**Personality-Informed Intervention Design:
Examining How Trait Regulation Can Inform Efforts to Change Behavior**

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Abstract

Research that helps people change their behavior has the potential to improve the quality of lives, but it is too often approached in a way that divorces behavior from the people who need to enact it. In this paper, we propose a personality-informed approach to classifying behavior-change problems and designing interventions to address them. In particular, we argue that interventions will be most effective when they target the appropriate psychological process given the *disposition of the participant* and the *desired duration of change*. Considering these dimensions can help to reveal the differences among common types of behavior-change problems, and it can guide decisions about what kinds of intervention solutions will most effectively solve them. We review key concepts and findings from the personality literature that can help us understand the dynamic nature of dispositions and to identify the psychological processes that best explain both short-term variance in behavior and long-term development of personality. Drawing on this literature, we argue that different types of behavior-change problems require different forms of ‘trait regulation,’ and we offer a series of propositions to be evaluated as potential guides for the design of intervention strategies to address them.

Keywords: Personality, intervention, behavior change, self-regulation

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The countless choices we make about how to behave in our daily lives—what we eat, how often we exercise, where we spend our money, etc.—substantially influence our health, well-being, and other important life outcomes (Loewenstein et al., 2007). Yet even when we know what actions we should take to achieve long-term goals, it can be challenging to prioritize these over our short-term desires (Milkman et al., 2008). This can be highly costly to individuals and societies (Duckworth et al., 2018), prompting calls to examine how psychological science can help people change their behavior (Gruber et al., 2019).

Research on behavior change can be found across most sub-disciplines of psychology (e.g., clinical, organizational, health), as well as in related disciplines like behavioral economics. These studies target a broad range of behaviors in a variety of contexts—such as getting undergraduates to eat more vegetables (Turnwald et al., 2019), healthcare workers to practice hand hygiene (Grant & Hofmann, 2011), and employees to save more money (Thaler & Benartzi, 2004). Our primary focus in this paper is on interventions that treat behavior as the focal outcome variable, including those aiming to promote health (e.g., exercise behaviors), education (e.g., studying behaviors), citizenship (e.g., voting), or any other salutary outcome. Such studies have identified hundreds of behavior change strategies and techniques, from simple ‘nudges’ to more complex lifestyle change programs (for reviews, see Abraham & Michie, 2008; Duckworth et al., 2018; Knittle et al., 2020). There is immense variety in both the means and ends of such behavior-change interventions.

Despite substantial progress in identifying promising intervention techniques, the breadth of this research also presents a new challenge: How can we know how to design the best intervention for the particular behavior-change problem we are trying to solve? Although there have been helpful efforts to compile and categorize intervention techniques (see the aforementioned reviews) — as well as to develop theories of particular classes of psychological interventions (e.g., ‘wise interventions’; Walton & Wilson, 2018) — there is a surprising lack of theoretically-grounded frameworks for guiding behavioral intervention design. We argue that personality psychology is particularly well-suited to fill this gap, and that its potential in this space has been greatly underappreciated.

The common premise underlying most interventions research is that we can steer people toward adaptive behaviors (or away from maladaptive ones) by activating or modifying the appropriate psychological processes. Too often, however, this research is approached in a way that divorces *behavior* from the *people* who need to enact it. We propose that an understanding of the dynamics of personality expression and the processes that explain them can yield novel insights into the mechanisms of behavioral interventions.

In a sense, personality describes the *default settings of an individual’s psychological system*. The behavior change literature shows that people often follow the default ways of acting in a given situation (e.g., people are more likely to enroll in a retirement plan when the default option is to do so; Thaler & Sunstein, 2009). Importantly, however, defaults do not impose strict constraints; people can opt out of them. As we will show in this paper, personality functions in much the same way: All else being equal, when faced with a choice about how to behave, people will default to their typical ways of interpreting and responding to whatever situation they find themselves in (e.g., Sherman et al., 2015). As a result, people often behave in ways that align closely with their personality (e.g., Epstein, 1979). But our personalities are not ‘fixed,’ and our dispositional tendencies are routinely interrupted by situational demands or competing desires, leading to natural short-term variation in our behavior and experience (e.g., Fleeson & Gallagher, 2009). Over time, we may also experience more enduring changes to our default behavioral dispositions (e.g., McAdams & Olson, 2010).

Drawing on research on personality dynamics, our central thesis is that interventions will be most effective when they target the appropriate psychological process given the *disposition of the participant* and the *desired duration of change*. This is because—as we will demonstrate in the following sections—different psychological processes are likely to be responsible for dispositional vs. counter-dispositional behaviors over the short- vs. long-term. It is these ‘trait regulation’ processes that help to explain how we change our behavior, both over the course of a day and over the course of our lives. And it is therefore these processes that should be the targets of behavioral interventions. To illustrate this, we introduce a framework for classifying different types of behavior-change problems, then show how an understanding of trait regulation can clarify the aims and the strategies required for interventions to solve them.

A Personality-Informed Classification of Behavior-Change Problems

Although there have been multiple attempts to classify different types of interventions, there have not to our knowledge been similar attempts to classify different types of behavior-change problems. This might make sense if the diversity of intervention techniques merely reflected different ways of solving the same problem. Yet the distinctions that are drawn between interventions often imply that they differ not only in their means, but also their ends.

Shifting vs. Changing Behavior

As a first example of how behavior-change problems might differ, consider the difference between so-called ‘nudge’ and ‘boost’ interventions (Hertwig & Grüne-Yanoff, 2017). Nudges are interventions that target specific behaviors in particular contexts, without any expectation that they will influence other behaviors in different contexts. If a nudge is discontinued, its effects cease. Boosts, by contrast, aim to develop people’s competencies to make salutary decisions across multiple situations and contexts (e.g., teaching people how to manage risk when making a range of different decisions). If successful, a boost-style intervention should continue to help people over time. Thus, the appropriateness of nudge vs. boost interventions depends, at least partly, on whether one is trying to solve a short- or long-term behavior-change problem. Hence, we propose that one way in which behavior-change problems differ is in their *desired duration of change*.

On one end of this continuum is the problem of figuring out how to temporarily shift behavior, wherein the goal is to ensure that people will enact a specific behavior at a particular time, usually without regard for whether the behavior will persist into the future. For example, most studies that test strategies to encourage vaccination uptake (Brewer et al., 2017) or voter turnout (Nickerson & Rogers, 2010) measure their success in terms of individual behaviors. Voter turnout interventions are typically narrowly focused on making sure that people enact a certain behavior (casting a ballot) by a certain date (election day), rather than turning people into more active citizens in general. Similarly, most nudge interventions (Thaler & Sunstein, 2009) are designed to influence individual behaviors by altering some aspect of the immediate decision-making environment. There have been hundreds of empirical studies testing the efficacy of various nudges, although there are surprisingly few generalizable insights about what makes some nudges more effective than others (Szasz et al., 2018)¹. This suggests that influencing a narrow set of behaviors over relatively brief periods of time is a common and difficult problem.

¹ There have also been some high-profile cases of successful nudges (Shu et al., 2012) failing to replicate (Kristal et al., 2020). As noted in multiple recent reviews (Duckworth et al., 2018; Hummel & Maedche, 2019), many intervention techniques have not yet been robustly replicated, making it hard to know which strategies are likely to work even in the same context as the original study. We echo calls for replication efforts and reviews of research on intervention techniques.

On the other end of the duration continuum are the kinds of difficult problems we typically call to mind when we hear the phrase *behavior change*, like encouraging people to establish better nutrition and exercise habits (Wood & Neal, 2016) or to adopt more environmentally sustainable household practices (e.g., re-using shopping bags; Verplanken & Roy, 2016). In such cases, it is insufficient to change a single behavior—an exercise routine will only bring benefits if it is adhered to with some consistency. Examples of interventions that try to enduringly change behavior across time and contexts include those that try to create or alter habits (Verplanken & Wood, 2006); ‘wise interventions’ that target self-reinforcing mental processes as a way of influencing ongoing behaviors (Walton & Wilson, 2018); and the aforementioned boosts that try to help people develop a mental framework that can be applied not only to the present situation, but to future ones as well (Hertwig & Grüne-Yanoff, 2017).

To see why this distinction matters for the design of interventions, consider two different examples of health behavior-change problems. To increase vegetable consumption during a single meal, it may be sufficient to convince people that vegetables taste good (Turnwald et al., 2019). Yet, most parents will tell you that this technique is likely to work only a handful of times for young children (at best). Instead, if the challenge is to find ways to influence kids’ enduring nutritional choices, it may be more effective to teach parents a broader set of mealtime practices they can use to influence their kids’ ongoing dining decisions (Dallacker et al., 2019). Thus, we argue that knowing which interventions will work best depends on knowing the duration of the behavior-change problem at hand.

Encouraging Dispositional vs. Counter-Dispositional Behaviors

We propose that adopting a personality-informed approach to intervention design can reveal a second way of classifying different types of behavior-change problems based on the *disposition of those whose behavior you are trying to change*. Interventions are most often used to promote behaviors that people are unlikely to do on their own, perhaps because they are not particularly motivated or accustomed to doing them (i.e., to make it easier to enact counter-dispositional behaviors). Sometimes, though, they may be sought to help close the gap between being *likely* to do something and *actually* doing it (i.e., to prevent failures to follow through on dispositional behaviors). Although this distinction is often not made in these terms explicitly, the behavior-change literature includes examples of interventions that try to solve both of these problems.

For instance, a key issue that behavioral interventions need to contend with is that people often don’t want to behave in ways that align with their long-term interests (Milkman et al., 2008). Party animal undergraduates know they should study for an exam, but they want to go out with their friends. Sedentary office workers know they should probably exercise more, but they want to relax instead. In other words, the problem that many interventions are designed to solve is to help people overcome their dispositional aversion to behaviors that would ultimately be good for them.

In other cases, though, interventions are trying to solve a different problem: How can we account for the possibility that on any given occasion, someone might not do something they are typically likely to do? As Sheeran and Webb (2016, p. 503) quip, “Bitter personal experience and meta-analysis converge on the conclusion that people do not always do the things that they intend to do.” Similarly, as we discuss in the next section, research on personality dynamics shows that people do not always do the things they normally tend to do. Thus, even when someone has a positive disposition toward a behavior (e.g., they are in the habit of doing it, they intend to do it, and/or it aligns with their values or some aspect of their personality), they may need still help following through with it. In these cases, interventions are guided by a different goal: Instead of trying to

enable deviation from one's desired behaviors, they attempt to constrain it in hopes of ensuring the person will act on their useful inclinations.

As an example of where such an intervention might be useful, consider that—although the people who make it through medical school are those who are most concerned about others (Lievens et al., 2009)—doctors and nurses routinely fail to practice the hand hygiene necessary to protect their patients from infection (Gawande, 2004). Grant and Hofmann (2011) recognized that healthcare workers did not need to be persuaded that hand hygiene is an important behavior. Instead, they merely needed to be reminded that failing to wash their hands after going to the bathroom would be inconsistent with their prosocial goals. Accordingly, they found that a sign reminding them of the prosocial consequences of hand-washing (“Hand hygiene prevents patients from catching diseases.”) significantly improved hygiene practices, whereas a reminder of their personal risks did not. In other words, the sign reminded them of a goal (protecting patients) that was well-aligned with their disposition (being prosocial) and likely to be salient to them while working as healthcare providers.

As with the distinction between short- and long-term behavior-change problems, whether one is trying to encourage a relatively dispositional or counter-dispositional behavior should inform what kind of intervention is used. For example, it may be necessary to use different strategies to encourage blood donation from someone who has never done so before and is reluctant to start (a counter-dispositional behavior) than from someone who has done so in the past (a dispositional behavior). For new donors, whether they will give blood depends “almost exclusively on their level of motivation” to do so (Godin et al., 2007, p. 1612), which suggests that motivational interventions may be particularly effective. Someone who has given blood in the past, on the other hand, likely doesn't need to be persuaded about the benefits of being a donor—but an intervention might be able to increase the likelihood that they will do so more regularly by addressing some of the perceived barriers that might otherwise discourage them from returning (Sinclair et al., 2010).

Four Common Behavior-change problems

There are likely many dimensions along which behavior-change problems can be classified. However, we propose that intervention designers can significantly improve their understanding of the problem they are trying to solve by answering two questions:

1. Is the goal to temporarily shift or enduringly change behavior? In other words, is the aim to influence a particular behavior without concern for whether it persists beyond the present situation, or is the goal to alter a pattern of behaviors across time and context?
2. Is the goal to enable a counter-dispositional behavior or to ensure a dispositional behavior? In other words, is the aim to get someone to do something they have a propensity or inclination to avoid, or to help someone behave in a way that's consistent with their existing behavioral tendencies?

If we combine these two dimensions—the desired duration of change and the participant's disposition toward the behavior—a framework emerges for classifying four common types of problems that behavior-change researchers try to address: How to encourage (1) temporary dispositional behaviors, such that people *follow through* on behaviors to which they are already inclined; (2) temporary counter-dispositional behaviors, such that people *stretch* outside of their comfort zone to temporarily do something different or new; (3) enduring dispositional behaviors, whereby people increase the *consistency* of behaviors they usually do but sometimes neglect; or (4) enduring counter-dispositional behaviors, helping people *transform* their behavior for the long-term (as depicted in Figure 1). We refer to these as problems of *trait adherence*, *trait enactment*, *trait reinforcement*, and *trait change*, respectively, in order to reflect the different self-regulatory

processes that are implicated in solving them (as discussed more in the next section). We argue that these different kinds of problems often require different kinds of solutions (i.e., intervention strategies), and therefore that it is important to better understand the nature of dispositions and the psychological factors that shape a person's behavior in the short- and long-term. As we will show in the next section, personality psychology can help with both of these needs.

Figure 1

A Personality-Informed Classification of Behavior-Change Problems

Figure 1. Behavior-change problems can be classified according to (a) whether the behavior is relatively dispositional or counter-dispositional given the personality of the target audience, and (b) the desired duration of change (i.e., whether the intervention aims to temporarily shift a particular behavior or to enduringly change an overall pattern of behaviors). In general, people are more likely to enact dispositional behaviors than counter-dispositional behaviors, and temporary shifts in behavior are more common than enduring changes. The combination of these dimensions highlights the differences between four common behavior-change problems: 1) Ensuring follow-through on temporary dispositional behaviors; 2) Stretching to enact temporary counter-dispositional behaviors; 3) Increasing the long-term consistency of dispositional behaviors; 4) Changing one's disposition toward an enduring pattern of behaviors. We refer to these as challenges of trait adherence, trait enactment, trait reinforcement, and trait change, respectively, to reflect the different self-regulatory processes that we argue need to be addressed by interventions to address them.

Review of Key Personality Concepts for Intervention Design

How can an understanding of personality dynamics and processes inform our approach to behavioral intervention design? We begin with a brief overview of key concepts and terms from the personality literature. Even personality psychologists do not always agree on the definitions of the terms used commonly in their field (Baumert et al., 2017), and behavior-change researchers will have varying levels of familiarity with more recent theoretical and empirical advances in personality science. We focus on areas of this literature that are most likely to be useful when designing behavioral interventions.

In broad terms, personality psychology helps us “make sense of persons” (McAdams, 1995), which it does in large part by identifying characteristics that (a) distinguish people from one another, and (b)

provide coherence to a person's varied behaviors and experiences (Cervone & Little, 2019). These characteristics include basic traits within the Big Five and HEXACO models (Anglim & O'Connor, 2019), as well as values (Schwartz & Bilsky, 1987), political orientation (Sibley et al., 2012), beliefs (Clifton et al., 2019), and abilities (Elfenbein & MacCann, 2017), among other individual differences. Although these varied constructs cover a broad spectrum of psychological content and phenomena, they share a common focus on describing patterns in people's affects, behaviors, cognitions, and desires (Revelle, 2007; Wilt & Revelle, 2015)².

For intervention designers, information about someone's personality would be most helpful if it can help to predict (and provide information about how to influence) their future actions. For example, political psychologists might want to know how likely someone is to vote (Rentsch et al., 2019) and what kind of intervention would help to ensure that they do (Gerber et al., 2013). In this section, we review evidence that personality research can be a rich source of both types of information.

Traits as Behavioral Dispositions

Although one of the goals of personality psychology is to describe and explain *behavior*, there can be a surprising lack of clarity about what behavior is and how personality relates to it (Furr, 2009). We use the term "behavior" to refer to the kinds of concrete, observable actions that are the typical targets of behavior-change research (e.g., exercising, voting, getting a vaccination). This is close to Furr's (2009, p. 372) definition of behavior as "verbal utterances (excluding verbal reports in psychological assessment contexts) or movements that are potentially available to careful observers using normal sensory processes"—but with a somewhat higher-order focus on the class of behaviors that might be described as acts or activities.

The prevailing view in personality psychology (e.g., Buss & Craik, 1983; DeYoung, 2015; DeYoung & Krueger, 2020; Fleenon, 2001; McAdams, 1995; Tellegen, 1991) is that traits represent *behavioral dispositions* that provide not only summaries of what a person has tended to do in the past, but also probabilistic information about what they are *likely to do* in the future. In this view, traits are not the underlying causes of individual behaviors, but they nevertheless predict the likelihood that a person will enact them. For instance, conscientiousness predicts engagement in health-promoting behaviors (Bogg & Roberts, 2004), and thus offers useful information to health practitioners, regardless of the underlying causes of either conscientiousness or healthy behaviors.

Describing Patterns of Behavior

One way personality helps us predict a person's behavior is by providing a descriptive summary of what they *tend to do* (Buss & Craik, 1983). For instance, people who are highly conscientious tend to use daily planners to manage their schedules and tend not to oversleep for class or work (Jackson et al., 2010), whereas people who score high on extraversion and openness (i.e., plasticity) do things like plan parties or lounge around at home without clothes on (Hirsh et al., 2009). People who value benevolence, on the other hand, are often happy to lend things to their neighbors and usually keep their promises (Bardi & Schwartz, 2003).

Although people often act in accordance with their personality, they do not always do so and sometimes choose not to (Little, 2008). This is perhaps best captured in Fleenon's (2001) framing of traits as density distributions of states, which posits that momentary behaviors (along with thoughts, motivations, and emotions) can be described using the same content and scales as conventional personality trait questionnaires. For instance, *state conscientiousness* can be assessed by asking,

² We focus primarily on personality traits in this paper, but the principles we describe can be applied to most types of psychological individual differences that provide dispositional information about how people typically behave.

“During the last half-hour, how *hard-working* have you been?”³ When people are asked to repeatedly describe their behavior in these terms using experience sampling (Fleeson & Gallagher, 2009), a consistent but dynamic pattern emerges:

1. Scores on conventional trait questionnaires are strongly associated with the mean of a person’s corresponding states ($r_s = .4$ to $.6$ for the Big Five traits, uncorrected), indicating that personality provides a useful summary of how people are behaving much of the time (at least in broad terms, see Rauthmann et al., 2019);
2. Like scores on conventional trait questionnaires, average levels of personality states across multiple days or weeks are highly stable over time ($r_s \sim .70$, see Fleeson, 2001);
3. Nevertheless, people often deviate from their own typical ways of behaving (Proportion of within-person variance = 49-78%), and trait scores derived from personality questionnaires are less strongly associated with single behavioral states ($r_s = .18$ to $.37$; Fleeson & Gallagher, 2009).

Predicting Future Behavior

Conceiving of traits as behavioral dispositions can help to explain one of the primary contributions personality psychology has made to behavior-change research to date: Traits often moderate the effectiveness of interventions. For example, interventions to increase psychological well-being tend to be more effective when there is a high degree of person-activity fit (Lyubomirsky & Layous, 2013). Similarly, an implementation intention intervention can be effective at encouraging students to attend class more often (Webb et al., 2007) – but less so for students who are highly conscientious. What explains the role of personality in these experiments?

The class attendance intervention provides a particularly informative example. As the authors note (Webb et al., 2007), highly conscientious students are less likely to miss class in the first place and thus may have had less to gain from the intervention. If that were the only explanation, then it might not be necessary to invoke personality at all: Interventions of any kind to promote class attendance are likely to show smaller effects for students with high baseline attendance rates, merely owing to the fact that they have less room to improve. Yet there is a reason that conscientiousness, in particular (rather than another trait like extraversion), serves as the moderator in this case: Conscientiousness provides information about each student’s propensity to attend class (i.e., their disposition toward class attendance). Higher levels of conscientiousness are associated with more positive attitudes about going to class ($r = .40$) and stronger intentions to attend ($r = .38$)⁴. For highly conscientious students, then, going to class is an expression of their personality that is likely to be appealing and relatively easy. For the least conscientious students, on the other hand, attending class is a counter-dispositional behavior that may be less appealing and more effortful.

People report that they generally want to behave in ways that are consistent with their traits (i.e., to enact dispositional behaviors; Hudson & Roberts, 2014), even when they have goals to change

³ It is worth noting that these self-reported personality states are often described as measures of trait-relevant “behavior” (e.g., Fleeson, 2001; Furr, 2009). Because these behavioral states describe not only one’s momentary observable actions or activities, but also reflect other trait-relevant aspects of their psychological state (e.g., affect, Wilson et al., 2017), we distinguish between behavioral states (i.e., trait expressions or personality states) and individual actions or activities (behaviors). For example, the act of going to a party is a *behavior* that is commonly associated with trait extraversion, but some people at a party might be talkative and energetic while others mostly sit in a corner and keep to themselves (extraverted and introverted personality states, respectively).

⁴ This is described in the original paper in terms of the theory of planned behavior (Ajzen, 1991), which posits that our attitudes toward and beliefs about a behavior influence our motivation to enact it. We propose that this shares many similarities with the notion of behavioral dispositions, and this may point to areas of future integration between personality science and behavior-change research.

certain aspects of their personalities. There is also evidence that people find it more difficult to act in counter-dispositional ways (Gallagher et al., 2011). For instance, there is at least some evidence that introverts find it more tiring and inauthentic to act extraverted (Jacques-Hamilton et al., 2019)⁵, and that extraverts become depleted after acting more introverted (Zelenski et al., 2012). There are many potential explanations for these findings, from set-point theories that posit homeostatic physiological processes (Ormel et al., 2017) to skills-based frameworks that emphasize the importance of behavioral capabilities (Soto et al., 2020). Regardless of the precise cause, it is essentially axiomatic within personality psychology that people are more likely to enact future behaviors that are consistent with their personality and less likely to enact behaviors that are counter-dispositional.

Deviating from Dispositions

As discussed earlier, we know that people are not perfectly consistent in their personality expressions, and therefore we cannot presume that people who are positively predisposed towards a behavior will always enact it. Conversely, we cannot presume that those who have a negative disposition toward a behavior will never enact it. This is because traits “indicate states toward which the person will tend to gravitate but do not preclude that person from being in other states” (DeYoung, 2015, p. 35).

What explains these deviations from one’s normal ways of behaving? Although personality traits are primarily descriptive, they nevertheless point toward potential explanations for a person’s behavior. This is because they reveal the existence of causal mechanisms that must account for the way a diverse range of psychological processes are organized within an individual (Hampson, 2012; Jayawickreme et al., 2019; Zuckerman, 1992). For example, consider again the class attendance intervention (Webb et al., 2007): Setting implementation intentions may be more helpful for students who are low in conscientiousness because it reduces the effort required to enact a future behavior (Gollwitzer & Sheeran, 2006). People who are highly conscientious tend to spend more time thinking about the future, whereas those low in conscientiousness focus more on the present (Park et al., 2017). Thus, this intervention can help the latter students act in a way that doesn’t come naturally (i.e., it facilitates trait enactment, as depicted in Figure 1 and described in more detail later). Another way to think of this is that implementation intentions offer a structured way of helping students who aren’t very conscientious to *act as though they were*.

When and why people deviate from their typical behaviors is the subject of growing research interest in personality dynamics (e.g., Beckmann & Wood, 2020; Podsakoff et al., 2019; Rauthmann, 2020; and this special issue). We discuss the processes that explain personality-behavior relations in greater detail in the next section. For now, though, the key point is that personality traits predict behavior because they capture information about the psychological processes that cause behavior (as depicted in Figure 2).

⁵ It is worth noting that, in other contexts, extraverts show signs of fatigue after they act like introverts but introverts appear able to act like extraverts without negative consequences (Zelenski et al., 2012). Thus, not all forms of counter-dispositional behaviors are likely to be equally challenging.

A Simplified Model of Personality-Behavior Relations

Figure 2. A person's behavioral dispositions (i.e., personality traits and related individual differences) provide summaries of their general behavioral propensities or inclinations that have been shaped (at least in part) by past behaviors and experiences. Dispositions can be used to predict the likelihood that someone will enact specific, future trait-relevant behaviors (e.g., voting) and/or the degree to which they will more generally express that aspect of their personality in a given instance (e.g., the degree to which they will act conscientiously). This can be explained by the fact that dispositions predict individual differences in the short-term self-regulatory processes (e.g., perception of and response to situational demands, goal activation) that explain specific instances of behavior. Changes in individual behaviors can lead to changes in general behavioral dispositions through long-term trait regulation processes such as repetition or adopting new social roles.

Summary

To summarize, personality provides dispositional information that can help us predict which behaviors someone will tend to enact and which they'll usually avoid. In general, the more aligned a future behavior is with someone's personality, the more likely they will be to enact it. Conversely, people are less likely to behave in ways that conflict with their personality, because such behavior may be unappealing or difficult to enact. However, these general principles come with an important caveat: People do not always behave consistently with their traits, routinely engaging in at least some uncharacteristic behaviors. This makes sense when we consider that traits are not direct causes of behavior, but rather reflect probabilistic dispositions to act in certain ways.

This dynamic nature of trait expression has at least two important implications for behavioral intervention design that will be explored in more depth later in this paper: 1) People can be encouraged to enact counter-dispositional behaviors, at least temporarily; and 2) even someone with a positive disposition toward a behavior may still benefit from an intervention to reinforce or encourage that behavior. First, though, we need to take a closer look at the psychological processes that explain these dispositions and why people sometimes deviate from them.

Trait Regulation Processes

Despite its primary focus on relatively stable aspects of behavior, personality psychology is also concerned with describing and seeking explanations for momentary variability (e.g., Fleeson & Nofle, 2008) and longer-term change (e.g., Roberts et al., 2017) in behavior. Multiple theories have proposed models for understanding the conditions that are likely to elicit the expression of different traits (e.g., Mischel & Shoda, 1995; Tett & Burnett, 2003), and research is starting to tease apart how person and situation factors jointly influence momentary individual behaviors (e.g., Horstmann et al., 2020). On a longer timescale, it is well-established that personality develops over the course of the lifespan (Caspi et al., 2005; McAdams & Olson, 2010), often in normative or predictable ways (Geukes et al., 2017b; Specht et al., 2014; Wrzus & Roberts, 2017). There is also some evidence for

individual patterns of change brought about through volitional effort (Hudson & Fraley, 2015). While these various lines of research offer unique perspectives, they share a common focus on the personality processes that explain why dispositions predict different behaviors in different situations over time (Baumert et al., 2017).

Process-oriented approaches to explaining the dynamics of trait expression are drawn from a number of different theories and use a wide range of methodologies (for recent reviews, see Baumert et al., 2017; Hampson, 2012; McAdams & Olson, 2010; Rauthmann, 2020). These include both cognitive neuroscientific perspectives (e.g., Corr et al., 2013; Read et al., 2010) and socio-cognitive approaches (e.g., Geukes et al., 2017a; Wrzus & Roberts, 2017), as well as theories that integrate the two (e.g., DeYoung, 2015; Roberts, 2018). Regardless of the relative merits of each of these perspectives, they all share a common focus on self-regulatory processes.

We discuss specific examples of these processes in greater detail below, but we refer to them collectively as *trait regulation*⁶, or the psychological process of expressing preferred personality characteristics. Drawing on a definition from the emotion regulation literature (Gross, 2015, p. 6), trait regulation “refers to shaping which [traits] one has...and how one experiences or expresses these [traits].” In this sense, trait regulation can be understood as a form or type of self-regulation in which the psychological content (affect, behavior, cognition, or motivation) that is being regulated can be best described in personality terms. Trait regulation can be subsumed under the broader notion of self-regulation, and ultimately trait regulation processes can be broken down into the regulation of specific behaviors, emotions, or cognitions. However, there are times when self-regulation processes are most helpfully construed at an intermediate level of abstraction—one that is broader than processes like emotion regulation but more specific than general descriptions of self-regulation.

In the sections that follow, we review some of the trait regulation processes that have been identified to date as potential explanations for short- and long-term variations in trait expression. For a more comprehensive overview of such processes, please see the aforementioned reviews.

Explaining Temporary Shifts in Trait Expression

Temporary shifts in trait expression refer to state-level changes in how personality is manifest through our behavior from one moment to the next. In density distribution terms, this is the process of moving from one region of one’s distribution of personality states to another, which may or may not result in an ongoing change in the shape of that person’s distribution. For example, consider an undergraduate who might be extremely conscientious while studying for an exam on Friday afternoon and decidedly less so when attending a party later that evening. Or imagine a parent who relaxes the rules while playing a messy game with their children but then needs to return to order so as to get them to school on time. Which trait regulation processes best help to explain these short-term shifts? In other words, what are the most proximal causes of which personality characteristics a person will express at a particular moment? Although there may be many factors at play in any given instance, two of the most commonly proposed explanations for short-term variability in behavior are situational demands and the activation of trait-relevant goals.

Situational Demands. For many psychologists, the default explanation for within-person variation in behavior is “the situation.” For instance, conscientious students might occasionally miss class because their bus was late, or if there happened to be a career fair on that day that they really

⁶ The term “personality processes” is sometimes used to refer to these processes in aggregate (e.g., Baumert et al., 2017; Hampson, 2012). Given that most if not all modern accounts of these processes are described in self-regulatory terms, we propose that “trait regulation” offers a more descriptive term for the over-arching construct.

wanted to attend. Indeed, when we find ourselves in a wider variety of situations, our behavior tends to be less consistent (Sherman et al., 2010). There also have been many attempts to identify associations between behaviors and certain situational *cues* (i.e., the objective conditions, such as where one is and who one is with), *classes* (i.e., the category or type of situation, as in the distinction between work and home), and *characteristics* (i.e., the psychological conditions, such as how the objective conditions are being perceived or interpreted; Rauthmann et al., 2015). For instance, people tend to behave more aggressively when temperatures are higher (a situational cue; Anderson, 1989), they tend to act more extraverted when at restaurants than at home (situational classes; Matz & Harari, 2020), and they tend to be more conscientious in situations they perceive to be important (situational characteristic; Parrigon et al., 2017). Accordingly, personality theorists have long adopted an interactionist perspective that suggests behavior is jointly determined by both dispositional and environmental influences, as well as by how they interact with one another (e.g., DeYoung, 2015; Lewin, 1935; Tett & Burnett, 2003; Wrzus & Roberts, 2017).

For behavior-change researchers, process-oriented approaches to understanding causal links between situations and behavior may be particularly relevant, as they emphasize interactions between the person and the environment that may offer opportunities to intervene. For example, over the past decade, there have been multiple attempts to provide a taxonomic description of the major psychological features of situations (e.g., Oreg et al., 2020; Parrigon et al., 2017; Rauthmann et al., 2014; Rauthmann & Sherman, 2020), at least partly in hope that doing so will illuminate how changes in the interpretation of situations will lead to corresponding changes in behaviors (e.g., Conley & Saucier, 2017). Other types of proposed person-situation interactions include situation selection (i.e., choosing what kinds of situations to enter or avoid; Ickes et al., 1997) and situation modification (i.e., altering one or more aspects of a situation; Gosling et al., 2002). There is not yet a consensus about the best way to classify situations—nor of how person-situation interactions reliably influence behavior (Rauthmann & Sherman, 2020). It is sufficient for the purposes of this paper, however, to note that modifying the way a person thinks about and interacts with a situation may play an important role in how they will behave within it.

Goal Activation. A more agentic perspective on short-term trait regulation processes can be found in Little's (2008) notion of free traits. In Little's proposal, people do not merely react like chameleons to their changing surroundings. Rather, they may sometimes want to act "out of character" (i.e., to express a counter-dispositional trait) if it aids their pursuit of a personally meaningful goal. Introverts, for example, may choose to behave more like extraverts in the short-term if they think it will improve their well-being (Blackie et al., 2014). Similarly, in an effort to please the crowd, comedians sometimes bring out a different persona on stage than they normally maintain in daily life (Irwing et al., 2020).

Goal-directed processes have also been proposed to play a more general role in shaping moment-to-moment trait expressions (DeYoung, 2015; DeYoung & Weisberg, 2019; Fleeson & Jayawickreme, 2015; Jayawickreme et al., 2019). McCabe and Fleeson (2016) have shown that momentary goals account for about half of the within-person variance in expressions of extraversion and conscientiousness in daily life. When people have tasks that they want to get done, they tend to be more hard-working and organized; when they want to have fun, their more enthusiastic and sociable side comes out in their behavior. As with the previous discussions of situational influences on behavior, these observed associations do not necessarily show a clear causal pathway from goals to behaviors (and there may be third variables that explain both). Nevertheless, they suggest that how someone will behave in a particular instance may be influenced by whatever goals are made salient to them at that moment⁷.

⁷ Although we are focusing here on momentary desires, goals can of course be construed at various time-courses ranging from fleeting impulses to life-long ambitions. Little (2008) notes, for example, that personal

Explaining Enduring Changes in Trait Expression

We now turn our attention to the processes that might explain longer-term changes in one's personality⁸. There is a large body of research describing how traits develop across the lifespan (e.g., Caspi et al., 2005; McAdams & Olson, 2010; Specht et al., 2014) and offering potential explanations—from genetics to culture—for both the general consistency and occasional changes in people's trait levels. There is also a growing interest in the possibility of volitional trait change (e.g., Hennecke et al., 2014; Hudson & Fraley, 2015; Roberts et al., 2017; Stieger et al., 2021) and potential pathways for people who want to intentionally alter one or more aspects of their personalities.

Returning once more to the density distribution model, enduring changes in trait expression would be represented not by movement from one point in the distribution to another, but instead by a change in the distribution's overall shape or location along a personality dimension. If the center of the distribution moved further to the right (or left), that would be indicative of an increase (or decrease) in one's average trait expression. Imagine a young adult who behaves somewhat conscientiously in their early 20s and acts increasingly so as they take on significant life responsibilities over the ensuing decade—their density distribution for conscientiousness would shift to the right as they spend a greater proportion of their time working hard and staying organized. Similarly, a person's distribution may grow taller and narrower (or shorter and wider) over time, which would signal there has been an increase (or decrease) in the consistency of their typical trait expression. Such changes in trait variability might appeal to someone who is emotionally stable most of the time, but prone to somewhat regular spikes of anxiety under certain conditions. It is not so much that they want to change their average or modal level of neuroticism, but instead that they want to decrease the frequency of undesired deviations from their norm.

As with processes that support temporary shifts in trait expression, numerous factors may influence the long-term stability and change in traits, as has been more extensively reviewed elsewhere. Here we describe two types of temporal processes that may be particularly relevant to behavior change: Repetition and roles/life events.

Repetition. The most basic process influencing enduring behavioral dispositions is repetition, a concept that to our knowledge appears in all major frameworks for understanding personality stability and change. In the TESSERA framework of adult personality development, for instance, traits are reinforced when similar “TESSERA sequences” (Triggering situations → Expectancies → States / State expressions → Reactions) are repeated over time (Wrzus & Roberts, 2017). Similarly, Whole Trait Theory posits that “upon repetition...state changes will lead to mechanism changes and ultimately shifts in density distributions” (Jayawickreme et al., 2019, p. 5). And recent research on volitional trait change reinforces this theme: Trait change goals can be achieved by the repeated enactment of trait-relevant behaviors (Hudson & Fraley, 2015; Hudson et al., 2019).

projects can range from mundane tasks like wanting to service the car to meaningful endeavors like improving one's moral character. Longer-term goal constructs like personal strivings (Emmons, 1986) and major life goals (Roberts & Robins, 2000) may influence not only how one behaves from moment to moment, but also how one's dispositions develop over time.

⁸ There is ongoing debate about whether personality change is synonymous with enduring trait-relevant behavior change or whether a more basic change in biological dispositions is necessary for ‘true’ trait change (Baumert et al., 2017). Because we are focused largely on the socio-cognitive explanations for traits (e.g., Geukes et al., 2017b; Jayawickreme et al., 2019), we adopt the view that an enduring change in trait expressions is likely to be reflective of at least some degree of change in a person's underlying disposition, even if that is not reflected in a biological change. Accordingly, we use the terms ‘enduring change in trait expressions’ and ‘trait change’ interchangeably.

In one sense, repetition of this kind can be thought of as a type of habit formation. Habits are behavioral dispositions that are defined as “implicit associations between contexts and responses that develop through repeated reward learning” (Wood, 2017, p. 1). Compared to traits, habits are (a) generally defined at a more granular level as an association between a particular situational cue and a corresponding action sequence, and (b) generally thought to be more automatic (i.e., habits comprise a very strong propensity to enact a particular behavior in the presence of a situational cue). That said, traits and habits share many similarities as psychological constructs, and repetition plays a role in both processes. Accordingly, Hennecke and colleagues (2014) have proposed that changes in behavior must become habitual in order to constitute a stable change in the corresponding personality trait.

Roles and Life Events. Another major theme in the personality development literature is the importance of key life events or phases that might afford or demand a change in personality. Much of the research in this area arises out of an interest in why personality tends to “mature” as people age (i.e., people become more agreeable, more conscientious, and less neurotic), particularly in the period from early- to middle-adulthood (Bleidorn et al., 2013). Multiple theories have been developed to explain this pattern (for a review, see Specht et al., 2014), but most of them include at least some focus on the role of key changes in life circumstances that people tend to experience during this time (e.g., education and career milestones, moving, getting married and/or divorced, etc.). For example, social-investment theory proposes that these life transitions push people into new social roles, and with those new roles come new expectations and norms for how one should behave (Roberts et al., 2005). In this view, the adoption of a new role creates an opportunity for personality change, while the maintenance of an existing role may contribute to consistency in one’s traits.

Other research in this area has focused on the impact of significant life events. Changes to one’s relationship or employment status likely bring about not only a change in one’s social environment, but also many other disruptions to one’s routines. Changes in context have been shown to disrupt even very strong habits (Verplanken & Wood, 2006; Wood, 2017), so it stands to reason that they might prompt changes to personality traits as well. Yet, as Denissen and colleagues (2019) have shown in a large, longitudinal study, the relationship between life events and personality traits is complicated. They did find some evidence for effects of key life events on trait change (e.g., parents tend to become less conscientious and more neurotic after the birth of their children). However, in accord with the kinds of person-situation transactions described earlier, personality traits also predict which life events people tend to experience (e.g., people who are more conscientious and less neurotic are more likely to get married). This can make it hard to disentangle effects of an event from effects of the disposition that lead one to the event. Moreover, some event-related changes in personality occurred in the months leading up to a big event, rather than after it. This reinforces the view that although life “events” are often pinned to a specific day (e.g., the first day of work, one’s wedding day), they loom large enough in our psychology, both before and after that milestone, to influence our enduring behavioral patterns.

Summary

In this section, we have reviewed a large body of research on personality processes, with a focus on some of the most widely researched socio-cognitive mechanisms of trait expression. These include social (*roles*), motivational (*goal activation*), cognitive (*situation perception*), and developmental (*life events*) processes, and there are many others beyond those discussed here (e.g., *affective processes*). In the aggregate, we refer to these processes as trait regulation, as they represent the means by which we experience and express our traits in different ways at different times—and how we might even change those traits for good.

Personality-Informed Intervention Design

We now return to the question of how insights from personality psychology can help intervention designers address each of the behavior-change problems described in our framework above. As we have shown in the previous section, personality characteristics (i.e., traits as well as other psychological individual differences) provide dispositional information about the likelihood that someone will enact a future behavior. Importantly, however, the way personality manifests in a person's behavior is subject to both (a) short-term fluctuations, such that characteristics are expressed to differing degrees in various situations, and (b) longer-term change, such that how a person typically behaves develops over their lifespan. These temporary shifts and enduring changes in personality expression can be explained, at least in part, by various trait regulation processes.

Drawing on this literature, we argue that behavior-change researchers should consider the disposition of their participants and the desired duration of change when designing their interventions. Specifically, although we acknowledge the need for further research, we argue that the literature reviewed above supports the following propositions:

1. Interventions will more effectively *facilitate counter-dispositional behaviors if they prompt deviations* from one's typical ways of behaving, either by increasing the perceived benefits and/or mitigating the anticipated costs of the target behavior; by contrast, interventions will more effectively *support dispositional behaviors if they constrain potential deviations* from one's typical ways of behaving, such as by providing reminders or removing temptations.
2. Interventions will more effectively *promote temporary shifts in behavior if they target short-term trait regulation processes* that have been shown to be the most proximal influences of individual behaviors (e.g., situational demands, goal activation). Conversely, interventions will more effectively *foster enduring changes in behavior if they target long-term trait regulation processes* that include a temporal mechanism to elicit the target behavior across time and contexts (e.g., repetition, roles).

In drawing these contrasts, we do not mean to imply that these strategies are mutually exclusive. Making a behavior easier or more appealing will increase its likelihood no matter how positive a person's disposition is toward it, and competing temptations can sometimes be an impediment to counter-dispositional behaviors. Similarly, long-term trait regulation processes like roles and repetition are relevant to many individual behaviors, and any effort to influence long-term behavior should plan for the fact that situations and goals will eventually change. Instead, what we mean to highlight are the essential components interventions need to include in each of these instances.

One way to understand why these are the most important components is to ask: Why is the participant unlikely to do this on their own, absent an intervention? Consider counter-dispositional behaviors as an example. As discussed in the previous section, prior research has shown that people find counter-dispositional behaviors to be effortful, and they are less likely to see the potential benefits in doing them. Accordingly, an intervention that merely reminds someone to do this, or that removes the temptation to engage in alternative behaviors, may not be sufficient. Therefore, we argue that intervention designers should include some mechanism for persuading the person of the likely benefits of the behavior, and/or a way of reducing the perceived effort involved. For dispositional behaviors, on the other hand, a lack of perceived benefits or an excess of anticipated costs is unlikely to be the main culprit. By definition, dispositional behaviors are those a person is already inclined to do. In these cases, the most likely explanations for why someone did not do them are because they didn't realize they could or should (e.g., because they were distracted by a pressing situational demand), or because they chose to do something else that served a competing goal or priority. Hence, we recommend that interventions targeting dispositional behaviors use strategies

that prevent factors such as these from getting in the way of the person following through on the target behavior.

Similar logic applies to our differing recommendations for temporary shifts vs. enduring changes in behavior. Here we can ask the question: What processes best explain individual behaviors, and which explain long-term patterns of behavior? As discussed in the previous section, the answers to these two questions do not perfectly overlap. The self-regulatory processes that explain variance in individual behaviors are things like situational demands and the activation of momentary goals, whereas those that explain variance in enduring patterns of behaviors (i.e., traits and other behavioral dispositions) are those that unfold over longer periods of time, such as repetition and roles. Therefore, we propose that interventions target the appropriate process given their goals.

Once again, we do not mean to suggest that a process like repeating a behavior many times to increase one's comfort with it will not increase the likelihood that someone will do it in a particular instance. In many cases it will. However, it may not matter how much practice someone has had with a behavior if an unexpected situational demand or competing priority arises at the exact moment they need to enact it. Conversely, a person's enduring pattern of behaviors might be influenced simply through repeating the kinds of short-term interventions that influence individual behaviors in perpetuity. But such an approach will often be impractical, and may not always be effective (e.g., if people adapt to or abandon the intervention). Thus, we advise intervention designers to focus on short-term trait regulation processes when targeting individual behaviors, and to leverage long-term trait regulation processes when the goal is to shape a broader pattern of behaviors over time.

As we noted earlier in the paper, looking at the two dimensions of disposition and duration together creates a classification of four common types of behavior-change problems (see Figure 1). Below we describe each of these problems in more detail and provide suggestions for how interventions can address them based on these propositions. We present an example of an intervention that addresses each type of behavior-change problem in Table 1, and Figure 3 shows how interventions can offer solutions by influencing the corresponding trait regulation processes.

Four Paths to Behavior Change via Trait Regulation

Figure 3. Interventions can address different types of behavior-change problems by influencing different types of trait regulation processes. Interventions that target individual behaviors should engage the short-term trait regulation processes that constrain (*trait adherence*) or enable (*trait enactment*) temporary deviations from one's typical ways of behaving. Interventions that seek to influence enduring behaviors, on the other hand, should influence long-term trait regulation processes that promote consistency (*trait reinforcement*) or development (*trait change*) of one's behavioral dispositions.

Ensuring Dispositional Behaviors through Trait Adherence and Trait Reinforcement

The easiest interventions are likely to be those that are designed to ensure someone *temporarily* acts in a way that is *well-aligned with their personality*, which we describe as a process of *trait adherence*. In these cases, the goal of the intervention is to ensure someone follows through with a dispositional behavior by preventing inopportune deviations from what they would normally be inclined to do. For instance, ethical blind spots (Sezer et al., 2015) and unethical temptations (Fishbach & Woolley, 2015) can leave people who are usually virtuous susceptible to unintentionally acting against their own values at times. Similarly, as discussed earlier, healthcare workers who are otherwise dedicated to protecting their patients' lives will sometimes skip the hand hygiene routines that play an important part in that goal. Drawing on the propositions we outlined above, the most effective strategies for trait adherence interventions are likely to be those that target short-term trait regulation processes (e.g., situational demands, goal activation) to (a) limit the influence of contextual factors that may tempt people to act out of character (Sheldon & Fishbach, 2015), and/or (b) to provide cues to promote expression of the relevant characteristic (Tett & Burnett, 2003). An example would be the use of a sign (a situational cue) to remind healthcare workers of a trait-relevant goal (protect your patients) to encourage an occupational safety behavior (hand-washing) at precisely the moment needed (when using the bathroom; Grant & Hofmann, 2011).

A similar but somewhat more difficult behavior-change problem is figuring out how to increase the long-term consistency of behaviors that are adopted on occasion, but not with enough regularity. For example, as discussed earlier, researchers have been interested in identifying interventions that would encourage one-time blood donors to become regular donors (Sinclair et al., 2010). Similarly, many people value healthy eating and exercise enough to do them on occasion, but not enough to turn them into durable habits (Wood & Neal, 2016). The question in such cases is whether an

intervention can increase the consistency of a dispositional behavior, a process we refer to as *trait reinforcement*. As with trait adherence, trait reinforcement is a process that ensures an existing disposition translates into behavior. Similarly, then, interventions to promote trait reinforcement should increase the salience of relevant aspects of one's personality and/or should constrain the influence of disruptive contextual factors. Here, though, the challenge is finding a way to not only ensure someone does the right behavior in the right place at the right time (as in the hand-washing example), but also to reinforce the motivational and contextual factors that encourage repetition of the behavior over time. To do that, interventions should target longer-term trait regulation processes, such as by increasing the salience of one's identity in relation to the pursuit of the present goal (Oyserman et al., 2017).

Enabling Counter-Dispositional Behaviors through Trait Enactment and Trait Change

As mentioned earlier, the majority of behavioral interventions are designed to encourage people to do things they would typically not do, even if they know they probably should. Whereas trait adherence and trait reinforcement processes are aided by the presence of a positive disposition, the challenge of encouraging counter-dispositional behaviors is figuring out how to overcome an aversion to the behavior in question. People are likely to see counter-dispositional behaviors as unappealing and/or difficult, so here the goal of an intervention is not to prevent deviation from one's typical trait expressions, but rather to enable it.

This may not be so difficult in the short-term process of *trait enactment*, where the aim is merely to stretch oneself temporarily outside of one's comfort zone in order to enact a counter-dispositional behavior. People can act out of character for at least brief periods of time merely when instructed to do so (e.g., Fleeson et al., 2002; Zelenski et al., 2012), or when they think it will help them achieve a short-term goal (McCabe & Fleeson, 2016). As with trait adherence, then, interventions to support trait enactment should also target short-term trait regulation processes, like situational processes or goal activation. Rather than reminding people of their usual motives, however, these interventions are likely to be more effective if they appeal to or activate goals that are salient in that particular moment. For instance, if you want an undergraduate with a normally unhealthy diet to choose vegetables when they are standing in line at the cafeteria, you will likely have more success if you remind them how tasty and enjoyable vegetables can be than if you try to appeal to concerns for their long-term health (Turnwald et al., 2019).

Enabling sustained counter-dispositional behaviors, which we refer to as *trait change*, is much more difficult. This involves changing someone's repeated behaviors, which results in a transformation of at least some portion of their disposition. To achieve trait change, then, an intervention will need to influence long-term trait regulation processes in a way that provides sustained motivation to act out of character and/or that disrupts person's context in a way that enables deviation from their typical ways of behaving. Given this challenge, interventions to promote trait change may need to incorporate multiple components that are introduced sequentially based on the needs and progress of each individual (e.g., Allemand & Flückiger, 2017; Almirall et al., 2012). The self-regulatory processes that prompt behavioral initiation are not always the same as those that support behavioral maintenance (Rothman et al., 2004). For example, in the early stages of goal pursuit, motivation increases when people are reminded of how much progress they have already made (Koo & Fishbach, 2008). As commitment to the goal increases, though, progress feedback becomes less helpful, and reminders of how much work there still is to be done becomes more motivating instead. Whereas short-term trait enactment may be achieved through the activation of short-term goals, trait change may require a way of providing people with tools that will help them self-manage their motivation over time (e.g., Scholer et al., 2018).

Applications

The primary way in which we think this framework can be useful to intervention designers is by providing a structured way of thinking through which strategies are likely to be most effective for the particular behavior-change problem they are trying to solve. As noted earlier, it can be difficult to know which of the hundreds of promising intervention techniques (e.g., Abraham & Michie, 2008; Duckworth et al., 2018; Knittle et al., 2020; Roberts et al., 2017) might work best in a given context. By considering the questions posed in this paper, however, intervention designers can make more informed choices about how their interventions should work.

As an example of how this could work in practice, we would argue that an intervention targeting a counter-dispositional behavior needs to include a stronger mechanism for increasing the motivation to act than it would for a behavior that is relatively dispositional. This could include strategies like motivational interviewing (Martins & McNeil, 2009), temptation bundling (Milkman et al., 2014), or mental contrasting (Adriaanse et al., 2010), all of which have been shown to influence motivational processes. Similarly, as discussed earlier, if the goal is to alter a pattern of behaviors over time, then we would argue that the intervention needs to include a temporal component that influences behavior beyond the initial moment of the intervention. This might include a strategy for boosting a person's competence with the behavior (Hertwig & Grüne-Yanoff, 2017), techniques to foster habit formation (Verplanken & Wood, 2006), or the engagement of a recursive psychological process, as in "wise" interventions (Walton & Wilson, 2018).

More generally, there may be opportunities to integrate classifications of intervention techniques with this framework. Recently, Duckworth and colleagues (2018) proposed that interventions be classified loosely based on whether they were (a) self-initiated through deliberate action or deployed by others (with or without the target's awareness), and (b) whether they modified participants' cognitions or altered features of the situation and environment. For instance, given that counter-dispositional behaviors are, by definition, poorly aligned with people's typical ways of thinking and behaving, it may make sense in such cases to use situational and/or other-deployed techniques that do not depend on participants' deliberate actions. On the other hand, people may be more readily able to self-deploy cognitive strategies that help them adopt behaviors that are more closely aligned with their personality. In making these suggestions, it is important to reiterate that our proposed framework should be treated as a guide rather than a definitive taxonomy. Sometimes a self-deployed intervention is the only available option, and we are not suggesting that such approaches will never work for counter-dispositional behaviors. When multiple intervention techniques are equally viable, however, our framework can help decide which is most likely to work.

Identifying Alternative Behavioral Paths to the Same Outcome. A second way this framework might help is by encouraging the consideration of different behavioral paths to the same desired outcome. In most areas of behavior-change research, the final outcome of interest is not the behavior itself, but some broader outcome that stems from it (e.g., exercise → health, studying → learning, etc.). The principle of equifinality applies here, in that these kinds of outcomes can be achieved through many behavioral pathways, and some paths may be easier to navigate than others. For example, if the goal of your intervention is to improve financial savings, you might attempt to do so by educating people on financial literacy (Lusardi & Mitchell, 2014) or by encouraging them to enroll in a program that will automate future savings decisions (Thaler & Benartzi, 2004). The latter leverages the relative ease of temporarily shifting behavior to achieve similar outcomes as a broader educational intervention, but with less time and effort. However, such temporary behavioral shifts are unlikely to generalize to other behaviors that determine a person's overall savings (e.g., discretionary spending). A financial literacy program might have broader impact, by comparison. Depending on their aims and

resources, intervention designers can consider these trade-offs to determine which approach is most appropriate for their needs.

Creating Adaptive Interventions. Finally, this framework highlights opportunities for creating adaptive interventions that are tailored to an individual. There are many examples of behavioral interventions that use a baseline personality assessment to individually tailor which treatment a person receives (e.g., Chapman et al., 2014). Typically, participants may first be asked to complete an initial assessment of relevant personality characteristics that is then used to include intervention components that are most appropriate to that individual. This can be done programmatically in the case of interventions that can be delivered online, which includes activities ranging from brief reflection activities (e.g., implementation intentions; Gollwitzer & Sheeran, 2006) to hour-long courses that incorporate a variety of media and interactive components (e.g., online diversity training; Chang et al., 2019). This kind of personalized intervention approach has been used to more effectively tailor marketing (Hirsh et al., 2012) and recruitment messages (Clary et al., 1994), and can be readily extended to other interventions.

One limitation of the prevailing approach to personalized interventions is that they generally assume that people's personality will not change, even if their behavior does. Our framework's emphasis on the dynamic nature of trait expression highlights the possibility that interventions could be designed to adapt to each individual participant as they change over time. This notion has been tested in some sequential multiple assignment randomized trial (SMART) designs (Almirall et al., 2012), as well as in studies of just-in-time adaptive interventions (JITIs) that leverage mobile technology to gather information about a person's current psychological state and deliver tailored, momentary interventions (Nahum-Shani et al., 2018). In this way, the goal of long-term trait change may be achieved by designing a sequence of programmatic interventions: First, an intervention would try to solve the problem of trait enactment by helping people adopt a counter-dispositional behavior temporarily. Then, as that behavior becomes somewhat more typical, a second intervention could encourage them to express that emerging disposition in other specific circumstances (trait adherence). Finally, a third intervention could attempt to strengthen that disposition in a way that makes the behavior a consistent part of the person's routine (trait reinforcement).

Challenges

The framework we have outlined here should not be seen as a rigid and comprehensive taxonomy—there may be other important dimensions along which behavior-change problems can be classified, and it may not always be clear which type of trait regulation is required. For instance, our framework presents four categories of trait regulation even though the two dimensions that form the basis of this framework—disposition and desired duration of behavior change—are fundamentally continuous constructs. Some intervention designers may wish to influence behavior for intermediate durations, in which case it might be difficult to determine whether to do so through short- or long-term trait regulation processes. Accordingly, we introduce this as a conceptual model for taking a structured, personality-informed approach to the design of interventions while acknowledging that there are important limitations to bear in mind.

Identifying Relevant Characteristics. A key part of our framework centers on the relationship between the specific behaviors that are the focus of an intervention and someone's standing on a relevant feature of their personality. However, there is no one-to-one mapping of which personality features might be relevant to which behaviors. For example, someone might choose to volunteer because they are compassionate or because they want to socialize (Clary et al., 1994; Stukas et al., 2016). Researchers and practitioners can draw inferences from research that examines the prototypical behaviors associated with different personality traits (Chapman & Goldberg, 2017) and

values (Skimina et al., 2019), but in some contexts it may be difficult to identify the most pertinent characteristics. If reliable information about the personality predictors of the target behavior is not available, we encourage researchers to start with a cross-sectional study to identify these associations before designing their interventions, as is sometimes done in person-based approaches to digital health interventions (Yardley et al., 2015).

Group-Based Interventions. Even when personality predictors of the target behavior are available, it can be difficult to use that information in contexts where an intervention is being deployed to a group (e.g., healthcare workers; truck drivers; first-time voters) rather than an individual. Although personality questionnaires are relatively easy to administer once the relevant constructs have been identified, it is not always practical to collect individual-level data. It is rarer still to have the opportunity to collect the kind of intensive longitudinal data necessary to characterize within-person personality dynamics. Further, even when person-level information is available, there may not be a feasible way to deliver individualized content. Although the technologies that support the kinds of adaptive interventions discussed earlier are likely to become more accessible in the near future, for now many interventions will need to be deployed more broadly, without any means for individual differentiation.

In such cases, we propose that intervention designers may still be able to apply our proposed framework by making inferences about the likely personality characteristics of their target group given the available information. For instance, as noted earlier, it might be reasonable to assume that most healthcare workers will have relatively prosocial dispositions (Lievens et al., 2009), although there is bound to be significant within-group heterogeneity. Using that information, researchers were able to design an effective intervention to encourage hand hygiene, tailored to the dispositional profile of a typical health worker (Grant & Hofmann, 2011).

Matching Intervention Techniques to Processes. Our approach advises intervention designers to choose strategies that will engage the appropriate trait regulation processes for the type of behavior-change problem they are trying to solve, yet we have not provided a comprehensive review of such processes. There are many other processes that have been proposed to play important roles in shaping both short- and long-term trait expression beyond those that we have discussed here. For example, psychotherapeutic approaches to trait change suggest that self-reflection may be an important process for facilitating long-term behavior change (Allemand & Flückiger, 2017).

Further, although we have proposed that different types of intervention strategies are likely to be better suited for certain types of behavior-change problems, we do not claim that there is a one-to-one mapping between intervention techniques and types of trait regulation. For example, in the context of promoting class attendance (Webb et al., 2007), setting implementation intentions facilitated trait enactment for students low in conscientiousness (i.e., it helped them temporarily behave more conscientiously), but it did not promote trait adherence for students high in conscientiousness. We suggested earlier that this may have been because class attendance is more effortful for less conscientious students, so a guided planning activity could make it easier for them. In another context, however, an implementation-intentions intervention might help conscientious individuals be more planful in addressing another behavior-change problem. For instance, setting implementation intentions has been shown to be useful in promoting one-time behaviors like voting (Nickerson & Rogers, 2010) and flu vaccination (Milkman et al., 2011). We suspect that implementation intentions could help conscientious individuals make contingency plans for potential events (e.g., bad weather, getting a cold) that could derail them from their plans (i.e., the intervention could promote trait adherence).

Although it would be very helpful if intervention techniques could be mapped directly and exclusively onto specific trait regulation processes, the flexibility with which they can be implemented renders that impractical. For example, the planning interventions we have been discussing generally target volitional processes (i.e., whether people will follow through on their intentions), but in some cases they have been paired with a mental contrasting exercise to add a stronger motivational component to the intervention (Adriaanse et al., 2010; Duckworth et al., 2013). Given the breadth and depth of the behavior-change literature, it will often be possible to find examples of someone who has adapted an intervention strategy to address a behavior-change problem in a counter-intuitive way. This limits our ability to provide a menu-like set of recommendations for which strategies will address which types of behavior-change problems. But it also suggests that researchers may be able to find creative ways of adapting common intervention techniques to the challenge they have at hand by modifying components of the intervention. Of course, not just any adaptation will be helpful: Adding a stronger motivational component to a volitional intervention when trying to encourage counter-dispositional behavior seems prudent; incorporating a habit formation technique when to temporarily shift an individual behavior seems unnecessary. By drawing on the propositions described above, researchers can make principled choices about which adjustments are likely to help and which will not.

Conclusion

In this paper, we have shown how personality dynamics and processes can inform the design of interventions to change behavior. Because personality reflects patterns in people's typical psychological states, it provides useful information about the degree of alignment between a target behavior and the person whose actions you are trying to influence. However, this degree of fit between a person and a behavior is not static—a person's trait expressions vary considerably in the course of their daily lives as a function of various situational factors and intra-personal processes, and sometimes change in a more enduring way over time. Accordingly, personality should be used not only to understand *for whom* an intervention is likely to be effective, but also to guide *how* we design interventions in the first place. Research that helps people change their behavior has great potential to improve the quality of lives. Taking a personality-informed approach to intervention design can help that potential become more of a reality.

Table 1*Examples of Behavioral Interventions that Engage Different Types of Trait Regulation*

Behavior-change problem	Reference	Target Behavior / Population	Form of Trait Regulation	Description
Individual dispositional behavior	Grant & Hofmann, 2011	Hand-washing / Healthcare workers	Trait Adherence	This intervention encouraged an individual behavior (hand-washing) that was dispositional for its target audience (healthcare workers, who tend to hold prosocial values) by using a situational cue (a sign) to activate a trait-relevant goal (protecting patients from getting sick)
Enduring dispositional behaviors	Sinclair et al., 2010	Repeat blood donations / Recent donors	Trait Reinforcement	This intervention encouraged an enduring behavior (future blood donations over the ensuing 12 months) that was dispositional for its target audience (recent blood donors) by using a motivational interview to address potential barriers or concerns that might discourage them from repeating their behavior
Individual counter-dispositional behavior	Sheeran and Orbell, 2000	Cervical cancer screening / Women who previously delayed appointments	Trait Enactment	This intervention encouraged an individual behavior (attending a cancer screening appointment) that was counter-dispositional for its target audience (women who had previously delayed such appointments) by having them set implementation intentions that would help them overcome obstacles to their attendance (anticipated situational demands)
Enduring counter-dispositional behaviors	Eskreis-Winkler et al., 2016	Deliberate practice / Low-achieving students	Trait Change	This intervention encouraged an enduring behavior (deliberate study practices up to one month later) that was counter-dispositional for its target audience (low-achieving students) by teaching students a skill (a boost) and prompting them to reappraise any self-limiting beliefs about the value of practice

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