

Mapping Emotional Change in Psychotherapy

Paul Thagard and Laurette Larocque
pthagard@uwaterloo.ca, laurette.larocque@gmail.com

Abstract

Psychotherapists help clients to reduce negative emotions such as sadness, anxiety and guilt while increasing positive emotions such as happiness and hope. Such changes can be displayed by cognitive-affective maps that indicate connections among concepts and emotions with positive and negative valence. Coherence among mental representations can explain shifts between patterns of emotions and attitudes depicted by cognitive-affective maps. Cognitive-affective mapping can be used to suggest how clients might understand their own emotional states and shift to more positive ones.

Keywords

Emotion, emotional change, coherence, cognitive-affective maps, psychotherapy.

People go to psychotherapists in search of emotional change because they are afflicted with negative emotions such as sadness, anxiety, anger, and low self-esteem. Effective therapists can help them to recover from these emotions and experience positive feelings such as happiness, confidence, hope, serenity, and pride (Castonguay and Hill, 2018; Greenberg, 2015). Such important changes can be charted using the technique of cognitive-affective mapping that has served to describe and explain numerous cases of social change (Thagard, 2010, 2019b). We are not offering a general theory of psychotherapy but rather showing how the changes it produces can be illustrated.

Cognitive-affective mapping is derived from a theory of emotional change based on coherence among attitudes, values, and emotions (Thagard, 2000, 2006). We provide

coherence analyses of specific cases of emotional change in psychotherapy drawn from the clinical experience of the second author of this paper.

Cognitive-Affective Mapping

Systems of emotional values can be conveniently displayed using a diagramming technique that produces a cognitive-affective map (CAM), also called a value map. Concept maps have been commonly used since the 1970s but they do not depict the values or emotions associated with concepts. The CAM method was developed by Thagard (2010) and has found numerous applications such as climate change and inequality (Findlay and Thagard, 2014; Homer-Dixon et al., 2013; Homer-Dixon et al., 2014; Milkoreit, 2017; Thagard, 2012a, 2012b, 2015, 2018, 2019b).

This technique employs the following conventions:

1. Ovals represent emotionally positive (pleasurable) elements.
2. Hexagons represent emotionally negative (painful) elements.
3. Rectangles represent elements that are neutral or carry both positive and negative aspects.
4. The thickness of the lines in the shape represents the relative strength of the positive or negative value associated with it.
5. Solid lines represent the relations between elements that are mutually supportive.
6. Dashed lines represent the relations between elements that are incompatible with each other.
7. The thickness of the lines in the connection represents the strength of the positive or negative relation.

When color is available, cognitive-affective maps conventionally represent positive elements by green ovals (go), negative ones by red hexagons (stop) , and neutral ones by yellow rectangles. Figure 1 schematizes this kind of representation.

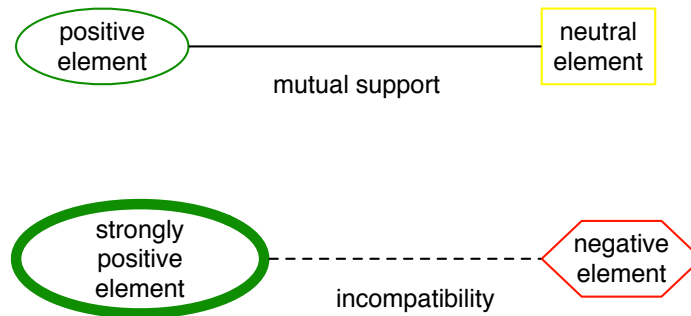


Figure 1 Schema for a value map. Use of color is optional depending on the medium used.

A value map can be drawn by following these steps:

1. Identify the main concepts, beliefs, goals, and emotions of the person being modeled.
2. Identify these elements as emotionally positive or negative, and accordingly represent them by ovals or hexagons.
3. Identify relations between elements that are either complementary (solid lines) or conflicting (dashed lines).
4. Show the resulting map to other people to see if it captures their understandings of the person and situation.

Case Studies

Here are four cases of emotional change in psychotherapy from the second author's private practice, modified to maintain anonymity. We use the technique of cognitive-affective mapping to depict the mental state of a client before, during, and after therapy.

Steve

Steve is a man in his 20s who suffered sexual abuse as an adolescent that induced prolonged negative emotions including shame, embarrassment, disgust, bitterness, and helplessness. Therapy helped him to experience less shame and increased frequency of positive emotions such as happiness and hope. Figure 2 shows some of the key concepts and emotions in Steve's mental state at the beginning of his therapy session. One technique used is gauging the emotional state of clients by asking them to circle their current emotions from a list of around 40 typical emotion words such as "afraid" and "sad". Questioning the client provides initial information about the causes of those emotions. Figure 2 shows a cluster of negative self-concepts arising from Steve's sexual abuse that led to him thinking of himself as a helpless victim who had been betrayed. The resulting emotions include shame, embarrassment, and disgust. These interlinked negative concepts and emotions are represented by hexagons. The one oval positive element in figure 2 is the therapist who is marked as opposed to helplessness by the dotted line.

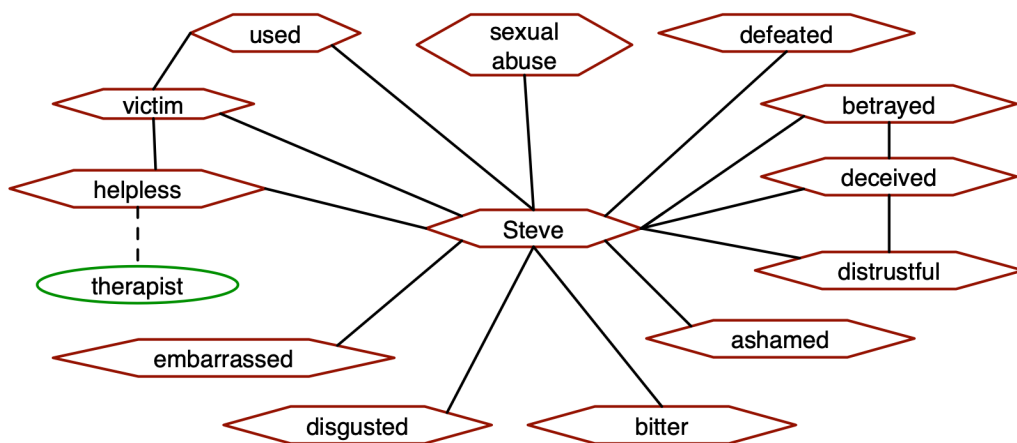


Figure 2 Cognitive-affective map of Steve at the beginning of therapy.

Hexagons indicate negative concepts and emotions.

As therapy progresses, the therapist helps Steve to develop the more positive configuration of values shown in figure 3. Steve realizes the possibility of self-change including thinking of himself as intelligent, hardworking, and good looking rather than as a helpless victim. Negative emotions such as embarrassment and guilt are inappropriate because he did nothing wrong and ongoing guilt reflects only his religious background. Steve feels less anxiety and has the beginnings of hope and happiness. The connections of the self-concept and emotions with the therapist fits with the finding that the existence of a strong alliance between the client and therapist is one of the major predictors of successful therapy (Horvath, Del Re, Flückiger, & Symonds, 2011; Castonguay and Hill, 2017).

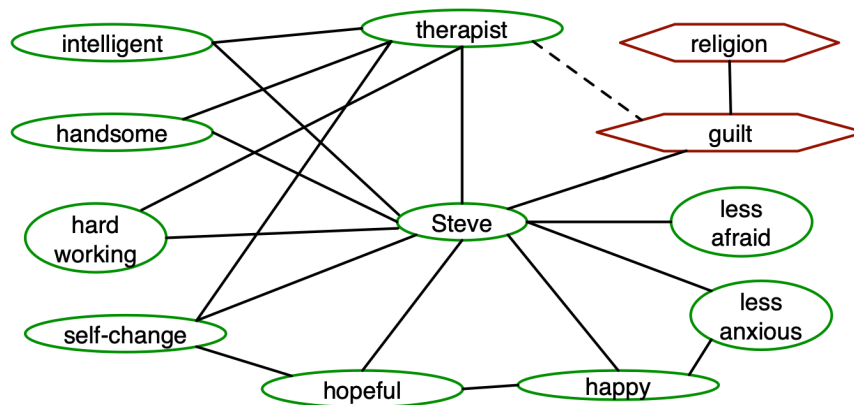


Figure 3 Cognitive-affective map of Steve as therapy progresses. Ovals indicate positive concepts and emotions.

Joan

Joan's reasons for seeking therapy are different from Steve's as shown in figure 4. Joan is a woman in her 40s who sought help for feelings of anxiety, depression, and guilt about her weaknesses in doing her job and looking after her family. Therapy helps her to be less anxious and more confident about dealing with work and family responsibilities. She is anxious and depressed because of feeling weakly inadequate with respect to her

demanding job and difficult family. But she feels safe with the therapist and curious about how she might be helped.

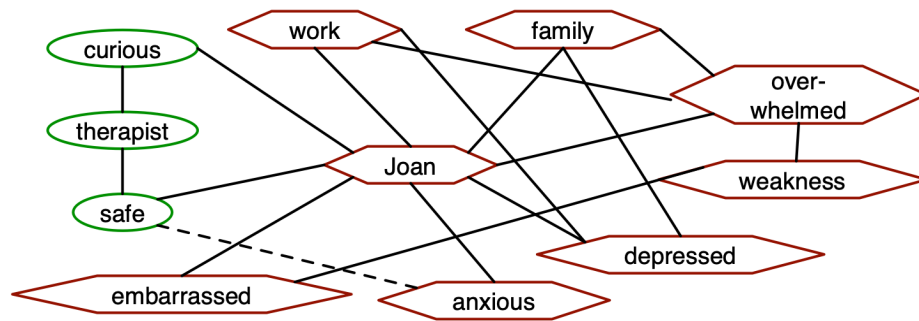


Figure 4 Cognitive-affective map of Joan at the beginning of therapy.

Through sessions with the therapist, Joan's emotional state improves as shown in figure 5. She still feels somewhat overwhelmed by work and family, but she feels safe, relaxed, and cared for with the therapist who provides advice about how she can be better organized in order to cope with her job and family members. She begins to have feelings of peace and happiness which lessens the depression that led her to therapy. The contrast between figures 4 and 5 (and between figures 2 and 3 for Steve) illustrate how psychotherapy can reorganize patterns of emotions. Thagard (2019b, ch. 10) provides an extended discussion of the multilevel mechanisms (molecular, neural, mental, and social) that cause depression.

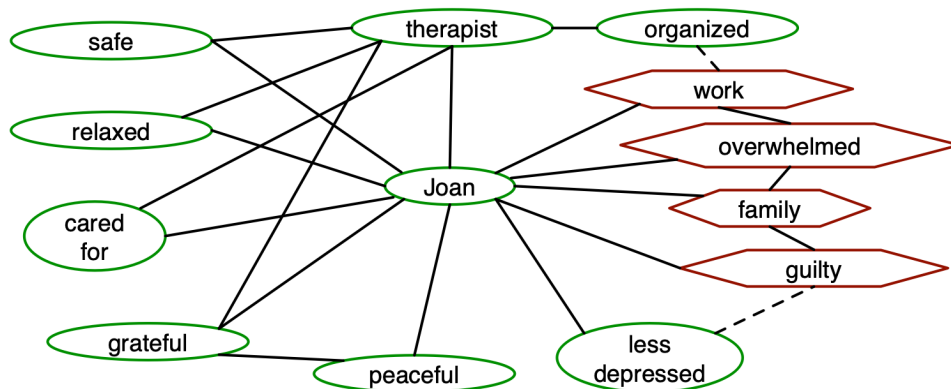


Figure 5 Cognitive-affective map of Joan as therapy progresses.

Sophia

Sophia is a widow in her 60s who began therapy to get help with negative emotions that included loneliness, missing her late husband, disappointment in Internet dating, and worries about getting older including questioning how her life could be meaningful. Therapy helped her to resolve her grief, find meaning and company through friends and activities, and discount the rejection she felt from online dating.

Figure 6 depicts Sophia's mental state at the beginning of therapy with a pattern of negative concepts and emotions. It shows some of the relevant emotional connections such as how increased age challenges meaning and encourages depression. The one positive is Sophia's hope that the therapist can help with her feelings of anxiety.

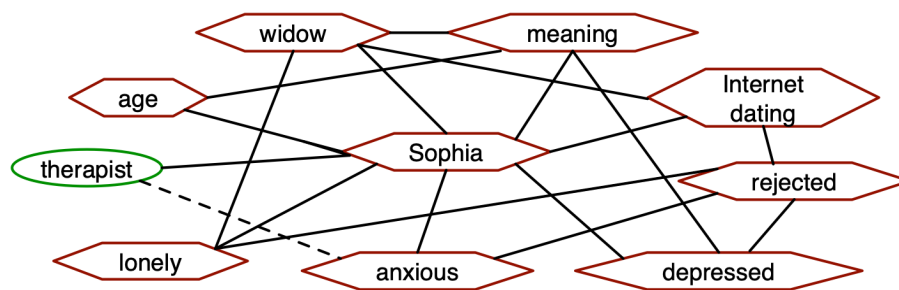


Figure 6 Cognitive-affective map of Sophia at the beginning of therapy.

With help from the therapist, Sophia develops a more positive view of her life based on finding new friends and activities and not worrying about dating. The therapist helps her to resolve the grief from loss of her husband and to feel more confident that she can adapt to aging. Figure 7 displays the newly positive pattern. Psychotherapists are increasingly recognizing the importance of helping clients deal with problems about meaning in life (Hill, 2018; Thagard, forthcoming).

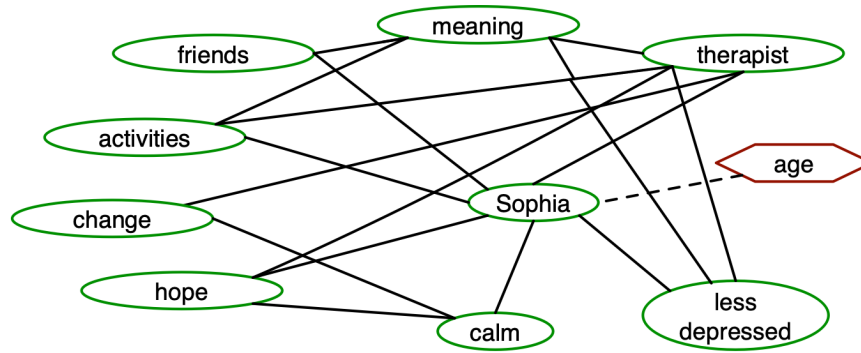


Figure 7 Cognitive-affective map of Sophia as therapy progresses.

Chris

Chris's situation is more serious than the first three cases because his troubles have him considering suicide although not actually planning it. Chris is a man in his 50s who feels despondent because he thinks that his faulty parenting is responsible for his son's addiction to cocaine. He feels helpless and incapable of discussing the son with his wife and is drinking more alcohol. Figure 8 depicts the negative pattern.

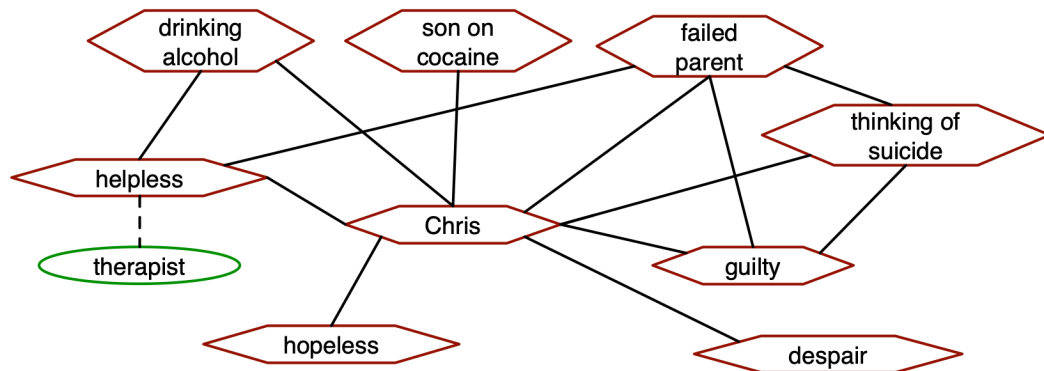


Figure 8 Cognitive-affective map of Chris at the beginning of therapy.

Because Chris has extensive experience with sports, the therapist describes how she can help to coach him through his difficulties. She points out to him that he is a kind of hero in his attempts to help his son and should view his wife as teammate in their joint efforts. He begins to see his life more enthusiastically and stops contemplating suicide. Figure 9 depicts the more positive pattern that develops.

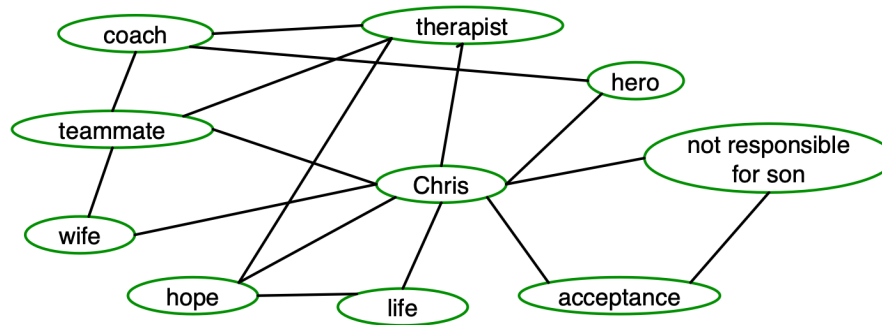


Figure 9 Cognitive-affective map of Chris as therapy progresses.

Cognitive-affective maps have several advantages over mere lists of negative concepts and emotions. First, they show important interconnections among concepts and emotions, for example that Chris's guilt is connected to failure as a parent related to his son's cocaine problem. Second, they provide an overall picture of the client's mental state with a configuration of positive and negative feelings. Third, each cognitive-affective map translates directly into an explanation of the client's negative emotions based on the theory of emotional coherence.

Emotional Coherence as a Mechanism of Change

Cognitive-affective maps are descriptive rather than explanatory, but the shifts that they describe can be explained by the theory of emotional coherence that has been applied to a wide range of phenomena including motivated inference, trust, and biased decision making (Thagard, 2000, 2006, 2019b). On this view, people's decisions and other judgments arise from a process of balancing different elements based on their emotional values (valences). The theory of emotional coherence can be summarized in three principles:

1. Mental representations have positive or negative valences.
2. Representations can have positive or negative emotional connections to other elements.

3. The valence of an element is determined by the valences and acceptability of all the elements to which it is connected.

Decisions result from emotional coherence when people figure out what to do on the basis of what how different actions fit with their various goals. The computer program HOTCO (for “hot coherence”) shows how emotional coherence can be processed:

1. Use artificial neurons to stand for mental representations such as concepts.
2. Use symmetric excitatory links between neurons to implement positive emotional connections, and use symmetric inhibitory links to implement negative connections.
3. Spread activation in the neural network according to the excitatory and inhibitory links until the network stabilizes with a configuration of valences.

Each of the maps in the previous figures generates a HOTCO simulation where the elements in ovals get positive valence, the elements in hexagons get negative valence, the solid lines become excitatory links, and the dotted lines become inhibitory links.

Using emotional coherence and HOTCO, important aspects of psychotherapy can be explained as a process in which the therapist helps the client to replace a network that generates negative valences with one that is more positive. The psychology of perception describes Gestalt shifts in examples such as the duck/rabbit, old woman/young woman, and Necker cube. Analogously, emotional coherence can generate emotional Gestalt shifts from one configuration of valences to another.

The transitions described for Steve, Joan, Sophia, and Chris are examples of such shifts. Experimental evidence that emotional coherence operates in human minds comes directly from the experiments of Simon, Stenstrom, and Read (2015) and indirectly from explanations of common phenomena such as motivated inference (Kunda, 1990; Thagard

2006). Non-emotional coherence is also important in therapy: Thagard and Larocque (2018) analyze mental health assessment as a process of explanatory coherence.

Psychotherapists are trained in traditions such as psychodynamic, cognitive-behavioral, rational-emotive, and emotion-focused theories. Regardless of theoretical orientation, conversations with clients can alter emotional coherence in numerous ways.

1. Introduce new representations and connections such as Steve thinking of himself as intelligent and Joan thinking of herself as organized.
2. Introduce representations of the therapist as allied with the client in generating positive emotions.
3. Encourage the client to see and feel that the new network of representations and connections is more coherent than the old one that generated distress.

Then therapy can work by emotional Gestalt shifts generated by coherence. Cognitive-affective maps are useful in depicting the beginning, intermediate, and end states of the process of emotional improvement.

Therapeutic Uses of Cognitive-Affective Maps

Mapping is not just an aid to theoretical explanation of changes but may also turn out to be a useful tool for therapists and their clients. For example, cognitive-affective mapping can be used to suggest how clients might understand their own emotional states and shift toward more positive ones. Figure 10 shows competition between two emotional patterns representing first the despair resulting from abuse and second the hope resulting from the therapist's advice. Instead of shame, the client can productively experience anger toward the abuser. Building and inspecting the combined CAM may aid the client to grasp how to have a better life.

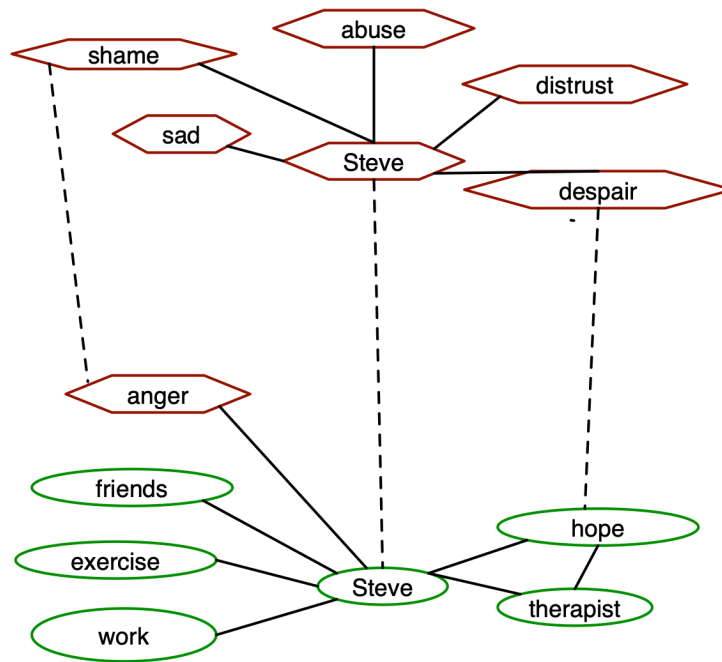


Figure 10 Dual cognitive-affective map showing switch between negative patterns of emotions (upper) and positive ones (lower). The dotted lines indicate competition between Steve’s negative and positive views.

Cognitive-affective mapping may also help clients to move from the shackles of fear-driven inference to the liberating effects of motivated inference. In motivated inference, people try to bring their beliefs in line with desired goals such as being happy, a process that may sometimes be delusional but may also contribute to healthy behaviors and relationships (Murray and Holmes, 2017). The second figure in each of our cases studies reflects motivated inferences about how clients can strive to improve their lives with the aid of the therapist.

In contrast, the first figure in each of the cases reflects fear-driven inference in which people maintain evidence-weak beliefs because they are attached to negative emotions that demand their attention (Thagard and Nussbaum, 2014; Thagard, 2019b; Elster, 2015, calls this “countermotivated” inference). For example, Chris may become so

distressed with the thought that he has failed as a parent that he cannot help believing it even though there is little evidence for it. Therapists can help their clients to make the emotional Gestalt switch from negative to positive as in figure 10, but also to switch from the destructive mode of fear-driven inference to the healthier mode of motivated inference.

Another use for cognitive-affective mapping and the underlying theory of emotional coherence is to understand the role of empathy in the therapeutic alliance. One way in which trust is established between therapists and clients is for the therapist to relate to the client's situation by comparison to an experience in the therapist's own life. This form of empathy is a kind of analogy in which systematic parallels are drawn between two people's emotional situations. An extended form of CAMs (analogical CAMs, or AnaCAMs) can be used to display the parallels as in figure 11. Here the client is dealing with a dissolving marriage with resulting sadness and anxiety. A therapist who has experienced a divorce can self-disclose and empathize in a way that is useful both for helping the therapist to understand the client's situation and for helping the client to see that the therapist understands and cares, cementing the alliance. Just as the therapist got over the divorce, the client can expect to get over the breakup. AnaCAMs could also be useful for depicting the psychodynamic process of transference in which a client has an emotional reaction to the therapist based on an analogy between the therapist and another important person in the client's life such as a difficult parent.

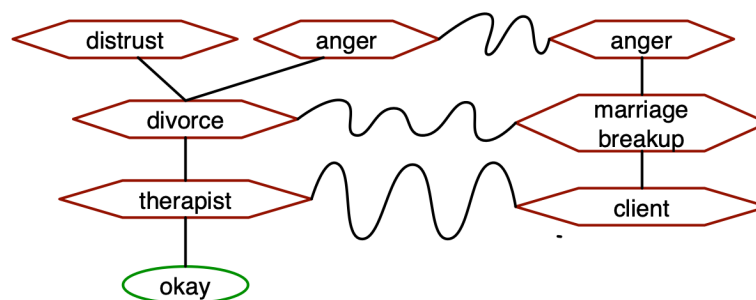


Figure 11. Empathic analogical mapping between therapist and client. The wavy line indicates analogical comparison.

Neural Mechanisms

The method of cognitive-affective mapping provides new ways of describing and explaining emotional change in psychotherapy but it has limitations. Most seriously, it treat emotions as unanalyzed concepts with no explanation of what they are or how they arise. Another problem is that the connections between elements in cognitive-affective maps and emotional coherence networks are simple symmetric relations of compatibility and incompatibility rather than underlying causal relations. A much fuller theory of emotional change can be developed by considering how the brain processes emotions (Thagard and Larocque, forthcoming; Thagard and Schröder, 2014; Thagard, 2019a, 2019b; Kajić, Schröder, Stewart, and Thagard, 2019).

According to the semantic pointer theory of emotions, an emotion such as sadness is a pattern of neural firing that binds together both appraisals of the goal-relevance of a current situation and the physiological response to the situation. For example, when Steve recalls his sexual abuse he feels shame because (1) his body reacts with changes such as increased heart rate, sweating, and increased cortisol levels and (2) he makes the appraisal that he should have done something to prevent the abuse. Semantic pointers are patterns of neural firing that result from binding together other firing patterns, in this case ones representing Steve's physiological changes and cognitive appraisal. Emotional change occurs when different physiological states and different appraisals together produce different semantic pointers, for example when the therapist helps Steve realize that anger is better than shame as a reaction to his abuser.

The neural mechanisms for emotional change based on semantic pointers are compatible with the coherence mechanism illustrated by cognitive-affective maps. The two explanations operate at different but compatible levels, just as explaining a disease can compatibly concern both organs and cells. Table 1 shows how to translate between explanations at different levels whose appropriateness is a pragmatic question. For outlining patterns of emotions and attitudes that change in psychotherapeutic cases such as Steve and Joan, the coherence level is appropriate because it highlights the patterns that change. For a deeper understanding of the nature of the emotions involved in therapy-aided change, the neural level based on semantic pointers is more useful.

	Coherence Mechanism	Semantic Pointers
Concept	Neuron in network	Neural group that binds examples and typical features
Emotion	Neuron in network	Neural group that binds situations, appraisal, and physiology
Connections	Excitatory links based on mutual support; inhibitory links based on incompatibility	Excitatory and inhibitory links between neurons in neural groups
Activity	Firing rate of neuron	Spiking patterns in groups of neurons
Result	Activate some nodes by maximizing coherence	Greater overall spiking in neural group

Table 1. Relation between coherence and semantic pointer mechanisms.

Conclusion

Psychotherapy aims at helping clients to achieve change that reduces negative emotions such as anxiety and depression. The primary contribution of our paper is to illustrate the use of cognitive-affective maps to depict the emotional states of people undergoing therapy. Second, we showed how these depictions translate into explanations

of emotional states and changes based on the mechanism of emotional coherence. Third, we connected emotional coherence with neural explanations of emotions and change. We hope that these contributions will improve understanding of the process of psychotherapy and also lead to more effective practices.

References

- Castonguay, L. G., & Hill, C. E. (Eds.). (2017). *How and why are some therapists better than others? Understanding therapist effects*. Washington, DC: American Psychological Association.
- Elster, J. (2015). *Explaining social behavior: More nuts and bolts for the social sciences* (2nd ed.). Cambridge: Cambridge University Press.
- Findlay, S. D., & Thagard, P. (2014). Emotional change in international negotiation: Analyzing the Camp David accords using cognitive-affective maps. *Group Decision and Negotiation*, 23, 1281-1300.
- Greenberg, L. S. (2015). *Emotion-focused therapy: Coaching clients to work through their feelings*. Washington, DC: American Psychological Association.
- Hill, C. E. (2018). *Meaning in life: A therapist's guide*. Washington DC: American Psychological Association.
- Homer-Dixon, T., Leader Maynard, J., Mildenerger, M., Milkoreit, M., Mock, S. J., Quilley, S., . . . Thagard, P. (2013). A complex systems approach to the study of ideology: Cognitive-affective structures and the dynamics of belief systems. *Journal of Social and Political Psychology*, 1, 337-364. doi:<http://dx.doi.org/10.5964/jspp.v1i1.36>
- Homer-Dixon, T., Milkoreit, M., Mock, S. J., Schröder, T., & Thagard, P. (2014). The conceptual structure of social disputes: Cognitive-affective maps as a tool for conflict analysis and resolution. *SAGE Open*, 4. doi:10.1177/2158244014526210
- Horvath, A. O., Del Re, A. C., Flückiger, C., & Symonds, D. (2011). Alliance in individual psychotherapy. *Psychotherapy*, 48(1), 9-16. doi:10.1037/a0022186
- Kajić, I., Schröder, T., Stewart, T. C., & Thagard, P. (2019). The semantic pointer theory of emotions. *Cognitive Systems Research*, 58, 35-53.
- Kunda, Z. (1990). The case for motivated reasoning. *Psychological Bulletin*, 108, 480-498.
- Milkoreit, M. (2017). *Mindmade politics: The cognitive roots of international climate governance*. Cambridge, MA: MIT Press.
- Murray, S. L., & Holmes, J. G. (2017). *Motivated cognition in relationships: The pursuit of belonging*. New York: Guilford.
- Simon, D., Stenstrom, D., & Read, S. J. (2015). The coherence effect: Blending cold and hot cognitions. *Journal of Personality and Social Psychology*, 109, 369-394.
- Thagard, P. (2000). *Coherence in thought and action*. Cambridge, MA: MIT Press.
- Thagard, P. (2006). *Hot thought: Mechanisms and applications of emotional cognition*. Cambridge, MA: MIT Press.
- Thagard, P. (2010). EMPATHICA: A computer support system with visual representations for cognitive-affective mapping. In K. McGregor (Ed.), *Proceedings of the*

- workshop on visual reasoning and representation* (pp. 79-81). Menlo Park, CA: AAAI Press.
- Thagard, P. (2012a). *The cognitive science of science: Explanation, discovery, and conceptual change*. Cambridge, MA: MIT Press.
- Thagard, P. (2012b). Mapping minds across cultures. In R. Sun (Ed.), *Grounding social sciences in cognitive sciences* (pp. 35-62). Cambridge, MA: MIT Press.
- Thagard, P. (2015). Value maps in applied ethics. *Teaching Ethics*, 15, 115-127. doi:10.5840/tej20149221
- Thagard, P. (2018). Social equality: Cognitive modeling based on emotional coherence explains attitude change. *Policy Insights from Behavioral and Brain Sciences*, 5(2), 247-256.
- Thagard, P. (2019). *Brain-mind: From neurons to consciousness and creativity*. New York: Oxford University Press.
- Thagard, P. (2019a). *Mind-society: From brains to social sciences and professions*. New York: Oxford University Press.
- Thagard, P. (2019b). *Natural philosophy: From social brains to knowledge, reality, morality, and beauty*. New York: Oxford University Press.
- Thagard, P. (forthcoming). The relevance of neuroscience to meaning in life. In I. Landau (Ed.), *Oxford handbook of meaning in life*. Oxford: Oxford University Press.
- Thagard, P., & Larocque, L. (2018). Mental health assessment: Inference, explanation, and coherence. *Journal of Evaluation in Clinical Practice*, 24(3), 649-654. doi:10.1111/jep.12885
- Thagard, P., & Larocque, L. (forthcoming). Emotional change: Neural mechanisms based on semantic pointers.
- Thagard, P., & Nussbaum, A. D. (2014). Fear-driven inference: Mechanisms of gut overreaction. In L. Magnani (Ed.), *Model-based reasoning in science and technology* (pp. 43-53). Berlin: Springer.
- Thagard, P., & Schröder, T. (2014). Emotions as semantic pointers: Constructive neural mechanisms. In L. F. Barrett & J. A. Russell (Eds.), *The psychological construction of emotions* (pp. 144-167). New York: Guilford.