

**Why We Are Not Acting to Save Ourselves:  
ACT, Health, and Culture**

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### **Abstract**

Chronic health conditions are increasing at an alarming rate world-wide, and many could be prevented if people were to engage in specific lifestyle behaviors. Intervening on lifestyle behaviors is challenging due to the fact that the consequences associated with unhealthy behaviors are temporally distant and probabilistic, and the aversive functions of covert stimuli may interfere with people's engagement in healthy, preventative behaviors. This paper explores the role of relational framing in the promotion of healthy lifestyle behaviors, and summarizes research supporting the use of Acceptance and Commitment Training (ACT) as a framework for prevention and intervention. We explore how ACT alters the context in which rigid patterns of rule-following occur. ACT loosens the literal functions of stimuli so that experiential avoidance behaviors are weakened and healthy, values-consistent behaviors are strengthened. We propose culture-wide interventions inspired by Contextual Behavior Science so that healthier societies can be cultivated.

*Keywords:* Health, prevention, Relational Frame Theory, ACT, culture

## **Why We are Not Acting to Save Ourselves**

### **ACT, Health, and Culture**

Chronic health conditions create suffering. They compromise an individual's ability to live a life characterized by wellness and vitality. Many health conditions are preventable. A number of lifestyle behaviors are considered key in prevention, as are screening and early detection. Research in behavioral medicine suggests that engaging in lifestyle behaviors such as physical activity, abstaining from smoking, eating healthily, and drinking low volumes of alcohol or abstaining entirely might prevent the development of chronic disease (Hagger et al., 2020). Despite this body of knowledge, the rates of chronic health problems are increasing. Why this might be the case when there is a substantial literature on behavioral interventions for reducing unhealthy behaviors and increasing healthy behaviors needs to be examined with a critical lens.

There are encouraging signs of recognition that, although the literature on behavioral interventions from the fields of health psychology and public health is sizable, what is needed is a coherent science of behavior change (Hagger et al., 2020; National Institutes of Health, 2019). As Zhang et al. (2018) highlighted, the sheer extent of the negative impact of health problems on well-being (whether social, emotional, economic, or physical), allied with oft-reported challenges in promoting maintenance of behavior change, suggests that a reanalysis of approaches to fostering cultural change in the context of health behavior is warranted. It might seem, therefore, that the suffering created by some chronic health conditions is avoidable and unnecessary. We feel that behavior analysis as a field is ideally positioned as a coherent science of behavior to provide leadership to promote a healthier society.

A challenge in developing effective interventions is the fact that the consequences for lifestyle behaviors are both temporally distant and probabilistic, a reality alluded to by Skinner

(1987) in his seminal paper, *Why We Are Not Acting to Save the World*. Skinner (1987) stated that, “the more remote the predicted consequences, the less likely we are to follow advice. We have more often been successful when we have followed advice about the immediate future because that kind of advice has been more often tested and found better. The advice we are now being offered is about a distant future; it may be good advice, but that has very little to do with whether we shall take it” (p. 5). In support of Skinner’s (1987) point, many health conditions develop after years of ongoing patterns of behavior, and it is not absolutely certain that a person who engages in unhealthy behavior will experience health issues later in life. The threat of a far-removed aversive consequence may thus be insufficient to influence everyday decision-making regarding one’s health.

Specialized antecedent and consequent interventions have been designed to facilitate the adoption of healthy lifestyle practices for this reason. Such interventions are based on the effects of direct-acting contingencies and show promise for increasing healthy lifestyle behaviors (see Normand & Bober, 2020). Skinner (1987, p. 6) anticipated the success of such interventions by asking, “why not arrange immediate consequences that will have the effect that remote consequences would have if they were acting now? There is nothing very new in that suggestion...cultures have helped to solve the problem by supplying immediate consequences that have the same effect as the remote ones”.

The psychological experience surrounding health -- both for those hoping to prevent the development of a chronic condition and for those enduring one -- should also be considered. Anxiety and depression have been shown to occur at a high prevalence in people living with chronic health conditions (Farrand & Woodford, 2015), and for many people even thinking about the possibility of a serious illness arouses fear (Dunn et al., 1993). In the face of distressing

psychological experience, the natural tendency is for people to avoid the stimuli that elicit such reactions: An individual deliberating whether or not they should eat a fast-food meal may tell themselves, ‘I don’t need to think about it now; I’ll worry about it when I get older,’ and consume the meal. An individual experiencing worrisome health symptoms might avoid seeking medical attention to avoid receiving frightening news. Such avoidance strategies have deleterious effects in the long-run, and are verbally mediated.

The purpose of this paper is to explore, from a contextual behavior science perspective, the processes involved in health-related behaviors. The contextual behavior science stance is an elaborated behavior analytic approach that involves exploring the role of context in influencing behavior at the individual, community, and cultural levels (Vilardaga et al., 2009). The ‘world within the skin’ is thus viewed as much a part of that context that influences behavior as external environmental contingencies (Hayes et al., 2017): People interact with covert rules, and expend efforts to avoid uncomfortable psychological experience (i.e., private events). We begin by discussing the prevalence of chronic health conditions in the general population and their linkage to specific lifestyle behaviors, followed by an analysis of some obstacles to promoting behavior change. We then explore how relational framing may promote rigid patterns of rule-following that are incongruous with values-consistent, healthy lifestyle behaviors, and summarize research in support of the efficacy of Acceptance and Commitment Training (Blackledge & Hayes, 2006) in fostering healthy repertoires. We conclude with a discussion of potential cultural-level interventions within and beyond healthcare inspired by contextual behavior science.

Throughout this paper, we adopt the word “training” in lieu of “therapy” in the ACT acronym to underscore the conceptualization of ACT as a framework for expanding adaptive

repertoires in all people, as opposed to a treatment for psychological disorders only (Levin et al., 2016).

### **Chronic Health Conditions: Burdensome and Preventable**

The medical community defines chronic health conditions as conditions that last one year or more, require ongoing medical attention, and limit the activities of daily living (Centers for Disease Control and Prevention, 2020). The most common chronic conditions include heart disease, stroke, cancer, and diabetes, which together are estimated to be responsible for more deaths worldwide than infectious diseases. The World Health Organization predicts that chronic diseases will account for almost three-quarters of all deaths worldwide this year (World Health Organization, 2020). Obesity and diabetes are occurring at younger and younger ages. According to WHO (2016) approximately 422 million adults live with diabetes mellitus (DM) worldwide. Treating chronic diseases, particularly at such a high prevalence, creates an economic burden for society. Chronic diseases contributed approximately 46% to global healthcare costs in 2001; the proportion of the burden is expected to increase to 57% by 2020 (World Health Organization, 2020).

Most chronic health conditions have been linked to specific behaviors, suggesting that if people changed their behaviors, certain conditions could be preventable. Ongoing tobacco use, poor nutrition, excessive alcohol use, and a sedentary lifestyle are all strong determinants of whether or not a person will develop a chronic health condition. To wit, the World Health Organization estimates that 80% of cardiovascular disease, including heart attacks and strokes, could be prevented if people stopped using tobacco, ate a healthier diet, and exercised regularly, and 40% of cancer cases could similarly be prevented (Saphier, 2020). Although a number of health conditions appear to have a probable genetic basis, epidemiological studies have

questioned whether genetics can be considered a primary cause in many cases (see Rappaport, 2016). Today's evolutionary science perspective acknowledges that an individual's interaction with their own sociocultural community is necessary to activate genetic susceptibility (Wilson, 2014).

### **Some Obstacles**

The onset of a chronic health condition would seem on the surface to be an aversive consequence following years of engagement in unhealthy behaviors. Chronic health conditions have painful and often debilitating symptoms and many treatments have unpleasant side effects. However, considerable research has shown that delayed outcomes are less successful at influencing behavior than more immediate outcomes (Critchfield & Kollins, 2001), and the contingency between lifestyle behaviors and health conditions is highly probabilistic. As Skinner (1987, p. 2) described, "we are being asked to do something about the future. But the future does not exist. It cannot act upon us; we cannot act upon it." Behavioral interventions to date have thus focused upon the implementation of relatively short-term direct-acting contingencies, including antecedent and consequent manipulations such as prompts, instructions, and environmental modifications to set the occasion for healthy behaviors, and praise, monetary reinforcement and tangible goods to reinforce such behaviors (Normand et al., 2015). Specialized functional assessment methodologies have been designed to identify the conditions under which healthy behaviors are likely to occur (see Hustyi et al., 2012). Such interventions have been shown to be generally effective and found acceptable by participants (Green & Dallery, 2019). Educational programs such as Food Dudes (Tapper et al., 2003), a curriculum that was designed to increase school-age children's choices for healthy food items, also shows promise but its long-term efficacy is at present unclear (Upton et al., 2013).

Covert stimulation may also influence an individual's engagement in prevention-related behaviors. Critchfield and Reed (2016) suggested that people's private psychological experience can actually interfere with such behaviors. These authors taught undergraduate participants to discriminate between melanoma and non-melanoma images, and found that discriminations were disrupted when participants were given verbal information about the risks and mortality rates of skin cancer. The authors speculated that the information on skin cancer elicited adverse psychological reactions in participants, as participants were likely thinking about the information as they completed the discrimination task. Their findings may well parallel the experience of people engaging in screening and prevention-related behaviors outside of the laboratory, where patient-education efforts rely on verbal information about risks and warning signs. For many, reading and thinking about disease may be so aversive that they avoid engaging in behaviors where such unpleasant psychological experience is likely to occur. Public health studies have shown that when people are fearful about disease they are likely to delay seeking medical treatment, in some cases indefinitely (Donovan et al., 2003). The U.S., for example, has one of the most robust breast cancer screening programs in the world, but 50% of American women do not get mammograms because they are afraid of the results (Saphier, 2020).

Thus far we have examined two obstacles in the design of interventions to promote healthy lifestyle behaviors, including the fact that temporally remote and probabilistic contingencies may be ineffective at influencing behavior, and the fact that thinking about one's health may be aversive or frightening in its own right, leading people to avoid contexts in which such problematic thoughts are likely. We now examine the additional challenges and solutions presented by Relational Frame Theory (Hayes et al., 2001) and its conceptualization of the relational basis of human behavior.

**Relational Frame Theory: How Language “Cuts Both Ways”**

In the context of both understanding preventative measures and informing therapeutic interventions in health behavior, Relational Frame Theory (RFT) offers scope and breadth (Zhang et al., 2018). RFT focuses on the function altering effects of language (Forsyth & Eifert, 1996) in terms of how rules and other verbal stimuli come to exert control over behavior. For example, abiding by the rule that ‘one cigarette won’t do any harm’ on a daily basis over many years might lead to insensitivity to health-related contingencies, such as premature development of breathlessness walking up a flight of stairs or early aging of the skin. In a sense, it might be conceptualized that an equivalence relation has been derived between ‘one cigarette’ and ‘no harm/safe’. Similarly, a person might have derived an equivalence relation between ‘smoking’ and ‘pleasure’ or ‘cigarette’ and ‘relaxing’ and those verbal rules come to exert stronger functional control over behavior than a rule such as ‘smoking causes heart disease/cancer’. It could also be the case that the person who smokes is engaging in avoidance of private events, where any thoughts about future development of Chronic Obstructive Pulmonary Disease (COPD) or lung cancer are simply ignored.

According to RFT, patterns of derived relational responding (e.g., relational frames such as sameness/coordination, opposition, distinction, more than /less than, temporal – now/then), or responding to one event in terms of another in accordance with the contingencies of one’s sociocultural context (Critchfield & Rehfeldt, 2019), are the key generalized operants underlying language and cognition (Dymond & Roche, 2013). A fundamental property of relational framing is the transformation of stimulus functions (Dymond & Rehfeldt, 2000; Dymond et al., 2007), which specifies that the functions of stimuli involved in relational networks change in accordance with the relational networks in which they participate. The transformation of function

phenomenon is observed when the behavioral functions of stimuli transfer via a relational network (e.g., a three-member stimulus equivalence class; A-B-C) to other stimuli which previously did not influence that behavior (e.g., Dougher et al., 1994).

As Dymond and Rehfeldt (2000) described, if one of the stimuli in a relational network is established as a discriminative stimulus for a given response then other members of the network will typically acquire discriminative properties without further training. This process could help account for derived avoidance of a yet-to-be experienced event rather than directly conditioned avoidance. Derived avoidance of medical procedures not yet experienced could potentially lead to negative health consequences such as allowing an aortic aneurism ‘bulge’ in an artery wall or a tumor to develop and spread undetected. For example, if a person is already slightly anxious about ‘Stimulus A’ (medical check procedure A) that they have previously experienced and is told that A is less painful than Stimulus B (medical procedure B) and B is less painful than Stimulus C (medical procedure C), an individual who has otherwise never encountered medical procedure C might display symptoms of extreme avoidance when offered it and not travel to the clinic or hospital on an appointed date.

The transformation-of-functions effect extends a person’s behavioral repertoire in the absence of direct training or reinforcement (Tyndall et al., 2009). However, a flipside to the generally adaptive transformation-of-function effect, as Dymond, Bennett, Boyle, Roche, and Schlund (2018) argued, is that this very relational basis of human behavior leads to both suffering and self-destruction. To illustrate, the stimulus function of an aversive event, such as dysregulated breathing, can be transferred to a neutral event. Consider a recreational hike with friends. For some, just thinking about or planning the hike can lead to dysregulated breathing. If

the person experiencing this discomfort withdraws from the event, they will lose out on potentially important reinforcement opportunities.

In a classic laboratory analog study, Augustson and Dougher (1997) trained eight participants in the formation of two four-member equivalence classes. They subsequently established an avoidance response (CS+) – pressing the spacebar on a computer keyboard 20 times prior to the potential administration of a mild electric shock – for a discriminative stimulus (B1) that was also a member of one of the equivalence classes (A1-B1-C1-D1). The avoidance response was shown to transfer to the other members of the particular equivalence class and not to members of the other equivalence class (A2-B2-C2-D2). Guinther and Dougher (2015) proposed that such observed transfer of function across stimulus equivalence classes could provide a behavioral account of the etiologies of avoidance responses that appear to have emerged in the absence of any explicit history of reinforcement for avoidance in the natural environment.

Dymond, Roche, Forsyth, Whelan, and Rhoden (2008) established an equivalence (or coordination) relation with a pair of nonsense word stimuli and an ‘opposite’ set (i.e., pair) of stimuli through direct training. In the absence of feedback, participants subsequently derived equivalence relations within both pairs and, importantly, derived opposite relations between both pairs. Using a fear-conditioning paradigm, a stimulus from the equivalence set was aversively conditioned in that pressing a space bar button on a keyboard functioned to control avoidance of aversive stimulus. A non-aversive conditioning procedure was employed for one stimulus from the opposite set (i.e., a space bar press response was withheld). Broadly speaking, generalized avoidance was observed as participants subsequently produced a higher rate of avoidance (i.e., pressing the space bar) in the presence of the other stimulus of the equivalence set (i.e., the non-

directly conditioned stimulus) than the remaining stimulus of the opposite pair. To summarize, a derived equivalence relation, where one member of the equivalent set was a directly aversively conditioned stimulus, seemed to function as a context for generalized (or symbolic) avoidance behavior whereas derived opposition relations did not.

What are the implications, then, of such basic empirical studies on verbal and symbolic behavior from the laboratory with respect to health? As Hayes, Strosahl, and Wilson (2012) argued, it is via normal language processes that much human suffering emerges. From an RFT perspective, an unfortunate counterproductive consequence of arbitrarily applicable relational responding (AARR) is a tendency to engage in symbolically-derived maladaptive avoidance behavior (Dymond et al., 2018). A behavioral practitioner working within an RFT framework would aim to either strengthen or weaken relational frames that are already apparent in a client's verbal behavior repertoire, and to also set the occasion for learning novel and more adaptive relational responses in the context of specific health behavior targets (Zhang et al., 2018).

As outlined above, RFT proposes that verbal relations (e.g., verbal rules) are learned through direct and derived processes (e.g., Dymond et al., 2008). Thus, a key implication is that it is not fully possible to remove the historically established psychological relations between environmental cues and past unhealthy behaviors. Many typical Cognitive Therapy approaches focus on changing or removing the content of a person's cognitions via techniques such as thought stopping or cognitive restructuring. From an RFT stance, however, such strategies are likely to be unproductive in facilitating long lasting behavior change because, as Forsyth and Eifert (1996) noted, there is no psychological process called *unlearning*. Thus, RFT suggests that a more fruitful approach would be to focus on altering the context in which the verbal rules are

evoked in order to strengthen or weaken the behavioral impact of rules rather than try to eliminate or change the rules themselves.

At this juncture it is important to accede that to date, very little empirical work has been conducted within an RFT framework with respect to public health. The current treatise is speculative and serves somewhat as a call-to-arms to encourage basic and applied investigations to develop the fresh perspective needed to promote lasting health behavior change.

ACT has particular potential to serve as one key fresh approach to health behavior change due to its coherent theoretical framework (Hayes et al., 2012), transdiagnostic scope (Levin et al., 2014), and adaptability across a variety of health and cultural contexts (Zhang et al., 2018). The emphasis within ACT and RFT on altering the context in which verbal rules are experienced or acted upon is key to a psychologically flexible approach to health (Guinther & Dougher, 2015; Kashdan & Rottenberg, 2010; Zhang et al., 2018). Psychological flexibility is conceptualized as a person's awareness of the stimuli included in the present moment, including one's psychological experience, while engaging in values-consistent behaviors that achieve important external reinforcers. With ACT, a wide array of behavioral techniques are employed to encourage clients to experience stimuli or events with psychological distance, or mindful awareness. This allows for greater variability in response functions in the presence of such stimuli, rather than automatically following the conditioned response functions of the stimuli per se. An ACT practitioner might endeavor to establish contexts in which relational framing behavior could emerge that could support desirable and adaptive behavioral change (e.g., establish a frame of equivalence or co-ordination between engaging in a difficult health behavior task and a person's chosen values). ACT practitioners rely heavily on the use of analogy and metaphor to evoke psychological distance between a person's covert (e.g., thoughts) and overt

responses. This sets the stage for identifying a client's values and the behaviors that would commit them to those values.

There is mounting evidence for the efficacy of ACT interventions across many health behavior domains (e.g., A-tjak et al., 2020; Manchón et al., 2020) including the reduction of cigarette smoking (e.g., Bricker et al., 2014; Bricker et al., 2013), increasing physical activity (Manchón et al., 2020; Moffit & Mohr, 2015) and weight loss (Forman & Butryn, 2015). Indeed, Gloster, Meyer, and Lieb (2017) proposed that increasing psychological flexibility among the general population could be a public health target that is potentially achievable.

It is important to note that, from an ACT perspective, there is no one *correct* way to implement ACT and there are a great variety of ways to conduct ACT-based work with many diverse methods. In other words, rather than rigidly adhering to a particular technique or specific protocol, a practitioner focuses on the 'act in context' and a pragmatic workability in order to broaden a client's behavioral repertoire in line with self-chosen values. An ACT trainer or coach in a health context would help a client become more aware of their thoughts or self-stories (e.g., "Well I'm already overweight so what's the point in cutting down on food" or "I'll never be fit again") in terms of thinking as a dynamic ongoing relational process, rather than the thought as fixed or static product. From the workability perspective, the ACT health coach focuses their intervention on what they can predict and influence in terms of a client's behavior. Indeed, this can be very different across clients in one-to-one sessions or support group formats (e.g., weight loss groups) even though on the surface the behavioral or health problem might look quite similar across that client group (e.g., smokers; obese persons; excessive drinkers).

The following section will detail three (experiential avoidance, cognitive fusion, lack of values clarity) of the six core processes (others being self-as-content, lack of present moment

awareness, and non-committal to action) of psychological *inflexibility* (i.e., the polar opposite of psychological flexibility; Hayes et al., 2006) that are most relevant to consider in the context of health. Cognitive fusion and experiential avoidance are particularly central processes and are often viewed as a pair working together to facilitate maladaptive patterns of behavior (e.g., Bardeen & Fergus, 2016). In simple terms, cognitive fusion refers to responding to the content of one's thoughts as if they are literally true, while experiential avoidance relates to attempts to control or regulate thoughts, feelings, and emotions (Dixon & Paliliunas, 2020). From a functional-analytic perspective, mindfulness-based interventions typically encourage people to discriminate between private events and stimuli occurring in the person's social and physical environment, as well as attending to situations in which their private verbal behavior is not functionally adaptive. A clinical behavior analyst would ascertain the function of private (i.e., verbal) and publicly observable behavior and employ behavioral strategies to reduce rigid and excessive rule-following that are not adaptive for living a healthier life (see Fletcher & Hayes, 2005; Dixon & Paliliunas, 2020).

### **Experiential Avoidance**

Experiential avoidance is a cardinal component of the psychological inflexibility model that appears to be closely tied to the development of negative health outcomes (Hayes et al., 1996; Karademas et al., 2017). With respect to health, experiential avoidance likely involves avoidance of internal private events (e.g., thoughts about developing cancer or feelings of breathlessness due to obesity). For example, not engaging in physical activity could serve the function of avoiding internal experiences (Manchón et al., 2020) such as thoughts, sensations or emotions related to the physical exercise (e.g., fearing the painful muscle aches that might emerge following a session on the treadmill or lifting weights at a gym). Avoiding medical

consultation may serve a similar function. Experiential avoidance behaviors are negatively reinforced as they remove the private event associated with an aversive stimulus (e.g., anxiety evoking thought about mortality), rather than the aversive stimulus itself.

A negative impact of experiential avoidance on physical health might emerge if a person engages in unhealthy behavioral responses such as binge eating (see Lillis et al., 2011), overconsumption of alcohol, or chain-smoking, while experiencing stress. These maladaptive behavioral responses might provide initial relief and comfort as they help suppress or avoid unwanted aversive private events (e.g., thoughts and memories about a stressful day at work). However, over the long term, if this behavioral response pattern becomes rigid and deeply embedded as a *go-to* experiential avoidance response to everyday stressors, it can have severe detrimental health consequences over time.

### **Cognitive Fusion**

Cognitive fusion appears to have direct links to physical health (Bodenlos et al., 2020; Trindade et al., 2020; Trindade et al., 2018). Cognitive fusion refers to a contextually controlled behavior-behavior relation in which private events (i.e., thoughts and feelings) are responded to as if they are literally ‘true’ (Blackledge, 2018). From an ACT perspective, when a person takes their thoughts literally, it results in insensitivity to direct contingencies of reinforcement by impeding contact with direct antecedents and consequences of behavior (Hayes, Strosahl et al., 2012). As McCracken, Barker, and Chilcott (2014) put it, cognitive fusion creates difficulties in tracking experiences outside of the actual content of those specific thoughts that exert excessive control over behavior.

What are the implications of cognitive fusion from a health perspective? ‘Fusion’ with illness or disease-related thoughts such as, “That medical procedure is just too frightening to

even think about” or “It won’t make any difference if I do not exercise anyway”, is associated with a tendency to act in accordance with such thoughts. Treating thoughts as if they are ‘true’ can come to exert rigid influence over illness-related behavior (Trindade et al., 2018). For example, fusion with such thoughts could lead to patterns of behavioral avoidance such as not adhering to a medication regime, going to medical check-up appointments, or taking a daily walk in the open air - avoidance strategies that will paradoxically worsen ill-health (Trindade & Ferreira, 2014); thus, engaging in healthier lifestyle behaviors becomes ever more challenging.

It is not just avoidance of potential physical pain that makes cognitive fusion and experiential avoidance a particularly potent combination in undermining physical health and well-being (Bardeen & Fergus, 2016). Fusion with thoughts effectively becomes a rule that is reinforced by the literal context. For example, “it’s just a couple of drinks” may help justify regular alcohol consumption but create health complications later in life. Cognitive fusion with such thoughts helps facilitate experiential avoidance behaviors such as suppressing unpleasant thoughts of liver failure or ignoring warning signs such as yellowing skin, while adhering to the rule “it’s just a couple of drinks”.

Cognitive defusion is the opposing end of the spectrum to cognitive fusion. As a procedure (see Assaz et al., 2018), defusion aims to loosen the relationship between thought and action by encouraging clients to see thoughts as verbal stimuli that come and go rather than as verbal stimuli that represent literal truths about external contingencies. In a health context, cognitive defusion interventions (e.g., Karekla et al., 2020) can help loosen the rigid functions of verbal stimuli to facilitate an expansion of the person’s behavioral repertoire. For example, if a person is fused with the thought “I won’t go for a walk if it’s cold and damp”, that might lead to a restricted repertoire of sedentary behavior during long dark winter months. With cognitive

defusion, the aim is to alter the functional context so that the person sees this thought as just a thought (i.e., verbal stimulus) that does not have to restrict one's behavioral repertoire (i.e., rarely leaving the house for exercise in winter months).

### **Lack of Values Clarification**

Where cognitive fusion and experiential avoidance result in rigid problematic rule following (e.g., 'We're all going to die anyway so why should I quit drinking/smoking/binge-eating'), it often reflects a lack of contact with a person's values. It might be the case that many people go through life without ever articulating the qualities by which they would like to live. Contact with values might help counteract some of the rigid control that verbal rules have over a person's lifestyle. For example, if a person notes that 'I would like to play a big part in helping and seeing my grandchildren grow up' because they value intergenerational family time, then this could help loosen the control of the verbal rule (i.e., 'We're all going to die anyway so why should I quit...'). In other words, they become more aware that their verbally-constructed rules and rigid behavioral patterns are in conflict with deeply held values, and that if they quit the unhealthy habit they might live longer and experience their grandchildren for a greater length of time.

From an RFT point of view, values can be defined as sources of positive reinforcement that are intrinsic and overarching (Villatte, 2020). Villatte (2020) refers to each of the three reinforcement terms as follows: a) overarching in the sense that reinforcement is provided by many different actions that can help to connect to a specific value; b) intrinsic in terms of the reinforcement derived from carrying out an action due to its symbolic relation to a value; and c) positive as values are appetitive and thus approached rather than avoided. Dixon and Paliliunas (2020) proposed that behavior analysts teach clients to identify personal reinforcers, build verbal

descriptions of those reinforcers, discriminate between situations that will provide access to those reinforcers and those that will not, and develop self-management plans to maintain values-consistent behavior.

With respect to values and physical health, behavior analysts need to help clients focus on specific health-related values rather than identifying broad values per se. Stapleton, O'Connor, Feerick, Kerr, and McHugh (2020) examined values in relation to key health-related behaviors, physical activity, quality of diet, quality of sleep, alcohol consumption, and smoking in a cross-sectional sample of Irish university students. Stapleton and colleagues found that measures of general values directedness did not function well as predictors of health-behavior. It must be acknowledged that a key limitation is that college samples are particularly prone to delay and probability discounting due to their youth and that potential long-term ill-health effects are too far distant to impact current behavior. However, this finding suggests that the proposed link between the process of values clarification and subsequent health behavior change (e.g., Dahl, 2015) might not always function as expected, and more research needs to be conducted in this area.

The following section will present an overview of three particular health domains where ACT-based interventions appear to have encouraging signs of efficacy: Obesity (including weight management and physical activity), cancer, and chronic pain.

### **ACT and Obesity**

Lillis, Dalal, and Forman (2020) noted that obesity is one of the leading causes of preventable morbidity and mortality worldwide. Two treatment packages derived from ACT principles, referred to as Acceptance-Based Therapy (ABT) and Values-Based Healthy Living (VHL), seem effective in facilitating and sustaining weight loss (see Lillis et al., 2020). For

example, in a 12-week ABT program participants lost an average of 8.1% of their initial weight post-intervention and maintained these weight losses six-month later (Forman et al., 2009).

Forman et al. (2013) conducted a year-long randomized controlled trial group ABT intervention with 128 overweight individuals and followed-up with participants six months post-treatment (i.e., 18 months after initial weight assessment). Forman and colleagues reported that ABT participants' average weight loss was favorable compared to a standard behavioral intervention control group. In a later study with 190 overweight individuals (Forman et al., 2016), ABT-group participants lost considerably more weight (13.3%) than did those receiving standard behavioral treatment (9.8%).

In the context of physical activity, Butryn, Forman, Hoffman, Shaw, and Jurascio (2011) reported improvements in quality and intensity of bouts of physical activity among college students following ABT intervention when compared to a standard educational program. More recently, an ABT protocol was applied to a sample of community adults who were trying to maintain clinically important levels of exercise (i.e., moderate-to moderate-to-vigorous-intensity; MVPA; Butryn et al., 2018). The ABT intervention resulted in increased time per week engaged in MPVA. This is an important finding, as public health literature repeatedly reports that MVPA provides substantive and varied benefits for overall health and wellbeing (e.g., Reiner et al., 2013).

ABT and VHL programs are adaptable and may help reach larger numbers of clients than more typical one-to-one treatment interventions. They are generally applied to groups of between 12 and 16 individuals, with a gradual reduction in the number of contact sessions over time (Lillis et al., 2020). Wallin, Parling, Weineland, and Dahl (2018) conducted a study which focused on the three core ACT targets of values, acceptance and mindfulness, and committed

action, using a self-help protocol for obesity (see Lillis et al., 2014). Wallin and colleagues employed nonconcurrent multiple baseline designs and participants were randomly assigned to different baseline lengths according to three staggered intervals. The primary measures of interest were daily ratings of values attainment related to health (e.g. “With regard to your values, to what extent have you taken care of your health today?”), and weight related experiential avoidance (e.g. “To what extent do thoughts and feelings related to your weight keep you from living according to your values?”). Results were somewhat mixed, with significant differences observed in values attainment for seven participants and reductions in experiential avoidance reported for five participants. Little change in physical activity levels were reported.

### **ACT for Cancer**

Cancer is a complex context for treatment, as it can appear in over 100 different forms, classifications, and varying levels of severity, making a one-size fits all approach to intervention untenable (Arch et al., 2020). Furthermore, the psychological needs of people diagnosed with a curable form of cancer are very different to those with a terminal diagnosis. The flexibility of ACT makes it amenable to working with cancer sufferers (e.g., Feros et al., 2013; González-Fernández, & Fernández-Rodríguez, 2019; Hawkes et al., 2014; Hulbert-Williams et al., 2015). A key point to note, however, in the context of adapting ACT for cancer patients is that some strategies or techniques, such as cognitive defusion (Blackledge, 2018), might not always be appropriate for a person with cancer. Arch et al. (2020) highlighted one such instance: “...people with metastatic cancer often experience distressing thoughts and beliefs (“When I die, my kids won’t have a dad”) that are true, valid, and devastating to contemplate. We have seen patients with incurable cancer whose parent died of the same disease when the patient was a child, with the patient now repeating this loss for their own children. If a person is haunted by such

thoughts, it can be highly invalidating to jump straight into cognitive defusion” (p. 165). Arch and colleagues suggest that compassion and acceptance be cultivated as both the client and practitioner sit with such painful private events, acknowledging instances when the negative thoughts and emotions hinder engagement in values-consistent action. This is challenging in practice due to the aversive nature of the verbal networks in which the word “cancer” participates (i.e., many people may assume cancer is equivalent to death), rendering experiential avoidance of such private events more likely and appetitive as a short-term coping strategy. Engaging in valued actions may also be compromised for a person encountering the aversive side effects of cancer treatment.

### **ACT for Chronic Pain**

ACT for chronic pain is the most widely researched of all health domains within the ACT literature. The effects of ACT appear to compare favorably with standard cognitive behavior treatment packages (e.g., Åkerblom et al., 2020; Scott, Hann, & McCracken, 2016; Vowles et al., 2014; but see Williams et al., 2020, for a challenge to the evidence base of ACT for chronic pain). There is a clear need for approaches that can positively influence the quality of life for a person who suffers with chronic pain.

Dahl et al. (2004) recommended focusing on three core targets of ACT in treating chronic pain: experiential avoidance, cognitive fusion, and lack of values-led behavior. All three processes are interlinked with respect to chronic pain and should be considered in interactive terms. Whereas behavioral avoidance appears adaptive in the context of acute pain (e.g., to avoid compounding an injury), experiential avoidance does not seem so adaptive in the context of ongoing chronic pain. Experiential avoidance might help account for the reluctance of chronic pain sufferers to attempt prescribed exercise plans, for example, or avoid work tasks or going on

social outings because of the threat of pain. Such avoidance not only increases the risk of developing more debilitating health conditions, but limits the opportunities for reinforcement that a person could contact with a new job, extra money, and wider social networks. Exposure work might be effective in such contexts when clients' avoidance of aversive private events impedes engaging in committed action (Dahl et al., 2004).

A particular challenge in applying ACT with people who suffer chronic pain is that patients can overly focus on one psychological flexibility process (e.g., valued living) at the expense of others (e.g., cognitive fusion) in order to target a specific pain symptom. This might lead to increased persistence of other pain-associated problems. Thus, behavioral researchers could conduct empirical studies to identify manipulable contexts that promote the generalization of ACT skills and techniques across the wide array of persistent symptoms that chronic pain sufferers may experience. Furthermore, behavioral practitioners could conduct research on whether ACT-based interventions serve a similar behavioral function across different chronic pain conditions or syndromes, as it appears they might be more or less effective in some contexts than others. Indeed, behavioral health coaches working within an ACT model could conduct research on identifying novel reinforcers to broaden a client's repertoire of committed actions.

While many of the studies cited in the preceding sections have employed between-subject group designs, behavior analytic practitioners look to single-subject methodology for more convincing evidence of treatment efficacy. In a step towards this direction, Barreto and Gaynor (2019) demonstrated the efficacy of one-hour ACT-based protocol interventions across four case studies, three of which were successful. Each participant received a 60-minute protocol that included the following components: short focused clinical interview, introduction to the ACT matrix worksheets, identification of behavioral barriers and internal obstacles, cognitive defusion

exercises, physicalizing mindfulness, completion of values identification exercise, developing an action plan, and completing a commitment statement. The first successful case study described a 21-year female college student who reduced the amount of alcohol consumed to a healthy range recommended by Center for Disease Control guidelines. The second case study featured a 25-year old college student who was chronically sleep-deprived, who increased the number of hours of sleep per night for a higher percentage of time relative to baseline following ACT. The third successful case study focused on a 19-year male college student with poor diet, who showed an increase in self-reported consumption of healthy food items following the ACT intervention. More work of this vein should be conducted using single-subject design methodology to ascertain functional relationships between ACT and behavior change.

### **ACT for Prevention**

The preceding section highlighted some health domains where ACT-based interventions seem particularly helpful. However, medical and psychotherapeutic interventions are costly (financially, emotionally, and physically) and are not always available to those who might be most in need. Thus, developing health promotion programs based on behavior analytic and ACT principles to encourage healthy lifestyle behaviors before health problems develop would be beneficial. Research should focus upon the effectiveness and feasibility of ACT for Health programs in high schools, colleges, workplaces, and community centers. Behavior analysts must also be cognizant of the limitations of individualized interventions without acknowledging where reinforcers lie culturally. For example, it might be difficult to conduct cognitive defusion and values-clarification based work with a heavy drinker whose social network involves regular alcohol consumption with a group of friends. Disrupting the social contingencies in this context would be challenging. Similarly, in terms of ready reinforcement for eating quick, easy,

unhealthy food, it is difficult to implement healthier eating interventions in contexts where fast-food outlets are readily accessible (Lillis et al., 2020). Thus, while ACT may regulate emotional reactivity to private events and broaden behavioral repertoires, a greater awareness of wider cultural contingencies at play in influencing health behaviors and daily choices is warranted.

We have explored how relational responding may give rise to rigid patterns of rule-following that interfere with a person's engagement in health-related behaviors. We have summarized the literature to date in support of the application of ACT as a strategy for intervention and prevention. We now explore the potential contributions of contextual behavior science to cultural-level health practices, including behavioral health coaching, health education, and health-care delivery. We conclude with a call for scaled-up applications to evaluate strategies for promoting healthier societies.

### **Behavioral Health Coaching**

Behavioral health coaching has caught the attention of behavior analysts in recent years (i.e., Finn & Watson, 2017; Normand & Bobber, 2020), and may be the ideal profession in which to incorporate ACT. Health coaches typically work in fitness centers, gyms, and clinics to help clients achieve goals related to their overall health (Normand & Bobber, 2020). Health coaches use several strategies that are consistent with applied behavior analysis, including tracking client progress, teaching self-management skills, and arranging for social reinforcement when goals are met (Finn & Watson, 2017; Rehfeldt, 2020). Its emphasis on measurement, skill generalization and maintenance, and data-based decision-making further aligns health coaching within the professional scope of applied behavior analysis (see Normand & Bobber, 2020).

ACT programs could readily compliment the work of health coaches by facilitating values clarification and committed actions in clients working to improve their health outcomes.

Health coaches might promote psychological flexibility in their clients if they can identify rigid rule-following and experiential avoidance behaviors in which clients have been engaging that are incompatible with values-consistent, health-related behaviors. A health coach could work with a client to identify personal reinforcers with which he or she has lost contact, build up verbal descriptions of those reinforcers, and teach self-management skills to facilitate contact with those reinforcers (Dixon & Paliliunas, 2020). In so doing, the client may learn to track experiences outside of the function of his or her thoughts and expand his or her behavioral repertoire so that contact with reinforcers for health-related behaviors is established. ACT and mindfulness curricula have already been adopted by those working with youth and professional athletes to improve performance and reduce stress (Biegel & Corbin, 2018; Saltzman, 2018), and the ACT approach is now commonly embraced by life coaches (Blonna, 2010). Thus, a clear pathway to its adoption by health coaches exists, awaiting empirical investigation.

### **Health Education**

By understanding the processes of transformation of functions and experiential avoidance, behavior analysts are poised to advise the field of healthcare on its patient education efforts. Specifically, behavior analysts can offer strategies for how information about chronic health conditions is framed so that, despite unpleasant emotional reactions, behavior change is nonetheless likely to occur. In analyzing the influence of cigarette advertisements on teen smoking, Biglan (2018) found that where and how the behavioral functions of verbal stimuli were actualized in magazine advertisements influenced the likelihood of adolescents engaging in smoking behavior. Similar investigations of the function altering effects of language could be extended into the study of public health campaigns. For example, rather than using fear-tactics to induce behavior change, public health messages could be framed in such a way so as to appeal to

people's values, thus serving an augmental function. Augmentals, or verbal rules which change the capacity of events to function as reinforcers and punishers, indirectly increase or decrease target behaviors because they increase the value of a given consequence (Zettle & Hayes, 1982, p. 81). Public health messages might, therefore, carry value-themed messages so as to set the occasion for values-consistent behaviors. Rather than advertising the mortality rates of a particular disease, a message might instead focus upon the positive health benefits of prevention behavior, such as, for example, "your cells will thank you for eating freshly grown produce;" "don't you want healthy, natural-looking skin;" and "imagine how good you will feel and how great you will sleep after exercising." Jackson et al. (2016) explored the augmental functions of health messages in exactly this manner, demonstrating that participants in an indoor cycling class exercised harder when reinforcer-focused signage was visible during their exercise than when it was not. Exploring where such messages are disseminated also seems in order. Posting information in doctors' offices and medical clinics, where they are encountered infrequently and viewed during times of stress, may be less beneficial than a wider circulation on social media, television, and print media that can be viewed during every-day life. In short, altering the context in which public health messages are accessed may better occasion values-consistent behavior. Biglan (2018) suggested that single-systems methodology be "scaled up" so that the effects of such cultural-level manipulations be evaluated outside of the laboratory.

Researchers in the field of health communication have been exploring the role of humor-based messages in promoting screening, self-exams, and other prevention behaviors. Humor-based messages were found to improve attitudes about breast and testicular exams in undergraduate students relative to fear-inducing messages, and hope-inspiring messages increased participants' intentions to engage in behavior change relative to messages associated

with fear (Nabi, 2015; 2016). In addition, Blanc and Brigaud (2013) reported that humorous messages received prolonged attention, were evaluated as being more convincing, and were better retained by participants relative to nonhumorous advertisements. Framing messages with humor may help reduce the literal functions of fear-provoking verbal stimuli, making engagement in behaviors previously avoided more likely. Such a simple, systems-level change may go a long way toward facilitating the values clarification necessary for a healthier society. Future research might explore the probability and accuracy with which people engage in screening and prevention when presented with humorous verbal stimuli using single-subject methodology, and then “scaled up” to systems-level analyses.

### **Reconceptualizing Healthcare**

Behavior scientists are prepared to contribute to a reconceptualization of healthcare delivery, work that is already underway in the field of alternative medicine. It is now widely recognized that short and long-term stress can affect bodily functions in a number of ways: Long-term stress has been linked to high blood pressure, inflammation, and disruption of immune, digestive, cardiovascular, sleep, and reproductive systems (National Institute of Mental Health, 2020). For this reason, a number of medical practices employ specialized clinics to teach stress-reduction strategies such as mindfulness. McCabe and Mackenzie (2009) argue that alternative treatments such as mindfulness warrant widespread adoption as a preventative strategy, with an eye toward reducing the incidence of chronic health conditions requiring expensive treatment is reduced. These authors envision widespread inclusion of mindfulness training in healthcare education, and advise tax incentives or discounts on health insurance products for employers who offer mindfulness programs for their employees. The practice of ACT would fit in well with such initiatives. Research should explore, for example, how

mindfulness might supplement contingency management approaches for lifestyle behaviors, both at the level of individuals and also larger systems such as schools, organizations, and communities.

### **Scaled-Up Applications**

Biglan, Johannson, Van Ryzin, and Embry (2019) define “scaling up” as the process of moving from an individually focused intervention to the implementation of the intervention to affect an entire population. Recognition of the relational basis of human behavior offers some hope for a language-based approach to teaching people to consider the future consequences of their behavior in the present. Biglan and Barnes-Holmes (2015) propose that, despite what the literature on delay discounting suggests, people actually do consider future consequences for their behavior. Planning for college, career, social events, and retirement, for example, all involve consideration of long-term contingencies. A repertoire known as deictic framing involves deriving relations along the dimensions of time and place; in other words, changing perspective between HERE and THERE and NOW and THEN. “I am paying off debts now, but will have enough money saved to travel in 10 years,” and “someday I will be elderly too” are examples of deictic framing. Planning for the future also involves causal framing, or behaving as though something that happens in the present causes something to happen in the future. Examples of causal frames include, “if I smoke now, my lungs will be unhealthy when I get older,” or “if I exercise, my heart will be strong for the future.” According to Biglan and Barnes-Holmes (2015), the coordination and comparison between NOW and THEN may promote the derivation of rule statements such as these. Protocols that promote deictic framing regarding future health outcomes warrant investigation. In fact, laboratory protocols should be created and evaluated for this very purpose.

Biglan et al. (2019) advocate for the evaluation of systems-wide ACT interventions to create healthier, happier, and less-stressed societies. The long-term effects of stressors on physical health are substantial, and often proliferate across the lifespan and generations (Thoits, 2010). Psychological flexibility can be promoted not only via the implementation of ACT protocols in organizations such as schools, work-places, health-care establishments, and community-centers, but also through the elimination of community stressors. Fast-paced, competitive cultures which value the success of individuals rather than the well-being of entire communities, Biglan et al. (2019) maintain, are likely to promote risky, unhealthy behaviors because rigid rule-following dominates over values-consistent behavior. For example, working late into the evening and eating fast-food may be highly encouraged in a university community because, “I may not be promoted if they don’t see me here working at night.” Limiting time for exercise at conferences may be supported because of the busy conference programs and the notion that, “I may miss out on opportunities if I’m not around to socially network.” Healthy behaviors may be more likely in nurturing, noncompetitive environments where the success of a community is valued as much as individual gain (Biglan, 2020). In addition, needed is collaboration between behavior scientists and public policy-makers. Knowledge of how verbal stimuli affect health behaviors can advise in the adoption of government policies for regulating unhealthy behavioral choices. Biglan (2011) outlined ways in which marketing practices might be altered so that nicotine and alcohol are not easily accessible in at-risk communities.

Teaching people to value the well-being of not only themselves but that of others may well play a role in prevention efforts. Health outcomes are best for people who are part of engaged social communities (see Strom & Egede, 2012). People living in communities where caring for others is appreciated report less stress and greater life satisfaction than others (Grinde

et al., 2018). Wilson (2016) highlights the evolutionary basis of caring for one's community, noting that activities such as hunting and gathering, child-rearing, and defending territory were likely to be more successful if performed cooperatively by a group. That health outcomes are poorer for people who are socially isolated further reinforces the idea that a fast-paced, competitive way of life differs from the way humans are genetically adapted to live (Wilson, 2014). As behavior scientists, we may have much to learn from the behavioral repertoires of people residing in intentional communities, or small, tightly-knit communities assembled according to some shared values among its members. The study of health-related behaviors in intentional communities may make possible the sort of scaled up experimentation that Biglan (2018) calls for.

### **A Post-Script: COVID 19**

The COVID-19 pandemic has raised many fundamental questions not only about how we manage societies and healthcare systems, but also the relational networks with which people interact. The conceptualization that we have provided in this paper fits well with understanding the sometimes irrational behaviors in which individuals engage during pandemic times. A pandemic serves as a stark mirror to how societies function and what their individuals value most. Not all countries that reported coronavirus deaths have been affected equally. It is apparent that the effects of swift and strictly imposed lockdown measures in certain countries had positive effects in reducing infection rates and lowering mortality figures from the virus. The pandemic has also shone a blinding spotlight on inequalities in our societies. While the challenges of combining working from home and caring for children during lockdown measures are well-documented, the highest risk of exposure to the virus was for those in the lowest-paid jobs, along with health-care professionals who were not given the opportunity to work from the safety of

home. For many, there was no safety net of salaried employment, but rather, a basic survival need to continue to work.

Patterns of symbolic language appear to be commonly used by certain sections of society to justify beliefs and behavior during the global pandemic. RFT and delay and probability discounting can help elucidate the processes underlying specific responses. For example, in the U.S., there has been a marked resistance to the wearing of masks in public spaces by some. The objections are often framed in terms of the 'self' (e.g., 'My rights....'; 'I don't have virus so why should I wear one') rather than 'other' (e.g., 'we could reframe it as 'I am wearing this mask to protect others/the elderly/the vulnerable'; 'I am protecting my community', 'I am wearing this mask to protect our key workers [nurses/doctors/carers/grocery store staff]'; 'I am doing my part to protect the elderly'). It seems apparent that government messages that are focused on the individual are less effective than those focused on coming together as a community.

The influence of immediate reinforcers such as going on vacations or holidays is also striking. A certain percentage of the populations of many countries find it very difficult to move beyond beliefs or verbally constructed rules such that summer is in a relation of coordination with holidays or vacations to which they are 'entitled.' This discounting of the potential effects of infecting others in the community overrides the desire for immediate reinforcement of taking the vacation or holiday 'now'. There are many forms of these conditional 'if-then' rules. Some take advantage of the hard work undertaken by societies as a whole during lockdowns, so a minority rides on the back of the sacrifices and efforts of the majority. Instead of framing it as 'If I don't go on a vacation NOW, THEN my year/summer will be ruined', we could look at ways to socially frame messages as 'If you go on vacation NOW, THEN your risk of infecting yourself

and others when you come home is high' or 'If I don't go on holidays NOW, THEN I am protecting others in my community and we will hopefully be able to travel safely later'.

Cognitive fusion and experiential avoidance processes may account for the risky rule-following behaviors engaged in by people who avoid medical treatment during the pandemic. Put simply, a person with heart problems who is aware that their heart rate is becoming more irregular, pains in their left arm are becoming more pronounced, and breathing becoming more labored could ignore these potential warning signs of stroke or heart attack as they might engage in experiential avoidance to suppress those private events. Thus, they might not go to see a doctor or emergency room because they fear they might die from a coronavirus infection picked up at the hospital due to fusion with the thought 'Hospitals are full of infection, if I go to a hospital I will catch the virus and die'. The knock-on effects of this are likely to be higher rates of serious ill health among people who could have been treated much sooner under normal circumstances.

Finally, there is a noteworthy increase in the spread of conspiracy beliefs at this time. People who tend to believe that climate change and medical vaccinations are a conspiracy are also more likely to believe that COVID-19 is a conspiracy (Freeman et al., 2020). For example, in a UK sample of 2501 participants, Freeman et al. (2020) found that 15% showed a pattern of endorsement of coronavirus conspiracy beliefs with other conspiracy beliefs such as denial of climate change and anti-vaccinations, while 10% showed a high degree of general endorsement. From an RFT perspective, such people might be cognitively fused, via relational processes such as equivalence/co-ordination, with such thoughts as 'Scientists are wrong and paid to make up these lies', or 'All governments/institutions are bad and corrupt'. Moreover, they could be

engaging in experiential avoidance of thinking about an aversive future where bad things could happen, ‘I might die from COVID-19’ or ‘Climate change will end human life on earth.’

### **Conclusion**

Chronic health conditions create suffering, and compromise the abilities of individuals to live lives characterized by wellness and vitality. Skinner (1987) anticipated the bleak reality that we would one day face events like those of 2020, stating “that many people have begun to find a recital of these dangers tiresome is perhaps an even greater threat” (1987, p. 1). We have analyzed the role of relational framing and the interrelated processes of rule-following and experiential avoidance in health behaviors, and considered ACT as a framework for prevention and intervention. We have proposed scaled up investigations of psychological flexibility at the cultural level, and suggested strategies for making purposeful and conscious engagement in healthy behaviors more likely in more members of a society. Skinner (1987, p. 14) questioned whether it would be “better to be a better world or no world at all”. True, verbal relations cannot be unlearned, but the functional contexts in which relations are bound can be altered. By viewing health through the auspices of contextual behavior science, we have the framework for creating evidence-based interventions for supporting healthier repertoires in individuals and societies.

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