TBT-S has five core principles derived from neurobiological research:
1. Eating disorders are brain and biologically based illnesses.
2. Treat to the trait or the temperament underpinnings.
3. Food is medicine.
4. Supports are a necessary part of the treatment process.
5. Action or movement is fundamental to change.

Eating Disorders Are Brain and Biologically Based Disorders

TBT-S is grounded in the temperament based neurobiological etiological model of anorexia nervosa (AN) initially developed by Kaye et al.\(^{35}\) and coined “When Good Traits Go Bad: Temperament and the Course of AN.” This model, as shown in Figure 2.1, recognizes AN as a heritable illness with a strong genetic component.\(^{6, 27, 28, 33, 63–66}\) Heritable risk is conferred through temperament traits that increase susceptibility to developing AN and also serve to maintain the illness. This neurobiological model has been updated to integrate findings from brain imaging studies showing altered function in brain systems regulating food intake in AN.

Key Point: Temperament traits and altered brain responses inform the treatment targets of TBT-S, which include altered anxiety, interoception, reward and punishment sensitivity, decision-making, and cognitive or inhibitory control.

The updated neurobiological model shown in Figure 2.1 depicts that good traits can go bad, and then become good again. This is the TBT-S philosophy. More detail is provided in Chapter 9.

Approaching AN from a temperament based neurobiological perspective provides a biological foundation and conceptual framework from which to view symptoms and the underlying mechanisms that drive behavior. Temperament informs targeted interventions directed at the cause of the behavior, rather than the behavior itself. This is a paradigm shift for many. Treatment of AN has been thwarted by the lack of a mechanistic understanding of the disorder and recognition of the central role of temperament in its biological basis. This is similar to how treatments of medical illnesses (like diabetes) were ineffective until the underlying mechanisms (insulin production) were discovered. Similarly, by adopting a temperament based neurobiological etiological model of AN, the treatment emphasis shifts away from attempts to understand how behaviors developed and toward a focus on
their functional impact to guide strategies to redirect trait expressions to achieve a reduction in eating disorder (ED) symptoms.

Key Point: TBT-S has emerged from a neurobiological model that identifies how “good” traits biologically shift to “bad” expressions and can become “good” again with trait-based intervention to promote recovery.

Treat to the Trait: Targeting Temperament in Treatment

Individuals with AN often exhibit characteristic temperament traits (see Figure 2.2). Some AN traits are productive and serve as strengths throughout life. These traits can be utilized in the course of treatment to help clients manage destructive traits. For example, many persons with AN are highly achievement oriented, which is needed to reduce ED symptoms and accomplish recovery. On the other hand, some AN traits result from genetically induced altered neural circuit function that impacts the development and maintenance of the disorder. As indicated in the TBT-S neurobiological model, ultimately, the same traits that increase vulnerability to AN can be shifted from destructive expressions that exacerbate ED symptoms to productive expressions that become strengths in overcoming and maintaining a healthier
and more successful lifestyle. It is important to note that not all people with AN will identify with all of the traits associated with AN. Rather, these traits are like a menu, where most people with AN identify with at least a few, if not many or all, of these traits (see Figure 2.2). Rather than trying to change traits that are hardwired in the brain (e.g., it would be difficult for an introvert to naturally become an extrovert), the goal of “treat to the trait” is to identify and experientially explore how an individual’s traits could contribute to their strengths to reduce their ED symptoms. TBT-S focuses on adjusting destructively expressed traits to expressions of strength by (a) clients experientially identifying their own trait-based productive responses, (b) teaching skills to endorse client solutions, and (c) drawing upon Supports’ strategies to compensate for inherent difficulties.

The philosophy of TBT-S is to utilize “traits as strengths.” Treatment modules and activities are specifically designed to target one or more of the destructive trait expressions and help clients realize how to shift them to strengths. This requires the clinician to adopt what may be a different framework for conceptualizing these traits as strengths. Table 2.1 provides an example of reconceptualizing traits as strengths and treatment strategies that are used when treating to the trait.

### Table 2.1 Reconceptualizing traits as strengths and strategies to treat to the trait

<table>
<thead>
<tr>
<th>Trait</th>
<th>Trait as strength (productively expressed)</th>
<th>TBT-S treatment strategy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uncertainty Intolerance</td>
<td>Highly structured</td>
<td>• Structure treatment</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Structure meal plan</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Identify explicit rules</td>
</tr>
<tr>
<td>Altered sensitivity to reward/punishment</td>
<td>Motivated by having options/choices, planning, structure, and long-term goals</td>
<td>• Offer multiple options instead of open-ended questions</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Structure plans</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Contingency management/ nonnegotiables</td>
</tr>
<tr>
<td>Obsessionality</td>
<td>High error detection</td>
<td>• Specific, concrete rules</td>
</tr>
<tr>
<td></td>
<td>Attention to detail</td>
<td>• Provide the details</td>
</tr>
</tbody>
</table>
Key Point: Traits can be expressed destructively or productively and clients can be taught to utilize their own traits as strengths throughout life.

In discussing temperament, it is important to clarify differences between traits and symptoms, highlighted in Figures 2.3 and 2.4. Symptoms are thoughts, feelings, and behaviors that have become problematic, dysfunctional, or harmful for persons and/or those around them. They are often influenced by traits. For example, a person with a strong impulsive trait is more likely to develop a substance use disorder or engage in binge eating than a person with an inhibited trait, who is more likely to avoid eating. ED symptoms, such as food restriction, binge eating, purging, or excessive exercise, are behaviors that can and should be eliminated. Temperament and traits, however, cannot be eliminated.

### Table 2.1 (cont.)

<table>
<thead>
<tr>
<th>Trait</th>
<th>Trait as strength (productively expressed)</th>
<th>TBT-S treatment strategy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anxiety</td>
<td>Thinks about potential what-ifs, thinks through worst-case scenarios, ability to plan and prepare</td>
<td>• Redirect, re-attend&lt;br&gt;• Stop, reboot, reroute</td>
</tr>
<tr>
<td>Inhibition</td>
<td>Ability to delay gratification, cautious, and unlikely to impulsively enter into harmful situation</td>
<td>• Use long-term rewards and consequences via contingency management</td>
</tr>
</tbody>
</table>

### Figure 2.3  How traits relate to symptoms

### Figure 2.4  Example of trait impact on symptoms

**Symptoms**
- Are outward behavioral expressions
- Are indicators or reactions to illnesses
- Have the potential to be reduced and eliminated

**Traits**
- Are genetically programmed innate features
- Can be altered via intentionally shifting expressions
- Cannot be eliminated

<table>
<thead>
<tr>
<th>Traits</th>
<th>Symptoms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Impulsive</td>
<td>Binge Eating</td>
</tr>
<tr>
<td>Inhibited</td>
<td>Restricts foods, activities</td>
</tr>
</tbody>
</table>
**Food Is Medicine**

Drawing from a biological perspective, food is the natural and fundamental substance that “medicates” our bodies to be strong, healthy, and balanced. Food is energy. Like other ED treatments, TBT-S recognizes that appropriate nutrition and body composition stabilization are necessary and fundamental to recovery. To facilitate this, TBT-S includes comprehensive dietetic recommendations and meal plans “prescribed” by an ED dietitian.

The dietetic philosophy in TBT-S is that dosing energy for adults with AN is similar to dosing medicine. Clients and Supports attend dietary sessions and groups where they are “prescribed” foods and learn a meal plan tailored to the clients’ needs alongside other basic dietary information. Biological tenets of TBT-S are woven into the dietary philosophy by prescribing a dietary approach that acknowledges core personality and temperament traits and the biologically based function of recommended foods. TBT-S emphasizes a highly structured meal plan in an effort to prioritize nutritional and weight rehabilitation in a way that honors the AN client’s unique temperamental tendency toward structure and certainty.

Meal plans are organized to prioritize predictability and consistency. This can include adherence to highly scheduled meal and snack times and predictable (and, importantly, calorically sufficient) meals and snacks, among other things. In this way, the treatment prioritizes structure and certainty over flexibility and variety to cater to the clients’ preferences for structure based on personality. TBT-S continues to acknowledge the need for dietary expansion, which may include incorporating additional foods or expanding food horizons in a variety of different ways. However, even this therapeutic endeavor toward variety is approached in a structured manner.

Alongside Supports and the dietary team, clients learn to plan out challenge foods in a structured format and, importantly, are the key stakeholders in deciding how and when, and even if, this therapeutic endeavor is undertaken. As such, TBT-S is unwavering in the need for abstinence from restriction and ensures that clients adopt and practice a meal plan that is calorically sufficient, includes major macronutrient groups, and upholds a more flexible approach with regard to variety. This allowance stems from acknowledging that the need for sameness and routine surrounding eating may be related to core personality styles and may in fact promote a more sustainable recovery practice in the long term. This structure and routine around meals compensate for altered interoception (e.g., altered hunger and/or satiety signaling that promotes food restriction or overeating, altered trust in body-related signals), decision-making (e.g., difficulty deciding what foods to eat), and reward sensitivity (e.g., reduced brain response for pleasure to motivate eating and affirm how much energy the body needs).
Supports Are a Necessary Part of Treatment

TBT-S advocates that it is necessary to include Supports (spouses, parents, children of adult clients, roommates, partners, friends, colleagues, etc.) in the treatment process for adults of all ages. The term “Supports” was chosen at the request of clients participating in an open trial of TBT-S at The Center for Balanced Living in Ohio to reflect their preference for support rather than being cared for, which they believed the more common term “carer” connotes. TBT-S requires that a minimum of one Support person participate in treatment with each client in designated sessions. Family-based treatment (FBT) is the first-line treatment for adolescents with AN. It is effective because it teaches families strategies to understand, interact, and manage AN.\(^{[67–69]}\) Similarly, TBT-S focuses on providing psychoeducation and skills training so that Supports learn about the causes of AN and effective ways to interact and manage symptoms.

Supports are appointed as part of the treatment team and are seen as an important asset to aid with recovery. The education, training, and practice that they receive in TBT-S sessions are intended to increase empathy and understanding by providing a biological understanding of AN and improving their ability to provide effective assistance. Supports in TBT-S sessions receive focused skills training on effective and age-appropriate assistance strategies that are practiced throughout the clients’ treatment.

TBT-S takes the perspective that Supports play a critical role in recovery by providing accountability, assistance, leverage, and the potential to compensate for traits clients do not have. Supports learn tools that the client chooses as helpful to assist in the process of reducing ED symptoms. In addition to formal skills training, when TBT-S is offered in group settings, Supports also learn new skills by receiving feedback and consultation from both their loved one and other Supports, as part of the TBT-S group milieu. If TBT-S is offered in a 5-day program, upon completion, Supports are armed with what the adult clients deem to be the best practices for providing assistance, in the context of a biological and temperament perspective of the illness. TBT-S views clients as the experts. Experts, however, do not work and function alone.

**Key Point: A Support is any person who offers support/assistance in a client’s life. Supports need the same information and tools as clients to offer consistency in reshaping altered trait expressions to promote recovery.**

Movement and/or Actions Are Fundamental to Change

TBT-S is a treatment of “doing.” The tendency to be physically active is one of the first traits to be identified historically and is considered the most essential trait of one’s temperament.\(^{[70]}\) Behavioral change requires behavioral action. Learning occurs when “neurons that fire together, wire together.”\(^{[50]}\) Thus, our brains are fluidly flexible to change throughout life. The brain rewires through extensive practice of new ways of expression and behaviors, and TBT-S capitalizes on this through guiding *in vivo* practice of new skills during treatment. Clients and their Supports identify and practice the same phrases and actions that they have identified as helpful toward achieving a healthier lifestyle. Many of the TBT-S treatment interventions are movement driven; clients “try them on” to explore new behaviors that bring them closer to their goals. Active interventions are helpful because the
brain learns through actions. Individuals are more likely to repeat what they have practiced. *In vivo* activities allow clients to refine their verbal and behavioral responses through corrective feedback via their own experience or from that of others. This iterative method of corrective feedback serves to enhance building new skills.

Movement is also needed to shift cognitive sets. Many ED behaviors represent rituals that have become automatic. Many individuals with AN have a trait-based tendency that causes their thoughts to become stuck on one topic. Movement can be used to interrupt destructive thoughts and behaviors to shift and move on to more productive thoughts and behaviors. TBT-S utilizes movement as a core part of the change process.

**Key Point: TBT-S is an active intervention approach.**

**Summary Key Point**

TBT-S has five core principles that draw from neurobiological research to inform and direct treatment.