Dynamic self-processes

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Personality is increasingly being viewed as a complex and changing system. Self-processes are worth considering in this context because of their highly dynamic quality: they interact and influence one another in extremely intricate ways. In this chapter we first classify self-related terms and examine the following key processes in detail: self-awareness and associated processes (e.g., self-reflection, self-distancing, mindfulness), mental time travel (autobiography and prospection), and self-knowledge (including self-concept). More briefly, we also review Theory-of-Mind, self-rumination, self-esteem, and self-talk. We present information about neuroanatomy, subtypes, measurement, and functions of self-processes, as well as links with personality. Some important messages proposed are: (1) self-awareness is made up of various sub-processes and must be divided into self-reflection and self-rumination, (2) prospection depends on autobiographical knowledge, (3) our self-concept often is inaccurate, and (4) self-talk is present in most—if not all—other self-processes.

Introduction

Personality has traditionally been defined as a set of behavioral, cognitive, emotional, and motivational characteristics that are relatively stable across time and situations (Feist, Feist & Roberts, 2018). However, some older theories acknowledged that there is a dynamic quality to personality (see Revelle, Chapter 1). For instance, Allport (1961) stated that personality is not simply a structure: it *does* something, and once well structured, it takes a life of its own. Similarly, Maslow's theory (1968) has been described as a "holistic-dynamic" system in which one is perpetually moving toward self-actualization. More recent accounts of personality are increasingly emphasizing its changing nature by looking at within-person variability (Sherman, Chapter 3), person-situation transactions (Rauthmann & Sherman, Chapter 6), dynamic genotype-environment interplays (Kandler, Chapter 8), motivational and goal processes (Schultheiss, Chapter 15), and more.

Self-processes too are dynamic and thus worth including in the study of personality. Processes such as self-awareness and self-esteem have been described both in situational and dispositional terms (Duval & Wicklund, 1972; Racy, 2015). Self-processes develop and evolve over the lifespan, and, perhaps more importantly, they *interact* together—they *influence* one another—in extremely complex ways (Morin, 2017). As a case in point, episodic memory serves as a springboard for the creation of future-oriented thoughts (prospection) to be used in the formulation of personal goals, which in turn most likely activate efforts to reach these goals (self-regulation) (Schacter, Benoit & Szpunar, 2017). In short, self-related constructs and processes effectively contribute to the creation of stable yet flexible personality characteristics.

This chapter pertains to self-processes with an emphasis on their underlying dynamic quality. We first classify self-related terms and examine the following key processes in detail: self-awareness and connected processes (e.g., self-reflection, self-distancing, mindfulness), mental time travel (autobiography and prospection), and self-knowledge (including self-concept). More briefly, we also survey Theory-of-Mind, self-rumination, and self-esteem. Our final discussion focuses on a cognitive activity which arguably underlies all preceding self-processes—self-talk. We present relevant information about the neuroanatomical substrates, functions, and measurement pertaining to key

dynamic self-processes. We also establish connections between self-processes and personality, mostly in terms of the Big Five model (Costa & McCrae, 1985). Note that we do not systematically discuss self-regulation as it is the topic of another chapter in this handbook (Masicampo, Chapter 17). Also, while we acknowledge cultural influences on self-processes, we do not address this question here (see Benet-Martinez, chapter 11).

Toward a classification of self-processes

There are multiple conceptualizations of self-related processes. To illustrate, Gillihan and Farah (2005) distinguish between the physical and psychological selves, where each is made up of the following sub-parts: self-recognition and agency for the physical self, and traits, autobiography, and first-person perspective for the psychological self. Mischel and Morf (2002) see the self as an organized dynamic-motivational, cognitive-affective, and interpersonal action system; Burns and Engdahl (1998) further stress the importance of language within the cognitive part of this system. (For an integrative neurocognitive and socioecological model see Morin, 2004).

While these and other conceptualizations offer valuable views of the self, none systematically organize a large number of self-related processes into a coherent classification system (but see Leary, 2004). Morin (2017) put forward such a classification system as follows: (1) basic terms related to the overall process of self-perception, (2) non self-terms that are importantly associated with some other self-terms, (3) processes related to the executive self involving agency, volition, and self-control, (4) self-views, that is, the content of, and feelings about, the self, (5) self-biases, (6) reactions to the self, and (7) interpersonal styles. Table 1 provides some examples of self-related terms for each of these seven groups; terms in bold are further examined below. Figure 1 suggests several links between key self-terms that will be discussed throughout this chapter.

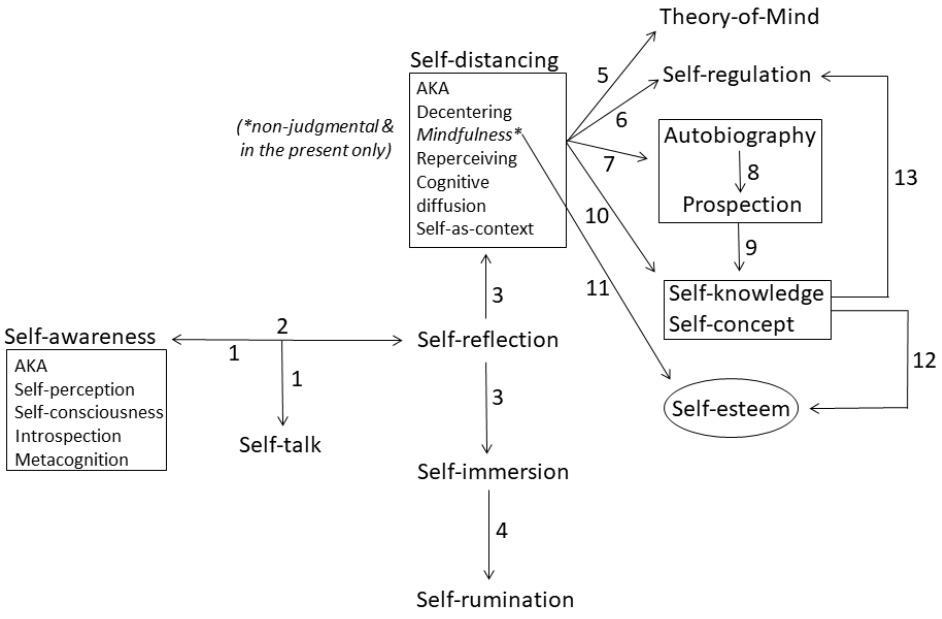

Figure 1. Postulated relations between various self-related processes (based on Morin, 2017).

(1) Self-awareness initiates self-talk; inner speech leads to self-awareness (Morin, 2018). (2) Self-awareness represents a broader term encompassing any type of self-focused attention, one of which is self-reflection—a healthy curiosity toward the self (Trapnell & Campbell, 1999). (3) Self-reflection may further lead to two different types of self-focus: self-distancing, where the self looks at itself from an outside ("fly on the wall") perspective, and self-immersion, where the self looks at itself in a self-absorbed way (Kross & Ayduk, 2017). (4) Self-immersion tends to create self-rumination (Kross & Ayduc, 2017). Self-rumination represents a repetitive, uncontrollable, and negative form of self-focus (Trapnell & Campbell, 1999). (5) One first needs to reflect on one's own mental states before conceiving of mental states in others (Theory-of-Mind) (Dimaggio, Lysaker, Carcione, Nicolo & Semerari, 2008). (6) One must first determine what needs to be changed about the self (self-reflection/distancing) before effectively changing the self (self-regulation) (Bandura, 1991; Heatherton, 2011). (7) Self-reflection/distancing includes thinking about one's past (autobiography) and future (prospection) (Tulving, 2005). (8) One uses one's past to imagine one's future (Szpunar, 2010). (9) Reflecting on one's past (autobiography) and imagining one's future (prospection) inform the self about itself (self-concept, self-knowledge) (Vanderveren, Bijttebier & Hermans, 2018). (10) Sustained self-reflection/distancing allows one to gradually build a self-concept and to learn about oneself (self-knowledge) (Gibbons, 1983). (11) Because of its non-judgmental quality, mindfulness has been shown to increase self-esteem (Randal, Pratt & Bucci, 2015). (12) How one assesses oneself (self-esteem) depends one's view of the self (self-concept, self-knowledge) (Harter, 1993). (13) Self-knowledge participates to self-regulation because it contains goals and standards as well as strategies to reach these goals (Markus, 1983).

Basic terms	**Non self-terms**	**Executive self**	**Self-views**	**Self-biases**	**Self-reactions**	**Interpersonal styles**
Self-perception	Metacognition	Self-regulation	**Self-concept**	self-enhancement	self-regard	Self-centered
Self-awareness	Introspection	Self-agency	**Self-esteem**	Self-verification	Self-criticism	Self-important
Self-schema	**Mindfulness**	Self-discipline	Self-efficacy	Self-deception	Self-compassion	Self-effacing
Self-consciousness	**Autobiography**	**Self-talk**	Possible self	Self-handicapping	Self-blame	Self-conceited
Self-reflection	**Prospection**	Self-description	Self-discrepancy	Self-verification	Self-destruction	Self-confident
Self-rumination	**Theory-of-Mind**	Self-evaluation	Self-construal	Self-denial	Self-abuse	Self-involved
Self-recognition	consciousness	Self-presentation	Self-categorization	Self-delusion	Self-contempt	Self-indulgent
Self-knowledge	Insight	Self-monitoring	Self-belief	Self-protection	Self-disgust	Self-disciplined

Table 1. Examples of self-related terms as per Morin's (2017) proposed classification system. Terms in bold are systematically examined in this chapter.

Self-awareness

When asked to reflect on what they have learned about the concept of self-awareness, one of our *Psychology of Self* students wrote that "it is not necessarily one thing only, it has many different components that go into it". Another student added "self-awareness is a very complicated concept with multiple components and layers that interact and influence one another".

Indeed.

Self-awareness constitutes the ability to become the object of one's own attention (Duval & Wicklund, 1972); it also represents the active state of identifying, processing, and storing information

about the self (Morin, 2011). These simple definitions ignore several dynamic variations of self-focused attention that have been gradually introduced in the literature. Trapnell and Campbell (1999) proposed a fundamental distinction between *self-reflection* and *self-rumination*, where the former represents a healthy, non-anxious type of self-attention mostly associated with positive outcomes (link 2, Figure 1), and the latter, an unhealthy, anxious, repetitive form of self-focus targeting negative aspects of the self and linked to dysfunctional outcomes (see links 3 & 4, Figure 1). The term *self-absorption* designates the state in which the ruminating person is (Joireman, Parrott & Hammersia, 2002).

In terms of the Five-Factor Model of personality, self-reflection is mostly associated with Openness to experiences, and self-rumination is importantly linked to Neuroticism (Trapnell & Campbell, 1999). The expression *self-consciousness* describes the natural disposition to focus on the self more or less frequently (Fenigstein, Scheier & Buss, 1975), whereas *self-awareness* typically refers to a more transient and environmentally induced state (Carver, 2002). To complicate matters, saying that one is *self-conscious* usually means that one is aware of being observed by others (Buss, 1980). Another important distinction is between focus on private (e.g., thoughts, emotions, motives) or public (e.g., appearance, others' opinion of self) aspects of the self (Davies, 2005).

Research conducted in the 70s and 80s was based on the broader definition of self-awareness as self-directed attention. Self-awareness manipulations employed self-focusing stimuli such as mirrors, cameras, and audiences (Carver & Scheier, 1978), and individual differences were mostly measured with the Self-Consciousness Scale (Fenigstein et al., 1975; for more measures and manipulations of self-awareness see Morin, 2011, Table 2.) Three decades of experimental and correlational research show that main short-term effects and long-term consequences of self-awareness are self-evaluation, self-criticism, escape from the self, increased emotional intensity, self-knowledge, self-regulation, and Theory-of-Mind (Morin, 2011; Silvia & Duval, 2001). Figure 1 above presents postulated connections between self-awareness and some of these outcomes—see links 5, 6, and 10.

Development

The use of personal pronouns, mirror self-recognition, self-conscious emotions, and pretend play all appear between 15 and 24 months of age in humans, which suggests the development of underlying self-reflection activity (Lewis & Ramsay, 2004). Shame, pride, guilt, envy, and embarrassment emerge during the second year of life; they represent self-conscious emotions because they require a basic sense of self to be experienced (Buss, 1980).

Very few views of self-awareness development exist. Rochat (2003) proposes five stages of self-awareness. *Differentiation* (from birth) occurs when infants can physically differentiate the self from the non-self, shown by less rooting from self-stimulation than when stimulated by another person. *Situation* (2 months) takes place when infants can situate themselves in relation to another person, for example, when imitating a modeled behaviour. *Identification* (2 years) arises when children become capable of self-recognition in front of a mirror, and *Permanence* (3 years) emerges when children know that their sense of self persists across time and space (see Povinelli, Landau & Perilloux, 1996). Finally, self-consciousness (*meta self-awareness*; 4-5 years) occurs when children can perceive themselves as seen by others.

Related terms

While several terms are equivalent to self-awareness (e.g., self-observation, introspection, self-

focused attention), others represent specific cases or different forms of self-awareness (see Figure 1). To illustrate, *metacognition* specifically refers to an awareness of one's thoughts (Smith, 2009). *Insight* has been defined as the ability to identify and express one's feelings (Grant, Franklin & Langford, 2002). *Agency* means action toward an end and involves a sense that one is causally responsible for one's actions (Kelso, 2016). *Self-distancing* and *self-immersion* are opposite types of self-reflection (link 3, Figure 1), where the former involves examining the self from a distance ("taking a step back"), and the latter, with no distance (Kross & Ayduc, 2011, 2017).

A large body of research (ibid) suggests that self-distancing facilitates adaptive self-reflection by making oneself look at the self in a more detached and objective way, leading to better understanding of past experiences (autobiography) as well as more positive look at one's imagined future (prospection) and goal attainment (self-regulation), as shown in links 6 & 7 in Figure 1. Self-immersion and self-distancing are usually experimentally manipulated by asking participants to engage in self-reflection two ways: (1) think about some self-relevant characteristic, behavior, or event through one's own eyes, or (2) through the eyes of another person—a well-intentioned neutral observer. A variation consists in asking participants to talk to themselves using first-person pronouns (self-immersion), or using their own name (self-distancing) (Zell, Warriner & Albarracín, 2012). Self-report measures can also assess spontaneous self-distancing and self-immersion.

When thinking about a past negative event, the self-immersed person simply relives it and thus re-experiences all distressing emotions associated with the event. On the other hand, the self-distanced individual constructively re-interprets the event in a way comparable to another person objectively commenting on the event. Self-distancing buffers individuals against self-rumination (link 4, Figure 1), reduces aggression, dysphoria (e.g., enhances emotion regulation), depressive symptoms, anxiety, and increases coping with trauma, physical health, self-control, problem solving, reasoning, and intergroup relationships (Kross & Ayduc, 2017).

Mindfulness constitutes a specific case of self-distancing, where self-focus is non-judgemental and restricted to the present moment (Carlson, 2013). It involves accepting what is observed in a compassionate, non-attached, non-reactive way. Individual differences can be identified using self-report scales such as the Mindful Attention and Awareness Scale, and can be trained using meditative practices that encourage a detached and present-oriented awareness of self (Shapiro, Oman, Thoresen, Plante & Flinders, 2008). Like self-distancing, mindfulness is associated with positive outcomes such as decrease of chronic pain, generalized anxiety, panic disorders, binge eating disorder, depression, and fibromyalgia (Baer, 2003). *Mind wandering* refers to the occurrence of thoughts that are not tied to the immediate environment—thoughts that are not related to a given task at hand (Bastian et al., 2017). These "task-independent thoughts" are largely about the self (D'Argembeau, in press), happen frequently (over 47% of the time in a very large sample) and are associated with negative emotions (Killington & Gilbert, 2010). Diaz and colleagues (2014) identified several components to mind wandering, among which verbal and visual thoughts, planning, health concerns, and somatic awareness.

Neuroanatomy

Early brain imaging studies of neural correlates underlying self-referential activity mostly used personality trait judgment tasks (Craik et al., 1999) and self-face recognition tasks (Keenan, Nelson, O'Connor & Pascual-Leone, 2001). The initial and premature conclusion was that self-awareness is importantly associated with activity of the right prefrontal cortex (e.g., Keenan, Gallup & Falk, 2003).

Later studies investigated diverse facets of self-awareness such as autobiography, prospection, emotions, agency, Theory-of-Mind, and preferences (see Morin & Hamper, 2012), and more recent efforts have concentrated on very specific dimensions of self-awareness, such as autobiographical remembering and reasoning (D'Argembeau, Cassol, Phillips, Balteau, Salmon & Van der Linden, 2014). Overall, brain regions typically activated during self-referential tasks are the medial prefrontal cortex, posterior cingulate/precuneus, inferior parietal lobules, and areas of the medial and lateral temporal lobes (D'Argembeau, in press), more so on the left side of the brain (Denny, Kober, Wager & Ochsner, 2012).

Activation of the aforementioned regions has also been linked to the *resting state* (also called "default mode"), when participants are asked to close their eyes and simply do nothing (Buckner, Andrews-Hanna & Schacter, 2008). These instructions are used as a control condition in a fMRI scanner. This observation implies that people in a resting state are actually not resting but instead thinking about a host of self-related matters such as remembering some past event and imagining a future one—in short, they are in a state of self-awareness (Davey, Pujol & Harrison, 2016).

Mental time travel

"I remember how hot it was last summer when I visited Spain." "I am looking forward to Jean's birthday." These represent two typical examples of *mental time travel* (MTT) respectively— *episodic memory* (AKA autobiographical recall) and *episodic future thinking* (AKA prospection). Episodic memory consists in the capacity to recall personal past events, while prospection refers to the ability to think about events that are relevant to one's own future (Schacter et al., 2017; Szpunar, 2010). Both invariably involve the self and the subjective feeling of re-experiencing or pre-experiencing events—not just recalling or expecting them. *Autonoetic consciousness* is the term used by Tulving (2005) to describe this phenomenal flavor of being the one who was the subject of real past experiences and will be at the center of imagined future ones. Both also inform the self in various important ways, as will be seen below (see link 9, Figure 1).

Episodic memory and prospection can be assessed using thought-sampling, word-cuing, and think aloud procedures (Demblon & D'Argembeau, 2014; Szpunar, 2010). Another approach called the "episodic specificity induction" consists in training participants to focus on retrieving specific episodic details of a past experience, such as people, objects, and actions, in a recently viewed videotape of an everyday event (Madore, Gaesser & Schacter, 2014). Two key characteristics of autobiographical memory are memory specificity and coherence (Vanderveren, Bijttebier & Hermans, 2017). Memory specificity refers to the extent to which retrieved autobiographical memories are clearly defined (i.e., memories about a particular experience that happened on a particular day); memory coherence pertains to the narrative expression of the overall structure of autobiographical memories. Little is known regarding personality characteristics associated with MTT. Quoidbach, Hansenne, and Mottet (2008) observed that Neuroticism and harm avoidance predict recall of more negative past memories and future projections; other personality dimensions (e.g., Extraversion, Openness, Agreeableness) exhibit a more limited influence on MTT.

Focusing here more on prospection for a moment, D'Argembeau and colleagues (2011; also see Szpunar, 2010) have shown that (1) on average, people report thinking about the future four times per hour, (2) half of future-directed thoughts include episodic content (see next section), (3) episodic future thoughts revolve around short-term concerns, (4) personal future episodes are rated as being less detailed and more positive than memories of personal events, and (5) personal future episodes

occurring in near future are rated as being more detailed than future episodes occurring in distant future. Malek, Berna, and D'Argembeau (2017) found that people rarely locate past and future personal events in a direct fashion (e.g., automatically remembering on what date some event took/will take place) but instead use reconstructive and inferential strategies such as associating a given event to lifetime periods (e.g., first job, while living in a specific place) and factual knowledge (semantic memory; e.g., most conferences take place in April or May).

Connection between episodic memory and prospection

Perhaps the most robust discovery about MTT is that prospection heavily relies on episodic memory (Schacter et al., 2017; see link 8, Figure 1). Deficits in autobiographical access following brain injury or dementia reliably result in prospection deficits (Addis & Schacter, 2008). Patient populations characterized by poor episodic memory (e.g., depression, schizophrenia) exhibit difficulty in imagining their future in a vivid way (Szpunar, 2010). Common brain activations observed when participants either engage in autobiographical or prospection tasks include the left medial prefrontal cortex, posteromedial parietal cortex, and medial temporal lobes (Schacter et al., 2017).

Szpunar (2010) and others (e.g., Schacter et al., 2017; Tulving, 1985) speculate that the primary function of episodic memory is to provide building blocks from which episodic future thoughts are constructed. The contents of episodic memory are sampled and recombined in various ways, leading to the construction of coherent mental representations of future scenarios. The content of episodic future thought used in the creation of self-related future thoughts is most likely determined by accessibility, that is, the information that comes to mind most easily. Both mental images (e.g., Brewer, Knight, Meeks & Marsh, 2011) and inner speech (D'Argembeau et al., 2011) are recruited during MTT, but Demblon and D'Argembeau (2014) note that the latter is particularly involved in (1) making causal connections between imagined events (sequential organization of ideation; creation of event clusters), and (2) providing an organizational structure for remembered events. *Semantic memory* (information about non-personal facts) is postulated to contribute to prospection as well (Duval, Desgranges, De La Sayette, Belliard, Eustache & Piolino, 2012). For example, in imagining the upcoming personal experience of travelling to Africa, one might rely on remembering how it felt to visit Europe as a adolescent (episodic memory) and on objective information about Africa gathered by reading books (semantic memory).

Connection between episodic memory and self

Several models propose ideas pertaining to how episodic memory relates to the self. For example, Conway's *self-memory system* (Conway, 2005; Conway & Pleydell-Pearce, 2000) posits that autobiographical information is organized at four different levels of abstraction: (1) *life stories*: highly abstracted summaries of one's whole life, (2) *lifetime periods*: knowledge relating to periods of one's life, (3) *general events*: summaries of extended and repeated events, and (4) *episodic details*: specific sensory-perceptual details of particular events. Vanderveren and colleagues (2017) add that episodic memory (a) provides a sense of continuity through time, (b) facilitates the creation and maintenance of a social network through reminiscing with others, (c) guides our current and future behavior (see below), and (d) facilitates the process of coping with and resolving negative emotions by integrating these negative memories within a broader framework. (Also see Prebble, Addis & Tippett, 2013.)

Types and functions of prospection

Schacter and colleagues (2017; also see Szpunar, Spreng & Schacter, 2016) propose a taxonomy which contains four basic forms of prospection: (1) *simulation*: creation of a specific mental representation of the future, (2) *prediction*: estimation of the likelihood of a future outcome, (3) intention (setting of a goal, and (4) *planning*: organization of steps for achieving a goal. Each form of prospection varies in terms of representational contents on a gradient from episodic memory (e.g., a specific meeting with a friend that will take place next week) to semantic (e.g., the political landscape after an upcoming election). Simulation entails scene construction, or mentally generating and maintaining a complex and coherent scene, and allows people to experience mental states that are removed from the immediate environment. Prediction includes reactions to personal events (episodic, e.g., likelihood of being promoted at work) as well as reactions to general or abstract states of the world (semantic, e.g., likelihood of a recession). Intention means setting a goal regarding a specific personal future event (e.g., buying bread before dinner); it involves formulating a plan of action (e.g., "I will do so on my way back home") and organizing complex action sequences (e.g., "I will stop at the food store and will buy milk too"), and thus is importantly linked to *prospective memory*—the ability to become aware of a previously formed plan at the right time and place (Uttl, 2008). Planning is required for intended behaviors to be carried out effectively and is defined as the predetermination of a course of action aimed at achieving some goal (Szpunar et al., 2016). Planning actually rests on all three previous forms of prospection: simulation, prediction, and intention formation.

Self-knowledge

Definition and related terms

Self-knowledge can be defined as actual genuine information one possesses about oneself (Carlson, 2013; Vazire & Carlson, 2010). It includes information about one's personality traits, typical emotional states, needs and goals, values, opinions, beliefs, preferences, physical attributes, relationships, behavioral patterns, and social identity. As such, self-knowledge does not represent a self-process *per se* but rather the result of multiple self-reflective and social processes—some examined earlier. This must be contrasted with *self-concept*, the image one develops about oneself (Marsh & Shavelson, 1985), which, unlike self-knowledge, may or may not be realistic. Self-concept is characterized by beliefs about the self based on self-information (Campbell et al., 1996), whereas self-knowledge is supported by various sources of evidence external to the self. Indeed, self-knowledge is commonly measured by looking at the degree of agreement between self-ratings and others' ratings of one's personality traits (Vazire, 2010) or daily behavior (Vazire & Mehl, 2008). Instead, self-concept is often assessed using the Twenty-Statements Test (TST), where participants freely answer the question "Who am I?" twenty times.

Using this latter technique with a large group of participants, Rathbone and Moulin (2017) identified the following self-concept contents (in descending frequency order): social roles (i.e., friend, student, sports player, occupation), positive traits (i.e., happy, optimistic, friendly), and negative traits (i.e., lazy, worry, pessimistic). As we age, self-descriptions gradually become more abstract and include personal beliefs, goals, and preferences (L'Ecuyer, 1975; Markus, 1983). Lack of clarity, consistency, and stability of one's self-concept is related to low self-esteem, low internal state awareness, chronic self-analysis, high self-rumination, high neuroticism, low conscientiousness, and

low agreeableness (Campbell et al., 1996).

Although importantly based on conclusions drawn from examinations of regularities found in one's past (episodic memory), self-knowledge also includes *possible selves* (Markus & Nurius, 1986)—what one hopes for and fears to become in the future (prospection). This is because self-knowledge contains information about one's aspirations, which partially determines what one wants to become as well as one's view of oneself in the future. *Self-schemas* are small conclusions about the self such as "I am punctual", "I work well with people", "I am a good cook", or "I am shy" (Markus, 1997). These cognitive structures develop around those aspects that the self finds particularly important and salient; they determine what one will pay particular attention to (e.g., an upcoming social interaction), shape one's expectations ("this will be unpleasant because I am shy"), and guide action (i.e., self-regulation, "I will get prepared for it").

Self-knowledge is essential for healthy functioning because knowing oneself well leads to realistic decision making pertaining to key aspects of one's life: selecting a compatible intimate partner and friends, opting for education and career orientations that fit one's traits, preferences, and goals, choices about housing and geographic location, and so forth. Self-knowledge deficits are associated with an overestimation of one's strengths (which tends to irritate others), poor academic performance, and lower life satisfaction (Carlson, 2013). Self-knowledge also facilitates self-regulation (see link 13, Figure 1) because it contains information about one's goals, standards, and strategies to be deployed in order to effectively shape one's behavior in desired directions. As a result, self-knowledge is also predictive of one's actions across time and situations—personality (Markus, 1985).

Accuracy of self-perception

Introspection (i.e., self-reflection) as a tool for achieving self-knowledge was extensively used by early experimental psychologists like Wundt, Titchener, and Kulpe at the end of the 19th century. Behaviorism put an end to this practice until the rise of the Cognitive Revolution in the late 60's (Lieberman, 1979). Despite a more favorable attitude toward the use of introspection, persistent and recurring concerns have appeared in the literature. Nibett & Wilson's (1977) influential paper questioned the validity of verbal reports on mental processes, claiming (with supporting evidence) that these reports are based on a priori, implicit causal theories about how people think their minds work—not based on a direct access to mental processes being reported. Wilson (2002) adds that we lean toward positive reconstructions of our past, tend to believe that our current self is like our past self, and tend to see ourselves as relatively stable over time.

Carlson (2013) and colleagues (e.g., Bollich, Johannet & Vazire 2011) note that a moderate correlation exists between self and others' ratings of one's own personality traits—a symptom of self-knowledge deficit. Several studies point to people often being unaware of how they behave, how and why they made some decisions, what motivates them, and how they will do in future. Carlson (2013) suggests that the two main barriers or blind spots to introspective self-knowledge are informational and motivational in nature. *Informational barriers* are erected when available information about the self is limited or ambiguous (difficult to objectively assess; e.g., nonverbal behavior), simply unavailable, or overlooked because of distraction or other cognitive demands. *Motivational barriers* appear when ego-protective motives bias the gathering of self-information. To illustrate, the *self-enhancement motive* represents the desire to perceive the self positively, and the *self-verification motive* is the need to confirm one's identity. As a result, people tend to dismiss and avoid feedback that contradicts preconceived self-views.

Despite these limits to self-reflection, several ways to improve introspection have been proposed. Wilson (2009) suggests that we can try to be objective observers of our own behavior, and (ee ourselves through the eyes of others. For example, we can count how many CDs of different types of music we own in order to determine our favorite genres, or we can imagine how a partner sees our actions based on what they know about our situation. Carlson (2013) instead emphasizes the importance of adopting a specific form of self-reflection through mindfulness to enhance people's ability to pay attention to their experience (informational barriers) and to accept what they observe (motivational barriers). Note that an exclusive focus on one's present (mindfulness) implies not thinking about one's past (autobiography) or imagining one's future (prospection)—two important sources of self-knowledge (see link 7 in Figure 1).

Nasby (1989; also see Gibbons, 1983) reports evidence that individual high in *private self-consciousness* (the stable tendency to reflect on private aspects of the self) provide self-reports of greater reliability across time than those low on private self-consciousness (but see Silvia & Gendolla, 2001 for a skeptical view). In order to improve self-reflection and reduce self-report biases, Hurlburt and colleagues (Hurlburt, Alderson-Day, Fernyhough & Kühn, 2015; Lapping-Carr & Heavey, 2017) have developed the Descriptive Experience Sampling (DES) method, which consists in using beepers to randomly ask participants to report their inner experiences in natural settings. Participants are carefully trained to distinguish between different inner experiences (e.g., inner speech, mental imagery, sensations) so that they can accurately report on them before being distorted by attempts at observation or interpretation. Stepping outside of self-reflection, Bollich and colleagues (2011) suggest that the most effective path to self-knowledge is explicit feedback from close, knowledgeable others.

Other important self-processes

Theory-of-Mind

Theory of Mind (AKA mind-reading, mentalizing, empathy) represents the ability to attribute mental states (e.g., goals, intentions, beliefs, desires, thoughts, feelings) to others (Gallagher & Frith, 2003), allowing social agents to predict others' behavior and to help, avoid, or deceive others as a function of the situation (Malle, 2002). As a potential adaptive response to increasingly complex primate social interaction, Theory-of-Mind likely evolved to facilitate cheating detection and reinforce cooperation (Brune & Brune-Cohrs, 2006). Language acquisition (Milligan, Astington & Dack, 2007) and inner speech use (Fernyhough & Meins, 2009) potentially facilitate the development and application of Theory-of-Mind. Studies show Theory-of-Mind impairment in autism, schizophrenia, bipolar affective disorder, acquired brain damage, dementia, psychopathy, and alcoholism (Brüne, 2005). Theory-of-Mind performance is shaped by individual differences in working memory capacity, intelligence, cognitive impulsivity, and self-control (Cokely & Feltz, 2009).

Link 5 in Figure 1 suggests that self-reflection leads to Theory-or-Mind. The *Simulation Theory* proposes that people mentally simulate what others might be experiencing internally by imagining what types of experiences they, themselves, might have if they were in a comparable situation (Focquaert, Braeckman & Platek, 2008). Supporting this view, studies show that the more people are effective at reflecting on their own past, the better they are at reading others' minds (Dimaggio, Lysaker, Carcione, Nicolo & Semerari, 2008). In addition, self-awareness development in schizophrenic patients (through self-reflection exercises) precedes Theory-of-Mind improvement (Lysaker, Buck & Ringer, 2007). There is overlap in brain activity when participants work on self-reflection and Theory-

of-Mind tasks (Keysers & Gazzola, 2007), and patients with traumatic brain injury who exhibit self-reflection deficits also show impairment on Theory-of-Mind tasks (Bivona et al., 2014; Jonker, Wattjes & Scherder 2016).

In connection to personality, Dolan and Fullam (2004) note that there are Theory-of-Mind deficits in antisocial personality disorder but these are subtle. While Arntz, Bernstein, Oorschot, and Schobre (2009) claim that there are no Theory-of-Mind deficits in patients with borderline personality, Franzen and colleagues (2011) actually report superior attribution of mental states in such patients, particularly during interactions with partners when emotional cues are present. As one may expect, the propensity to attend to the mental states of others correlates with Agreeableness (Nettle & Liddle, 2008; also see Ferguson & Austin, 2010). Although no explicit links in Figure 1 are drawn between MTT, the resting state, and Theory-of-Mind, these self-processes are most likely connected in complex yet poorly understood ways, as they all recruit common brain regions (Spreng, Mar & Kim, 2009).

Self-rumination

Links 3 and 4 in Figure 1 remind us that there is a dark side to self-awareness: when self-focused attention turns into self-immersion instead of self-distancing, one becomes more at risk of *self-rumination*-- engaging in repetitive, uncontrollable, negative self-evaluation in response to distressing situations (Nolen-Hoeksema, Wisco & Lynbomirsky, 2008). Self-rumination can take the form of (1) negative *private self-focus*, which triggers thoughts about one's standards and is associated with depression when one falls short on some of these standards, or (2) negative *public self-focus*, which evokes thoughts about others' opinion of oneself (Theory-of-Mind) and leads to increased social anxiety (Mor & Winquist, 2002). Self-rumination maintains and amplifies depression by increasing negative thinking, disrupting problem solving, interfering with instrumental behavior, corroding social support (Nolen-Hoeksema et al., 2008), and increasing self-escape behavior such as alcohol abuse and binge eating (Baumeister, 1991). Coping mechanisms include distraction, thought suppression, positive appraisal, problem solving (Nolen-Hoeksema et al., 2008) and mindfulness (Mennin & Fresco, 2013). A novel approach in reducing self-rumination rests on the assumption that most negative self-generated thoughts are verbal in nature (Nalorczyk et al., 2017)—they are articulated via inner speech (see below), which is known to recruit facial speech muscles (Sokolov, 1972); thus facial electromyography may provide an operationalization of self-rumination. Importantly, relaxation focused on speech muscles may decrease self-rumination (Nalorczyk et al., 2017).

Self-rumination is associated with Neuroticism (Trapnell & Campbell, 1999), most probably because negative self-generated thoughts lead to unpleasant affect in the absence of any provoking agent (Perkins, Arnone, Smallwood, and Mobbs, 2015). Interestingly, Perkins and colleagues (2015) also explain why some neurotic individuals are creative: self-generated thoughts inherent to self-rumination allow one to reimagine present realities—that is, to recombine elements of reality in innovative, creative ways.

Self-esteem

Self-esteem is defined as a positive or negative global attitude toward the self, although several subtypes exist, e.g., self-competence and self-worth (Rosenberg, Schooler, Schoenbach, & Rosenberg, 1995; for complex dynamics of self-esteem and self-system overview see Racy, 2015). In general, it represents the overall assessment of one's *self-concept*—who we think we are (see links 11 & 12 in Figure 1).

High self-esteem is associated with strong health and wellbeing, while moderate associations exist between low self-esteem and greater risks of mental health problems, substance dependence, and lower levels of life and relationship satisfaction (Boden, Fergusson & Horwood, 2008). Longitudinal studies (e.g., Kuster, Orth & Meier, 2013) show that high self-esteem predicts multiple positive life outcomes such as work performance, conditions, and satisfaction. Complex relations between self-esteem and *narcissism* (a grandiose sense of self-worth) have been proposed (Bosson et al., 2008). For example, those with narcissism can have high and low self-esteem simultaneously (Bushman & Baumeister, 1998)—more specifically, high self-worth and low self competence (Murk, 2013).

Self-esteem is commonly self-reported on measures such as the Rosenberg Self-Esteem Scale (Rosenberg, 1965) or the State Self-Esteem Scale (Heatherton & Polivy, 1991). These are examples of explicit (direct) instruments, whereas implicit (indirect) self-esteem measures (e.g., Greenwald, McGhee & Schwartz, 1998) tap into more automatic or spontaneous self-evaluations by asking volunteers to sort self-characteristics as a function of their valence. More specifically, participants are presented with self-relevant words (e.g., "male") and the time it takes them to identify a negative word ("evil") or the positive word ("kind") is recorded. For a man, being faster at choosing "kind" implies a positive evaluation of one's male self-dimension (and vice-versa).

Factors that shape self-esteem include but are not limited to: past success and failure experiences, caregiver patterns of reinforcement toward the child, physical attractiveness, and self-evaluations resulting from social comparisons, competencies, and acceptance or rejection from others (see Cooperfield, 1967; Harter, 1993). Several functions of self-esteem have been put forward. One influential proposal is the Sociometer Hypothesis (Leary & Baumeister, 2000), which suggests that self-esteem may have evolved to monitor one's social acceptance (essential to reproduction and survival), allowing one to gauge, anticipate and avoid social devaluation and rejection. Terror Management Theory (TMT) views self-esteem as a buffer to help protect individuals from the anxiety they experience at the prospect of their own death. For example, people who rate higher on self-esteem also rate meaning in life higher when experiencing death anxiety than when experiencing a control condition, compared to those with lower self-esteem ratings (Solomon, Greenberg & Pyszcynski, 1991).

In their review, Orth and Robins (2014) draw two main conclusions pertaining to self-esteem development: (1) self-esteem increases from adolescence to middle adulthood, peaks between age 50 to 60 years, and decreases faster into old age; (2) self-esteem acts as a relatively stable trait—that is, individuals with high self-esteem at one stage of life are likely to have high self-esteem decades later—the same can be said about low self-esteem. Robins and colleagues report that high self-esteem is associated with low Neuroticism, Extraversion, Conscientiousness, and (to a lesser degree) Agreeableness and Openness to Experience (Robins, Tracy, Trzesniewski, Potter & Gosling, 2001). Baumeister, Tice, and Hutton (1989) add that high self-esteem scores are associated with a tendency to present oneself in a self-enhancing fashion, whereas low self-esteem scores are associated with the opposite tendency to present oneself in a self-protective way. We thus can see that the dynamics of self-esteem is particularly important to personality, as it is highly intertwined with who we are, how we relate to others, and how we act in the world.

Self-talk

Self-talk represents the activity of talking to oneself out loud or in silence (Hardy, 2006).

Synonyms are *inner speech* (specifically used when referring to silent self-talk)*, phonological loop, self-statements, internal dialogue, inner speaking, verbal thought, and self-directed, subvocal, covert, or acommunicative speech* (Hurlburt, Heavy & Kelsey, 2013). *Private speech* designates self-directed speech emitted out loud by children in social situations (Winsler, 2009). Inner speech is measured with self-report scales such as the Self-Talk Scale (Brinthaupt, Hein & Kramer, 2009) and the Varieties of inner Speech Questionnaire (McCarthy-Jones & Fernyhough, 2011), private speech recordings, thought sampling and listing techniques, articulatory suppression, and electromyographic recordings of tongue movements (Morin, 2012).

Inner speech has been shown to play an important role in self-regulation (e.g., planning, problem-solving), language functions such as reading and writing, task-switching performance, remembering the goals of action, Theory-of-Mind, self-awareness (see below), and rehearsing person-to-person communicative encounters (Morin, in press). Inner speech grows out of one's social environment: social speech comes first, followed by private speech, and then inner speech (Vygotsky, 1943/62). Cross-sectional and longitudinal studies show that the frequency of children's private speech peaks at 3–4 years of age, decreases at 6–7 years of age, and gradually fades out to be mostly internalized by age 10 (Alderson-Day & Fernyhough, 2015). However, adults have been observed to engage in external speech when alone for self-regulatory purposes, as well as for spatial navigation and search, concentration, and emotional discharge and control (Duncan & Cheyne, 1999).

Neuropsychological reports of brain-damaged patients and experimental data gathered using brain imaging technology show that the left inferior frontal gyrus (LIFG, AKA Broca's area) represents a key cortical area sustaining inner speech production (Geva et al., 2011). LIFG activity increases when volunteers silently read single words or sentences, or when they engage in working memory tasks requiring covert repetition of verbal material (McGuire et al., 1996). Other brain areas associated with inner speech use are Wernicke's area, the supplementary motor area, insula, left superior parietal lobe, and right posterior cerebellar cortex (Perrone-Bertolotti et al., 2014; also see Fernyhough, 2016).

In terms of connections between inner speech and personality, one unpublished study (Hamper & Morin, 2011) used an inner speech self-reported listing form and the NEO Five-Factor Inventory (Murray, Tawlings, Allen & Trinder, 2003); salient trends are presented in Table 2. Brinthaupt and colleagues (Brinthaupt et al., 2009; Khodayarifard, Brinthaupt, Zardkhaneh & Azar, 2014; Shi, Brinthaupt and McCree 2017) report positive correlations between their Self-Talk Scale and various measures of obsessive-compulsive tendencies, need for cognition, state anxiety, self-regulation, and self-knowledge. Using a thought-sampling procedure, Hurlburt and colleagues (2013) note important individual differences in inner speech experiences (e.g., phenomenology, frequency). To illustrate, some volunteers report talking to themselves 94% of the time whereas others have few or no inner speech to report; some feel that Inner speech is coming from their chest or head while others cannot identify a specific physical location; sometimes wordless self-"talk" is reported. The reasons for these individual differences in inner speech are currently unknown, but could be due in part by differences in awareness of and familiarity with one's inner speech and other inner experiences (Hurlburt et al., 2013).

Personality trait	Self-reported inner speech content
Neuroticism	+ planning (tasks to do) - to think/understand
Extroversion	+ planning (prioritizing) - fears/doubts
Openness	+ to think/understand - planning (time management)
Agreeableness	+ rehearsing what to say - problem solving
Conscientiousness	- [counter-intuitively] planning (tasks to do or prioritizing) & errands/appointments/chores

Table 2. Most frequently (+) and least frequently (-) self-reported inner speech use as a function of high scores obtained on the NEO Five-Factor Inventory (Hamper & Morin, 2011).

Connections with self-processes

Our view is that self-talk represents the "glue" that holds together all elements depicted in Figure 1. Table 3 presents examples of self-talk that make these dynamic self-processes possible. Crucially, inner speech is involved in self-awareness and self-reflection (link 1, Figure 1): the verbal labelling of self-characteristics via inner speech allows one to become fully aware of them and to gradually incorporate these characteristics into a self-concept (Morin, 2005), consistent with the higher-order representation view of cognition put forward by Carruthers (2002) and Rosenthal (2004): one becomes aware of one's mental states (self-awareness) when one generates higher-order thoughts (self-talk) about them.

Empirical evidence for the participation of inner speech in self-awareness/reflection includes (see Morin, in press for a detailed discussion): (1) in several studies, significant positive correlations exist between measures of self-related constructs (including self-awareness) and inner speech (e.g., Brinthaupt et al., 2009); (2) inner speech loss following brain injury leads to self-awareness deficits (Morin, 2009); (3) increased activation of the LIFG is observed during completion of many self-reflection tasks such as endorsement of personality traits, autobiography, and prospection (Morin & Hamper, 2012); (4) studies using thought-listing procedures note frequent self-reported inner speech about the self (Morin, Duhnych & Racy, in press); and (5) inner speech facilitates awareness of mind-wandering episodes (Bastian et al, 2017), cognitive performance, and other self-monitoring processes (Perrone-Bertolotti et al., 2014). Indirect evidence is provided by dialogic self-therapy, which consists in increasing participants' use of internal dialogues when making sense of personal experiences via self-narration, increasing self-reflection skills (Lysaker et al., 2011).

Conclusion

Self-processes interact in very complex ways, with some key processes affecting almost all other self-related phenomena (e.g., self-reflection/distancing, self-talk) while others having a more limited impact (e.g., self-knowledge/concept). What this means is that self-processes are highly dynamic in the sense that they stimulate change and progress within the broader self-system. It is thus fitting to include them when trying to understand personality, as personality itself is increasingly viewed as involving numerous dynamic processes. Figures 2a and 2b summarize the main connections between self-processes and personality reviewed here.

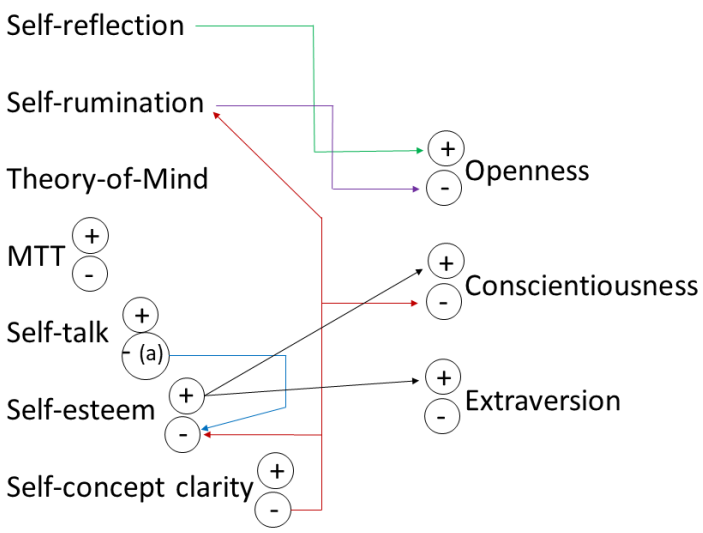

Figure 2a

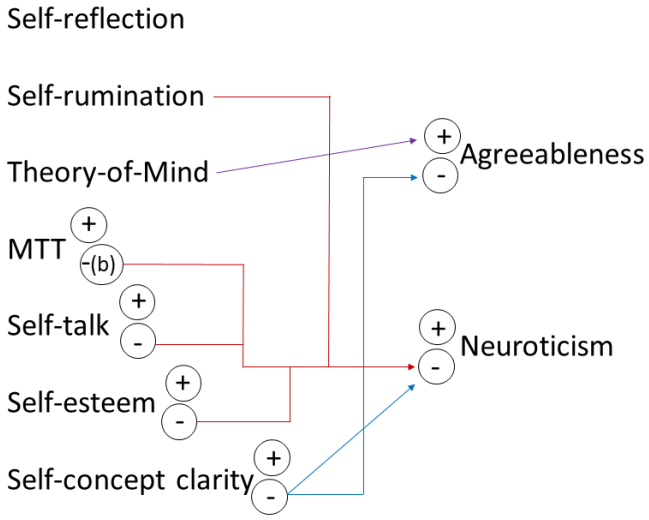

Figure 2b. Summary of main connections (trends) between self-processes and the Big Five as discusses in this chapter. Solid lines = reported relationships; - = lower levels, + = higher levels. Exceptions: (a) refers to negative memories and future thoughts; (b) refers to self-criticism and self-assessment inner speech (Brinthaupt et al., 2009).

In this chapter, key self-related processes have been examined, and information has been presented pertaining to definitions, measures, development, functions, subtypes, and neuroanatomy. Some key messages include: (1) self-awareness is made up of various sub-processes and must be divided into self-reflection and self-rumination, (2) prospection depends on autobiographical knowledge, (3) our self-concept often is inaccurate, (4) self-talk is present in most—if not all—other self-processes and (5) self-processes are importantly associated with personality traits.

Several other self-processes were not addressed: self-efficacy, self-disclosure, self-presentation, self-management, self-regard, self-escape, and more. These should be included in future efforts aimed

at understanding the dynamic features of personality. Also, many links presented in Figure 1 are still in need of empirical support and the entire system should be tested via regression and path analyses. Importantly, some fundamental questions remain unanswered. To illustrate, why are some people more self-knowledgeable than others? Why are some individuals more prone to self-rumination and self-immersion? What is the nature of relationships between self-processes and personality dynamics, and what are the factors influencing these relationships? What are the implications of these relationships for health and well-being?

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