encodings of situations, in their expectancies, competencies, self-regulatory plans, and goals ([Allport, 1937](#); [Mischel, 1973](#); [Mischel & Shoda, 1995](#)). These social-cognitive variables are responsible for behavior, and given that these variables are presumably highly sensitive to situations, it would follow that behavior should be highly sensitive to situations.

The trait approach, as instantiated in the Big 5 model of personality ([Ashton & Lee, 2009](#); [Costa & McCrae, 2006](#); [DeYoung, Weisberg, Quilty, & Peterson, 2013](#); [Goldberg, 1992](#); [Johnson, 1997](#); [Perugini & Gallucci, 1997](#)), has a substantive research base in providing evidence for the existence of traits and identifying their content. Traits can be organized into a hierarchical structure, with the “Big Five” traits

[☆] This review of WTT adapts material first presented in [Blackie, Roepke, Forgeard, Jayawickreme, and Fleeson \(2014\)](#), [Fleeson and Jayawickreme \(2015\)](#), [Jayawickreme and Fleeson \(2017\)](#), [Fleeson and Jayawickreme \(in press\)](#), [Nofle and Fleeson \(2015\)](#) and [Jayawickreme & Zachry \(in press\)](#). Readers interested in learning more about WTT are encouraged to consult these articles. We thank Mike Prentice, John Rauthmann, R. Michael Furr, and Lara Kammrath for helpful comments on an earlier version of this manuscript.

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(extraversion, agreeableness, conscientiousness, emotional stability, and intellect) at a middle hierarchical level (John, Naumann, & Soto, 2008). Given the hierarchical nature of the Big 5, these trait descriptions are relatively rich (e.g. a conscientious individual is careful, thorough, diligent, responsible, organized, and not careless, lazy, sloppy, nor reckless). Evidence for the Big 5 includes strong cross-questionnaire (Costa & McCrae, 2006) and cross-cultural replicability (Saucier, 2009). Observers agree about Big 5 levels of targets (Vazire, 2010), and traits have been implicated in important life outcomes (Duckworth, Weir, Tsukayama, & Kwok, 2012; Ozer & Benet-Martínez, 2006; Roberts, Kuncel, Shiner, Caspi, & Goldberg, 2007).

However, while traits are great descriptors of individual differences, there has long been a call to explain the origins of traits, how they operate, and how they produce differences in behavior. Trait approaches have historically been mostly a theoretical and non-explanatory (Cramer et al., 2012; Hampson, 2012), and have focused on describing the *what*, but for the most part have not attempted to explain the *why* or *how* (see Depue & Collins, 1999; DeYoung, 2010; DeYoung et al., 2010; Eysenck, 1997; Gray, 1981; see also DeYoung, 2015 and Read et al., 2010 for exceptions to this). Moreover, while traits do a reasonable job of describing behavior and identity, they do not provide a full account of how individual differences in traits are manifest in behaviors (Kandler, Zimmermann, & McAdams, 2014; McAdams & Pals, 2006). Many studies have shown specific behavioral correlates of traits, but a conceptual account of how a trait label translates into accounts of daily behavior is wanting. For example, it is not known what describing someone as extraverted means for how extraverted he or she is in daily life and how much he or she deviates from his or her overall extraversion standing.

Conversely, while social-cognitive approaches suggest an explanation for personality variables, they have not yet explicitly identified the individual differences the theories should be used to explain. Whatever ways people turn out to differ, social-cognitive approaches argue that the causes of those differences will be social cognitive mechanisms such as encodings, expectancies, and self-regulatory plans. For social-cognitive approaches to be truly comprehensive, they require a descriptive account of personality to explain (Baumert & Schmitt, 2009). WTT aims to correct for the weaknesses of each of these perspectives by combining these two seemingly opposing traditions into a single unified view that embraces *both* within-person variability *and* consistency, as will be described below.

2. The descriptive aspect of the trait

Fleeson's program of research (Fleeson, 2001, 2004) has built on key insights from Allport (1937; 1968), Epstein (1979) and Buss and Craik (1983). As Mischel (1968) noted in his critique of trait psychology, people do in fact routinely vary on a given dimension of behavior. However, their range of behavior is also centered on different portions of that dimension, and differences between individuals' centers remains highly stable over the long-term. Thus, while people vary substantially in their behavior across different situations, their typical or average behavior remains highly consistent from week to week.

Importantly, this resolution of the person-situation debate is premised on a reconceptualization of traits as *density distributions of trait-relevant behaviors or states* (Fleeson, 2001), as well as a more precise understanding of behavioral consistency (Fleeson & Noflie, 2009). Specifically, at the single-behavior level, the predictive power of behavioral consistency is equal in magnitude to the predictive power of situational factors. However, at the level of trait-relevant behaviors averaged within persons, behavior is shown to be highly consistent. Examining people's behavior in terms of a *distribution* provides one way to grasp this concept in a single idea: each person has a wide distribution of behaviors, which allows him or her to adjust to the situation, but different people have different locations of their distributions and those locations stay consistent. Thus, when it comes to single,

short-term manifestations of behaviors (e.g. how a person acts for 15 min), traits are about as powerful as situations – no more and no less powerful – in determining single behaviors. When it comes to larger behavioral episodes or time courses (e.g. how a person acts for a day), traits are extremely powerful in predicting how a person will act.

Having a specific trait level at a descriptive level consists in part of behaving in a trait-relevant manner (e.g., talkative, bold, and assertive for extraversion) more or less often than others who possess other levels. Thus, personality traits are stable in the sense that there is reliable between-person variation in the aggregate over time, and flexible in the sense that there is also substantial within-person variation in an individual's behavior depending on situational cues. While most peoples' distributions of these personality states are very wide, their distributions can occupy different locations on the dimension. Further, distributions can also be differentiated by variance, and degree of skewness or kurtosis. The location of the distribution can be represented by a distribution's mean or median. These central points seem to show remarkable consistency from week to week, with correlations around 0.9 (Fleeson, 2004).

The density-distribution approach therefore provides a resolution to the person-situation debate by incorporating empirical evidence from both sides of the debate into a new understanding of personality traits (Fleeson, 2004; Jayawickreme, Meindl, Helzer, Furr, & Fleeson, 2014). The evidence for the existence and impact broad traits is conclusive, and the density distributions model settles concerns over within-person variability by integrating the evidence for situationism and traits into a single account of traits. As a demonstration, while each individual varies considerably in his or her behavior, each individual also has a central point or tendency around which he or she varies. By splitting the data in half, it is possible to calculate two central tendencies for each individual and then correlate them (Fleeson, 2001). The extremely high resulting correlations mean that differences between individuals in their average tendencies are highly stable and highly predictable. Thus, personality differences show up in averages, as opposed to in qualitative differences in the single behaviors they enact (Jayawickreme et al., 2014). In other words, stable individual differences exist and matter.

However, once we accept that traits are real descriptions of how people act, *these traits need to be constituted by mechanisms capable of discriminating between situations to explain an individual's behavioral variability*. WTT proposes that social-cognitive processes can explain density distributions of states. This is because social-cognitive mechanisms can explain both the considerable within-person variation in personality states, and the between-person variation in parameters of distributions.

3. Core principles of WTT

WTT makes the following five primary points (Fleeson & Jayawickreme, 2015, p. 83–84):

- 1) The *descriptive side of traits is best defined as density distributions of states* (Baird, Le, & Lucas, 2006; Church et al., 2013; Fleeson, 2001, 2012; Fleeson & Wilt, 2010; Judge, Simon, Hurst, & Kelley, 2013). Summary descriptions of behavior provided by Big 5 are incomplete, as they do not indicate what people with a given trait level looked like in regard to that trait's manifestation in daily life (Allemand & Mehl, 2017). The density distributions approach argues that individuals can be described in terms of distributions of personality states. These distributions are wide because people change their personality from moment to moment in meaningful ways (Lievens et al., *in press*); but the distributions differ between individuals in their location, size, and shape. This description of individuals focuses the description on how people act rather than on the trait label.
- 2) *An explanatory account of the Big 5 is needed*. WTT begins with the Big 5 and the corresponding descriptive account, and seeks an

explanation of the mechanisms underlying these dimensions. The existence of stable differences in descriptiveness implies logically that there must be some explanation for those individual differences. We note that this assertion is widely shared by many other personality psychologists seeking an explanatory account for traits (e.g. DeYoung, 2015; Read et al., 2010; Wood, Gardner, & Harms, 2015).

- 3) *Adding an explanatory account to the Big 5 creates two parts to traits, an explanatory part and a descriptive part, and these two parts are distinct entities that nevertheless can be joined into whole traits because one of the parts is the causal consequence of the other part.* This explanation has added a second an explanatory part (which we term Trait_{EXP}) to the descriptive part (which we term Trait_{DES}). Detailing the mechanisms constitutive of traits only does the explanatory part of the job. In other words, trait levels refer to more than the mechanisms explaining the label, but also to the distributions of states on which people differ. Given that a) both the explanatory and the descriptive accounts of traits are needed, b) individuals differ from each other in both the descriptive and explanatory parts of traits, c) the explanatory and descriptive accounts are constituted by different constructs, and d) the explanatory and descriptive parts of each individual may not always align with each other, we therefore maintain it is important for researchers interested in studying traits to recognize that there are two distinct aspects of *whole traits*. Crucially, *the explanatory side of traits causes the descriptive side of traits*. The descriptive and explanatory parts of traits belong together, because they stand in a very direct and mutually logically necessary relationship to each other. Personality researchers *should therefore focus on traits as wholes* – that is, understand both the descriptive and the explanatory parts of traits.

- 4) The nature of the explanatory part of traits is most efficiently discovered by trying to deduce what sort of mechanisms would produce the form and structure of the descriptive part of traits. In seeking to address this question, WTT proposes that *the explanatory part of traits consists of social-cognitive mechanisms*. Because the descriptive side is caused by the explanatory side, it is possible to use the nature of the descriptive side to infer the nature of the explanatory side. Social-cognitive mechanisms explain variability, and can also account for the stability of means (Mischel, 2004), so they fit with the evidence relevant to the Big 5 for the descriptive side of traits (defined as density distributions of states). Social-cognitive mechanism includes a variety of key psychological variables (e.g., goals, beliefs, values, scripts, life stories, etc.).

We arrive at this proposal by taking the assumptions that all states are the outcome of trait-constitutive processes, and correspondingly, all causes of states are constituents of the explanatory mechanisms of traits (Fleeson, 2017). Regarding the first assumption, if the descriptive side of traits consists of density distributions of states, then these states make up the descriptive side of trait. Therefore, when we try to explain why some people act more extraverted than others, or some people act more conscientiously than others, we are trying to explain why those people exhibit state extraversion or state conscientiousness more often than others. Regarding the second assumption, then, if all states are caused by trait-constitutive processes, then all causes of states are at least partially constituents of the corresponding trait. As a result, there is a massive proliferation of causal mechanisms making up the explanatory side of traits.

All external causes of a state, such as the behavior of others, must go through the person to cause their behavior. That is to say, the external causes must engage psychological mechanisms that can lead to the behavior. Fleeson (2017) further argues that every cause of a state, in order to cause a state, must go through the specific part of that psychological apparatus. Other people could not cause agreeable states without engaging the part of the person that is capable of causing state agreeableness. This relevant part of the psychological apparatus is the causal part of the trait; therefore every external

cause of the state must work through the causal part of the trait.

- 5) Finally, *research in personality science should focus on identifying the social-cognitive mechanisms constituting the explanatory side of traits*. State variability can be used to discover the causes of states, in order to determine how traits become manifest in actual behavior. Explaining variability in states would reveal the *production mechanisms* of traits (Fleeson, 2017); systematic relationships between at least one predictor variable and a resulting state. Such production mechanisms would be part of the explanatory side of the trait, as the explain how trait content is manifest in behavior. For researchers, this means that one way to discover the mechanisms that underlie traits is to discover the production mechanisms that produce states. There is a great deal of work to be done and a great deal of creative theorizing to be done to uncover these mechanisms, and finally provide a full account of traits.

4. The explanatory aspect of the trait

As discussed in Fleeson and Jayawickreme (2015), we propose that a number of processes, including social-cognitive ones described by (but not identical to) CAPS (Mischel & Shoda, 1995), are the determinants of states (Fleeson & Jolley, 2006). These processes include interpretative processes, motivational processes, stability-inducing processes, temporal processes, and random error processes. We designate these processes, which make up the explanatory part of traits, as Trait_{EXP}. The Interpretative Process represents cognitive processes—the manner in which information is processed and which results in implications for behavior. The Motivational Process is the representation of desired and feared end-states that create directional impetuses. The Stability-Inducing Process account for factors that guide the individual towards typical trait manifestations, such as genetic, homeostatic, or habit forces. The Temporal Process accounts for influences of past events on the present, such as inertia or cycles. The Random Error Process accounts for unpredictable trait manifestations. To provide an example of these processes, openness state manifestations are the function of *interpreting* the current situation as favorable towards openness, *pursuing* a goal that produces open behavior, a homeostatic *tendency* towards open behaviors, an ongoing *trend* that leads to open behavior, and/or purely *random processes*.

These processes have structural elements and dynamic elements. The structural elements include inputs, intermediates, outputs, and links. The dynamic elements are flows. The first structural elements – inputs – are environmental or internal events. Intermediates are other environmental or internal events influenced by those inputs. The outputs are always increases or decreases in at least one of the Big-5 states. For example, the output of an interpretative process might be to increase an individual's state openness and to decrease his or her state conscientiousness. Finally, links are connections between inputs, intermediates, and/or outputs; they are structural elements that allow other structural elements to influence each other. For example, there may be a link between the goal of wanting to do well on an exam and the output of state conscientiousness.

Flows are the dynamic processes that run across these structural elements. When a given structural element is activated, a link will spread that activation to other structural elements, and so on, creating a dynamic process. Prior to a flow, a particular process is relatively dormant. When a flow spreads to and through a structural element via links, a structural element become active in producing states. Thus, these processes explain the occurrence of any given state as the result of flow across one or more of the social-cognitive processes. Different states happen at different times because of different inputs to the processes at different times, because of different intermediates in the processes, and because of different links between the inputs, intermediates, and outputs.

Individuals differ in these processes because they differ in the links between the inputs, intermediates, and outputs. As a result, the same

input to different individuals may lead to different outputs (i.e. to different states), depending on the individuals' strengths of the links between those inputs and those outputs. For example, individuals with strong links between goals of connecting with others and extraverted behavior are likely to manifest high levels of extraversion in their behavior (McCabe & Fleeson, 2012). The outputs of these processes are changes in current levels of states. Because states include affective, behavioral, and cognitive elements, states may influence each other; the cognitive change in a state may then lead to a behavioral change in the same state. It is important to keep in mind that states have these dual roles as outputs and intermediates. They also can influence future state manifestations through the consequences of the state. Individuals may also differ in the chronic activation of the nodes or the ease of linking to various nodes.

In an interpretative process, psychologically active elements of situations trigger cognitive-affective units that ultimately lead to behavior (Fleeson, 2007; Shoda & Lee-Tiernan, 2002). Variability in trait manifestations is caused by the situation, and people interpret situations and act accordingly. To provide one example, an individual at a party may meet some people they know and so may increase their level of extraversion. In such a manner, inputted environmental or internal events flow via encoding of the events into interpretations, which flow via activation to other beliefs. These beliefs have implications for behavior, and the output of that flow is behavioral changes in manifestation of states. These outputs (interpretations, beliefs, and behaviors) count as internal or environmental events that feedback into the process, continuously adjusting this process, and impacts of the outputs on the situation also change the environmental events, leading to new situations. This interpretative process is therefore a continuous process, which includes changes in states on an on-going basis. Changes in states influence other beliefs, which continue to influence other beliefs, other emotions, and other behaviors in a dynamic manner.

The link between the descriptive side of traits (the density distributions of states) and the explanatory side of traits (the social-cognitive mechanisms) posited by WTT can be empirically tested in two ways. First, when one manipulates social-cognitive mechanisms, this should predict the actual manifestation of traits, showing that they are indeed at least part of the explanation of traits (Fleeson, 2007; McCabe & Fleeson, 2012; McNiel, Lowman, & Fleeson, 2010). Second, the actual manifestation of traits in everyday life takes a form conducive to social-cognitive explanations (Fleeson, 2001; Fleeson & Gallagher, 2009). Thus, the descriptive account of traits that is empirically supported is consistent with social-cognitive mechanisms, in that states are highly variable across moments. In other words, this variability reveals the importance of mechanisms that explain density distributions of states.

5. WTT and personality development

How does personality development occur on this account? Personality changes primarily because of the consequences of manifesting states. Here it is important to distinguish between what explains changes in the descriptive part of the trait and what explains changes in the explanatory part of the trait (Nofle & Fleeson, 2015). Individuals are motivated by goals (McCabe & Fleeson, 2012) and respond to characteristics of their situation (Fleeson, 2007) to vary their manifestation of states. These states are determined by social-cognitive mechanisms (Fleeson & Jayawickreme, 2015). However, manifesting states have consequences. For example, people change their states in order to achieve goals. When such goal pursuit is successful, this can lead to a shift in individuals' density distributions, given that the change in states led to positive outcomes. This shift leads to long-term changes when the change in states results in changes to the links between inputs, intermediates, and/or outputs of different social-cognitive processes (Fleeson & Jayawickreme, 2014). Such changes in the links between processes represent *associative* processes. Such changes in the explanatory side of traits are likely when the consequences of state change

lead people to desire to change their long-term manifestations, think such change feasible, and the changes exacted become habitual (Hennecke, Bleidorn, Denissen, & Wood, 2014).

We note that Wrzus and Roberts (2016) have proposed a theoretical framework of the short- and long-term processes that underlie personality development throughout adulthood that are very similar to those in WTT. This framework specifies the key parts of daily experience and behavior that lead to patterns of continuity and change in personality. These parts are recursive sequences of Triggering situations, Expectancies, State/State expressions, and ReActions (TESSERA). They propose that while normative personality change has been shown to occur gradually over time, the specific short-term processes of how life events translate into repeated daily experiences and situations, captured by TESSERA sequences, lead to changes in behavioral patterns and personality representations through both *reflective* and *associative* processes.

This model presents a compelling account of personality development, and it fits well with WTT on at least two counts. First, the TESSERA framework shares and incorporates important assumptions of WTT: chiefly that personality state manifestations have consequences (as noted above), and these consequences lead to feedback. Such repeated state manifestations have to work against defenses and other learned behaviors, but upon repetition, these states changes will lead to mechanism changes and ultimately shifts in density distributions. Second, it acknowledges the importance of behavior variability as a developmental phenomenon in its own right (Charles & Pasupathi, 2003; Nesselroade, 1991). On the one hand, maturation, growth, and stabilization can be revealed in examining personality trait averages and tracking those averages over long periods of time (Brandstadter & Greve, 1994; Ozer & Benet-Martínez, 2006; Whitbourne, 1999). On the other hand, behavior variability allows the study of additional processes, especially processes over the short-term such as those that are the focus of TESSERA, which would be invisible with an exclusive focus on averages.

However, while we are gratified by this approach, we also note one major difference between WTT and TESSERA. While TESSERA shares the mechanisms of development with WTT in its discussion of the specific short-term processes associated with state change, the framework distinguishes between these mechanisms and “trait personality”. In contrast, WTT identifies the TESSERA processes with the explanatory side of traits; WTT does not invoke an additional entity that is the personality or the trait. For example, associative processes are mentioned in TESSERA as resulting from the TESSERA processes and becoming a cause of changes in this “trait”, but no processes associated with this are specified. In WTT, trait development happens because learning attendant upon the consequences of behavior changes the processes that produce that behavior. The processes change, and given that the processes constitute the trait ($Trait_{EXP}$), the trait thereby changes. In TESSERA, the trait does not change until the TESSERA processes invoke change in another entity. From our point of view, it is unclear how these reactions to situations specified in TESSERA change the trait unless the nature of the trait itself is specified. Thus, WTT identifies the trait with the processes themselves.

6. Whole Trait Theory and other dynamic theories of personality

Wright (2017) has noted that one of the signature achievements of descriptive work in personality has been how different labs over the last 80 years have independently examined and verified the Big Five model. In other words, one of the strengths of the Big Five is its replicability across multiple research programs. In a similar vein, we are gratified that while WTT does make certain specific claims regarding the dynamic expression of personality (e.g. density distributions of personality states as representing the descriptive side of traits; the primacy of social-cognitive mechanisms in explaining the manifestation of states), it is a process model that overlaps significantly with other recent

Table 1
Outline of current dynamic approaches to personality.

Theory	Scope	Core assumptions	Major themes and concepts	Major issues	Predictions and hypotheses
CAPS	Representation of personality processing system in which people respond in characteristic ways to situational features. CAPS attempts to explain cross-situational consistency and variability.	Substantial situational variation of personality traits Variability should not be treated as measurement error, but as information about when people differ in their behaviors. Variation is conceptualized as a pattern of behaviors representing the underlying relationships among CAUs.	<i>Cognitive-affective units (CAUs)</i> – mental representations which lead to behaviors when enacted (ex. Goals, expectations, beliefs, affects, self-regulatory standards, competencies, plans, strategies) <i>If...then profiles</i> – behavioral signatures that explain how individuals respond to situational features, i.e. if situation A, then the person does X, but if situation B, then the person does Y. Also called a <i>situation-behavior profile</i>	Individual differences are due to accessibility of CAUs, and the relationships between CAUs	People who perceive themselves as consistent will have relatively stable situation-behavior profiles Cross-situational variability reflects a stable organization of personality systems
CBST	Attempts to “explain interpersonal personality differences in terms of variations in the intrapersonal elements of personality”. Conceptualizes personality as a cybernetic system, in which an activated goal guides the selection of an appropriate goal-oriented action, which is then performed. Individuals then assess feedback regarding the consequences of the action that was performed, which is then used to assess discrepancies between the outcome and the goal. This information informs further behavior towards the goal. Conceptualizes personality as a system consisting of traits, states, environments and biological factors.	McAdams and Pals' (2006) “New Big Five” personality science principles – “Personality is conceived as (a) an individual's unique variation on the general evolutionary design for human nature, expressed as a developing pattern of (b) dispositional traits, (c) characteristic adaptations, and (d) self-defining life narratives, complexly and differentially situated (e) in culture and social context” Processes of the cybernetic system occur simultaneously, rather than in a linear fashion Environment can affect the ways that DNA-coded information is expressed (epigenetic personality systems) Generalizability of animal model studies of personality to human models Identities are “nested” in a hierarchy. Role identities are below general identities. Experiences and behaviors related to a role are below role identities.	<i>Cybernetics</i> - the study of goal-directed, adaptive systems <i>Characteristic adaptations</i> – “relatively stable goals, interpretations, and strategies, specified in relation to an individual's particular life circumstances”	Conceptualizes personality traits as a probabilistic hierarchy centered on the Big Five Characteristic adaptations fall into three categories: goals, interpretations and strategies	Individual differences exist due to variation in individuals' cybernetic systems Two “metraits” – stability and plasticity – represent changing cybernetic systems and goals. Cybernetic systems depend on the ability to maintain stability, but also the ability to adapt to new environments and circumstances. Each of the Big Five are conceptualized as falling into either the stability metrait (i.e. conscientiousness, agreeableness, low neuroticism) or the plasticity metrait (i.e. extraversion and openness) Personality stability is largely genetic Personality change is based in genetics and environment Environments cause changes in states General trait measures capture dispositional causes of behavior better than role-contextualized measures *Does not address why traits are causal, just that they are Situational variance as part of a structural model, instead of dismissing it as measurement error like in aggregate approaches.
Sociogenomic model				Traits are long-term patterns of states States mediate changes in traits	
PRISM	Conceptualized to capture variation in self-perception of a trait across different situations (ex. I think I am more agreeable in my role as a volunteer than I am with my fiancé)		<i>General identity</i> – general perception of one's identity <i>Role identity</i> – identity as contextualized in a specific role <i>True score variable</i> – latent state variable <i>Latent state residuals</i> – the difference between the latent state variable and the latent trait variable	General traits influence role behaviors Trait judgments change over time due to situations/life experiences Account for person-situation interaction variance in observational data and in structural equation modeling. States, traits, and interaction effects are all a part of the model	
LSTT					

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Table 1 (continued)

Theory	Scope	Core assumptions	Major themes and concepts	Major issues	Predictions and hypotheses
	Decompose observed variable into latent state variable and error variable	Trait measures are measuring systematic effects of the situation in addition to whatever they aim to measure			
	Questions to answer:	State differences are due to trait differences, situation differences and person-situation interactions			
	1) What are the proportions of variance in observable variables determined by traits/situation interaction/unreliability	Multi-state multi-trait model –			
	2) How do different traits correlate?	1. All latent trait variables belonging to the same measurement instrument but different occasions of measurement are identical.			
	3) How do different latent state residuals correlate?	2. All latent state residuals belonging to the same occasion of measurement but different measurements are identical			
	4) What are the correlates of true state change?	3. All latent state residuals belonging to different occasions of measurement are uncorrelated.			
	5) What are the correlates of true trait change?	4. All error variables are uncorrelated			
	6) Are there differences among subpopulation with respect to questions 1–5?	5. All error variables of an occasion are uncorrelated with the common state residuals of another occasion			
NIPS	Attempts to establish NIPS as a general model for person $\times$ situation interactions in determining behaviors	Moderate provocation level will have some effect on everyone Assumptions of schema theory in NIPS interaction: 1. A cognitive schema works like a pattern recognition tool 2. A difficult situation contains fewer or less obvious indications of the elements that define the pattern 3. Individuals high on a trait have more sensitive and finely tuned schemas and will, for this reason, more easily recognize and combine the elements of a pattern	<i>Strong situation</i> – situation that is confined by norms and standards for behaviors. More uniform behaviors result. <i>Weak situation</i> – situation that is not confined by norms and standards for behavior. Behaviors are unrestricted. <i>Strong person</i> – little variability across situations/provocations <i>Weak person</i> – show more variation across situations/provocations <i>Synergy</i> – conceptual or mathematical product of functionally equivalent factors	Trait effects are non-linear Synergistic interactions – traits and situational provocations are functionally equivalent because they both affect behaviors	Using NIPS model for bipolar constructs should result in symmetrical data patterns Schemas can explain convergent and divergent aspects of interactions
TESSERA	Understanding personality change/personality development	Environmental factors influence “TESSERA” processes by constraining experiences Differences in positive/negative valence influence personality development, such that negatively valenced triggers stronger development	<i>Triggering situation</i> – External situations that serve as triggers for expectancies <i>Expectancy</i> – A response selected from possible states after a trigger <i>State/State Expression</i> – Momentary thoughts, feelings and behaviors relevant to the expectancy <i>Reaction</i> – Reaction to the state behavior	Repeated behavioral states, trigger-behavior links or goal-action patterns are encoded into procedural memory as habitual behavior – TESSERA as reinforcement learning	External or internal locus of TESSERA components moderates the magnitude of personality change

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Table 1 (continued)

Theory	Scope	Core assumptions	Major themes and concepts	Major issues	Predictions and hypotheses
WTT	A model of whole traits including the description of individual differences in behaviors and the causes of those individual differences, as well as the internal operation of traits.	Traits as density distributions of states – states change over time Two parts of traits – explanatory and descriptive Descriptive part is a causal consequence of the explanatory part Explanatory part output is a behavior or state	<i>Density distribution</i> - a distribution of state levels formed over time	Trait model that accounts for stability and variability	Density distribution models allow for dynamic processes in the descriptive part of traits The variability (width) in density distributions allow for dynamic process in the explanatory part of traits Shifting of states

theoretical approaches to personality process. As we have already shown, WTT aims to combine the strengths of the trait and social-cognitive approaches and compensate for their weaknesses by integrating them into a single model. Similarly, a number of integrative approaches to personality have been posited in the wake of WTT (see Table 1). These new approaches share with WTT a recognition of the importance of developing an explanatory account of personality that accounts of variability and change in personality over time. To provide one recent example, Roberts' sociogenomic approach (2017) distinguishes between two different levels of the trait—an enduring trait concept that is embedded within neurological structures (Jackson, Hill, & Roberts, 2012), and state-level manifestations of that personality trait. This account thus both highlights the mechanisms underlying stability in the trait as well as trait manifestations that both reflect the trait but vary in response to contextual factors (Jackson & Roberts, 2017).

We note that these different theories vary in key respects. DeYoung (2015) couches his theory within a cybernetic framework, which posits functional values for each of the Big 5 traits. The sociogenomic model (Roberts, 2018), the TESSARA framework (Wrzus & Roberts, 2016), and DeYoung's (2015) approach additionally do not conceptualize descriptive traits in terms of density distributions of states. What most process approaches share, however, is a view that, in so far as traits are descriptions of how people act, then mechanisms capable of explaining the dynamic nature of personality manifestations across time and individuals are required (review Table 1 for a summary of a selection of recent theoretical paradigms).

7. Applying Whole Trait Theory outside the Big Five: the example of moral traits

In our prior work (Jayawickreme et al., 2014; Jayawickreme & Fleeson, 2017), we noted some considerations about applying WTT to traits outside those covered by the Big Five. It is important to note that empirical evidence for WTT has mostly concerned the Big Five in general, and not necessarily other traits. We have nevertheless speculated about the plausibility of applying WTT to moral traits (or virtues; Jayawickreme & Fleeson, 2017; Fleeson & Jayawickreme, in press). It has been objected that the existing evidence for WTT does not necessarily apply to virtues, because virtues may be categorically different from traits (Jayawickreme et al., 2014). However, in so far as the scientific evidence is relevant to the virtues, the scientific evidence supports the study of virtue. Moreover, we believe that the evidence can indeed apply to moral traits. One reason is that recent research has suggested that at least some of the virtues appear to be contained within the Big 5. Moral traits including prudence, reliability and compassion seem to be incorporated within the traits of Conscientiousness and Agreeableness. Thus, research based upon the Big 5 does have clear implication for at least some virtues.

As we have noted elsewhere (Jayawickreme & Fleeson, 2017; see also Jayawickreme et al., 2014), traits understood as density distributions are consistent with widely held intuitions about most moral traits. To take compassion as an example (see Jayawickreme et al., 2014, Jayawickreme & Fleeson, 2017, and Fleeson & Jayawickreme, in press for more on this question), most people vary from moment to moment in their level of compassion in their daily life. However, the more compassionate people tend to be repeatedly more compassionate than the less compassionate people, and we are likely to notice these differences. Additionally, we would be more likely to accept this conclusion because we would tolerate the compassionate individuals' decisions to be less than perfectly compassionate on some infrequent occasions as possibly being forgivable mistakes or even as being reasonable judgments given the circumstances of the situation. Our view that one would be willing to tolerate such actions and nevertheless conclude that the person on the right end of the distribution (i.e. an individual with a higher mean level of compassion) was more

compassionate in a meaningful way than was the person to the left end of the distribution (i.e. an individual with a lower mean level of compassion).

Many other important virtues in our everyday life can be defined in a similar way. (Jayawickreme et al., 2014; Jayawickreme & Fleeson, 2017). For example, people are honest on some occasions, but fail to be honest on other occasions. However, the more honest among us are repeatedly and clearly more honest than the more deceitful. Additionally, those honest individuals may indeed be less honest on some infrequent occasions; a single transgression would not likely suffice to undermine one's moral status (although this would likely depend on the action committed; Jayawickreme & Fleeson, 2017).

A similar strategy could be employed for traits that are considered vices. Similar to compassion, for example, most people are selfish on some occasions and are not selfish on other occasions. However, the more selfish people are repeatedly and clearly more selfish than people who are more generous. Such people may lack important social-cognitive mechanisms that could lead them to act less selfishly when it is reasonable to do so, (e.g., Prentice & Sheldon, 2015). Similar to compassion, we would accept this conclusion because we would be more willing to excuse those generous individuals' occasional decisions to be selfish. And again, just as with compassion, we prefer an attribution of relative generosity or selfishness over a categorical judgment where reaching a threshold of being "fully virtuous" is the only criteria for being virtuous.

In sum, using WTT to evaluate moral traits fits with our intuitions about most everyday moral traits. WTT provides a framework for examining the various mechanisms (the explanatory side of moral traits) undergirding moral thoughts, feelings and behaviors (the descriptive side of moral traits) and affords the opportunity to provide an explanatory account of many moral traits. In other words, WTT hold the potential to explain the mechanisms behind the manifestations of these moral traits in the same way that it explains the traits of the Big 5. Similar to the Big 5, it is also possible to attribute moral traits and vices to individuals without the need for absolute consistency (Fleeson & Jayawickreme, *in press*). From a WTT perspective, possessing a greater degree of one virtue should in most cases make an individual more virtuous than someone who possesses a lower degree of that virtue, as opposed to both individuals being seen as lacking virtue on a categorical perspective.

8. Possible application of WTT for interventions

WTT also provides the insight for personality interventions. One of the core insights of WTT is the functional nature of traits—individuals enact trait manifestations in order to fulfil specific goals (McCabe & Fleeson, 2016). We call this the multipotency of personality – personality can change as needed to accomplish the goals that are before the person. In this section we highlight a selection of possible intervention strategies that highlight the "freedom" afforded by WTT's functional approach to traits (see Blackie et al., 2014, for a more detailed discussion of interventions).

8.1. Interventions to promote well-being

Multiple experience sampling studies confirm that participants report feeling happier when acting extraverted (Fleeson, Malanos, & Achille, 2002; Wilt, Nofle, Fleeson, & Spain, 2012). Fleeson et al., (2002) found that a simple manipulation that instructed participants to act extraverted in a group discussion (e.g., talkative, energetic, and assertive) increased participants' self-reported positive affect compared to participants who were instructed to act introverted in the discussion (e.g., reserved, passive, and quiet). This manipulation was found to be effective regardless of whether participants were normally extraverted or introverted. The results of these studies have important implications for promoting well-being, because they suggest that individuals might

be able to enhance aspects of their well-being by self-regulating their extraverted behaviors (see also McNiel et al., 2010; McNiel & Fleeson, 2006). Developing interventions to promote enactment behavioral states of specific personality traits may offer a direct and effective way to enhance well-being. It should be noted that such an intervention is similar to behavioral activation strategies used to treat borderline personality disorder, social withdrawal, inactivity, and anhedonia (Jacobson, Martell, & Dimidjian, 2001; see Blackie et al., 2014).

Research examining relationships between Big Five personality traits and work performance (Barrick & Mount, 1991; Barrick, Mount, & Judge, 2001; see also Chiaburu, Oh, Berry, Li, & Gardner, 2011) suggest additional avenues for the cultivation of personality states that promote functioning in daily life. To provide one example, an employee might learn to act in a conscientious manner at work while preserving the flexibility to act in a less conscientious manner at other times, especially in settings where the importance of conscientiousness may not be as important.

9. Positive personality change following adversity

It is also possible that enacting behaviorally-based personality states may effectively facilitate positive psychological change in the wake of adversity, struggle or failure. In recent years, a growing literature on posttraumatic growth (PTG) has reported that some individuals continue to grow and develop in the aftermath of personal adversity (Jayawickreme & Blackie, 2014; Tedeschi, Park, & Calhoun, 1998). PTG has been defined as "positive psychological change experienced as a result of the struggle with highly challenging life circumstances" (Tedeschi & Calhoun, 2004, p. 1). PTG focuses on how negative events can be overcome and personal adversity can serve as a springboard for positive growth and development. Individuals who have experienced diagnoses with cancer, heart attacks, diagnosis with HIV, and sexual assault have reported PTG (Tedeschi & Calhoun, 2004). The veracity of such retrospective self-perceived growth, however, has been much debated (Jayawickreme & Blackie, 2014; Fleeson, 2014).

This controversy notwithstanding, the personality traits of openness to experience, extraversion, and agreeableness have been associated with PTG (Jayawickreme & Blackie, 2014). Thus, promoting open, extraverted, and/or agreeable states could lead to positive psychological change following personal adversity. While these speculations need to be verified through careful prospective research, such interventions may help individuals to behaviorally enact these traits in relevant life domains in the wake of the experience of adversity. To provide one example, researchers can identify relevant behavioral manifestations of extraversion, and then help trauma survivors to enact these behaviors in order to explore opportunities to grow and extract meaning from their struggle with difficult events.

From the perspective of identifying mechanisms that could lead to positive personality change, interventions that focus on changing individuals' narratives about the adverse life event may have the impact of leading to downstream personality change (Roepke, Tsukayama, Forgeard, Blackie, & Jayawickreme, 2018). Narrative strategies could be a powerful tool for increasing personality change. Through the process of strategically suggesting specific stories, clinicians may influence how people make sense of the ways that difficult experiences fit into their pasts, lead them to the present, and set up their futures. When reflecting on adversity, a person can use the same facts to tell different stories: for example, the same information can inform a story of ruin and despair versus a story of pain and subsequent redemption. Narrative strategies represent a potent personality mechanism to target in interventions.

It would, however, be necessary to determine the effectiveness of these interventions in an experimental setting with a manipulation akin to that employed by Fleeson et al. (2002) before applying them to more vulnerable populations. Established evidence-based treatments, including prolonged exposure and other cognitive-behavioral therapies,

may of course be a more appropriate treatment option for trauma survivors at (Powers, Halpern, Ferenschak, Gillihan, & Foa, 2010).

10. Conclusion

In this review, we have outlined WTT, with a focus on the density distribution and social cognitive approaches as well as an account of how these approaches are integrated in one theory. We discussed the theory in relation to developmental mechanisms and its potential application to non-Big Five traits, and highlighted some possibilities for interventions. We believe that this model of understanding personality affords new and exciting directions for personality research, and are hopeful that more researchers will seek to examine traits from this perspective.

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