Modeling the mind: Assessment of *if...then...* profiles as a window to shared and
idiosyncratic psychological processes

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Abstract

People's behavior is characterized by stable *if...then...* profiles, or *if* in x situation *then* behavior a , but *if* in y situation *then* behavior b . But how do researchers conceptualize and measure *if...then...* profiles? Drawing from Cognitive-Affective Processing System (CAPS) theory, we discuss recent developments in assessing *if...then...* profiles, and how such profiles can provide a window for elucidating key aspects of the underlying personality system. Specifically, the Highly-Repeated Within-Person (HRWP) approach assesses how a behavior varies as a function of key features in a situation, and operationalizes *if...then...* profiles as regression betas. We illustrate how the HRWP approach can be applied to data from often-used social cognitive tasks, wherein an individual is exposed to a large number of situations that differ on a dimension that has been experimentally-manipulated by the researcher, and their behaviors to the situations are tracked. The HRWP approach allows researchers to more precisely assess a given individual's *if...then...* pattern, make stronger causal inferences about a given individual's personality system, and empirically investigate, rather than simply assume, if there are meaningful differences between individuals in the causal processes.

Keywords: psychological processes; personality dynamics; causal inference; person perception

Introduction

“I do not react to some absolute reality, but to my perception of this reality. It is this perception which for me *is* reality.” (Carl Rogers, 1951)

As noted by Rogers (1951), people do not respond to some objective reality, but instead respond to their construed reality. Naturally, researchers have long sought a more accurate representation of the mind that can account for how a person perceives, interprets, and responds to their world. In social and personality psychology, a central focus has been on the role of psychological processes, such as encodings, affects, goals, beliefs, and expectancies, in shaping how individuals construct their worlds (Dewey, 1894; Cooley, 1902; James, 1890; see also Adler, 1930; Allport, 1937; Bandura, 1986; Fishbein & Ajzen, 1974; Heider, 1958; Horney, 1937; Kantor, 1924; Kelly, 1955; Kelley, 1973; Lazarus, 1991; Lewin, 1935; Murray, 1938; Rotter, 1954; Syngg & Combs, 1949; Rogers, 1951). Such psychological processes are assumed to account for why people differ from one another (between-person, trait-level differences). But to the extent that psychological processes are differentially activated in different situations, they also account for why a given individual’s experience and behavior varies from one situation to another (within-person patterns, intraindividual patterns).

Drawing from the Cognitive-Affective Processing System (CAPS) theory, we describe how one approach to gaining an understanding of a person’s mind is by studying how a person’s behavior varies in response to the particular features of situations. Original work (Shoda, Mischel, & Wright, 1994) on *if...then...* profiles served as a proof of concept about the ecological validity of such patterns, and how they provide insight into a person’s encodings, attitudes, values, goals, expectations, and strategies (see also Shoda, 1990; Shoda, Mischel, & Wright, 1989, 1993a, 1993b, Wright & Mischel, 1987, 1988). Nonetheless, these studies were

labor intensive. In the present chapter, we discuss the Highly-Repeated Within-Person (HRWP) approach as a way of assessing *if...then...* profiles in a less labor-intensive manner. The HRWP approach tracks how an individual's behavior varies across a large number of situations and aims to identify the features of the situation that affect behavior. Past work has mostly used correlational approaches wherein aspects of situations were not experimentally manipulated, and attempted to identify features of situations in a bottom-up, data-driven fashion.

In the present chapter, we demonstrate how the HRWP approach can be used when psychological features are experimentally manipulated after they have been identified *a priori* using a top-down, theory driven approach. The experimental nature of the research design allows for stronger causal inferences about the features of the situations that give rise to behavior. The use of theory to derive *a priori* features of situation also makes the study of *if...then...* profiles less labor intensive. Indeed, many experiments, for example, in social cognition, already collect a large number of responses for a given individual. The HRWP approach—when applied to social cognitive tasks that are designed to assess psychological processes—provides a tool to more precisely understand the effects of the particular features of situations that may be important for the occurrence of a behavior. We demonstrate how data from often-used experimental designs can be analyzed from a HRWP approach to provide information about the psychological processes relevant for an individual.

The chapter is organized around five sections. We begin in the first section with an anecdotal illustration of how the lay person may observe another person's behaviors across diverse situations and infer the person's mental states, and how such observations can be simulated by researchers. In the second section, we provide a brief description of the CAPS framework and original work identifying stable *if...then...* profiles, which provides the

theoretical foundation for the rest of the chapter. In the third section, we describe the Highly-Repeated Within-Person (HRWP) approach, which can be more efficient and less cost intensive for assessing each individual's *if...then...* profiles. We discuss previous instantiations of the HRWP approach, which have used a data-driven, bottom-up approach for identifying features of situations and compare it to the present application, which uses a theory-driven, top-down approach. In the fourth section, we reanalyze data collected in a social cognitive study on snap judgments of unknown others to illustrate how the HRWP approach can be used in a top-down way within an experimental design wherein a researcher manipulates the features present in the situations. The experimental nature of this approach allows for stronger causal influence about the psychological processes giving rise to behavior. Additionally, because the social cognitive task assesses a person's reflexive evaluations of unknown others, the HRWP approach, including data analytic recommendations, sheds light on psychological processes within a person's CAPS network. Finally, in section five, we describe the implications of studying *if...then...* profiles for understanding the mind, how the HRWP approach illuminates shared and idiosyncratic psychological processes that are typically obscured using standard data analytic approaches, and potential directions for future research.

Mental Inference in Daily Life: An Anecdotal Illustration

Given that psychological processes are not directly observable, how does one gain access to a person's mind? Consider how in daily life people develop models of other people. A person might observe another's behavior and observe how they generally behave. Kevin might observe his best friends: Serena and Lisa. Serena generally is comfortable when interacting with others, whereas Lisa is generally more guarded. But Kevin also notices *patterns* in how his two best friends behave in different situations. Although Serena is generally comfortable with most

people, smiling and easily having a conversation, with other people, she seems less comfortable, more reserved and guarded. Likewise, Although Lisa is generally more guarded, with certain people, she seems to relax and feel at ease. Having observed Serena and Lisa across different situations, Kevin might develop a more nuanced understanding of his two closest friends. He might infer that Serena is particularly comfortable and trusting when she is interacting with people who appear to come from a similar rural Midwestern upbringing, and less comfortable interacting with people who come from a more urban, coastal upbringing. Kevin might also think that Lisa is particularly comfortable with people who are from her ethnic and racial identity. Ultimately, Kevin's understanding of his friends' minds may lead him to make astute predictions about how they will act, and who they will like, in the future.

This anecdotal story illustrates four points that are central to the present chapter. One, perceivers often notice stable *if...then...* profiles (Kammrath, Mendoza-Denton, & Mischel, 2005; Shoda, Wright & Mischel, 1993b; Wright & Mischel, 1988). Two, perceivers use these observable patterns to make inferences about the unobservable psychological processes that may give rise to those patterns; for example, perceivers implicitly develop a model of a person's mind, inferring their goals, attitudes, and expectancies, and other psychological processes (Idson & Mischel, 2001; see also Heider, 1958; Jones & Davis, 1965; Kelley, 1967; Krull & Erickson, 1995; Malle & Knobe, 1997; Shoda & Mischel, 1993). Three, knowledge about a person's mind allows perceivers to make predictions about how that person is likely to behave in novel, not-yet-encountered situations (Vazire & Mehl, 2008). Given that Kevin knows that Serena tends to feel more comfortable with Midwesterners, he might expect that the next time Serena is at a social gathering meeting new people, she might naturally gravitate towards people from America's Heartland. Fourth, and related to the central goal of this chapter, ultimately, perceivers cannot

know if their model is correct without conducting some sort of experiment wherein the psychological feature is manipulated. Perhaps Kevin has seen Serena interact with fellow Midwesterners in social gatherings, and sees her interact with more Metropolitan individuals at formal work events. Thus, he may be wrong about the reason for her behaviors. For Kevin to have more certainty in his causal model, he would have to introduce Serena to some fellow Midwesterners in one instance, and introduce her to Metropolitans in another. This way, he could become more confident about the reason for her behaviors.

In the present chapter, we will describe how researchers can use the Highly-Repeated Within-Person approach—a systematic version of what lay people do when observing *if...then...* profiles—to make inferences about a person’s mind. Moreover, it is possible to experimentally manipulate features of situations to obtain stronger evidence of the causal role of theorized features. Before doing so, we describe a social cognitive conceptualization of the mind, which is theorized to underlie consistent and stable *if...then...* profiles as well as for between-person, trait-like differences.

Cognitive-Affective Processing System (CAPS) theory: Basic principles

Informed by cognitive and neural network models of the mind, theoretical frameworks such as the Cognitive-Affective Processing System (CAPS) theory (Mischel & Shoda, 1995; Shoda & Mischel, 1998) conceptualize a person’s “mind” as a network of cognitions and affects that mediate the effect of a situation on behavior. Importantly, these approaches provide a framework for understanding the psychological bases for differences *within* a person as well as differences *between* people (Mischel & Shoda, 1995, 1998, 2008; Shoda, 1999, 2004; Shoda & Mischel, 1998; Shoda, Mischel, & Wright, 1994; see Fleeson, 2007a; Fleeson, 2007b; Fleeson, Malanos, & Achille, 2002; Wood & Brumbaugh, 2009 for other interactionist frameworks).

The CAPS network

A premise of the CAPS approach is that each person has a unique and stable network of cognitions and affects that mediates the effect of the situation on behavior. To illustrate, the top, left panel of Figure 1 provides a schematic representation of the network of a hypothetical individual: Person 1. The circles inside Person 1's "mind" represent interrelated psychological processes that have long been of interest to personality and social psychologists. These include processes, such as encodings and construals (of self, other people, situations), expectancies and beliefs (about outcomes and of one's own self-efficacy), affective and physiological responses, goals (that motivate behaviors towards certain outcomes and affective states), and competencies and self-regulatory strategies (of how to achieve desired goals). The associations among such cognitive-affective processes within a person's network are represented with arrows within the network, and the strength and patterning are assumed to be stable over time and across situations. Returning to our example of Serena, we might understand Serena's general tendencies of getting along with others by gaining insight into her expectations and beliefs about others' intentions.

The “Mind” As a Network of Cognitive-Affective Units

Figure 1. Schematic representation of the Cognitive-Affective Processing System (CAPS) for two hypothetical individuals (i.e., Person 1 and Person 2). Each person’s mind is conceptualized by a stable network of interconnected cognitions and affects that mediates the effect of the situational features on behavior. Solid lines within and outside of the network represent excitatory associations (e.g., activation of one cognition automatically activates associated cognitions). Dotted lines within and outside of the network represent inhibitory associations (e.g., activation of one cognition makes it more difficult to activate associated cognitions). In the above illustration, situations (Situation A vs. B) are conceptualized as nominal, distinct categories.

Each person’s unique network is expected to account for how their behavior varies across situations—that is, their within-person variability. Although the network (i.e., the organization among available cognitions and affects and their interconnects) remains stable, the particular cognitions and affects that are activated at a given moment depend on the features of the situation encountered. To illustrate, the top and bottom left panels of Figure 1 both provide a schematic representation of Person 1’s mind as this person encounters two different situations (situation A and situation B). The CAPS network itself may be completely unchanged in terms of the available cognitions and affects and their pattern of associations. However, the particular cognitions and affects activated differ depending on the situation. In other words, not all

cognitions and affects within a network are active in all situations. Instead, based on principles of *accessibility*, a subset of cognitions and affects become temporarily accessible depending on the features in the situation. Consequently, as individuals encounter different situations, the psychological processes that are activated within the network differ, and the active cognitions and affects are expected to influence the corresponding behaviors that become expressed.

Returning to our illustration, we can understand variability in Serena's behavior by thinking about the different thoughts that are activated in each situation. One psychological process that differs across situations is the self-schema. People have multiple self-schemas and the particular schema activated in one situation depends on the features of situations, and affects how one behaves (Andersen & Chen, 2002; Baldwin, 1992). Given that Serena grew up in the Midwest, but went to college and graduate school in NYC, she has both a Midwestern and Metropolitan schema available in her network. But being in a situation with other Midwesterners may activate her own Midwestern self-schema, leading her to be friendly and warm. But being in a situation with other more Metropolitan individuals activates her NYC self-schema.

Additionally, her network may also reflect her general preferences for Midwesterners over Metropolitans. More concretely, if we were to apply this to Figure 1, we can think of Person 1 as Serena, situation A as meeting Metropolitans, situation B as meeting Midwesterners, and the behavior as friendliness and warmth. In this fashion, CAPS theory provides a framework for understanding how a given person's behaviors vary across situations (see Zayas, Shoda, & Ayduk, 2002; Shoda & Smith, 2004; Mendoza-Denton & Mischel, 2007; Kross, Shoda, & Mischel, 2010; Ayduk & Mendoza-Denton, 2021). *If* meeting Metropolitans, *then* Serena is guarded, but *if* meeting Midwesterners, *then* Serena is friendly.

Importantly, every person has a unique and distinctive CAPS network, reflecting that individuals differ from one another in biologically-based predispositions as well as learning histories. As illustrated in the right panel of Figure 1, the network of a different person, Person 2, is assumed to differ in the availability of cognitions and affects within each person's network, and the accessibility of these cognitions and affects. Returning to our example of Serena and Lisa, we might explain their general tendencies by understanding chronic expectations they have of others. Whereas Serena tends to expect that others have good intentions, Lisa tends to have more suspicion about others' motivations and intentions. Networks between people also differ in the pattern of associations within the network (i.e., how cognitions and affects are linked with one another), as well as the strength of associations among available cognitions and affects, which determines the ease with which a given part of the networks is activated (e.g., accessibility). Differences in the structure of networks are expected to account for individual differences in overall tendency to engage in a particular behavior. They also account for differences in patterns of behaving across situations. As such, the CAPS framework can be used to understand between-person, trait-like differences reflecting differences in the ways people generally behave. Specifically, as illustrated in Figure 1 by comparing the top left and top right panels, even when faced with the same objective situation (situation A), two people with different networks will respond to the situation differently. Further, these differences in behavior are assumed to arise because of different ways of construing the situation, reflected in different patterns of activation among available cognitions and affects.

Original conceptualization and measurement of *if...then...* profiles

A basic premise of the CAPS approach is that each person's network accounts for predictable *if... then...* profiles. For nearly 100 years, the field has known that individuals vary

considerably within themselves. Hartshorne and May (1928) showed that school aged children who cheated on an exam, a behavior presumably reflecting the trait of dishonesty, were only moderately more likely to lie to a teacher, another behavior also presumably reflecting the trait of dishonesty. Across diverse types of behaviors, such as talkativeness, dependency, and impulsivity, there was considerable within-person variability across different situations (e.g., taking an exam, talking to a teacher; see Fleeson & Leicht, 2006; Fournier, Moskowitz, & Zuroff, 2008; McCabe & Fleeson, 2016; Minbashian, Wood, & Beckmann, 2009; Miner, Glomb, & Hulin, 2005; Newcomb, 1929; Ross & Nisbett, 1991; Röcke, Li & Smith, 2009). Although this variability was originally viewed as problematic for the construct validity of personality, it turned out that at least some of the within-person variability was not just random noise to be ignored, but stable and reliable within-person behavioral patterns.

Some of the early evidence that within-person behavioral patterns are stable and meaningful was obtained in a study of children at the Wediko residential summer camp (Shoda, 1990; Shoda et al., 1989, 1993a, 1993b, 1994; Wright & Mischel, 1987, 1988). Hours of observations revealed that each child's aggressive behaviors were systematically related to features in his or her situation. For example, for some children, the situational feature (*if*) was being teased by peers, and this reliably elicited high levels of aggressive behavior (*then*), but being reprimanded by a counselor did not. Other children showed the opposite pattern: being reprimanded by a counselor (*if*) elicited high levels of aggressive behaviors (*then*), but being teased by peers did not. Thus, each child was characterized by a unique 'behavioral signature,' or *if ... then ...* profile, where the *if* referred to the particular feature present in the situation (e.g., *if* teased by peers, *then* the child is aggressive). Most importantly, these situation-behavior profiles proved to be highly stable over time; the child who showed the '*if* teased by peers, *then* behave

aggressively' pattern during one half of the summer session showed a similar *if... then...* profile in the second half of the summer session.

Importantly, these studies introduced an advancement in the conceptualization and measurement of situations, or “*ifs*.” Earlier studies (e.g., Hartshorne & May, 1928; Newcomb, 1929) used discrete nominal categories, describing the nominal situation where a behavior occurs (e.g., playground, cafeteria, or classroom). This nominal approach to conceptualizing situations is illustrated in Figure 1, where Situation A is categorially distinct from Situation B. But, such conceptualizations limit the generalizability of findings. When situations are conceptualized as discrete nominal categories, observations about past behavior in one nominal situation are useful in predicting behavior only in that exact situation, but cannot be used to predict behavior in categorically distinct situations. For example, if a child is aggressive at the playground, one can predict that when the child is at the playground again in the future, then the child is likely to be aggressive. But, observations about a child’s aggressive behaviors at the playground provide little information about how the child would behave in categorically distinct situation, such as the cafeteria. In short, a nominal approach to conceptualizing situations provides no principled basis for generalizing observations from one situation to another; and, it says little about *what* aspect of a situation triggered a particular behavior.

Ultimately, researchers are *not* interested in the “nominal” situations in which behaviors occur; instead, they are interested in the “feature” of a situations that gives rise to a particular behavior. The Wediko summer camp studies conceptualized situations, or “*ifs*,” in more molecular terms, or as *features* of situations that could occur across quite distinct larger units (or nominal situations). Thus, “peer tease” could be a prominent feature of larger, nominal situations, such as in the playground and the cafeteria (see Shoda et al., 1994 Table 2). By

understanding individuals' behavioral responses (i.e., *thens*) with regard to *features* of situations (e.g., the possibility of being teased by peers), observations made in one nominal situation (e.g., the playground) can be generalized to other similar nominal situations (e.g., the cafeteria) that share similar features. In short, by characterizing nominal situations with regard to situation features, this approach provided a principled way of generalizing observations of behavior from one situation to another, by characterizing both situations with regard to a common set of situation features.

A contemporary approach to conceptualizing *if...then...* profiles:

The Highly-Repeated Within-Person approach (HRWP)

Past work demonstrated the ecologically-validity of *if...then...* profiles as stable and distinct characteristics of each individual, and began to address the generalizability issue by conceptualizing situations (*ifs*) in terms of *features* rather than nominally. Still, several practical and theoretical challenges remained. First, at a practical level, the earlier work was resource intensive; it involved observing a person's behavior multiple times in a given situation, and across different situations (in the Wediko summer camp study, approximately 167 hours of behaviors were recorded for *each* child). Additionally, these behaviors and situations had to be coded. Many researchers do not have the time and money for such massive data collection and coding efforts.

Second, at a theoretical level, most situations have more than one feature for predicting whether a child is honest or dishonest, the goals salient in a situation may be an important situation feature, but it may not be the only situation feature that affect the likelihood of dishonest behavior; the expectations of the consequences of dishonesty activated by the situation, as well as the people in the situation, may also play a crucial role. Most behaviors arise from

perceiving a set of situational features, each of which might trigger a different psychological process. Thus, it is important to identify the effects of a set of psychological features, the extent to which some features have stronger effects compared to other features, and possible interactions among features.

Third, and relatedly, features of situation are rarely present in an all-or-nothing fashion. Some features vary on a continuum. For example, whether a person feels included or excluded is a feature that may be best captured on a continuum (Löckenhoff, Cook, Anderson, & Zayas, 2012). Moreover, the effect of some features, like arousal, are nonlinear (Duffy, 1957); so simply assessing behaviors as they occur in two situations that represent the end points of this continuum (low vs. high arousal) might fail to detect important the effect of situational features on behavior (Zayas, Sridharan, R.T. Lee, & Shoda, 2019).

Fourth, and not least, how exactly can researchers use observable *if...then...* profiles to enhance understanding of underlying psychological processes (i.e., a person's CAPS network) without falling prey to the propositional fallacy of affirming the consequent. That is, just because a unique CAPS network may account for stable observable *if...then...* profiles, does not mean that observable *if...then...* profiles reflect a particular CAPS. Two people can be characterized by the same observable *if...then...* pattern, yet still perceive the situation differently; the same *if...then...* pattern can emerge from the functioning of two quite distinct CAPS systems.

Returning to Serena and Lisa, it is possible that at a social event both Serena and Lisa smile and are engaged, but Serena's behavior may reflect that her affective responses to the people she is with and that she genuinely enjoys their company. Lisa, however, may be networking for new job opportunities and advancement. Her social demeanor is more motivated by her goals, rather than her genuine enjoyment of the social event. Given this challenge, how might researchers

begin to provide stronger, more direct assessment of the psychological processes associated with observable *if...then...* profiles?

Over the last two decades, we have made advances in addressing these practical and theoretical challenges using the Highly-Repeated Within-Person (HWRP) approach, which itself has evolved over the last two decades. In the next section, we describe how the HWRP approach conceptualizes situations and describes in more concrete details how the HWRP approach assesses *if...then...* patterns, which can then be used to make inferences about underlying psychological processes.

The HWRP approach: Assessing features present in a situation

The Highly-Repeated Within-Person (HWRP) approach involves both a research design wherein an individual's responses to multiple situations, ideally 80 or more, are recorded, as well as data analytic strategies and visualization techniques that appreciate how responses *within* an individual vary depending on the features present in the stimuli.

To illustrate the HWRP approach, we consider how it might be applied to the study of social preferences, including for potential partners. Imagine that Person 1 is on a dating app and scrolling through profiles of dating partners. Person 1 may like (or “swipe right”) for some profiles and dislike (or “swipe left”) for others. What are the most important features in the dating profiles that will affect whether Person 1 will swipe right or swipe left?

In this example, we can think of each potential dating partner as the nominal situation, with each dating partner being categorically distinct from another. An important goal of the HWRP approach is feature identification—identifying a common set of *features* that can describe a set of stimuli and might be important for predicting behavior. This idea is visually represented in Table 1.

Table 1. Illustration of how nominal (categorically distinct) situations can be conceptualized by a set of situation features (lower case letters in shaded cells), and assigned feature weights (bolded values in non-shaded cells) to reflect the extent to which the feature is present in a given nominal situation.

Generalizable features	Nominal (Categorically distinct) situations			
Situation feature	Dating profile 1	Dating profile 2	Dating profile 3	Dating profile 4
a	1	0	0	1
b	0	.25	1	.25
c	1	.5	0	.5
d	.5	1	1	0
e	.25	.5	.75	.5

In the study of social preferences, the researcher would attempt to identify a common set of features that could describe a set of potential dating partners and that likely shape liking. Each dating partner would be evaluated on the same set of features. Ultimately, each partner would be associated with a set of feature weights, reflecting the extent to which the partner possesses the feature or not.

In Figure 2, we further highlight the difference of conceptualizing situations as a set of features versus conceptualizing them nominally. In contrast to Figure 1, which represented situations nominally (Situation A and Situation B). Figure 2 represents different nominal situations with the same set of features (*a*, *b*, *c*, *d*, and *e*). Returning to understanding social preference, the nominal situation is a dating partner. Importantly, all dating partners can be characterized with the same feature weights. For example, feature *a* may represent the presence of a professional degree, feature *d* may represent trustworthiness, and feature *e* may represent social dominance. Some features may be dichotomous, such as whether the profile depicts a partner with a professional degree (or not). Other features may be represented in a continuous fashion, such as whether the dating partner is perceived as being high in trustworthiness and

social dominance.¹ Importantly, all profiles, even though distinct, can be represented by the extent to which the same features potentially characterize each of them, allowing for generalizability across nominally, categorically distinct situations. Thus, each dating partner is assigned a feature weight, reflecting the extent to which the partner possesses the feature. For example, some profiles may have a weight of 1 for feature d indicating that this person is consensually judged as highly trustworthy, whereas other profiles may have a weight of .5 reflecting that this person is consensually judged as moderately trustworthy, and other profiles may be assigned a weight of 0, reflecting that this person is consensually judged as lacking trustworthiness.

The particular features of dating profiles that affect whether one swipes right or swipes left is theorized to depend, in part, on the person and their CAPs network. That is, a person's CAPS network is expected to mediate how situations are encoded, interpreted, and ultimately, how one responds. As illustrated in Figure 2, Person 1 and Person 2 may encounter the same nominal situation (Situation A, which may represent a particular dating partner profile) that consists of a common set of features (e.g., a through e , such as a potential partner's education, trustworthiness, etc.). But not all features are equally meaningful for all people. Person 1 and Person 2 differ in the specific situational features that activate (or inhibit) certain cognitions and affects within each person's network, which in turn lead to a behavioral response. For Person 1, trustworthiness is particularly important, but for Person 2, potential partners with professional degrees are attractive.

¹Depending on the researchers' aims, situational features can be operationalized at a concrete, objective level or at a conceptual, subjective level. For example, at a concrete, objective level, skin tone can be operationalized as luminance of the photograph, and trustworthiness as facial-width-to-height ratio (Stirrat & Perrett, 2010). In contrast, at a conceptual, subjective level, skin tone can be operationalized as independent judges' ratings of skin tone on a self-report measure. Likewise, trustworthiness can be operationalized as independent judges' ratings of trustworthiness.

In this manner, preferences for potential partner can be understood in terms of the features of each potential dating partner (Zayas & Shoda, 2007). Specifically, if we assessed Person 2's decisions ("swipe right" vs. "swipe left") as they scan many dating profiles, Person 2's *if...then...* profile can be operationalized as a within-person slope, as shown in the right side of Figure 2. Thus, *if* Person 2 is exposed to a potential dating partner perceived to be high on social dominance (situation), *then* they will like ("swipe right") on this person's profile (behavior). Importantly, different people have different profiles. Accordingly, Person 2's within-person slope reflecting their preferences, as shown in the right side of Figure 2, is drastically different from that of Person 1.

Figure 2. Schematic representation of the Cognitive-Affective Processing System (CAPS) for two hypothetical individuals (i.e., Person 1 and Person 2) on a dating app. Each person's mind is conceptualized by a stable network of interconnected cognitions and affects that mediates the effect of the situational features on behavior. Solid lines within and outside of the network represent excitatory associations (e.g., activation of one cognition automatically activates associated cognitions). Dotted lines within and outside of the network represent inhibitory associations (e.g., activation of one cognition makes it more difficult to activate associated cognitions). In the above illustration, each person encounters the same situation that consists of a common set of features (e.g., *a* through *e*). Because not all features are meaningful for all people, Person 1 and Person 2 differ in the specific situational features that activate (or inhibit) certain cognitions and affects within each person's network, which in turn lead to a behavioral response.

As we will discuss, the HRWP approach can be used to study a given individual's profile. But, when applied to a sample of individuals, it can also quantify the extent to which a particular profile characterizes the sample as a whole (shared, normative influences), as well as the extent to which a given profile is idiosyncratic and unique, similar to other interactionist approaches (see Wood & Brumbaugh, 2009; Hitsch, Hortaçsu, & Ariely, 2010).

A Primer to the HRWP Approach

In the initial work on *if...then...* profiles, researchers observed children's behaviors as they occurred in different camp settings over the course of an entire summer. In recent adaptations using the HRWP approach, researchers present participants with "situations" or stimuli on a computer, and record their responses to exposures of the situation.

Figure 3 illustrates the general steps of the HRWP approach. The first step is to identify the behavior of interest and the domains in which the behavior is likely to occur. Potential behaviors and domains include, but are not limited to, social preferences, aggressive behaviors, susceptibility to fake news, and likelihood of adhering to public health recommendations. Once the researcher identifies the behavior of interest and the situations where the behavior is likely to occur, the second step is to collect or develop relevant stimuli. The third step is the process of feature identification. Of all the features present in the situation, or stimuli, which are likely to affect behavior?

How do we identify situational features? Two approaches have been used so far: A data-driven, bottom-up approach and a theory-driven, top-down approach (see Zayas, Whitsett, J. Lee, Wilson, & Shoda, 2008 for a discussion). Although this chapter focuses specifically on

describing a theory-driven, top-down approach wherein a researcher experimentally manipulates the features in the stimuli, we briefly describe data-driven bottom-up approaches.

Figure 3. Steps involved in the Highly-Repeated Within-Person approach for accessing the effects of psychological features of situations. Reprinted with permission from “An approach to test for individual differences in the effects of situations without using moderator variables,” by Whitsett & Shoda (2014) *Journal of Experimental Social Psychology*, 50, 94–104. Copyright 2014 by Elsevier.

Data-driven, “Bottom-up” approach

Much of the work using the HRWP approach has relied on correlational designs.² Here, researchers collect stimuli as they naturally occur in the environment and code the presence of relevant features, but do not experimentally manipulate any situational feature (see Zayas et al., 2008; see also J. Lee, 2009; LeeTiernan, 2002; Shoda, 1999, 2004; Shoda & LeeTiernan, 2002; Shoda, et al., 1994; Whitsett & Shoda, 2014; Wilson, 2008; Zayas & Shoda, 2007). For example, in one study (see Sridharan, 2015; Zayas et al., 2019), participants were presented with numerous anti-smoking messages, which had been collected from the internet, and their attitudes towards smoking were assessed after viewing each message. The anti-smoking messages were actual messages used in various anti-smoking campaigns. The researchers had a separate group of individuals identify the important potential psychological features in the messages. Ultimately, the researchers were able to determine how a person’s attitudes towards smoking varied as a function of a set of features (e.g., visual graphicness, credibility of message, etc.) present in the anti-smoking messages.

Bottom-up approaches are useful for at least two reasons: One, often times researchers are interested in how people respond to environments and stimuli as they occur naturally. Two, bottom-up approaches may help identify features of situations that have been overlooked in past theory or not known to the researcher *a priori*. Nonetheless, unless the features identified through bottom-up approaches are then used to construct stimuli that vary in them orthogonally,

² In the present paper, we focus on two approaches: bottom-up, data-driven approaches wherein features naturally occur in stimuli (i.e., not experimentally manipulated to be orthogonal to other features) vs. top-down, theory-driven approaches that experimentally manipulate situational features. But we note that this is an artificial categorization. For example, work can identify important features in a top-down, theory-driven fashion while assessing the presence of these features as they naturally occur in stimuli.

it is not possible to provide strong causal evidence that a particular feature leads to a particular response. For example, in the antismoking message study (Zayas, et al. 2019), it is possible that a feature that was not identified, and thus not measured, could co-occur with a measured situational feature. In that study, the credibility of the source posting the message (e.g., a message from the Center of Disease Control) predicted more negative anti-smoking attitudes. But credibility of the source was not experimentally manipulated and may have cooccurred with other message features (e.g., professionalism and quality of the message).

Moreover, identification of situational features via a bottom-up approach is also time intensive. It requires devoting resources to coding the stimuli. Indeed, steps 3 and 4 of the HRWP approach (see Figure 3) specifically focus on the identification of the features from a bottom-up manner, and coding the stimuli for the presence of the features. These steps require recruiting separate samples of participants to identify the features using open-ended approaches, and another sample of participants to code the features.

Theory-driven, “Top-down” Approach

A theory-driven, top-down approach capitalizes on identifying features *a priori*, this approach reduces the costs to researchers, making the task of identifying *if...then...* profiles easier and more efficient. Indeed, such approaches typically allow researchers to skip steps 2 and 3 (and often step 4) in Figure 3. One example of a top-down HRWP approach is a study on dating preferences contributing to psychologically abusive relationship dynamics (Zayas & Shoda, 2007). The researchers used theory to identify the features of dating partners that may attract women who might be at risk for experiencing psychological abuse. The researchers identified *a priori* characteristics such as partner jealousy, controlling, and withdrawing behaviors as features of potential dating partner and ensured that the dating profiles presented as

stimuli varied systematically on the presence of these features. The researchers found that women who had a history of experiencing psychological abuse were twice more likely to select a potential dating partner with “red flags,” i.e., possessing personality traits associated with an abusive partner. In a second study, Zayas and Shoda (2007) used a similar approach to examine the features of dating partners that attract men who may perpetuate psychological abuse. They found that men who had a history of perpetuating psychological abuse in their past relationship were three times more likely to select a potential female dating partner characterized by attachment insecurity (i.e., high vulnerability and low self-esteem).

How does studying *if...then...* profiles shed light on the personality system?

A key assumption underlying this work is that observable *if...then...* profiles reflect the workings of a person’s network, thus, studying *if...then...* profiles can provide a window to psychological processes. But how exactly do observable *if...then...* profiles tell us something about a person’s psychological processes?

A thorny theoretical issue is that *if...then...* profiles (i.e., behavioral variability across situations) observed in daily life may reflect an infinite number of psychological processes. Two people can be sociable at a party, more so than at home, but the underlying psychological processes giving rise to their behavior may be quite different (the principle of equifinality). One person may genuinely enjoy the party, and not enjoy spending time at home. Another person may be more introverted, and enjoy the downtime of being home, but when at a social gathering is actually bored and feels obligated to be the “life of the party.” Although the two individuals show highly similar observable *if...then...* profiles, they may reflect two very distinct psychological realities.

Is there a way of assessing psychological processes as they vary across different

situations with more precision? A natural candidate is well validated social cognitive tasks for assessing psychological processes, such as encodings, goals, values, expectations, and regulatory strategies (Greenwald & Lai, 2020; Frith & Frith, 2012). Some of these social cognitive tasks have been designed and validated as tools for assessing implicit processes, which occur reflexively, automatically, and are relatively unamenable to control (Fazio & Olson, 2003; Bar-Anan & Nosek, 2014). Such social cognitive tasks allow us to assess the initial, encoding “layer” of a person’s CAPS network (Herring et al., 2013), and begin to assess how activation of this initial encoding varies as a function of the situation, and the features of the situation.

Fortunately, and practically, often-used social cognitive tasks are well suited for a HRWP approach. That is, many social cognitive tasks already, by design, collect multiple responses for each participant. For example, in a standard snap judgment task (e.g., Oosterhof & Todorov, 2008; Rule, Krendl, Ivcevic, & Ambady 2013; Tabak & Zayas, 2012), participants are often exposed to over 100 trials wherein they are presented with the photograph of a person (situation) and make a judgment based on the photograph (behavior). Additionally, in such social cognitive tasks, researchers often involve identify a feature of the stimuli *a priori*, making the process of identifying a set of features easier. Because researchers randomly present participants with numerous situations, each of which was experimentally manipulated to contain features associated with each experimental condition (while holding other features constant or randomized across conditions), the experimental nature of the design allows for stronger causal inference that particular features present in the stimuli leading to a particular behavior.

Here, we illustrate the utility (and feasibility) of the Highly-Repeated Within-Person approach from a top-down approach by reanalyzing data from a study (Günaydin

et al. 2012) that focused specifically on snap judgments of interpersonal liking.

Spontaneous or “snap” judgments have been the subject of interest for psychologists and other behavioral scientists who appreciate its importance in a variety of life domains from choosing life-long partners and friends, to colleagues, to possibly even politicians. Why does a person gravitate towards some people and actively avoid others? We illustrate how the HRWP approach involves analyzing responses for a *given* individual as they vary depending on the presence of features in the situations, and ultimately summarizing individual effects for a sample (in contrast to standard approaches that focus on group-mean differences). As such, the HRWP approach assesses how a stimulus characteristic affects a *given* person, or group of persons, and it can be used to more precisely estimate theoretically important psychological processes, such as those that make up key aspects of a person’s CAPS network.

Illustrating the HRWP “Top-down” approach: Reanalysis of a transference study

A key aspect of a person’s network is likely to be mental representations of significant others (e.g., Bowlby, 1973, 1980, 1982; Erikson, 1956; Fairbairn, 1952; Freud, 1911; Hazan & Shaver, 1987; Klein, Heimann, & Money-Kyrle, 1956; Main, Kaplan, & Cassidy, 1985; Mead, 1934; Piaget, 1954; Sullivan, 1953; Sroufe & Fleeson, 1986; Winnicott, 1958, 1965; see also, Baldwin, 1992; Linehan, 1993; Pietromonaco & Barrett, 2000; Zayas, Günaydin, & Shoda, 2015; Zayas, Surenkok, & Pandey, 2017; Zayas & Hazan, 2015). Mental representations of significant others (SO), include affects, expectations, and beliefs—many of which can operate automatically and nonconsciously (Mikuliner & Shaver, 2007; McNulty et al., 2013; Zayas & Shoda, 2005; Zayas, et al., 2009; Selcuk et al., 2012). Importantly, mental representations of significant others are expected to have profound and broad effects on social functioning (Happé et al., 2017),

serving as a filter through which people perceive and interpret their world, and ultimately, shape their own behaviors in dyadic interactions.

How do existing SO mental representations shape how we perceive and evaluate others? From the social cognitive view of transference (Andersen & Chen, 2002), a novel other who shares attributes with an existing SO will activate the mental representation of the SO, and the existing SO representation activates representation-consistent associated affects and beliefs, which in turn is used to evaluate the novel person. In the original demonstration of transference, participants who read written descriptors of a new person who shared attributes with their SO evaluated this new person favorably and in ways consistent with the SO representation (Andersen & Baum, 1994; Andersen & Cole, 1990).

But often our first exposure to a person is not based on written information, often times especially in many dating contexts and dating apps, our first exposure is based on visual information. Günaydin et al. (2012) were interested in facially-triggered transference, and whether this effect occurs even when individuals are not consciously aware of the resemblance? More specifically, when seeing a photograph of an opposite-sex unknown other—similar to what one may encounter when scrolling through photographs in a dating app—what features of the photograph affect spontaneous liking? Does a new person’s objective facial resemblance to a significant other (SO) color snap judgments of liking?

Studying transference

To address these questions, romantic couples were recruited (for further details refer to Günaydin et al. 2012). In the first session, photographs of each member of the dyad was taken for use in an ostensibly different study (see Selcuk, Zayas, Günaydin, Hazan, & Kross, 2012).

Figure 4. Example of the morphing procedure used to digitally combine 50% of the partner's photograph with 50% of the photograph of a same sex target to produce a novel face resembling the partner ("partner-similar"). The morphing procedure was repeated 12 times, morphing the partner's photograph with 12 different same-sex faces. This procedure was also used to produce the yoked-similar faces, which served as control stimuli; the yoked participant's partner's face was morphed 12 times, each with one of 12 different same-sex faces. The same face or the same trait judgment question (e.g., trustworthiness, attractive, accepting, intelligent, supportive, and aggressive) did not appear on consecutive trials; trials were randomly presented otherwise. Adapted with permission from Günaydin, Zayas, Selcuk, & Hazan (2012). Copyright 2012 by Elsevier.

To create novel others for the snap judgment task, the researchers used morphing techniques to digitally create novel faces that resembled participants' partner (i.e., partner-similar, hereafter simply referred to as "*own*") and novel faces that bore no resemblance (i.e.,

yoked-similar, hereafter simply referred to as “*yoked*”) (see top panel, Figure 4). The yoking procedure essentially equated the stimuli. In the experimental session, each member of the couple completed a snap judgment task, in which they made trait judgments of 24 novel faces, each shown for 500 ms (see bottom panel, Figure 4). As is common in these types of tasks, participants were presented with numerous trials in which they were presented with a photograph and made an interpersonal judgment for each photograph. Specifically, each participant was presented with 144 trials. Given the within-person design, of these, each participant was presented with 72 trials that involved an “own” photograph, and 72 trials that involved a “yoked” photograph. Additionally, throughout the task, participants made six different judgments (i.e., trustworthiness, attractive, accepting, intelligent, supportive, and aggressive, which was reverse-coded), all assumed to reflect a positive interpersonal evaluation. The same face or the same trait judgment question did not appear on consecutive trials; trials were randomly presented otherwise. Because the researchers were interested in whether facially-triggered transference occurs in the absence of participants being consciously aware of any facial resemblance, after completing the snap judgment task, participants completed a funneled debriefing procedure. To investigate whether facially-triggered transference can occur in the absence of awareness, the researchers directly assessed participants' awareness of the resemblance using both subjective and objective methods, which tap different aspects of consciousness (Cheesman & Merikle, 1984; Wiens, 2007; Wiens & Öhman, 2007). Specifically, participants indicated whether the novel faces reminded them of anyone whom they knew (subjective awareness) and discriminated between faces that resembled the partner vs. those that did not in a forced-choice task (objective awareness).

Using linear mixed models, Günaydin et al. (2012) demonstrated that the extent to which an unknown other resembles a SO colors snap judgments of liking automatically, effortlessly, and without conscious awareness. Specifically, female participants judged novel men who resembled their partner (vs. those who did not) as more trustworthy, attractive, accepting, intelligent, supportive, and less aggressive. Interestingly, male participants did not show evidence of a transference effect: men's judgments of novel women were not appreciably affected by facial resemblance with their partner. Such gender differences in facially-cued transference effects are interesting in light of the extensive evolutionary psychological literature on sex differentiated mate preferences and sexual strategies (Buss, 1989; Finkel & Eastwick, 2008; Thorhnill & Gangestad, 1999; Walster et al., 1966). Transference occurred even when individuals were not consciously aware of the physical resemblance. Additionally, effect of facial resemblance on judgments of liking was more pronounced for individuals who were more satisfied in their relationship.

The HRWP approach to studying transference

Here, we illustrate how the HRWP approach can be used to enhance our theoretical understanding of the features that are important for spontaneous liking for a given individual, as well as a group of individuals. Specifically, from a HRWP framework, we can conceptualize the photograph of each novel other as the nominal situation, and various facial characteristics in the photograph as situational features that could possibly shape spontaneous liking. The features that influence liking can be identified *a priori* from theory. Based on the transference literature, a novel other's objective facial resemblance to a SO is theorized to be one such feature. Of course, the rich literature on person perception implicates other features, such as physical attractiveness, trustworthiness, and dominance, that are easily gleaned, even from static photographs, and are

expected to shape liking (Gunaydin, Selcuk, & Zayas, 2017; Oosterhof & 2008; Tabak & Zayas, 2012).

Because Günaydin et al. (2012) experimentally manipulated facial resemblance with a SO, the study design isolates the unique effect of SO resemblance on snap judgments of liking. We can then assess how interpersonal judgments towards a novel other varies depending on whether the novel other resembles a SO (or not). In effect, we can assess, each person's *if...then...* profile, that is, the extent to which facial resemblance to a SO is a psychologically active feature that shapes spontaneous liking (right side of Figure 2). Importantly, although the researcher assumes *a priori* that facial resemblance to a SO is an important situational feature for most people, it is an empirical question whether it in fact shapes liking for a given individual. It is possible that SO resemblance is an important feature for the researcher, and possibly many people, but not necessarily for a given individual, or a subset of individuals.

By using the HRWP approach, and conducting an analysis for *each* person, a researcher can ask: For a *given* individual, does a novel other's facial resemblance to a SO trigger liking? Moreover, how many individuals in a sample does the predicted transference effect occur? Stated differently, is facial resemblance to a SO a psychologically active feature for most people? But as will be shown, the HRWP approach also allows the researcher to ask: Do some individuals paradoxically show reversed transference effects, such that novel others who resemble a SO trigger more negative interpersonal judgments? Even if, on average for the sample as a whole, there is evidence of a transference effect, there still may be individuals for whom facial resemblance to a SO triggers aversion. Theoretically, such reversal effects are possible, for example, if an individual has had a history of negative, unrewarding interactions with the SO (Brumbaugh & Fraley, 2006; Collins & Feeney, 2000; Baldwin, 1992; see also Andersen &

Chen, 2002; Andersen & Baum, 1994; Andersen & Cole, 1990). In this case, we would expect to see heterogeneity in how people respond to a given feature. For one person, reminders of a SO may increase liking, but for another person reminders of a SO decrease liking. Finally, for some people, facial resemblance to a SO may not be a psychologically active feature. For these individuals, other features in the situation may be more impactful. Thus, facial resemblance to a SO may be a psychological feature that is important in the mind of the researchers, but not necessarily important in the mind of the actual participant.

Questions about the extent to which a manipulation has an effect on the majority of participants and the extent to which there is heterogeneity is theoretically informative. For example, with regards to snap judgments, one possibility is that such facial resemblance is a powerful feature for almost everyone. Evolutionary approaches highlight the fitness advantages of preferring individuals from one's in-group; facial resemblance to significant others may serve an important cue. Additionally, when a psychological process promotes survival and reproduction, it may show little variability across people. Thus, from an evolutionary account, participants in the sample should be similar in the effect of facial similarity on spontaneous liking, with variation across people reflecting noise or random variations.

In contrast, from the lens of various social-cultural learning perspectives, the use of facial cues on informing spontaneous liking may be shaped by one's personal experience. In this case, it is possible that people may vary in the extent that an unknown person's facial resemblance to a significant other may trigger spontaneous liking. According to this social-cultural account, participants in the sample may differ in the effect of facial similarity on spontaneous liking, showing more variation across people than one would expect by chance.

Reanalysis of the transference study using the HRWP approach

Using the HRWP approach, we capitalized on the highly-repeated nature of the data—every participant saw and responded to 144 nominal situations. Thus, we first estimated the transference effect (i.e., more positive judgments towards an unknown other that resembled the SO vs. yoked other) for *each* participant in the sample. We could then formally test whether for a given participant, the presence of the facial resemblance was an active feature or inert, and if it was an active feature, if facial resemblance led to liking or back fired, ironically leading to disliking.

After we estimated the transference effect for each person, we could then examine patterns for the sample as a whole. Specifically, we could estimate the percentage of participants in the sample showing the expected transference effect, which would reflect that this feature led to similar psychological processes (shared influence), as well as the percentage of the sample not showing a statistically significant effect, and the percentage of the sample showing a reversal (i.e., greater negativity for unknown others who resembled the significant other). Importantly, we could compare the distribution of observed transference effects to the distribution that would be expected if person-to-person variability was simply due to chance (random) variation (Whitsett & Shoda, 2014; Zayas et al., 2019). Finally, we used generalized linear mixed models (GLMMs) to formally estimate the shared transference effect, as well as the idiosyncratic transference effects (i.e., the extent to which the transference effect was dependent on a person). Below, we walk the reader through each step of this process.

Estimating the transference effect for each individual. For each person, we computed their within-person correlation (slope) reflecting the resemblance to the SO of the photo shown in a trial (yoked = 0 and own = 1) and judgment for that person (1 = presence of a positive judgment (e.g., trustworthy, attractive) vs. 0 = absence of a positive judgment). To visually

represent the data, we plotted, for each person, their within-person effect, representing the effect of own vs. yoked (i.e., transference effect).³ Figure 5 shows the within-person plots for a subset of female (Panel A) and male (Panel B) participants. As shown, for participant 29, viewing an unknown other that bared resemblance to own (vs. yoked) partner led to more favorable interpersonal judgments. This participant's within-person correlation indicated a statistically significant transference effect, $r(142) = .43, p < .001$.⁴ In contrast, we also see that participant 1 showed a reversal. For this participant, viewing an unknown other that bared resemblance to own (vs. yoked) partner led to more *unfavorable* interpersonal judgments. This participant's within-person correlation indicated a statistically significant reversal effect, $r(142) = -.38, p < .001$. On the other hand, for participant 820, we see no appreciable evidence of a transference effect, $r(142) = -.06, p = .495$.

The slope of the own vs. yoked effect represents a person's *if...then...* pattern. And more concretely, a statistically significant positive slope could be taken as evidence that the particular feature (an unknown other's facial resemblance to one's own partner) is psychologically meaningful for a given individual. A statistically significant negative slope could be taken as evidence that the particular feature is psychologically meaningful, but has the opposite effect. A slope that is not statistically significant in either direction could be taken that this feature may not be psychologically meaningful for this individual.

³ The meaning of the within-person tests of the transference effect are dependent on the statistical power of this test. A test of the within-person observation is conceptually similar to a test of a within-person design. A power analysis showed that with 144 observations (72 per condition), the within-person test achieves .99 statistical power for finding a statistically significant medium effect size (Cohen's $d = .5$, two-tailed, $\alpha = .05$). Restated, this design allowed us to detect a minimum within-person effect size of $d = .34$ (two-tailed, $\alpha = .05$).

⁴ The statistical power of this approach depends greatly on the number of stimuli. With a small number of stimuli (e.g., less than 30), confidence intervals for individual-level results are large, decreasing statistical power to detect an effect for a given individual, as well as making it more difficult to interpret null results as indicating no effect for the individual.

Figure 5. Within-person transference effects (i.e., effect of resemblance of partner-similar vs. yoked-similar) on positive interpersonal judgments for a sample of women (top panel) and men (bottom panel). Yoked-similar (yoked) and partner-similar (own) is represented on the x-axis and the aggregated trait judgment is represented on the y-axis. In each plot, the line estimates the effect of own vs. yoked for a given participant on aggregated trait judgments. A positive slope reflects the predicted transference effect (i.e., more favorable judgments towards own vs. yoked).

A negative slope reflects a reversal transference effect (i.e., less favorable judgments towards own vs. yoked). A flat line reflects no evidence of an effect of own vs. yoked.

Examining the transference effect for the sample as a whole: Shared and idiosyncratic effects. Given that each of the 57 participants was represented with a within-person correlation representing the transference effect (i.e., effect of own vs. yoked resemblance on positive interpersonal judgments), we depicted the results as histograms of within-person correlations (Figure 6). In other words, the magnitude and direction of slopes shown in Figure 5 are reflected in the histogram counts in Figure 6. The height of each bar corresponds to the number of individuals whose within-person correlation corresponds to the interval the bar represents. As shown in Figure 6 (Panel A), we see that the average within-person correlation, for the sample as a whole, was ($r = .10$), consistent with the overall conclusions drawn by Günaydin et al. (2012).

But importantly, we obtain a more nuanced view of the transference effect for the sample as a whole. When we examined the effect of each person, 21 (37%) participants had a significant positive effect, which is also consistent with the conclusion that facially-triggered transference occurs for a substantial number of participants. However, Figure 6 also illustrates variability and idiosyncrasy. Nine participants (16%) had a statistically significant reversal. When they encountered a novel other who resembled their partner, they evaluated the person more negatively. Twenty-seven participants (47%) showed no statistically significant effect.

Is the observed variability, depicted in the histograms in Figure 6, within the range expected by chance? Or is the observed variability greater than what is expected by chance? If the latter, this would signal possible moderation or meaningful heterogeneity—that the transference effect systematically and reliably differed across participants and this variability is

unlikely the result of chance. Assuming a roughly normal distribution, under the null hypothesis that the within-person correlation in the population is the same for all participants, we would expect only about 5% of participants to have within-person correlations beyond 2 standard errors (SEs) from the mean within-person correlation.⁵ In Figure 6 (Panel B), the shaded area identifies those participants who had within-person correlations that were beyond 2 SEs in either direction from the mean. Forty-four percent of the participants had within-person correlations that were greater than 2 SEs from the mean, and of these, 21% were 2 SEs greater than the mean, and 23% were 2 SEs less than the mean. Thus, the variability observed in transference effects does not simply reflect random “noise” or chance fluctuations, but meaningful individual differences between participants in their responses to novel others that resemble a SO.

⁵ The SE is provided by the formula, $\sqrt{(1 - r^2)/(n - 2)}$, given that the sampling distributions of correlation coefficients are approximated by a t distribution when the sample sizes are not very small and the correlations are not extreme (Kendall & Stuart, 1973, section 31.19; also, see Rahman, 1968).

Figure 6. Histograms of within-person correlations representing the transference effect (i.e., difference between partner-similar (own) vs. yoked-similar (yoked) on positive trait judgments). The y-axis indicates the frequency of participants with within-person correlations corresponding to each bar's position on the x-axis. In Panel A, the histogram is shaded to indicate participants who have a statistically significant negative effect (shaded in black) and positive effect (shaded in white) at $p < .05$, two-tailed, and contains a vertical dashed line to reflect 0 within-person correlation. In Panel B, areas of the histogram are shaded to illustrate where less than 5% of the sample are expected to be, if person-to-person variability simply reflects chance. The vertical dashed line indicates the average within-person correlation for the entire sample, and areas shaded in black are less than 2 times and areas shaded in gray are more than 2 times the *standard error* for $N = 144$ (the number of observations used to compute each within-person correlation).

Formal test of the transference effect and heterogeneity of the transference effect as a function of the person. To formally test for the average transference effect and the

heterogeneity of transference effects as a function of the person, we used generalized linear mixed models (GLMMs) fitted to binomial data. GLMMs account for the fact that responses to photographs of unknown others are nested within participants. By using GLMM, we can provide a statistical test of whether the variability in the effect of own vs. yoked across participants is greater than expected by chance.

As shown in Equation 1.1, the level-1 model predicts, for each participant k , his or her judgment y (yes or no) to each stimulus i as a function of whether the stimulus is own vs. yoked (yoked = 0 and own = 1). Participants judged each stimulus across six judgments (e.g., trustworthy, accepting, attractive). Thus, participant and judgments are crossed (hence in parentheses together, showing that they are at the same “level”). The critical feature of our GLMM is that we allowed the effect of own vs. yoked, represented by $b1_{(jk)}$, to vary for each participant. The R scripts can be found in the Appendix. The level-1 model is as follows:

Level-1 model

$$y_{i(jk)} = b_{0(jk)} + b_{1(jk)}(\text{PartnerSimilarvsYokedSimilar}_{i(jk)}) + r_{i(jk)} \quad (1.1)$$

Of interest are the b coefficients, which represent the within-person regression coefficients for the k^{th} participant and j^{th} trait judgment. Most relevant to our aims, $b1_{jk}$ is the regression coefficient, representing the effect of own vs. yoked on making a positive judgment for the k^{th} participant and the j^{th} trait judgment. Of less theoretical interest given our aims is $b0_{jk}$ the intercept, reflecting the mean “yes” response for the k^{th} participant, which may be viewed as reflecting acquiescence (versus nay-saying) and may be related to personality traits, such as agreeableness (see Knowles & Condon, 1999; Soto, John, Gosling, & Potter, 2008), and the j^{th}

trait judgment for the yoked pictures. The level-1 model also includes r_{ijk} , which refers to the residual.

The following level-2 equations predict the level-1 coefficients as a function of participants (i.e., subscript k) and trait judgment (i.e., subscript j),⁶ as follows:

Level-2 model

$$b_{0(jk)} = \gamma_{00} + \gamma_{01} (TraitJudgment_j) + u_{0k} \quad (1.2)$$

$$b_{1(jk)} = \gamma_{10} + u_{1k} \quad (1.3)$$

As shown in Equation 1.2 predicts each participant's intercept, $b_{0(jk)}$, for each of the j th judgment representing the average “yes” response, and thus is not of central interest here. u_{0k} is the random deviation for k th participant. Most relevant, is Equation 1.3, which predicts each participant k 's transference effect ($b_{1(jk)}$) from the effect for the sample as a whole (γ_{10}) and the u_{10k} , representing the residual (i.e., how the transference effect for participant k deviates from γ_{10}).

Consistent with the conclusions of Günaydin et al. (2012), viewing an image that was morphed to look “partner-similar” significantly predicted higher average judgments of unknown others ($\gamma_{10} = .48$, $SE = 0.15$, $z = 3.22$, $p = .001$). But importantly, the present analyses allow for a test of the variance component, u_{10k} , that reflects the extent to which the transference effect for each person (i.e., each person's slope reflecting the effect of own vs. yoked) varies more than

⁶ In these analyses, *TraitJudgment* was treated as a fixed effect, given that Gunaydin et al. (2012) assumed that the effect of own vs. yoked was similar across trait judgments. Analyses treating *TraitJudgment* as a random variable led to the same conclusions. Although our equation depicts *TraitJudgment* as a single variable, it represents as a set of dummy codes.

what is expected by chance. The variance component was highly statistically significant ($p < .001$), indicating that the transference effect (more positive judgments towards own vs. yoked novel others) varies across participants than what we expect by chance. The formal statistical analysis of both the average tendency and the heterogeneity in responses confirms our visual inspection of the histogram Figure 4 (Panel B).

Of note, a statistically significant variance component provides a test of moderation as a function of the person in the absence of defining an explicit moderator (Whitsett & Shoda, 2014). The test of the variance component can provide a useful signal to researchers that it may be fruitful for identifying person factors (e.g., quality of relationship) that may moderate the effect. Typically, researchers who are interested in questions about how personal characteristics moderate an effect identify factors *a priori*. Günaydin et. al (2012) identified relationship quality and participant gender. But here we are able to see evidence of moderation in the absence of identifying the moderator.

Who shows the expected transference effect, and who shows a reversal? Predicting heterogeneity of transference effect. Given that we found greater between-person variability than what we would expect by chance, a natural question is: what predicts whether someone is drawn to a novel other who resembles the SO and conversely, what predicts who is drawn away from them? This broad aim of linking certain people with certain situation...behavior... profiles has a long history (see Bem, 1983).

Following Günaydin et al. (2012), we examined the effect of relationship quality and participant gender. For example, do people who are highly satisfied show greater transference effects, compared to people who are not as satisfied? To address the issue of moderation, we modified our GLMM by adding two 2-way interactions in which the effect of own vs. yoked

interacted with relationship quality and gender (male = 0 and female = 1).⁷ Specifically, the level-1 model was the same as 1.1, but the level-2 model added two variables representing participant characteristics. The following Level-2 equation predicts the level-1 coefficients (1.1) as a function of participants (i.e., subscript k) and trait judgment (i.e., subscript j),⁸ as follows (The R scripts for both models can be found in the appendix):

$$b_{0(jk)} = \gamma_{00} + \gamma_{01} (TraitJudgment_j) + u_{0k} \quad (2.2)$$

$$b_{1(jk)} = \gamma_{10} + \gamma_{11} (Gender_k) + \gamma_{12} (RelationshipQuality_k) + u_{1(jk)} \quad (2.3)$$

In the above equation, γ_{11} represents the interaction between own vs. yoked and gender (i.e., how the within-person effect of own vs. yoked varies as a function of gender). γ_{12} represents the interaction between own vs. yoked and relationship quality (i.e., how the within-person effect of own vs. yoked varies as a function of relationship satisfaction).

The magnitude of transference effect depended on relationship quality ($\hat{\gamma}_{12} = .46$, $SE = 0.22$, $p = .035$), reflecting that individuals who reported higher relationship quality viewed partner-similar images significantly more positively than yoked-partner similar images. To probe this interaction further, we used the Johnson-Neyman technique for examining regions of significance for continuous moderator variables (see Johnson & Neyman, 1936, Johnson & Fay, 1950). The Johnson-Neyman significance region (.05, two-sided) indicated that the own vs. yoked and relationship quality interaction effect was statistically significant for all levels of relationship quality except for those in the lower 26.32% of relationship quality [<5.76].

⁷ The three-way interaction was not statistically significant, and thus dropped from the model.

⁸ See footnote 4.

Additionally, the transference effect depended on participant's gender (male = 0 and female = 1, as reflected by two-way interaction between own vs. yoked and gender ($\hat{\gamma}_{11} = .68$, $SE = 0.27$, $p = .012$). To examine this interaction further, we looked at the conditional effects of own vs. yoked and gender. Women judged partner-similar (own) images more positively than yoked-similar (yoked) images ($b_{1(jk)} = .813$, $SE = .190$, $p < .001$), whereas men did not show a statistically significant preference for own vs. yoked images ($b_{1(jk)} = .132$, $SE = .193$, $p = .494$).

These analyses more precisely speak to whether facial-resemblance to a SO is an active feature for a particular person. For those who report high relationship satisfaction, and for women, facial-resemblance to a SO is more likely to be a psychologically active feature. However, for those who are lower in relationship quality and for men, facial-resemblance to a SO is an inert feature, or can be a psychologically active feature than can backfire.

Exploring unexplained variability: Identifying systematic variability

Experimental manipulations derived *a priori* are useful, relying on the wealth of knowledge in the literature. Still, they may miss important idiosyncratic effects. By examining effects of manipulations within-person, the HRWP approach helps us appreciate, empirically test, and visualize heterogeneity (versus obscuring it by focusing on mean differences). An additional benefit is that the HRWP approach has evolved to apply data analytic techniques that help researchers identify in a bottom-up, data-driven fashion person and situation factors not yet known. More concretely, despite modeling a person's unique transference effect, there is still considerable unexplained variance. Some of the variability could be modeled by coding for important facial characteristics, such as attractiveness (Wood & Brumbaugh, 2009; Günaydin, Selcuk, & Zayas, 2017). Here we describe data analytic tools that can help identify other meaningful person and situation sources of variability.

Exploring unexplained person-to-person variability in the transference effect. The conclusion that the magnitude of the transference effect is dependent on gender and relationship quality is consistent with the findings from Günaydin et al. (2012). But importantly, our HRWP approach allowed us to examine whether inclusion of the predictor accounted for all the between-subject variance in the transference effect, or whether some between-person variance was still greater than what was expected by chance and remained to be explained. The latter would signal to a researcher that there are remaining predictors of individual differences. Critically, it alerts researchers of a possible moderator without requiring a researcher to know what those predictors are *a priori* (Whitsett & Shoda, 2014).

In the model with the predictors (equation 2), the variance component ($\sigma_b^2 = 1.514$) although significantly reduced from the simpler model (equation 1) without predictors, still continued to be statistically significant ($p = .011$). This indicates that a considerable amount of between-person variability remained unexplained, signaling to the researcher that there are still person-level moderators that might predict individual differences in the transference effect. For example, a person's adult attachment style and relationship history with the SO are likely to be an important moderator of the transference effect (Brumbaugh & Fraley, 2006; Hazan & Shaver, 1987). For individuals who have a positive representation of the SO, a novel person who resembles the SO is likely to be judged favorably. But to the extent that an individual has had more negative experiences with the SO, a novel person who resembles the SO is likely to be judged unfavorably. Other person-level variables, such as rejection sensitivity, may also play an important role, to the extent that such individuals have a history of perceiving rejection with the SO (e.g., Ayduk et al., 2000). Nonetheless, this test of variance provides a useful signal to a researcher interested in transference effects that there are likely additional important moderators

of the transference effect. Conversely, if the test of variance is not statistically significant, suggesting that the variability in the transference effect could reflect chance or random variation, this is equally as informative; it signals to a researchers that such an effect is similar across individuals and unlikely to be moderated by personal factors (Gaby & Zayas, 2017).

Exploratory analyses: How the transference effect varies as a function of judgment being made. In the Günaydin et al. study, we can also capitalize on the fact that, for each novel other, participants made six different types of judgments (i.e., trustworthiness, attractiveness, accepting, aggressiveness, intelligence, and supportiveness). Because the six interpersonal judgments were all positive (once aggressiveness was reverse-coded), Günaydin et al. aggregated across the different operationalizations of judgments to increase statistical power. But it is worth nothing that the judgments differ in semantic meaning, and although the judgments are positive, there are ways in which they diverge. For example, a novel other could be judged as attractive, but not necessarily as intelligent. A novel other could be judged as accepting, but not necessarily as attractive. Indeed, Günaydin et al. analyzed the effect of own vs. yoked for each judgment separately. Even though the conclusions were highly similar across the different judgments, there was some evidence that judgments were distinct. In particular, although men in general did not show a statistically significant transference effect across all judgments (using the aggregate), they did show a transference effect for the judgment of attractiveness.

One question we might ask is: does the transference effect (i.e., the tendency to evaluate a novel other who similar to a SO vs. not positively) depend on the specific type of positive judgment made? The data structure allows us to assess how each person's transference effect (i.e., the effect of own vs. yoked) varies as a function of trait judgment. To take advantage of these data, we modified the GLMM to allow for the effect of own vs. yoked (which represents

the transference effect) to vary as a function of not only the participant but also as a function of trait judgment. A statistically significant effect of the random component for this interaction indicates that the effect of own vs. yoked varies as a function of the particular participant x trait combination. In model 3, we found a statistically significant participant x trait effect, which indicates that the effect of own vs. yoked differs as a function of the target and trait judgment.

Level-1 model

$$y_{i(jk)} = b_{0(jk)} + b_{1(jk)}(\text{OwnvYoked}_{i(jk)}) + r_{i(jk)} \quad (3.1)$$

Level-2 model

$$b_{0(jk)} = \gamma_{00} + u_{0j} + u_{0k} + u_{0jk} \quad (3.2)$$

$$b_{1(jk)} = \gamma_{10} + u_{1k} + u_{1jk} \quad (3.2)$$

To illustrate these person $\times$ trait judgments interactions, we plotted in Figure 7, for each person, the transference effect as a function of each trait judgment. If the trait judgments were all tapping into the same underlying construct, we would expect “tight” parallel lines, reflecting that the effect of own) vs. yoked was consistent across the judgments. Participant 21 appears to match this profile. The effect of own vs. yoked is positive, and appears similar for all trait judgments. Likewise, participant 13 shows an effect of own vs. yoked, and it appears highly similar across trait judgments. Participant 1 shows a reversal, reflecting that they judge novel others who resemble their SO more negatively, and this pattern is observed across all the trait judgments. But importantly, not all participants show this profile, wherein responses to own vs. yoked are the same across trait judgments. For example, participant 29 shows an effect of own vs. yoked for all judgments except for attractive. Likewise, participant 7 shows a similar pattern.

These patterns may reflect meaningful differences in the effect of own vs. yoked on interpersonal judgments, revealing important information about the idiosyncratic ways in which people make sense of others, and ultimately how they behave. Admittedly, the patterns are identified post-hoc in a bottom-up fashion. Nonetheless, they can provide researchers with valuable information for refining hypotheses, which could then be tested in a confirmatory manner. For example, a research interested in the psychological processes underlying infidelity may identify the profile associated with participant 13 as signaling a potential risk for infidelity. This individual may judge novel others who resemble the SO in a favorable manner including on dimensions of attractiveness, which be precursors for behaviors that lead to more intimacy and increases the risk of infidelity. However, a profile such as the one associated with participant 29 may pose less of a vulnerability. Although novel others that resemble the SO are judged favorably on a number of dimensions, when it comes to attractiveness, which may most relevant to physical attraction and infidelity, this individual shows little effect. Indeed, this pattern may characterize motivated dynamics that help individuals regulate their attention and behavior away from attractive alternatives.

Figure 7. Within-person transference effects (i.e., effect of resemblance of partner-similar vs. yoked-similar) on positive interpersonal trait judgments as a function of specific prompt (accepting, attractive, supportive, intelligent, trustworthy, and calm (reverse-scored from aggressive)) for a sample of women (top panel) and men (bottom panel). Yoked-similar (yoked) and partner-similar (own) is represented on the x-axis and the aggregated trait judgment is represented on the y-axis. In each plot, each line estimates the effect of own vs. yoked for a given participant, for all six trait judgments separately. A positive slope reflects the predicted transference effect (i.e., more favorable judgments towards own vs. yoked) for a given trait. A negative slope reflects a reversal transference effect (i.e., less favorable judgments towards own vs. yoked) on the given trait. A flat line reflects no evidence of an effect of own vs. yoked on a given trait.

Implications of Using the HRWP approach

Over three decades ago, work showed that a person's variability across situations or *if...then...* profiles are stable and meaningful. This research began the arguably Herculean task of identifying features of situations that are most meaningful for behavior. Importantly, *if...then...* profiles showed much promise, potentially revealing insights to aspects of the personality system that are largely invisible. Still, the earlier work was labor-intensive work. Although it assessed *if...then...* profiles in ecologically valid settings, it required hours of observation and coding.

The aim of the present chapter is to illustrate how the HRWP approach can be used to assess *if...then...* profiles more easily. Moreover, it also aims to explain how *if...then...* profiles can be used to shed light on the psychological processes that characterize each person's unique network. To do so, we used the HRWP approach to assess *if...then...* profiles from data obtained from a social cognitive tasks of snap judgments, attempting to shed light on initial encoding processes that characterize a person's network. Because these types of studies experimentally manipulate features of stimuli or situations within each person, such studies allow for stronger causal inference about how the presence of a feature *affects* behavior.

Below, we highlight key implications of the HRWP approach for understanding a person's personality system. Specifically, what is gained by using the HRWP approach that is not gained from more standard approaches?

A more direct approach of assessing intraindividual psychological processes by measuring intraindividual dynamics

An advantage of the HRWP approach illustrated here is that it more directly examines the psychological processes that underlie phenomenon of interest for a *given* individual. By observing responses across a large number of stimuli (144 trials, or nominal situations) and

assessing how a *given* person's responses (snap judgments, or behaviors) vary depending on the features of the situation (resemblance or not to each participant's significant other, or SO), the HRWP approach more directly examines how a novel other's facial resemblance to a SO affects a given person. By seeing evidence of transference within a given person, the HRWP provides stronger causal evidence of facially cued transference.

More specifically, to appreciate the strengths of HRWP approach, it needs to be contrasted with the most prevalent approach for examining the structure of the mind, and the psychological processes that people use to make sense of their world: Experimental designs that focus on group-level effects (e.g., comparing the mean of one condition to another). When researchers manipulate a factor of interest, conceptually they are manipulating a feature of a situation that a person is exposed to. Researchers then record how responses vary as a function of the feature. Researchers assume that exposure to a stimulus with the critical feature will activate particular cognitions-affects within a person's mind, and ultimately lead to a response. If statistically significant differences are observed between conditions, when responses from all participants within each condition are aggregated, researchers conclude that the feature has an effect.

Although such group-level analyses have several strengths, they also have limitations. One limitation is that group-level approaches that aggregate responses across individuals do *not* directly address whether the manipulation of the feature has the desired effect for any *given* individual. Psychological processes, such as activation of the SO representation, is inherently a *within-person* phenomena—i.e., when a *person* is exposed to a stimulus, there will be a change in that person's cognition, affect, and behavior. Group-level analyses only indirectly address psychological processes. Indeed, inferences about within-person phenomena from group-level

data are valid only when we can safely assume that participants are more or less interchangeable with regard to the psychological process of interest. That is, the assumption in standard approaches is that the effect of the manipulation is homogeneous—relatively, the same effect for all individuals.⁹ Research has demonstrated that in the presence of heterogeneity of effect, effects observed at the group-level may not apply to all or even any individuals (e.g., Gallistel, Fairhurst, & Balsam, 2004; Wood & Brumbaugh, 2009). Thus, to provide stronger causal evidence that a hypothesized process occurs within-person, the process should be demonstrated within-person.

Bolstering causal inference and assessing the heterogeneity (vs. homogeneity) of effects

But scholars have long known that situations, and experimental manipulations, often don't have the same effect for all people; often, there is considerable heterogeneity of responses, reflecting construals of the situation (Ross & Nisbett, 1991). A second limitation of traditional data analytic techniques strategies that focus on group-level effects is that they are not able to empirically determine if the assumption of homogeneity of treatment effects is correct; rather,

⁹ One might think that the issues raised above are addressed by the use of repeated-measures design, wherein it is assumed that each participant is compared to themselves. However, even in standard repeated-measures designs, the researcher focuses on group-level effects, comparing responses in one condition to responses in another condition. In one version of the repeated-measures design, a participant is exposed to one or two instances of each level of the manipulated factor. Although each person is characterized by a number that represents the difference between the two conditions, the few observations within each level do not allow the researcher to separate the participant's within-person effect from random noise. Stated differently, if a participant shows a difference between two conditions of the manipulated factor, it is not possible to know if this difference is expected by chance, or if it is a statistically significant departure from chance. Another version of repeated measures designs, like those used in many social cognition studies, expose participants to many instances of each level of the manipulated factor. For example, in a standard Implicit Association Test (IAT; Greenwald, McGhee, & Schwartz, 1998), participants are exposed to 80 instances of the compatible condition and 80 instances of the incompatible condition. Researchers then compute the means for each participant and each condition and derive a difference score between reaction times between the incompatible and compatible conditions (IAT effect = incompatible – compatible). But here too, because researchers aggregate across the trials, the process of aggregated data does not allow to assess the extent to which the within-person effect differs from chance variation. Note that it is possible to compute a t-test for each participant, but this is not the standard data analytic approach. Thus, even repeated measures designs, as they are typically implemented and analyzed, do not directly estimate psychological processes *within-person*.

the assumption is that effects are homogeneous and infer within-person processes from group averages.

Although the presence of heterogeneity of experimental effects undermines the validity of inferences drawn from group-level data, it is easy for well-intentioned researchers, and consumers of research, to fall prey to unsubstantiated generalizations (DeJesus, Callanan, Solis, & Gelman, 2019). Researchers are sensitive to the generalizability of results across settings, populations, and measures. But there is less attention to question of the generalizability of treatment effects across participants within the same study. The assumption is that a statistically significant group-level difference reflects that the manipulation is effective for the majority of individuals in the study. Statistically significant “main effects” are easily incorrectly interpreted, either explicitly or implicitly, as effects that affect most people to a similar extent. In other words, even though the standard group-level approach does not directly assess whether an effect occurs in a given individual, when a feature is shown to be statistically significant effect, the assumption (mostly likely implicit) is that the feature is important for everyone, and effects everyone in similar ways. At the very least, as researchers, we should be mindful about whether the effect of a manipulation generalizes across people, and ultimately, the homogeneity vs. heterogeneity of effects should be empirically assessed, versus assumed.

A unified framework for assessing shared and unique psychological processes

The HRWP approach provides a way of representing shared and unique effects of situations—allowing one to appreciate important ways that individuals may react to situations similarly, and important ways in which individuals may differ. Although the data analytic strategies that focus on group-level effects are not able to examine the homogeneity vs. heterogeneity of effects, the HRWP approach applies statistical techniques at the level of the

individual to assess whether an effect is present for a given person. The visual depiction of the within-person effects in Figure 6 highlights information not apparent in the standard approach. First, although we provide direct evidence that 37% of the sample (21 participants) clearly showed the expected positive transference effect, consistent with the conclusions of the standard approach reported in the original study (Günaydin et al., 2012), we see that 37% is far from everyone in the study, or even half of the sample. Although certainly part of the reason that we may have failed to detect a statistically significant effect in 47% of the sample (27 participants) rests in statistical power considerations, it is important to note that 16% of the sample (9 participants) showed statistically significant reversals. This is clearly more than expected by chance. Representing the distribution of individual effects provides information not readily available with standard group-level approaches.

What do *if... then...* profiles reveal about a person?

By assessing how a person's behavior varies as a function of the feature, we were able to assess each person's unique *if... then...* profile. A researcher may assume that a feature is relevant for a given person. The feature may have been identified in a top-down fashion, like in the Günaydin study, or in a bottom-up fashion, as identified by independent coders. But in both cases, what the researcher thinks is an important feature of the situation may not be the same as the actual important situational feature for a person or a group of people. Thus, the HRWP approach gets us one step closer at assessing the features that are important for an individual, not by assuming that it is, but by empirically examining its importance to a given individual. For example, one participant may be characterized with a profile such that *if* a novel other resembles a SO, *then* the novel other is viewed as attractive. But for another participant, *if* the novel other resembled a SO, the novel other was viewed as *less* attractive. And there were participants for

whom novel others' resemblance to a SO was relatively unrelated to their judgments of the novel other.

Do such observable specific observable *if... then...* relationships reflect the workings of a person's CAPS network? We reason that given the nature of the snap judgment task a person's *if...then...* profile allows us to make more confident inferences about the organization and dynamics of their Cognitive-Affective Processing System. Specifically, snap judgment tasks are designed to assess relatively immediate result of the encoding processes, particularly those that operate automatically and reflexively, rather than examining behaviors that are far downstream and that reflect many other processes. As a result, an analysis of how such snap judgments vary depending on the facial features sheds light on psychological processes operating as a person initially encoding of a situation. Thus, the profile being assessed reflects how situational features affect encoding of novel others.

Importantly, whether encodings, as reflected by snap judgments, affect actual behavior, such as whether a person will share contact information is expected to depend on other factors, such as a person's goals or strategies (e.g., Lazarus, 1991; Bolger & Zuckerman, 1995; McCabe & Fleeson, 2016; Mischel et al., 1989; Zayas, Pandey, & Mischel, 2014). For example, a person's initial snap judgment of a novel other may be favorable, but if she does not expect the person to reciprocate, she may override her initial favorable snap judgments for protective reasons (e.g., von Baeyer, Sherk, & Zanna, 1981; Campos et al., 2018). Ultimately, researchers would be interested in how other aspects of the CAPS network shape or alter the initial encoding.

What is an “if”? Looking forward

When thinking about all the situations a person encounters in their day to day, and all the possible features in those situations, the task of conceptualizing, identifying, and measuring “ifs”

can easily become daunting. In the present chapter, we discussed how the HRWP approach can make the task of studying situations more tractable by trying to identify the features of the situation.

In past work, the goal of identifying important features of situations has been viewed as akin to categorizing commercially available medication in terms of active ingredients. In particular, medications possess active ingredients. Knowing that two medicines have the same active ingredient, allows a person to predict how they will respond to taking one medication based on having taken the other. For example, Ibuprofen is the active ingredient of Advil and Motrin, but acetaminophen is the active ingredient of Tylenol. Thus, if Advil and Motrin are effective in reducing a person's fever, but Tylenol is ineffective, our knowledge about their active ingredients suggests that Nyquil, whose active ingredient is also acetaminophen, will *also* be ineffective in reducing the person's fever. This metaphor proves useful at conveying a central goal of the HRWP approach, and the original work identifying *if...then...* profiles. What are the most important features of situations affecting a person's behavior?

But even the best metaphors are an imperfect representation of the actual phenomenon, and the medicine metaphor does not perfectly apply to identifying ingredients in situations that are subjective and constructed. Active ingredients in medicine are physical entities, and the physical properties produce the physical effects. Likewise, features in situations *could be* objective. For example, facial width-to-height ratio is an objective facial feature that affects perceptions of trustworthiness (Stirrat & Perrett, 2010). Skin tone is also an objective feature of the situation that affects encoding of race and associated stereotypes. Thus, when features of situations are conceptualized in objective terms, the medicine metaphor seems particularly apt.

But often researchers are not so much interested in the objective features of a situation, but the psychological meaning of those features. Indeed, classic studies in social psychology have demonstrated how perceivers often view situations quite differently from the objective reality. Moreover, as noted by the opening quote, people behave in response to the subjective, constructed situation, not the objective one (Rogers, 1951). In this respect, the medicine metaphor highlights part of the difficulty in assessing features of situations. Of note, the Gunaydin et al. study did not manipulate objective features of situations, but more psychologically meaningful features of the situation. That is, even though two participants viewed the same novel other (objective stimulus), their evaluations of them differed because for one participant the novel other resembled the SO, but for the other participant, the novel other did not resemble the SO. The use of idiosyncratic stimuli and yoking procedures, such as the ones used by Gunaydin et al., seems like a promising directly for assessing more psychologically meaningful aspects of the situation.

Applications of the HRWP approach

In the present chapter, we discussed a reanalysis of a study on snap judgments of liking to illustrate the HRWP approach. But the approach of tracking how responses vary across diverse stimuli can be applied to diverse domains. When making purchases, individuals scroll through countless items. Why does a consumer buy some items and ignore others? To what extent does their decision-making track the presence particular features (e.g., color, utility, reviews, price)? In hiring decisions, individuals encounter hundreds of applicants. How do various pieces of information present in an application inform decisions about whom to invite for an interview? When scrolling through one's news feed, what features of news affect whether one clicks on the headline vs. continuous to scroll down? Is it the source of the article, the content, how much it

has been shared within one's network? In all these examples, individuals are exposed to numerous "situations" that collectively can be represented as a set of features, and decisions that follow each situation. The HRWP approach provides a framework from which to examine how the features of the stimuli affect behavior, for a given individual, and a group of individuals. This information can be used to identify the psychological ingredients relevant to a domain, and then used to predict behaviors in a novel set of situations (Zayas & Shoda, 2009).

Concluding remarks

In daily life, people make inferences about a person's mind—their goals, attitudes, expectations—by observing how a person's behavior varies across different situations. Perceivers implicitly try to identify the features in a situation (or in more lay person's terms, "psychological triggers"). The HRWP approach allows researchers to mimic this process in the lab setting. By seeing how a person's behavior varies as a function of the situation they are in, it is possible to begin inferring the psychological processes operating across diverse situations. In sum, the HRWP approach provides a window to psychological processes, giving us insights into how individuals construct their world.

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Appendix

R Code

Model 1.1-1.3:

This model specifies a random slope/intercept for participant (*subject*), with trait judgment (*traitjudgment*) as fixed.

```
glmer(Response ~ own_or_yoked + traitjudgment
      + (own_or_yoked|subject),
      family = "binomial",
      data = transference_data)
```

Model 2.1-2.3:

This model is identical to Model 1.1-1.3, but also includes participant-level moderators (after dropping the three-way interaction term). This model specifies a random slope/intercept for Participant (*subject*) with Trait Judgment (*traitjudgment*) as fixed. Additionally, this model has two 2-way interactions: (1) partner-similar vs. yoked-similar (*own_or_yoked*) & relationship quality (*rship_quality_Fletcher*), and (2) partner-similar vs. yoked-similar (*own_or_yoked*) & gender (*gender*).

```
glmer(Response ~ own_or_yoked*gender +
      own_or_yoked*rship_quality_Fletcher + traitjudgment
      + (own_or_yoked|subject),
      family = "binomial",
      data = transference_data)
```

Model 3.1-3.3:

This model specifies a random slope/intercept for participant (*subject*) and the participant (*subject*) x trait judgment (*traitjudgment*), and a random intercept of trait judgment (*traitjudgment*).

```
glmer(CorrectedKeyedResponse ~ own_or_yoked + (1| traitjudgment) +
      (own_or_yoked|subject) + (own_or_yoked|subject: traitjudgment),
      family = "binomial",
      data = Reordered_V2)
```