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SI: ACCEPTANCE AND COMMITMENT TRAINING IN BEHAVIOR ANALYSIS

Relational Behavior and ACT: A Dynamic Relationship

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Abstract
Acceptance and commitment therapy (ACT) and its counterpart, relational frame theory (RFT), represent emerging areas of research and professional interest for behavior analysts. We extend traditional RFT approaches by emphasizing relational framing as a dynamic pattern of behavior with implications for ACT-based strategies implemented by behavior analysts in practice and in research. We borrow from emerging approaches within affective dynamics, relational density theory, and the hyper-dimensional multilevel model to develop some immediate considerations for practitioners. We then extend an approach grounded in relational dynamics to the six core processes of the ACT hexaflex not only to influence negative affective patterns of relational behavior but also to promote greater psychological flexibility and well-being. Finally, we turn this account inward to discuss our own rigidity as a field and the necessity to engage more flexibly with our own science, ultimately to improve the lives of clients whom we serve.

Keywords Acceptance and commitment · Dynamical systems · Hyper-dimensional multilevel model · Relational density theory · Relational frame theory

Introduction

Acceptance and commitment therapy and training (both are hereafter referred to collectively as ACT; Dixon et al., 2020; Hayes et al., 2011; Tarbox et al., 2020) have been gaining increased attention within their home discipline of behavior analysis. In addition to a variety of empirical articles that have been appearing in *Behavior Analysis in Practice* (e.g., Paliliunas et al., 2018), the *Journal of Applied Behavior Analysis* (e.g., Twohig et al., 2007), and *The Psychological Record* (e.g., Salazar et al., 2020), a couple of conceptual writings have recently emerged that have declared the interconnectedness of ACT with the very definition of the field of applied behavior analysis (ABA; Dixon et al., 2020; Tarbox et al., 2020). After 30 years and thousands of articles on ACT across multiple journals and disciplines, the slow acceptance of this approach within behavior analysis has finally matured. Why behavior analysts may have been resistant to ACT is well outside the ambit of this current article. Nonetheless, the revolution (Kuhn, 1962) is well underway. ACT's root principles are clearly developed directly from a naturalistic approach to human behavior set forward by Skinner and within the radical behaviorist tradition (see Ivancic & Belisle, 2019, and Belisle, 2020). In this article, we explain how ACT principles and processes not only extend from relational frame theory (RFT) but also can be viewed as an approach explicitly designed to alter functional patterns of relational framing. To do so may require approaching relational behavior as dynamic and self-organizing instead of as a static configuration of specific "relational frames" at any singular moment. Thus, the present article offers a conceptual overview that may guide basic and applied research from a dynamical systems perspective. We follow this discussion by discussing potential implications for ACT practitioners across the six core processes of the ACT hexaflex (Hayes et al., 2011).

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Relational Frames Are Dynamic, Not Static

RFT describes, among other things, how new relations emerge in the absence of direct reinforcement (Hayes et al., 2001). In a relatively simple experimental arrangement, if a participant is taught to select a stimulus B in the presence of A (A-B) and to select a stimulus C in the presence of B (B-C), the participant

will most likely match A to C and C to A. This outcome is important for several theoretical reasons that are reviewed in depth by Critchfield et al. (2018). When linking RFT to ACT, however, the concept of transformation of stimulus function is critically important. Imagine that a stimulus event A (i.e., collection of co-occurring external stimuli) involves taking a test in college. Depending on one's history, this event may come to elicit negative affective emotions consistent with anxiety and produce avoidance or escape functions. Not only will the actual test-taking event elicit these experiences, but entailed stimuli such as hearing the word "test" or seeing the written word *TEST* on a college syllabus may also carry these functions (see Dougher et al., 2007, for a basic experimental demonstration of this general phenomenon). Thus, the functions of "test" and *TEST* are transformed in terms of their entailed relationship to test taking and, for a student experiencing test anxiety, may result in significant avoidance behaviors such as procrastination, binge-watching television, or avoiding classes altogether. For behavior analysts, these latter behaviors may be the explicit targets of behavior intervention using strategies such as ACT that necessitate an understanding of the relationship between relational frames, transformations of stimulus function, and avoidance behavior. This simple illustrative example, however, is likely insufficient to account for the pervasiveness and resistance of patterns of psychological inflexibility experienced by consumers who may seek behavior-analytic interventions that involve negative affective experiences such as anxiety or depression.

To appreciate the potential complexity of relational framing involved in the pathology of psychological suffering, consider that the same person is later told that "life is a test" or that their boss at work is simply "testing them." Not only will the functions transfer to "life" and "boss," but likely to anything previously related to "life" and "boss," like "home" and "work." Although these examples may not represent the specific verbal relations of any one person, they illustrate how rapidly entailed relations can develop from a relatively small set of relational stimuli and become pervasive. According to Blazer et al. (1987), adults who experience one or more negative life events are three times more likely to develop generalized anxiety disorder within 1 year of the event. That is, the functions of the event appear to transfer across contexts without the individual directly experiencing aversive conditions within those contexts. From an RFT perspective, it may be assumed that established negative affective verbal relations quickly become pervasive and encompass multiple relational classes, resulting in anxiety or other negative affective experiences "showing up" across situations. As noted by Hayes and Wilson (2003) in reconciling ACT and RFT with Goldiamond's (1974) constructional approach, it is likely that new relations build on old relations and provide greater contextual nuance. However, when these relations carry negative affective and avoidance or escape functions (see Layng, 2009), what is constructed is a generalized pattern of avoidance that involves the co-occurring processes of cognitive fusion (i.e., literalization of verbal relations) and experiential avoidance (i.e., attempts to alter the form or function of negative emotions, thoughts, or experiences; Hayes et al., 2011).

Critical to the present article is that the link between RFT and ACT may not be in understanding relational frames as a static set of specific relations; rather, relating itself may instead be viewed as a dynamic and functional process that occurs within ever-changing external environmental events. Although the specific content or class members within relational frames may change and differ in their influence on behavior from moment to moment, higher order patterns of relating may be apparent that can serve as the target of process-based interventions such as ACT. For example, research with participants who experience depression has shown that participants with depression show a greater frequency of framing neutral events negatively relative to participants who do not experience depression (see Twohig & Levin, 2017; see also Kanter et al., 2008). The result is that new or ambiguous stimuli can come to participate in avoidance frames without explicit training or instruction. Viewed in this way, simply altering the form of specific relations is unlikely to effectively change behavior—at least long term—because new negative affective relations will likely emerge that cohere with this generalized pattern of relating and therefore avoidance. Thus, approaching relational behavior dynamically may confer some advantage over a traditional RFT account by incorporating more recent work on affective dynamics, relational density theory (RDT), and the hyper-dimensional multilevel (HDML) model. In particular, we may be able to draw some provisional conclusions about how patterns of relational behavior interact with external contingencies with implications for greater integration of RFT within ACT-based interventions developed by behavior analysts.

Dynamic Models of "Self-Organizing" and Relational Behavior

A system is said to be "self-organizing" not because the system contains a self, but rather because properties of the system at one point in time are highly predictive of how the system changes over time (i.e., dynamic patterns; Catania, 2013; Houben et al., 2015; Kelso, 1995). This is true even within traditional behavior intervention research, where autocorrelations exist between past behavior and current behavior that are readily apparent within single-case research studies (Jenson et al., 2007). In complex systems, patterns can be difficult to identify at lower levels but may be more easily observed at higher levels (Baum, 2002; M. J. Marr, 1992; Shimp, 2013). For example, if a person avoids social interactions, isolating the specific directly trained and derived relations that contribute to this behavior is immensely challenging or even

impossible; however, evaluating higher level patterns of relating may be more fruitful in guiding ACT intervention strategies.

When higher level patterns involve changes over time or in response to external events, these patterns are considered dynamic. There has been considerable work done outside of the field of ABA (e.g., developmental psychology) to understand dynamic patterns as they relate to language (e.g., Iskarous, 2017; Niyogi & Berwick, 1997) and movement (e.g., Thelen et al., 1987; Van Hooren et al., 2019), as well as to understand behavioral and affective processes that relate to pathology and experiential intervention (Shapiro, 2015). Common threads can be seen across fields and disciplines. Dynamical systems that are self-organizing tend to change in predictable patterns, or phases. Importantly, the multiplicity of factors that maintain system stability is not easily identified at lower levels of analysis—rather, they represent a collective variable termed an "attractor" (i.e., a behavior toward which a system tends to evolve or change). Attractors exist initially that may maintain maladaptive patterns of relating, affect, and behavior. Therefore, process-based interventions from a dynamical approach seek to alter or disrupt attractors to induce greater response variability and in a desired direction to contact new, more adaptive attractors. The transition from stability to chaotic variability to new adaptive stability is referred to as a phase change within dynamical systems.

To continue with the example of negative scanning in individuals with depression, predicting the specific relational frames that will evolve in a given moment as the individual interacts with the environment is likely impossible at lower levels (i.e., chaotic, or random). With some knowledge of a generalized pattern of negative affective relating, we could reasonably predict that the verbal content, whatever it is, is highly fused, carries the negative affective and escape or avoidance functions, and therefore will participate within an overarching pattern of experiential avoidance. That is, although the specific content is unstable or chaotic, the relational pattern may be stably maladaptive. We do not know how the content will change moment to moment, but we can predict the direction of change—toward a more pervasive and resistant experience of psychological suffering such as that observed within the complex dynamics involved in depression symptoms and pathology (Cramer et al., 2016).

Current research on affective dynamics may provide greater insight into these processes. As described previously, emotions and feelings are linked to relational frames through transformations of stimulus function. According to Larsen (2000), patterns of emotional changes in response to changes in the environment may contribute to psychological well-being. Emotions continuously fluctuate in response to "internal" and "external" events (Frijda, 2007) that can be conceptualized behavior-analytically as including private relational behavior (internal) and external contingencies (external). Houben et al. (2015) conducted a meta-analysis exploring how patterns of emotional variability may be predictive of psychological well-being. Dynamic patterns of emotion included emotional variability (i.e., within-person standard deviations in reported emotions), emotional instability (i.e., magnitude of emotional changes from moment to moment), and emotional inertia (i.e., autocorrelation between successive reports over time). The authors concluded that for participants experiencing greater mean levels of negative affect, highly variable and unstable reports that were more inert were predictive of low psychological well-being. That is, although emotional states appeared to change erratically, due to the inertia of change in only a single direction (i.e., negative affect), the result was diminished levels of psychological well-being and adjustment across different forms of well-being, pathologies, and psychiatric categories (Houben et al., 2015).

Interestingly, the authors did not find the same results for participants who showed greater mean levels of positive affect, wherein greater stability, lower variability, and lower inertia were not predictive of greater psychological well-being. These results cohere with a follow-up study conducted by Dejonckheere et al. (2019), which showed that mean levels of positive or negative affect are strong predictors independent of dynamics—although the authors noted that these dynamics likely contribute to these mean levels due to negative affective inertia. Marr (1992, 1996) described the potential prevalence of "strange attractors" within complex behavior systems (self-organizing relational behavior is likely a complex system; Y. Barnes-Holmes et al., 2004). When a system is chaotic or unstable, there may be multiple attractors that produce distinctive patterns that can only be identified by repeatedly observing the system. In affective dynamics, it appears to be the case that negative attractors with inertia may have the greatest impact on well-being, but when affect is variable and ebbs and flows between both positive and negative states (i.e., strange attractors), greater psychological well-being may be forthcoming. That is, it may be the case that affect is controlled more so by external environmental events than by negative affective verbal relations that produce greater contextual insensitivity.

Although this interpretation is related primarily to dynamics within feeling and emotion, as noted by Goldiamond (1974) and later by Layng (2009), emotions and behavior functions are inseparable. Therefore, intervention success may hinge on promoting greater contact with and identification of emotions and contingencies to bring about a corresponding change in behavior. In essence, Goldiamond's constructional approach necessitates altering attractor states to produce greater variability in behavior that is more sensitive to changing contingencies, and this approach is at the center of mindfulness strategies within ACT (Hayes & Wilson, 2003). Within the study of affective dynamics, Trull et al. (2015) noted that individuals with depression also show lower levels

of negative emotional differentiation (i.e., noticing and distinguishing between affective states) but do not differ in terms of positive emotional differentiation. As noted by the authors, this represents a greater tendency to label negative emotion as all bad or negative that speaks to the potential importance of patterns of relational behavior as verbal relations about emotions and how this relates to psychological well-being.

Research on dynamics outside of ABA is expansive and nuanced and involves analytic strategies that are currently outside of the knowledge base of many behavior analysts. The purpose of the current article is not to provide an extensive overview of this work; rather, we have attempted to provide enough of a summary so that readers are generally familiar with dynamics and how they may relate to the processes of cognitive fusion and experiential avoidance within ACT. Two emerging and compatible models (RDT and the HDML model) are evolving within the field of ABA and may have implications for understanding relational dynamics. We pause here to briefly introduce these models so that we can link this work back to the potential implications of this strategy for behavior analysts implementing ACT with the intended purpose of influencing patterns of relating that lead to suffering for consumers.

Relational Density Theory RDT was introduced by Belisle and Dixon (2020b) as a strategy to model higher order self-organizing properties of relational frames to predict and influence how relations respond to changes in environmental contingencies. The model is quantitatively described using transformations found within Newtonian classical mechanics (for equations, see Belisle & Dixon, 2020b, and Belisle & Clayton, 2021). Essentially, when relational frames are graphed within a two-dimensional space, relations that contain more members within a greater space will exhibit dynamics consistent with mass. First, we may predict that high-mass classes will be more resistant to change when environmental contingencies are altered. Belisle and Dixon (2020a) experimentally demonstrated this first higher order property where classes that exhibited greater density were also more resistant to counterconditioning in successive phases. Potential implications of this basic experimental work are that as relational classes become larger and stronger, they may become increasingly insensitive to changing contingencies. When these networks carry negative affective and escape or avoidance functions, this may contribute to the inertia within negative affective dynamics and the apparent resistance to change observed in disorders such as depression and anxiety. Indeed, as demonstrated by McAuliffe et al. (2014), excessive rule following and schedule insensitivity are highly predictive of depression symptoms.

Second, we may predict that two classes that show greater mass and with a smaller distance between them are more likely to merge. Belisle and Dixon (2020a) demonstrated this initially by predicting class mergers under ambiguous reinforcement conditions given differences in the relative density of two competing classes. Belisle and Clayton (2021) extended this work by showing the merging of coherent classes (i.e., classes with less distance between them) but not noncoherent classes (i.e., classes with more distance between them). Again, this may relate back to affective inertia in that larger, stronger classes are not only more resistant but also more likely to merge with other classes, producing a cascading problem like a snowball rolling down a hill gaining in both size and speed as it rolls. Much more research is needed that explores the relationship between this model, transformations of stimulus function, and ACT; however, these examples are given to provide some insight into how dynamical systems within ABA may play a considerable role in our ability to understand and influence complex relational behavior.

The Hyperdimensional Multilevel Model Barnes-Holmes and colleagues (Barnes-Holmes et al., 2020b) have recently attempted to "update" (Barnes-Holmes et al., 2020a) RFT by providing a model of the behavioral dynamics of relational responding with implications for process-based interventions such as ACT (Y. Barnes-Holmes et al., 2020a). This approach is contextualized within the HDML framework of relational dynamics. From within this framework, relational frames can be interpreted across multiple dimensions, including coherence (i.e., consistent patterns of relational responding), complexity (i.e., level of detail or density of a pattern of relational responding), derivation (i.e., degree of practice vs. derivation of specific relations), and flexibility (i.e., sensitivity to change by current environmental contingencies). Evidently, these dimensions are compatible with the quantitative models espoused within RDT, and this work is already underway (e.g., relational coherence as the geometric distance between classes; Belisle & Clayton, 2021). The HDML model also provides an interpretive framework for levels that interact with the dimensions, including mutual entailment, relational framing, relational networking, relating relations, and relating relational networks. This assumes that each of the dimensions exists at each of these levels of relational behavior, producing at least 20 analytic units. As noted by D. Barnes-Holmes et al. (2020a), experimental research within these analytic units has been occurring implicitly within RFT research, and this framework makes explicit the multiple dimensions and levels to guide this work.

"Hyper" within the HDML model refers to a new unit of analysis that combines the multidimensional multilevel model with the behavior change process of relating, orienting, and evoking that may be involved in almost all psychological events that involve human language (D. Barnes-Holmes et al., 2020a). This analytic unit is likely necessary to capture how dynamics within relational behavior can result in significant challenges for consumers through the transformation of stimulus function. Of particular interest within ACT-based

approaches, the HDML model can explain how fusion to dynamical patterns of relating can influence how consumers attend to external and internal stimulus events and which events they attend to, such as negative emotional scanning in individuals with depression, that evoke escape or avoidance behaviors that lead to psychological suffering (i.e., experiential avoidance).

Again, investigating precisely how research on dynamical systems in other fields, affective dynamics, RDT, and the HDML are compatible or incompatible should be further explored. For now, it is important that behavior analysts know that this theoretical and basic experimental work is ongoing. Simply approaching relational framing as a dynamic behavior that may exhibit identifiable patterns, rather than a static set of frames, may have implications for how behavior analysts approach ACT-based strategies.

Some Potential Implications and Strategies for Behavior Analysts

Comparing and contrasting these seemingly distinct but highly interrelated dynamical approaches is also well outside of the scope of this current article; however, in synthesizing this work, at least three themes arise that could influence how practitioners view relational behavior dynamically with immediate implications for ACT intervention. First, patterns likely involve the ongoing interaction of many lower level events that are constantly changing. Approaching relational behavior at a higher level of analysis may allow analysts to detect relevant patterns in relational and affective dynamics to identify attractors and to predict and influence phase transitions. Second, patterns improve system efficiency and stability (Kelso, 1995), and relational patterns that exhibit high mass and inertia may be inflexible to changes in external environmental contingencies. Therefore, introducing strange attractors and inducing response variability may be necessary to improve well-being. Third, parameters may be present that lead the system through potentially distinct patterns even when chaotic interactions at lower levels of analysis are present. That is, there may be external contingencies that interact with relational framing that exacerbate psychological suffering. We deal with each in turn, followed by a discussion of each in terms of the core processes of the ACT hexaflex.

Many Relations Combine to Produce Patterns of Relating and Affective Experience

The potential structures of relational networks are multiple, and isolating specific frames that contribute to suffering may be entirely unworkable. However, it is the interaction of these lower level structures that gives rise to identifiable patterns of relational behavior. That is, a behavior analyst may not know how A came to be related to B, nor whether this relation was directly trained or derived, but the analyst can readily observe avoidance functions and affective experiences that reliably occur in the presence of A and B, for example, by evaluating whether the presentation of either A or B evokes avoidance or approach behaviors in a client. This could be accomplished, for example, by presenting a verbal statement to the client, such as "What if you just decided to go to that social event?" Should the client engage in defensive or avoidant behavior—"There are too many people, and I wouldn't be comfortable with that"—then there may be some evidence that the verbal stimulus "social event," and likely related terms like "party" or "get-together," carry an avoidance function.

The strength of a relational class and its functional properties may also be determined using technologies such as the Implicit Relational Assessment Procedure (IRAP; D. Barnes-Holmes et al., 2006). In the IRAP, the participant is presented with two response options and must match a third sample stimulus to either option. Differences in the rate of matching are indicative of the strength of a given type of relation. For example, Hussey and Barnes-Holmes (2012) demonstrated that participants at risk for depression demonstrated stronger patterns of negative emotional relational responding within an experimental context designed to induce negative emotional valence. Within ACT intervention research, the IRAP has been used to provide an outcome variable showing that mindfulness can alter patterns of relating more so than thought suppression as an alternative strategy (Hooper et al., 2010). The IRAP has also been implicated as a way to detect differential relational responding effects that play a central role in the HDML model, so this work is already present within a dynamical approach to understanding relational behavior (D. Barnes-Holmes et al., 2020a; Pidgeon et al., 2020). The actual potential of applying a trigger analysis or the IRAP within the context of behavior-analytic treatment has not been evaluated; however, such research could prove fruitful for behavior analysts seeking to identify generalized patterns of relating to inform intervention.

Variable Patterns of Relating With Negative Inertia May Be Difficult to Change

Parameters lead a system through potentially distinct patterns of behavior. In dynamical systems, movement goes through phases of stability and instability. At initial conditions, systems tend to be chaotic and unstable, but over time, systems stabilize and emerge within identifiable patterns. Behavior analysts are intimately aware of this pattern of instability and stability in the context of behavior intervention. Take as an example teaching a child to perform a motor task such as writing letters. Initially, there are considerable differences in the topography of writing; however, over repeated attempts, eventually writing becomes stable and provides a socially

valid way to communicate. A strong writing program will use prompting and reinforcement strategies to ensure stability is achieved in a consistently legible form. Absent this instruction, as many readers may be personally aware, stability may be achieved, but the end result is a pattern of writing that is consistently illegible. Outside of behavior analysis, this may be referred to as a "habit," or a relatively consistent or stable pattern of responding that persists across contexts. Good habits happen seemingly automatically, and bad habits are notoriously hard to break (i.e., resistant to change, see RDT; Belisle & Dixon, 2020a, 2020b).

Relational behavior may act much the same way. At the moment a client is seeking services from a behavior analyst, the person likely has a densely established history of relating with their world verbally in ways that cause them to suffer. For example, the client with social anxiety, when meeting a new person for the first time, may readily attend to events that signal the person is "unsafe" or "judgmental" (entailed relations) and is therefore someone who should be avoided (transformation of stimulus function). Under normal conditions, stimuli such as a dark alley or the intentional hiding of one's face with clothing may evoke these verbal evaluations; however, this pattern of relating may become problematic when otherwise ambiguous stimuli (e.g., people at a party, unintentional facial expressions, traditional clothing) come to evoke these same negative evaluations. The result may include avoiding social events that could otherwise produce meaningful social relationships, as well as networking opportunities that could impact future employment and promotion. This relational pattern is, in turn, negatively reinforced as the person escapes or avoids the social event and the aversive private experiences that occur along with it.

Behavior analysts may benefit from evaluating the stability or variability that is present within challenging patterns of relating. One way to do this may be to examine the percentage of evaluations that fall within the pattern of interest. For example, the behavior analyst may present a succession of scenarios (discriminative stimuli) with an open-ended response option that allows the client to evaluate the event verbally. For example, the client with social anxiety may be presented with a series of social situations, and if on 90% of the trials the client provides an evaluation with negative valence, this may suggest that this pattern of relating is relatively stable. Conversely, if the client only demonstrates a negative evaluation of 30% of trials, a logical next step may be to determine the contextual factors that covary with the 70% of trials that did not evoke these same evaluations. As with the previous trigger analysis example, the research on discrete evaluations of relational frames within ACT is presently nascent, where strategies such as this one could provide an avenue for future research to inform a functional analysis of relational framing. This could also be accomplished in the context of therapy by capturing data on clients' verbal responses within session and coding the responses to evaluate the pervasiveness of a given relational pattern. In theory, the more pervasive the pattern, the more stable and resistant to change the pattern may be.

External Contingencies and Relational Frames May Produce Strange Attractors

Relational behavior does not occur in a vacuum; rather, as with all behavior, an analysis of relational behavior must include the external contingencies of reinforcement that maintain it. Hayes et al. (2001) appreciated this relationship by proposing that relating emerges as a generalized operant and is maintained because relating itself periodically contacts greater reinforcement in the environment. There is no reason to assume that generalized patterns of relating do not follow this same overarching principle. Recipients of behavior-analytic services who are receiving ACT interventions relate to the world the way that they do *because* reinforcement appears to be contingent on that pattern of relating. Take, for example, the single parent who is working multiple jobs to feed their family and experiences reductions in positive emotional experiences and energy consistent with a diagnosis of depression. The parent may engage in relational verbal behavior such as "I need to work this hard to put food on the table" or "I never have enough time for myself because my family needs me."

In this example, the contingencies maintaining this client's suffering are evident—income generated from working multiple jobs is needed to purchase food, clothes, and other commodities to ensure the health and safety of their family. Furthermore, aversive functions may be present when considering the different ways that clients relate to events in their lives verbally, such as "My family will not need me or love me if I do not work hard to support them" or "Parents who stay at home are lazy," adding even greater stability to this pattern. Given information regarding these contingencies, behavior analysts may adjust their approach to ACT in at least two ways. First, the analyst may evaluate if there is any tenable method to adjust these contingencies that is workable for the client. Complex systems are by definition complex, and attractors can be interrelated (Kelso, 1995), so determining alternative modes of obtaining reinforcement may be unworkable in many contexts. However, if the contingencies can be adjusted, this may lead to changes in the relations that are maintained by those contingencies—for example, accessing low-interest loans that are available for nontraditional students with provisions for parents that may allow the client to attend college in order to access employment with a higher hourly wage. The positive reinforcers that maintain the target relational behavior are still present through a loan program (i.e., access to an income that provides essential commodities), and the relations such as "I need to suffer to feed my family" may

no longer be needed to maintain day-to-day functioning under extreme work conditions.

Second, it may not always be possible to adjust the external contingencies that maintain the target relations. In this case, the analyst may attempt to adjust the function of existing frames without attempting to adjust the context within which they occur. For example, the analyst may seek to replace the relation "I never have enough time for myself because my family needs me" with "My family needs me to take care of myself too." This establishes both "family" and "self" in a coordinated frame as people who need to be actively cared for (i.e., self-compassion; Luoma & Platt, 2015; Yadavaia et al., 2014), with a potential shift in relational functions. The behavior analyst may also attempt to alter "My family will not need me or love me if I do not work hard to support them" to "My family needs me and loves me, and I work hard to support them." Again, the content is the same (i.e., the relational stimuli), but the relations between them are altered from a frame of opposition to a frame of coordination that may have an influence on the verbal functions the statement carries. Future research is needed to explore these specific strategies when embedded within ACT.

Relational Dynamics and the ACT Hexaflex

These are three potential implications and are certainly not exhaustive. We believe, however, that all three may influence how behavior analysts approach ACT as a strategy to alter the dynamical patterns and functioning within relational frames. Viewed in this way, RFT is not simply an underlying model for ACT interventions; rather, relational behavior is the explicit target of ACT interventions. This approach may be fundamentally more compatible with psychological flexibility as the target of ACT, where psychological flexibility describes relational behavior that is stable when adaptive and malleable to change when rigid patterns lead to psychological suffering (Hayes et al., 2011). Psychological flexibility does not describe a form of static relational frames (i.e., content), but instead a pattern of relational responding that is highly sensitive to external contingencies and experience. Therefore, we review these three implications across the six core processes described within the ACT hexaflex.

Values

Values represent abstract verbal categories of reinforcement that augment external contingencies (Plumb et al., 2009). For example, "family" is a value that may augment time spent with family as a reinforcer. According to Table 1, behavior analysts may experience resistance when multiple values fail to cohere, values identification is unstable, and contingencies maintain behavior that is incompatible with chosen values. Coherence between values may serve to strengthen these relations and avoid challenges resulting from competing values. For example, if "health" and "work" appear incompatible, engaging in behavior to support one value may pull from the other. However, if coherence between these values is present, such as establishing that productive work necessitates good health, and vice versa, engaging in behavior that supports one value may also strengthen the occurrence of behavior that supports the other. Stable values may also have a greater potential to augment external contingencies to support adaptive patterns of relating. For example, if a client identifies "family" as the most important value on one week and "health" as the most important value the next, this may suggest lower stability in these values and reduce their potential to consistently augment behavior change strategies. The analyst may therefore attempt to establish stability or localize patterns in value identification prior to attempting to augment behavior change using values-based approaches. Finally, contingencies are engineered to maintain a variety of behaviors—some of which fail to cohere with clients' chosen values. Values–behavior coherence may be more difficult to achieve if real external contingencies select behaviors that are incompatible with chosen values. In this case, there may be utility in exploring what values, if any, are supported by continued participation in the contingency system or whether seeking alternative reinforcers (e.g., a new job) may allow for greater values–behavior coherence.

Committed Action

Committed actions represent the class of behaviors that, when performed, are likely to move the client closer to their chosen values (Hayes et al., 2011). If the client is receiving behavior-analytic services, it may be likely that behaviors that qualify as committed action are occurring at low rates. As seen in Table 1, it is possible that encouraging committed action with clients may be especially challenging when the client engages in avoidance behavior that is inconsistent with multiple values, when low engagement has occurred over an extended period of time, and when contingencies that cannot be easily adjusted or augmented select behavior that is incompatible with behavior that moves the client closer to their values. When engagement in committed action is universally low across multiple values, behavior analysts may be unable to leverage momentum in the engagement of some committed actions when transferring engagement to other committed actions (i.e., through a transfer of stimulus function, such as "Are you willing to explore being just as compassionate with yourself as you are with your family?"). In these cases, behavior analysts may benefit from initially isolating a single value and building momentum with committed action toward that value. Once this is achieved, the functions of that value as a motivative augmental may successfully transfer to other value

Table 1 Potential Questions Raised by a Dynamical Approach to Relational Behavior Within the ACT Hexaflex That May Guide the Development of Future ACT Interventions and Research

Core process	1. Higher order relational patterns self-organize.	2. Stable relational patterns are resistant to change.	3. Contingencies maintain relational patterns.
Values	Do chosen values demonstrate coherence with other chosen values that align with multiple values-coherent behaviors?	Do chosen values appear to remain consistent and stable, or do values appear to change and exhibit considerable contextual control?	Do chosen values cohere with contingencies that appear to maintain patterns of relational behavior?
Committed action	Does avoidance of committed action occur within only one value, or is this pattern present across multiple chosen values?	Are low levels of engagement in committed actions temporally localized, or are they temporally extended in time?	Can contingencies be adjusted to support committed actions that move the client toward their chosen values?
Present moment awareness	Are relational patterns that detract from present moment awareness localized or related to multiple external events?	Does present moment awareness fluctuate, or does it appear universally absent?	Do contingencies support attending to events occurring in the present moment or directed attention to the past or future?
Defusion	Are avoidance functions contained within a small number of frames, or does this pattern of relating extend across multiple frames?	Are relations resistant to change when competing relations are introduced to disrupt challenging patterns of relating?	Does the apparent literalization or strength of relational frames allow for greater access to reinforcement and avoidance of punishment?
Self-as-context	Is a conceptualized self (self-as-content) apparent in only a single context, apparent in multiple contexts, or universally present?	Does the conceptualized self (self-as-content) remain consistent over time, or is self-as-content present but fleeting?	Does the conceptualized self (self-as-content) allow for greater access to superficial reinforcers that maintain rigid deictic frames?
Acceptance	Is a clear hierarchy of avoidance functions present so as to allow shaping of acceptance to occur within intervention?	Is a willingness to experience aversive events, thoughts, and emotions occasionally present or universally absent?	Do negative reinforcement contingencies maintain avoidance that negatively reinforces maladaptive relational behavior?

Note. ACT = acceptance and commitment therapy.

systems. Low levels of engagement in committed action that are temporally extended in time (i.e., with a long history) may also be highly resistant to change. For example, if a client only recently stopped engaging in behavior that aligns with their values, identifying recent changes in the external contingencies may reveal workable solutions for the behavior analyst and their client. However, if the client has an extended history of not engaging in committed actions, it may be more likely that dense verbal relations have developed alongside historic contingencies that must be addressed within the intervention if it is to be successful. Finally, external contingencies may maintain behavior that is incompatible with one's chosen values. For example, supporting the family financially may be incompatible with spending time with family. As with values, analysts must evaluate whether the contingencies can be adapted, and when they cannot, they must discover alternative committed action strategies that may allow for the future adaptation of challenging external contingency systems (e.g., attending college or promotional training to increase hourly wages).

Present Moment Awareness

Present moment awareness describes the allocation of attentional behavior to events occurring in the present moment, rather than engagement in verbal relational behavior about past and future events (Hayes et al., 2011). We predict that strengthening present moment awareness may pose greater challenges when verbal relations about the past and future are large and pervasive, when engagement with these verbal relations is stable and contact with the present moment is rare, and when contingencies maintain attending to hypothetical past and future events rather than contact with the present moment. Just as in basic experimental operant research, increasing lever pressing in an animal model is easier if the animal occasionally depresses the lever. Similarly, if a client struggles with present moment awareness, increasing present moment awareness may be more easily accomplished if the behavior occurs sporadically and if its occurrence can be predicted. Teaching the client to notice when they are present and prompting present moment awareness may be effective in increasing this behavior over time, resulting in new stable patterns favoring attending to the present moment. The behavior analyst may also seek to evaluate the size of relational classes that disrupt present moment awareness and their functions. For example, when the client is not interacting with the present moment, are they thinking about future events that carry an avoidance function? If avoidance functional classes are large and pervasive, accomplishing present moment awareness may not be easily achieved without reducing the strength of existing relations through processes like defusion. In addition, some contingencies may discourage present

moment awareness, such as a major deadline at work or a toxic relationship at home. In these cases, ruminating on the future may allow for localized success in the context of the meeting or relationship, but at the expense of greater psychological flexibility and the pursuit of other values and delayed reinforcers.

Defusion

Defusion involves reducing the strength of relations contained within a functional class and can be accomplished by expending the relational network (thus reducing the strength of any single relation). Defusion may be difficult to achieve when avoidance functions pervade across several relational frames, when the frames are highly resistant to counterconditioning or extinction effects, and when literalization of the relational frames is maintained by external contingencies. Within RDT, one model assumption that has been supported in prior research (Belisle & Dixon, 2020a) is that expanding the size of relational classes can reduce the strength of individual relations contained within the class. As noted in the previous processes, classes that contain several strong relations with avoidance functions may detract from present moment awareness and committed action that leads the client closer to their values. Defusion exercises may help to weaken classes that maintain challenging patterns of relating that appear stable and resistant by introducing instability within existing relations. Weakening stable patterns of relating that lead to suffering may also disrupt the self-organizational process, as these patterns of relating lessen their influence on the emergence of new, potentially more adaptive relational patterns. Contingencies may also maintain the literalization of specific frames. For example, a person may engage in frames of comparison such as "I am so much better than my colleagues," which appears to confer greater reinforcement in the workplace at an individualistic level. Even if this is true or simply appears true, when social comparisons become pervasive, this same pattern may harm the same person's pursuit of meaningful friendships with others, which are disrupted due to social comparisons, as well as potentially meaningful romantic relationships such as may occur given the relation "I must be the primary income in my household." In this case, establishing greater contextual control over relational frames may allow for the pursuit of multiple values in context. Alternatively, encouraging the client to attempt to contact alternative reinforcers in the workplace through collaboration over competition may result in corollary changes in comparative relations occurring within other domains.

Self-as-Context

Self-as-context involves responding to deictic relational frames (e.g., I-here-now) flexibly and contextually, rather than responding to the same frames rigidly and without consideration of context. When "self" becomes rigid and decontextualized, this process is referred to as self-as-content, or the conceptualized self. Responding in terms of a conceptualized self may be more challenging to influence when the conceptualization pervades across multiple contexts, is consistent over a temporally extended period of time or rarely fleeting, and is maintained by external (and, likely, superficial) reinforcers. For example, a client may respond in terms of the diagnostic label "depressed" and a depressed self without considering the context within which depression occurs. Behavior analysts may consider whether the client identifies as "being" depressed in every facet of their lives, including at work and with family and friends, or whether "being" depressed is localized within only a single context, such as "feeling" depressed at work. The analyst may also seek to determine the temporal stability of this self-evaluation. For example, does the client consistently identify as "being depressed," or is this evaluation more likely after a particularly challenging day at work or after a fight with their family? As with present moment awareness, promoting greater self-as-context may be accomplished by noticing those moments when self-as-context evaluations are most probabilistic and attempting to increase this occurrence in new contexts. When responding in terms of self-as-content is temporally stable, the behavior analyst may seek to introduce new contexts or expand existing relations in order to provide the opportunities for responding in terms of self-as-context to disrupt the stability and to introduce new attractors within the relational system. Doing so may be especially challenging when external contingencies maintain self-as-content evaluations. For example, if the client reports "being depressed," which occurs along with anxiety that presents at work, and is currently receiving paid stress leave, altering the stable pattern of relating consistent with depression carries a risk that the client may lose access to the negative reinforcement contingency that maintains the evaluation. When this occurs, augmenting reinforcers that are available through participation in the workplace, such as comradery and a sense of belonging, may be necessary, as well as promoting greater acceptance and willingness to temporarily experience anxiety at work in order to achieve these other values.

Acceptance

Finally, acceptance describes a willingness to experience potentially aversive public and private events that allow for greater committed action in the service of chosen values. As shown in Table 1, promoting acceptance meets greater resistance if there is no clear hierarchy of avoidance functions; unwillingness to experience aversive events, both public and private, is absolute; and readily identifiable negative reinforcement contingencies promote

greater avoidance behavior. Ideally, not all verbal relations lead to equal avoidance functions; rather, some relations carry weaker avoidance functions than others, as may occur when relations other than sameness are present (e.g., B is less than A). Systematic desensitization describes an approach to altering avoidance behavior where stimuli that evoke a lower negative emotional response are presented initially, and as the avoidance response dissipates, the therapist introduces the next stimulus in the hierarchy (see Numan, 2017, for application in the treatment of test anxiety). This is analogous to a shaping procedure that may allow for greater success when promoting acceptance given knowledge of the specific relations that result in avoidance. However, avoidance patterns may exhibit stability if generalized avoidance behavior is universally absent. As with committed actions, transferring momentum from acceptance of some public and private events to acceptance of additional public and private events necessitates that some minimal level of acceptance is occurring. When avoidance is pervasive and universal, behavior analysts may need to augment acceptance using other processes, like values identification, in order to increase the reinforcing value of outcomes that can occur once acceptance is realized. As with the other processes, this may be more difficult if external contingencies maintain the avoidance behavior, such as avoiding work to avoid harassment from colleagues, which may necessitate working with the client to remedy those contingencies, such as encouraging a willingness to report harassment to a human resources department or supervisor. In this example, accepting the discomfort of reporting harassment may lead to greater access to values that would otherwise be present at work if the contingencies that maintain avoidance of work were no longer present.

Summary

As behavior analysts, we have the tools necessary to move beyond what we have comfortably rested on for decades and to allow scientific discoveries in the domain of complex systems and human behavior to expand our field in the years that lie ahead. The advances we have seen in RFT, as well as in ACT, will require us to engage our own willingness to accept change, and commit to moving behavior analysis forward—not backward. As with any science that is alive, it constantly is evolving; change is consistent with our shared value of making the world better for people. If we cannot change when the data suggest that we need to, we are engaging in the same psychological rigidity that ACT interventionists encourage their clients to avoid. Arguably, we become a science no longer.

The maturation of ACT within ABA has been slow, and much more development still needs to occur. The careful articulation needed to bridge the gaps between basic RFT processes and adherence to ACT interventions still needs further empirical support. More research across the entire domain of RFT and ACT needs to be accomplished by multiple research teams, and direct comparisons of RFT and ACT interventions to "traditional" behavior analysis approaches still need to be conducted. The final decision on the utility of our approach or any approach should be based on its added contribution to existing behavior analysis approaches. As Kuhn (1962) spoke about over a half century ago, once the abnormalities of normal science are revealed, and subsequently magnified, it is unlikely that this evolving system can ever be put back to its initial state of beliefs and practices. It is time we become dynamical, flexible, and self-organizing, in order to move toward the values that set the stage for this emerging field nearly 50 years ago (Baer et al., 1968).

Echoing the crossroads in which the field stands, this same crossroads exists for the individual practicing behavior analyst. Some behavior analysts may continue to engage in traditional practices and hope that the need for ACT interventions will be unnecessary—that they can avoid complexity within a treatment of behavior that is inherently complex. Depending on the clinical populations chosen, and the availability of a more sophisticated competitor, such a path could yield the external reinforcers that maintain rigid responding. However, as the practicing behavior analyst finds themselves with the lives of their clients in their hands, with a promise to do everything and anything necessary to improve the human condition for those people, we find it perplexing that such a clinician would do anything less than deliver the optimal care. In the case of the many people who seek such services who do have complex language abilities, or the potential to gain such skills via quality intervention, it appears at this time the data suggest that ACT interventions hold great promise to improve their current state of affairs. We hope that the model of RFT put forward in the present article helps push the field forward. Not only will we benefit from the inclusion of ACT in our practice, but we believe ACT may yet benefit from the inclusion of us within its broader and growing practice.

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Declarations

Ethical Approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional human subjects committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Conflict of Interest The authors declare that they have no conflict of interest.

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