

**CHAPTER 13:**  
**FINAL EVALUATION**  
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Chapter 7 evaluated the core and corollary principles that constitute the Bio↔Psychology Network theory from the perspective of psychology as a natural science. It focused on providing a better way to explain psychology and behavior by triangulating (<http://psychologydictionary.org/triangulation/>) and cross-validating putative causal psychological mechanisms using neuroscience. It did not directly address clinical psychology because Chapter 7 occurs prior to Section 2 that addresses and advances psychotherapy integration via theoretical unification. Hence, the reader's final evaluation of the Bio↔Psychology Network theory is contingent upon their view of the contributions that this theory makes to psychotherapy integration through theoretical unification. It is quite possible that a reader will have a much better view of this theory after reading Section 2 than before reading it. Consequently, I have written Chapter 13: Final Evaluation to provide an additional appraisal of the Bio↔Psychology Network theory. I wrote this chapter after the book was published and consequently it exists only on-line.

**DO WE NEED MECHANISM INFORMATION?**

There are at least three reasons why clinical psychologists need mechanism information. The first reason is that cognitive neuroscience mechanism information enables psychologists to explain cognition, emotion, and behavior in ways that enable productive adaptation and change to occur. The second reason is that cognitive neuroscience mechanism information enables psychotherapy integration via theoretical unification. The third reason is that cognitive neuroscience mechanism information enables psychology to become a unified mature science that provides explanations instead of personal interpretations.

### Explanation as Psychological Intervention

The question “**how will explanatory principles help me to be a better clinician**<sup>1</sup>” can be directly answered in the following way. Explanation can be the core component of effective brief therapy. **Explanation can reorient your patient and modify their expectations of themselves and others** in ways that facilitates adapting to traits and conditions that cannot be modified. Explanation can facilitate **acceptance**, which is a primary objective of Acceptance and Commitment Therapy. Stated otherwise, effective psychological treatment does not always require change in the sense that manualized treatment understands and promotes change. Explanation alone can produce crucial psychological change that constitutes a successful outcome in and of itself.

Explanation can also provide a rationale for accepting the discomfort that effective therapies require. I refer to network **Principle 8: Dissonance Induction and Reduction**. Tryon (2014, p. 585) discussed the similarities between psychotherapy and orthodonture where the orthodontist purposively creates discomfort by placing braces on teeth to push them against jaw bone. This discomfort is necessary to dissolve jaw bone and allow teeth to move and thereby straighten. Likewise, effective therapies require patients to accept uncomfortable new experiences to activate the experience-dependent plasticity mechanisms that drive learning and memory formation in order to change how they think, feel, and behave.

The case formulation that Tryon (2014, p. 18) presented in Chapter 1 illustrates how explaining to a father that his daughter’s disruptive behavior was due to the fact that she did not have words for her feelings (alexithymia), probably caused by a dysfunctional mirror neuron system<sup>2</sup>, provided him with an alternative explanation of her behavior that enabled him to become much more supportive and help her receive proper treatment in the form of dialectical behavior therapy. His initial explanation of her disruptive behavior was that she was a rebellious teenager who needed more effective discipline than he or his wife could provide. He was therefore looking for more effective methods of punishment. The explanation I provided him with altered his perspective, modified his expectations of his daughter, and revised his view of what she required

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<sup>1</sup> Tryon (2014, p. 17) asked this same question as “**How can the Bio↔Psychology Network Theory help me to become a better therapist?**” (bold font in the original)

<sup>2</sup> Tryon (2014, p. 445) discusses the connection between alexithymia and the mirror neuron system.

by way of treatment. The father's revised perspective, based upon an alternative explanation, constitutes a positive outcome of a psychological intervention in and of itself.

Several studies have identified mirror neuron system dysfunction in children with autism spectrum disorders including Asperger's syndrome (Dapretto et al., 2006; Hadjikhani et al., 2005; Martineau et al., 2008; Nishitani et al., 2004; Oberman et al., 2005; Theoret et al., 2005; Williams et al., 2006; Woods et al., 1999). Their mirror neuron dysfunction explains their inability to empathize, their social awkwardness, their reluctance to make eye contact, and consequently their failure to develop friendships. Consider how providing a mirror-neuron-based explanation might have made a big difference in the case of Elliot Rodger who on Friday May 23, 2014 stabbed several people to death and shot others in Isla Vista California as "retribution" for perceived insults and rejection. Elliot was a reasonably good looking wealthy young man who drove a nice car (BMW), had access to Hollywood parties, but had no friends of either gender. Elliot thought that his, money, car, party access and appearance should have enabled him to have many girlfriends but instead he had none and, in his view, no prospects of ever having even one. Elliot therefore explained his social rejection as the result of other people being mean and nasty. Elliot used this explanation to justify retribution by random murder. Elliot used his explanation that all people are mean and nasty to justify killing anyone that he encountered that Friday evening. Elliot used his hopeless explanation to justify killing himself. In short, Elliot's explanation provided the psychological basis, justification, for his homicidal and suicidal actions<sup>3</sup>.

All of this might have been different had a therapist explained to Elliot that his social isolation was the result of his Asperger's; likely caused by a compromised mirror neuron system. He might have seen that the problem was with himself much more than with other people. He might have been referred to receive the more focused treatment developed for persons with Asperger's to help them manage social relationships. He might have been directed to find male and female friends who also had Asperger's by joining an Asperger social support group. In short, if Elliot had a different explanation for his troubles he might have found a way to enjoy life rather than end it in a rage that killed others and then himself. There are two main points here. First, this case shows just how important explanation is to people. Second, altering Elliot's explanation might

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<sup>3</sup> Personal narratives are largely explanatory. They are used to explain why life turned out the way it has to date. Put otherwise, explanation is the core of the personal narrative. Personal narratives justify a person's feelings and behaviors.

have made the crucial difference between a happy life and his tragic death and the heartbreaking death of other people. Adoption of a different explanation might have been sufficient to open new opportunities for Elliot. Put otherwise, providing a cognitive neuroscience explanation might have been a positive psychological intervention in and of itself.

The case example provided by Tryon (2014, p. 454) in Chapter 10 illustrated how Jeffrey Schwartz helped his OCD patients avoid self-recrimination and accept exposure treatment by changing how they explained their disorder. His patients initially viewed their OCD symptoms as the result of personal failure due to a lack of self-control. Schwartz provided them with a brain explanation that replaced self-blame with scientific understanding. It also helped them to understand and accept the exposure and response prevention therapy that reduced their symptoms. Revising their personal explanatory narrative to include cognitive neuroscience information was therapeutic in and of itself.

Neuroticism entails a propensity to experience negative affect and anxiety. People who seek treatment for anxiety disorders are frequently high in neuroticism. Explaining how neuroticism exacerbates clinical symptoms can facilitate acceptance of those experiences in patients who are high in neuroticism. Such acceptance can facilitate exposure treatment designed to reduce anxiety. The main point here is that revising your patient's explanation of their condition is an important first step in the effective treatment of anxiety disorders.

Temperament is the heritable precursor to personality. Temperaments can be easy, difficult, or slow to warm up. Parents sometimes seek treatment for their child if their child is fearful of nursery school or kindergarten. Their explanatory narratives may include concerns about inadequate parenting or having an abnormal, defective, child when actually their child's behavior may be the understandable expression of a slow to warm up or difficult temperament that is not subject to radical change. Explaining the child's behavior in terms of temperament both normalizes it and prepares the parents to expect that similar issues may arise at every developmental stage. Acceptance and support are in order here. Replacing the parent's explanatory narrative with one based on a natural science understanding of personality may be therapeutic in and of itself.

Introverts are frequently misunderstood by extraverts. Marital problems can arise when extraverts marry introverts. Extraverts often do not understand the need that introverts have for personal time. Introverts often do not understand why extraverts want to socialize so much. The personal explanatory narratives of both introverts and extraverts may entail unfounded attributions

including a lack of love by their spouse. Replacing this explanatory narrative with one based on a cognitive neuroscience understanding of personality may be therapeutic in and of itself.

These examples should be sufficient to establish two main points. First, people's personal explanatory narrative provides the psychological basis, justification, for their behavior. Second, altering a person's explanatory narrative can change their life in a major way and therefore constitutes a positive psychological intervention in and of itself.

### *Practice Definition*

The explanatory basis that you use to modify your patient's personal narrative defines the type of clinical practice that you are engaged in. If you use the proposed core and corollary principles, or their equivalent, to modify the explanatory basis of your client's personal narratives then your clinical practice is based on psychology as a mature science. If you use interpretations [see Teo (2012) below], whether or not they are based on research, to modify the explanatory basis of your client's personal narratives, then your clinical practice is based on psychology as an immature science. This can include psychology as a social or human science.

### *Outcome Measures*

The question of how to measure outcome is fundamental to psychotherapy research. Empirically supported treatments tend to focus on behavior change and symptom reduction. Other therapies focus on narrative change. Explanation as a psychological intervention aims to change behavior and reduce symptoms by modifying the patient's personal narrative that they use to explain their own feelings and behavior and the thoughts, feelings, and behaviors of other people. Genuine change in a person's narrative can result in substantive behavior change and symptom reduction. Genuine narrative change can set these other changes in motion. Put otherwise, treatments aimed at behavior change and symptom reduction become effective only after narrative change has occurred. Behavior change and symptom reduction should therefore only be expected after narrative change has occurred. The work of Caspi et al. (2014) regarding the presence of a general psychopathology p-factor suggests that the term "indicator" should replace the term "symptom". This change in terminology facilitates our transition from a medical to a psychological model of psychopathology.

### *Limitations*

All interventions have their limitations. This is also true for explanation as a psychological intervention. Narrative change can set behavioral and symptom change in motion. However, revising the explanatory basis of your patient's explanatory narrative is not always sufficient to fully address their problem(s) because corrective learning experiences are frequently required. For example, the case that I presented in Chapter 1 where I modified a father's explanation of his daughter's behavior entailed her receiving Dialectical Behavior Therapy. Modifying her father's explanation of her behavior was an important first step but not the last step. Providing Elliot with an alternative explanation of his behavior might have been sufficient to avoid the murderous rampage than ended in suicide but additional social skills therapy designed for persons with Asperger's was definitely needed. The cognitive neuroscience explanation provided by Jeffrey Schwartz was important but exposure and response treatment was also needed to produce behavior change and symptom reduction. ESTs were designed to advance treatment beyond what is possible by revising the explanatory core of the patient's personal narrative by providing specific corrective learning experiences.

### **Psychotherapy Integration via Theoretical Unification**

Clinical psychologists can only be expected to treat people alike when they share a common understanding of what is wrong and how therapy actually works. Meaningful psychotherapy integration therefore requires theoretical unification. It was my lucky discovery that psychological theories are already unified by virtue of not having causal mechanism information. Psychological theories lack mechanism information because they are functional theories which, by definition, lack causal mechanism information. The four core and eight corollary network principles formulated by Tryon (2014) are explanatory mechanisms that are composed of well replicated psychological phenomena that can be explained by neuroscience facts and mechanisms. Adoption of these network principles constitutes a **Bio↔Psychology Network (BPN)** theory<sup>4</sup> that supports an **Applied Psychological Science (APS)** clinical orientation that is fully consistent with all of the current Big Five clinical orientations: a) behavioral, b) cognitive, c) cognitive-behavioral,

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<sup>4</sup> Alternatively, one may more accurately describe the four core and eight corollary principles as an **explanatory system**.

d) psychodynamic, and e) pharmacologic. Put otherwise, mechanism information provides clinical psychologists with the required common perspective for meaningful psychotherapy integration.

### Scientific Explanation vs. Personal Interpretation

Tryon (2014) formulated the difference between scientific explanation and personal interpretation as follows:

Mature sciences explain well-replicated facts and phenomena on the basis of accepted principles and/or laws, using a common vocabulary. Immature sciences provide interpretations by individuals. Teo (2012) revealed this explanatory problem when he commented upon a psychological explanation by a prominent psychologist. ‘Lilienfeld (2012) could not rely on general laws or even statistical facts to provide a scientific *explanation* for this question. What is evident from all we know from the philosophy of science is that Lilienfeld offered us an *interpretation*’ (p. 807, italics in the original). Psychology presently offers **interpretations** rather than **explanations** because, with a few exceptions, it lacks general principles upon which to base its explanations. If you want a psychological explanation, just ask a psychologist. Some interpretations will make more sense than others. Some explanations will be better grounded in research than others. But in the end, one is faced with choosing among interpretations by individuals because no principled explanation is available (p. 7, italics and bold emphasis in the original).

Clinical psychologists are often called upon by their patients and the media to explain something about psychology and/or behavior. Teo (2012) reminded us that only a principle-based explanation is a scientific explanation; all other “explanations” are just personal interpretations. Clinical psychologists and all other psychologists benefit by having principles that carry explanatory force. Mature sciences are organized around such principles rather than persons or “isms”. Hence, Tryon (2014) presented four core and eight corollary principles that carry explanatory force to get things started. This effort is considered to be a beginning rather than an end point.

## COMMON FACTORS

Common factors bring psychotherapists together on the basis of what they all share. This section extends our understanding of common factors from the generally recognized list of six provided by Stricker (2010, pp. 18-19) to include four new ones by Shedler (2006) and ten additional common factors in the form of network principles introduced by Tryon (2014). The other two of Tryon's principles overlap two of Shedler's (2006) common factors. We now have  $6 + 4 + 10 = 20$  common factors which means that psychotherapy integration is more advanced than previously thought.

### Recognized Common Factors

Tryon (2014) noted that:

Stricker (2010, pp. 18–19) offered the following list of six common factors: (a) therapeutic alliance; (b) exposure to prior difficulties plus a new corrective emotional experience; (c) expectation of positive outcome; (d) therapist characteristics of attention, empathy, and positive regard; (d) providing the client with a rationale for why treatment works; and (f) use of a culturally sanctioned healing procedure/ritual. See Grencavage and Norcross (1990) for additional details concerning common factors. Weinberger (1993, 1995) referenced common factors with the acronym REMA where R = relationships, **E = exposure**, M = mastery, and A = attribution (p. 566, bold emphasis in original).

### Memory and Learning as Common Factors

Tryon (2014, p. 50) quoted Carlson et al., (2010, p. 440) who defined learning in terms of memory: "*Learning* refers to the process by which experiences change our nervous system and hence our behavior. We refer to these changes as *memories*" (italics in the original). All psychological development depends crucially upon learning and memory. If people could not learn and form memories then psychological development would not occur and psychotherapy would not be possible. Psychotherapists are currently unified in that they all believe that their client's learn and remember something from therapy. **Our differences concern what needs to be taught and how best to teach it.** These differences are not sufficient to base separate schools of therapy



on. They are clinical matters that reflect the needs of particular patients with particular problems at particular times in their lives.

The Bio↔Psychology Network theory is based on the neuroscience mechanisms that explain learning as memory formation. These mechanisms include, but are not limited to, experience-dependent plasticity mechanisms, epigenetic mechanisms, and glial mechanisms as discussed by Tryon (2014) in Chapter 3.

### **Shedler's Additional Common Factors**

Shedler (2006) provided a two chapter introduction to psychodynamic therapy for medical students and residents regarding key features of contemporary psychodynamic therapy. The following four key features constitute additional common factors that characterize all contemporary forms of psychotherapy.

#### **Conflict**

Shedler (2006) observed that conflict is a common factor in **all forms of therapy**. “Psychotherapy is an ongoing tug-of-war between a part of us that seeks change and a part of us that strives to preserve what is known and familiar, however painful that may be. As therapists, we side with the forces seeking growth” (p. 33). He further noted that “Another central recognition is that humans can be of two (or more) minds about things. We can have loving feelings and hateful feelings toward the same person, we can desire something and also fear it, and we can desire things that are mutually contradictory” (p. 15). Shedler hereby recognized that approach-avoidance conflicts characterize all forms of psychotherapy. These conflicts induce dissonance. Principle 7 of the Bio↔Psychology Network theory maintains that people seek consonance in the presence of dissonance. Principle 8 of the Bio↔Psychology Network theory recognizes the role of dissonance induction and reduction in all effective therapies. Shedler concluded “There is **universal recognition** that inner dissonance is part of the human condition” (p. 18, bold emphasis added).

#### **Memory**

Shedler (2006) noted that “Through our earliest experiences we learn certain templates or scripts about how the world works (a cognitive therapist would call them schemas)” (p. 19). He observed that “*Every* school of therapy addresses the impact of the past on the present. Cognitive

therapists may discuss the assimilation of new experiences into existing schemas, systems oriented therapists may note the repetition of family dynamics across generations, behaviorists may speak of conditioning history and stimulus generalization” (p. 21, italics in the original). Shedler (2006) stated that “People tend to react to what *was* rather than what *is*...” (p. 3, italics in the original). **All therapies** endeavor to free patients from the bonds created by past experience in order that they might live a happier, more productive, and satisfying life. Principle 2 of the Bio↔Psychology Network theory emphasizes the crucial role that memory plays in all phases of psychological development.

### **Defense**

Shedler (2006) noted that “Once we recognize that there are things we prefer not to know, we find ourselves thinking about how it is that we avoid knowing. *Anything* a person does that serves to distract his or her attention from something unsettling or dissonant can be said to serve a defensive function” (p. 28, italics in the original). This observation is corollary to Shedler’s (2006) recognition of approach-avoidance conflicts noted above. Defensive maneuvers pertain to the avoidance side of these conflicts.

Attention bias is the cognitive-behavioral term for psychological defense. Siegle (1999) provided a neural network model of attention biases in depression. Tryon (2014) reported that:

Hertel and Mathews (2011) presented evidence that cognitive biases of attention, interpretation, and memory are not only associated with anxiety disorders, but appear to contribute to them. They discussed attention-training treatments designed to reduce attention bias and interpretation bias (p. 513).

Cognitive heuristics are also defensive in that they avoid activating what Kahneman (2011) referred to as System 2 and the greater effort that it requires. Cognitive short cuts are taken instead. The general reluctance of people to tolerate cognitive dissonance reveals their tendency to avoid and thus defend against it. Tryon (2014) reviewed this literature in connection with Principle 7: Consonance and Dissonance. Tryon (2014) discussed the need to induce dissonance as part of treatment as Principle 8: Dissonance Induction/Reduction. Such actions frequently produce patient

resistance, avoidance, and noncompliance all of which are forms of defense. All of this evidence demonstrates that cognitive-behavioral therapists share the concept of defense.

### **Unconscious Processes**

The fourth feature that Shedler (2006) introduced, unconscious processing, is also a common factor because it characterizes all cognition and affect. Shedler (2006) cited Kahneman's research on unconscious processing. Tryon (2014) also reviewed and discussed this literature plus additional supporting neuroscience evidence. The clear conclusion here is that all people engage in unconscious processing 24 hours of every day which includes the time spent in all forms of psychological treatment. Tryon (2014, p 167) noted that the Default Mode Network consumes at least 90% of the brain's energy. This fact conforms to the classic iceberg analogy of 10% consciousness and 90% unconsciousness.

Shedler (2006) correctly noted that the psychodynamic clinical orientation was the first to recognize the importance of unconscious processing because it was the first and is therefore is the oldest clinical orientation. But this authorship does not limit the validity of unconscious processing to patients seen by psychodynamic clinicians. Unconscious processing is partially recognized by cognitive behavior therapists in the form of automatic thoughts that Tryon (2014, p. 266, 388, 412) extended to include automatic feelings.

### **Explanatory Principles as Common Factors**

The proposed Bio↔Psychology Network theory recognizes unconscious processing as Principle 1 and learning and memory as Principle 2. Shedler's (2006) emphasis on unconscious processing coincides with Tryon's (2014) Principle 1. His emphasis on memory coincides with Tryon's (2014) Principle 2. While Tryon's (2014) Principles 7 and 8 concern dissonance and its reduction, these principles contain much more content than Shedler provided and therefore are retained as additional new common factors. Hence, the Bio↔Psychology Network theory adds ten additional common factors. This brings the final count of common factors to 6 by Stricker (2010) + 4 by Shedler (2006) + 10 by Tryon (2014) = 20. Recognition and acceptance of all 20 common factors substantially advances psychotherapy integration.

### HOW WILL MECHANISM INFORMATION EFFECT MY PRACTCE?

Concerns that adopting the causal mechanism information provided by Tryon (2014) will require substantial changes to clinical practice are based on two common logical errors and are therefore unwarranted.

The first logical error is **Affirming the Consequent** which takes the following logical form: If A Then B, B, Therefore A. If Theory X is correct then Treatment Y should be effective. Treatment Y is effective, therefore Theory X is correct. Not necessarily! Clinicians can, and it seems often are, right for the wrong reasons<sup>5</sup>. Clinicians can implement effective treatments for the wrong reasons. Concluding that a theory is valid if a treatment derived from this theory is effective commits the logical error of Affirming the Consequent. My efforts to replace Theory X with core and corollary causal mechanism principles endeavors to make clinicians right for the right reasons. Replacing Theory X with a principled explanation does not invalidate any clinical practice that has already met empirically supported treatment (EST) criteria. Clinicians may or may not modify their clinical practice subsequent to a principled understanding and analysis of it.

A second, related, and more general logical error occurs when readers **conflate theory and treatment**. A classic example of this error occurred when main stream clinical psychology largely abandoned the behavior change technology developed using Applied Behavior Analysis on the basis that behaviorism is an inadequate explanatory system. Skinner's (1957) inability to explain how children learn to speak is a prime example of a serious explanatory limitation of behaviorism. Evidence of efficacy and effectiveness can stand independent of the explanatory system that generated it. One can retain empirically supported ABA treatments and discard behaviorism as an explanatory system. This is what Tryon (2014) does in Chapter 10 where he replaced behaviorism with neuroscience mechanisms that explain learning via memory formation. The result reauthorizes ABA treatments as part of cognitive-behavioral practice. Hence, your clinical practice

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<sup>5</sup> Clinicians can also be wrong for the right reasons as when the right reasons are not sufficient to result in a positive outcome. Partial knowledge can limit success. Other factors not under the clinician's control or that they do not know about might be responsible for a null or negative outcome. Hence, a null or negative outcome does not prove that the principles upon which a treatment is based are necessarily false. Existing principles might require qualification and/or modification in which case they are not simply wrong. Additional principles might be required. Validation of scientific principles is a complex and difficult business that requires multiple methods to triangulate and cross validate causal mechanisms. Simple association with treatment outcome is not a sufficient basis to validate scientific principles.

may expand to include ABA treatments. Tryon (2014, pp. 17-19) identified the following five ways that accepting mechanism information proposed by the Bio↔Psychology Network theory and resulting **Applied Psychological Science** clinical orientation will likely change your clinical practice:

1. The way that you think about yourself, your primary professional identity, will change. You will primarily identify with **principles** rather than **persons** such as august psychologists like Freud, Skinner, Rogers, Beck, Ellis, etc. You will dissociate yourself from all 'isms', such as behaviorism and cognitivism.
2. You will start thinking about psychology and your client's problems in **physical** rather than **mental** terms. This understanding will make seeking treatment more socially acceptable to your clients. It will also increase their tolerance of family members with psychological and/or behavioral disorders. Psychologists who practice in medical settings can now correctly claim to provide biological treatments.
3. Your clinical practice will become more **comprehensive** in at least the following four ways. (a) Your therapeutic goals will expand to include increasing psychological mindedness and emotional regulation in addition to symptom reduction/removal. (b) You will be open to all ESTs regardless of the orientation from which they were developed. (c) You will use multiple ESTs as necessary. (d) You will have a theoretical basis for this eclectic practice.
4. You will base your interventions on the core and corollary principles introduced in Chapters 3 and 4 rather than on manuals. You will customize your interventions to your clients in the way described by Paul (1967) during the early days of behavior therapy. Greene (2012) cited the contemporary trend to replace manuals with principles as an important rapprochement between investigators and clinicians.
5. Interventions based on operant and respondent conditioning will be reauthorized as cognitive-behavioral therapies.

The conflation logical error discussed above frequently leads to the presumption that a new theoretical rationale necessarily requires new therapeutic methods. I am frequently asked what these new methods are and what research supports them. These questions reflect Kazdin's (2009)

characterization of the Bio↔Psychology Network theory as a promising theory but one that requires testing before endorsement. No such evidence is needed for two reasons. First, no new clinical practices are required as presumed. Second, the four core and eight corollary principles that constitute this theory are among the most empirically supported findings that psychological science has generated. Hence, this criticism of the Bio↔Psychology Network theory is unwarranted.

Another manifestation of the above mentioned conflation error also devalues mechanism information. It occurs when readers question how mechanism information will help them become a better therapist. They correctly note that one does not need mechanism information to **follow** treatment manuals and therefore mechanism information is of no value to them. This view is partially correct. MA and even BA level students can be trained to administer manualized treatments by following instructions. This is routinely done in grant funded research. But what about those who **write** the treatment manuals? Do they not need to know why they are recommending one procedure over another? Trial and error clinical experience is one guide. But theory is another source. Explanation/understanding is the essence of theory. The proposed core and corollary principles provide a principled basis for recommending therapeutic methods. Rejection of explanatory principles implies that some clinicians expect to always be followers rather than authors of psychological interventions. Hence, they do not expect that they will ever need to understand why treatments work.

Another approach that some have taken that further diminishes the perceived relevance of mechanism information is to emphasize the irrelevance of mechanism information to a **functional approach** to therapy. Tryon (2014) has shown that psychological theories are functional theories that lack mechanism information yet functional theories have given rise to effective treatments; so why is mechanism information helpful or needed? One perspective is expressed as follows. Physicians know that smoking causes cancer and consequently they recommend that their patients not smoke. They do not need to know anything about how smoking causes cancer to recommend against smoking. This view is justified by a distinction between **causes and mechanisms**. **Mechanisms mediate causes** by specifying a chain of events that brings about a specific result. **Causes activate mechanisms**. Smoking is a cause of lung cancer. DNA modification is the mechanism by which smoking causes lung cancer. Hence, physicians need not know anything about DNA to recommend that their patients not smoke. Similarly, clinical psychologists can

administer treatments without understanding why they work. Clinical psychologists seem content with this functional justification of their clinical practice. But consider the following two cases.

Physicians whose recommendation against smoking is based on knowledge of DNA mechanisms are right for the right reasons. They think physically about pathology. They may investigate the physical basis of smoking addiction to find ways to enable addicted smokers to quit. They might also develop ways to protect DNA against damage due to smoking on the basis that smoking is addictive and that not everyone can overcome their addiction and follow the recommended advice to quit smoking. Here we have modern medicine based, in principle, on natural science.

Physicians whose recommendation against smoking is based on the view that smoking angers the ghosts of the smoker's ancestors and that ancestral spirits then curse the smoker's lungs, since breath is a spirit element, are right for the wrong reasons. They think in non-physical mental ways about patients and their extended family including dead relatives and how they might avoid upsetting them<sup>6</sup>. Their erroneous explanation would blind them to the biological mechanisms that actually cause cancer. Their preference to think in mental rather than physical terms about their patients would continually restrict their understanding in ways that would complicate improving their therapies. Absent a correct theory to guide further inquiry they will be entirely dependent upon accidental discovery of what works. Fortunately their clinical recommendation to quit smoking is sound. But here we have ancient to medieval medicine based on forms of explanation that were prevalent prior to the Enlightenment. At best we have medicine circa 1895 when Freud tried unsuccessfully to inform psychology using neuroscience.

Which physician would you prefer to see? Would you prefer to see a psychologist who is right for the wrong reasons or one who is right for the right reasons? It might not actually make a difference as long as they both gave you the same advice. Is that a chance you want to take? Should consumers be asked to take the same risk? Is asking potential clients to make such a choice ethical? Are the risks of something going wrong the same for both approaches? Should the public equally

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<sup>6</sup> Some readers may believe that this example is inappropriate because psychologists do not explain behavior using concepts such as ancestral spirits. This criticism is without merit because the entire point of the functional argument for clinical practice is that the reasons why treatments work are irrelevant, **can be anything**, and are not worth discussing in the least. Put otherwise, all explanations are equally irrelevant to the functional defense of clinical practice so it does not matter what they are. The motto here is "If it works, then I use it and I don't care to know why".

respect both approaches? Should the public equally fund both approaches? Do both approaches provide equivalent bases for developing the professional practice of psychology? The answer to all of these questions seems crystal clear to me to be NO and I hope also to you.

The core and corollary explanatory principles proposed by Tryon (2014) are intended to help clinicians be right for the right reasons. Clinicians can change how they explain why their treatments work without altering their interventions in any way. The hope is that the right reasons might lead to more effective treatments than the wrong reasons will.

### **THINK PHYSICAL, NOT MENTAL**

It might seem natural that physicians should think in physical terms whereas psychologists should think in mental terms because we have done so for so long that it seems only right to continue to do so. But this is a Western cultural tradition that is not shared worldwide. We will see below that not all physicians think in physical terms and that psychologists are not fully committed to thinking in mental terms.

### **Chinese and Hindu Medicine**

Acupuncture is a key component of traditional Chinese medicine that explains illness and response to treatment in terms of qi that is thought to flow through channels known as meridians (<http://en.wikipedia.org/wiki/Acupuncture>). Wikipedia (<http://en.wikipedia.org/wiki/Qi>) states that:

In traditional [Chinese culture](#), *qi* (more precisely *qì*, also *chi*, *ch'i* or *ki*) is an active principle forming part of any living thing.<sup>[1][2][3]</sup> *Qi* is frequently translated as "natural energy", "life force", or "[energy](#) flow". *Qi* is the central underlying principle in traditional Chinese [medicine](#) and [martial arts](#). The literal [translation](#) of "*qi*" is "breath", "air", or "gas"."

The emphasis on breath, as in the breath of life, is understandable given that respiration ceases upon death. Hence, the view that breath is life or causes life. Wikipedia further reports that:



“Concepts similar to *qi* can be found in many cultures, for example, *prana* and *cit* in [Hindu](#) religion, *mana* in Hawaiian culture, *ling* in Tibetan Buddhism, *ruah* in Hebrew culture, and [Vital energy](#) in Western philosophy. Some elements of *qi* can be understood in the term [energy](#) when used by writers and practitioners of various esoteric forms of spirituality and [alternative medicine](#). Elements of the *qi* concept can also be found in Western popular culture, for example "The Force" in *Star Wars*.<sup>[4]</sup> Notions in the West of *energeia*, *élan vital*, or "[vitalism](#)" are purported to be similar.<sup>[5]</sup>

Hindu medicine is based on the Chakra. Wikipedia (<http://en.wikipedia.org/wiki/Chakra>) reports that:

In [Hindu](#) and tantric/yogic traditions and other belief systems **chakras** are energy points or knots in the [subtle body](#). They are located at the physical counterparts of the major [plexuses](#) of arteries, veins and nerves. **Chakras are part of the subtle body, not the physical body**, and as such are the meeting points of the subtle (non-physical) energy channels, called nadiis. Nadiis are channels in the subtle body through which the life force ([prana](#)), or [vital energy](#) moves. Various scriptural texts and teachings present a different number of chakras. There are many chakras in the subtle human body according to the tantric texts, but there are 7 chakras that are considered to be the most important ones (bold emphasis added).

Western culture considers all of this to be pseudoscience because there is no physical evidence that “life force” or chakras exists. Nor are there any valid biological mechanisms that explain how this hypothetical “life force” creates or cures illness. While not purely mental or psychological, “life force” is definitely not physical and pertains to the “subtle body” which we are told is “not the physical body”. Chinese and Hindu physicians therefore do not think in physical terms. Hence, not all physicians think in physical terms.

### Mind-Body Problem

Tryon (2014) reported that:

The search for mechanism information has led psychologists into a **double denial** that reveals a **second fundamental anomaly** in psychological science; the absence of a psychological substrate for mechanisms to operate on. On the one hand, psychologists deny that psychological mechanisms are entirely mental. Psychologists argue this way to preserve their identity as natural scientists. Otherwise, their psychological mechanisms could be viewed as mere metaphor or philosophical musing if they were purely mental mechanisms (p. 41, bold emphasis in the original).

Thinking only in non-physical, mental, terms conflicts with efforts to present psychology as a natural science. Natural science only recognizes mechanisms that have physical existence. “Life force” and chakras are not physical. The same is true regarding the presumed psychological substrate upon which hypothesized psychological mechanisms operate because psychological mechanisms entail mental states that are not necessarily brain states. Their non-physical nature provides them with the same existential status as does “life force” and chakras. It follows that psychological mechanisms are not real and can confidently be regarded as metaphor. Choosing to think only in mental terms renders psychology as a social or human science ([http://en.wikipedia.org/wiki/Human\\_science](http://en.wikipedia.org/wiki/Human_science)). It is contradictory to think in mental terms and to claim that psychology is a natural science.

What about thinking in both mental and physical terms? I am sorry but you really can't have it both ways. Physical mechanisms are part of natural science; mental mechanisms are not. Of course, we can always continue to **pretend** that our mental psychological mechanisms are physical ones. Psychologists have a long and enduring history of pretending. Carver (1978) identified three prominent pretentions that were still firmly in place when he published again fifteen years later (Carver, 1993). These pretentions continue to be widely practiced today. One of these pretentions is that null hypothesis testing provides Bayesian results. We calculate the probability of data given the null hypothesis and interpret the results as if we had determined the probability of the null hypothesis given the data in an effort to show that the data are unlikely due to chance. But  $p(\text{Data} | H_0)$  is not equal to  $p(H_0 | \text{Data})$ . In the first case we assume  $H_0$  to be true

whereas in the second case we ask if  $H_0$  is true which is what we really want to know. The illogic here can be seen in that that  $p(\text{Dead} | \text{Hanged})$  is not equal to  $p(\text{Hanged} | \text{Dead})$ . The probability that a person is dead if hanged is near unity. The fraction, and therefore probability, of all dead people who died by hanging is extremely small these days.

A second common pretention is to presume that  $p(H_0) < .05$  means that  $p(\text{replicability}) > .95$  and therefore a statistically significant null hypothesis test certifies that the results will replicate. This pretention frees us from actually having to replicate our research findings.

A third common pretention is that significant null hypothesis testing confers validity on our research hypothesis. We do this when we conclude that  $p(H_0) < .05$  means that  $p(H_1) > .95$ . Hence, rejection of the null hypothesis is taken as proof that the alternative hypothesis is correct even though it isn't.

A fourth common pretention occurs when we interpret correlation as causation which we do when we conclude that structural equation and regression models **explain** variation rather than **account** for variation which is what they actually do. Explanations require specifying a causal sequence and neither structural equation or regression models do this. We identify what we call **risk factors** based on correlations and then recommend interventions as if these were **causal factors**. This practice is fine for epidemiologists whose main concern is reducing illness across an entire population but is inappropriate for psychologists who mainly treat individual patients.

A fifth and even more widely practiced pretention is the **uniformity presumption**. It is an extension of the fourth presumption discussed above. We study groups, analyze averages by comparing means, and then apply the results to all individuals as if everyone's score equaled the mean. Conversely, the generalizability of results based on single subject research designs is questioned despite the fact that the many findings derived from the Experimental Analysis of Behavior are among the most replicable and clinically useful findings that psychological science has ever produced (See Tryon, 2014, Chapter 10).

A sixth and very popular fifth pretention, discussed in greater detail below under the heading "The Illusion of Explanation", is where we analyze for **mediators** and interpret the results as causal **mechanisms** even though they aren't. This pretention frees us from having to think in neuroscience terms about physical causes.

Most psychologists neither notice nor complain about these pretentions just as they neither notice nor remark upon the contradiction of continuing to think in mental terms and present

psychology as a natural science. Next, our consideration of the other part of the double denial reveals that fear of reductionism is a major motive that maintains the presumption that natural science permits mental mechanisms.

Tryon (2014) presented the remainder of the double denial as follows:

On the other hand, psychologists deny that psychological mechanisms are entirely biological. They do this to avoid, and guard against what Dennett (1995, p. 82) described and Lilienfeld (2007) referred to as **greedy reductionism**; the systematic effort to replace psychology with neuroscience (see Miller, 2010; Miller & Keller, 2000). The alternative less aggressive form of reductionism identified by Dennett (1995, p. 82) is **eliminative reductionism**; a nebulous claim that somehow all psychological events are biological events (p. 41).

Tryon (2014) has shown that such fears are unfounded because reductionism can only ever provide half of a complete explanation because it cannot explain how psychology emerges from the biological structures that mediate psychological phenomena. Emergence entails **synthetic** explanations whereas reductionism entails **analytic** explanations. No amount of analysis will result in a synthetic explanation. Hence, psychology has nothing to fear from neuroscience as long as it focuses on developing emergent explanations.

We are left with the following situation. Psychologists must think in physical terms if psychology is to be a natural science. Reductionism identifies the biological structures and mechanisms that mediate psychological phenomena but as we will see in the next section mediation does not provide mechanism information. Reductionism can only ever provide but half of a complete explanation because identifying biological structures that mediate psychological phenomena cannot explain how psychology emerges from those structures. Emergence entails synthetic explanations; reduction entails analytic explanations. These are fundamentally different but complementary. Each needs the other. Psychology needs biology and biology needs psychology. This is a central theme for Tryon (2014).

### The Illusion of Explanation

The *Journal of Clinical Psychology* published six articles in 2006 about treating borderline personality disorder that carried the word “mechanism” in their title. Lynch, Chapman, Rosenthal, Kuo, and Linehan (2006) claimed that “**Mechanisms of change are mediators** (Baron & Kenny, 1986) ...” (p. 460, italics in the original, bold emphasis added). If mechanisms are mediators then why do we need the term mechanism? Why can’t we just stick with the word mediator? The main reason is because the word **mechanism implies causation** whereas the term mediator does not. Mediators are established by correlational methods. It is well known that causation cannot be consistently inferred from correlation. Hence, mediators do not, because they cannot, provide causal mechanism information. Mediators cannot explain anything. Claiming that mediators are mechanisms only provides the illusion of explanation. This **cognitive illusion** appears to be motivated by a strong desire to have mechanism information coupled by the inability of functional psychological theories to provide mechanism information. Wishing therefore results in believing, presuming, that mediators are mechanisms. A major problem with this illusion is that it prevents searching for causal mechanism information because such information seems to be already at hand.

Gigerenzer’s (1998, 2009) definition of mechanism requires evidence of causation. Kazdin’s (2007, 2008) definition of mechanism also includes causation. He requires that mechanisms must explain how causes produce their effects. He gave the example of smoking and cancer. Smoking causes cancer but DNA mechanisms explain how smoking causes cancer. **Explanation is the primary purpose of mechanism information.** Mediation does not explain how causes produce their effects. Interpreting mediation as mechanism is what members of immature sciences do because their functional theories cannot provide causal mechanism information. For example, box and arrow models identify functional relationships among variables. The arrows among boxes containing variable names impute causation but do not, because they cannot, explain how one variable actually causes another to change. Mature sciences provide principled causal explanations. Tryon’s (2014) core and corollary principles constitute an initial attempt to provide the required causal explanations.

Psychologists also foster the illusion of explanation in their writings. Lynch, Chapman, Rosenthal, Kuo, and Linehan (2006) endeavored to explain how dialectical behavior therapy works as follows: “One **mechanism** associated with validation involves enhancing the stability of the patient’s sense of self” (p. 467, bold emphasis added). Enhancing a patient’s sense of self may be

an effective clinical process/method but it is not a mechanism of any kind because it does not explain how anything about borderline personality disorder changes or comes to be. Explaining **how** to produce a clinical result does not explain **why** that treatment works. Never-the-less, the **cognitive illusion** that mechanism information has been presented is strong.

Wenzel, Chapman, Newman, Beck, and Brown (2006) claimed: “It is hypothesized that a change in dysfunctional beliefs is the primary mechanism of change associated with CT. However, additional mechanisms of change are likely also at work in CT, including enhancement of skills, reduction in hopelessness, and improvement in attitude toward treatment” (p. 503). No explanation was provided for how beliefs, skills, attitudes and/or feelings of hopelessness actually change anything. But the illusion that mechanism information regarding cognitive therapy was presented is strong. This same analysis reveals that the presumed mechanisms presented by the other four articles in this special journal section are also not real. But these articles authoritatively state that explanatory mechanisms are known to clinical psychologists.

### PRINCIPLE 13: RESONANCE

Mirror neurons mediate brain-to-brain communications that include **emotions** as well as cognitions and intentions. Tryon (2014) did not propose a principle pertinent to this phenomenon but Charles Olbert’s (2014) term paper led me to propose Principle 13: Resonance. Olbert (2014) observed that “Psychological discussions of **empathy** often exploit metaphors of attunement, synchronization, coupling, **resonance**, and mirroring” (p. 3, bold emphasis added). The fact that observing an action primed by the premotor cortex and implemented by motor cortex of the performer activates the same motor sequences in the premotor cortex of an observer is a form of resonance. That is, the observer(s) can be said to resonant with the performer.

However, the technical meaning of resonance is not quite right in that it pertains to a special frequency where a small input produces a much larger output. Wikipedia stated, “In [physics](#), **resonance** is the tendency of a system to [oscillate](#) with greater [amplitude](#) at some [frequencies](#) than at others. Frequencies at which the response amplitude is a relative maximum are known as the system's **resonant frequencies**, or **resonance frequencies**.” (<http://en.wikipedia.org/wiki/Resonance>). The term resonance is appropriate if one means that the EEG associated with the premotor and motor cortex of the performer activates the same EEG

**pattern** in the observer which may or may not be at the same or different absolute frequencies. The term resonance is also appropriate in the sense that input drives output in a causal way.

Coherence, as defined in the signal processing literature, entails the cross correlation between two waveforms. “The coherence of two waves follows from how well correlated the waves are as quantified by the [cross-correlation](#) function.<sup>[1][2][3][4][5]</sup> The cross-correlation quantifies the ability to predict the value of the second wave by knowing the value of the first” ([http://en.wikipedia.org/wiki/Coherence\\_%28physics%29](http://en.wikipedia.org/wiki/Coherence_%28physics%29)). “The **spectral coherence** is a [statistic](#) that can be used to examine the relation between two [signals](#) or [data](#) sets. It is commonly used to estimate the [power](#) transfer between input and output of a [linear system](#)” ([http://en.wikipedia.org/wiki/Coherence\\_%28signal\\_processing%29](http://en.wikipedia.org/wiki/Coherence_%28signal_processing%29)). Hence, the spectral coherence statistic can be used to quantify the relationship between the EEG associated with the premotor cortices of both the performer and the observer.

I chose the more intuitive term “resonance” for Principle 13 instead of “coherence” for at least two reasons. First, it is more familiar to psychologists as indicated by Olbert (2014). Second, coherence could easily be confused with consonance and therefore mixed up with dissonance; I wish to avoid such confusion. That said, the cross-correlation coefficient and spectral coherence statistic are the methods of choice to quantify the direct brain-to-brain communication at issue here.

## CONCLUSIONS

The more similar that clinicians think about psychology and behavior the more likely it is that they will agree on what is to be done and consequently the greater psychotherapy integration will become. Common factors provide a strong basis for psychotherapy integration. The fact that we now have 20 common factors means that psychotherapy integration is presently greater than has previously been recognized and acknowledged. Twelve of these common factors are network principles that provide cognitive neuroscience mechanism information that is consistent with the conceptual “must haves” of all of the Big Five clinical orientations: a) behavioral, b) cognitive, c) cognitive-behavioral, d) psychodynamic, and e) pharmacologic. Tryon’s (2014) emphasis on learning and memory (Principle 2) is especially noteworthy because if people could not learn and form memories neither normal nor abnormal psychological development would occur and no form of psychotherapy could exist. Tryon (2014) discussed the clinical relevance of all twelve principles

and how they support an **Applied Psychological Science** (APS) clinical orientation that grounds clinical practice in psychology as a mature natural science.

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<sup>7</sup> References not included in this list are in the reference section of the Tryon (2014).