The Scientific Building Blocks of PeaceBuilders

Nine Key Principles of the Science of PeaceBuilding

From an original treatise by Dennis D. Embry, Ph.D.

1. Children's behavior is adaptive.

This key principle is supported by Dr. Donald Baer, who argued that children's behavior is always functional in the conditions they face. Dr. Dennis D. Embry's work with children of deployed military parents during the Gulf War revealed that up to 40% of these children had significant behavior changes[1] such as increased fighting, fears, distractions, restlessness, nightmares, and sleeping problems. More of these children engaged in risk behaviors such as the use of tobacco, alcohol, drugs and early sexual behavior. Rather than view these behavior changes as symptoms of mental illness, Dr. Embry concluded that these behaviors were adaptations to a world that was perceived to be filled with predatory adult humans in a violent world. Some of Dr. Embry's students challenged him to write a book on how to build peace. He reread classic studies and phoned many scholars to seek understanding of what might be done. He began the collaborative work of applying these scientific principles in order to create a more peaceful world.

PeaceBuilders began with a fundamental precept: by building a different environment, peaceful behaviors will be adaptive and natural. Peace is not an accident; it is something built every day—by simple actions and routines that signal to the developing child that he or she is safe and that he or she can build a better world through common actions and vision with like-minded people of all ages.

This key principle is supported by classic studies on the science of behavior, clearly indicating that early behavior problems predict criminal behavior and substance abuse in later life[2]. Many of these classic studies also indicate that early behaviors can be changed through simple practices. If we change the early behaviors, we build more peace. Paradoxically, without the early predictors, prevention is not possible, which is why PeaceBuilders embraces those early predictors to change them.

2. Violence and other antisocial behavior have early behavioral predictors that can be observed and counted reliably.

This key principle is supported by a number of behavioral studies showing that early problem behaviors, even if serious, can be changed through relatively simple strategies.

3. Antisocial behavior can be changed by altering the attention for prosocial (PeaceBuilding) behaviors from peers and adults.

Antisocial behavior can be reduced by changing the organization and routines of child and adult environments.

Changing the attention, or reinforcement, that children get for behavior from peers and adults is extremely powerful in altering many of the negative behaviors in group, home and community settings—even for children or youth with very high levels of the problem behaviors[3].

How the environment is organized dramatically affects the behavior of children and adults[4]. Simple things like having mats to sit on, cubbies to put your things in, specific chores for each child and organized play could create an environment of peace or disturbance[5]. A British researcher, Dr. Michael Rutter, identified simple organizational aspects of schools that reduced delinquency among high school students. This finding was concurrent with the work of G. Roy Mayer, who provided experimental evidence for altering settings[6].

PeaceBuilders explicitly uses the findings from both these studies to provide many sources of reinforcement for peaceful, positive behaviors—directly and through routines.

4. Reducing perceived threats and neutral cues in all settings will reduce violence.

This key principle is supported by findings that people at risk for violence or exposed to violence see, hear and think about intentions differently. Most children who are aggressive or who have been hurt by violence perceive the world differently[7]. They are especially reactive to perceived threats and they often react to neutral events as threats. It is critical to reduce every manner of perceived threats and neutral cues in settings with children and adults who have been exposed to violence or were aggressive. This suggests that language, rituals, routines and cues would need to be deliberately structured to build peace. Thus, you will notice many strategies in the language and routines of PeaceBuilders that cue peace, rather than react to problems.

5. Peace is far more likely when all the people see themselves:
- **working together for a common good**
- **having a common identity of belonging**
- **having clear, positive "membership behaviors"**
- **being on the "same team"**
- **being in a group in which put-downs are minimal**

This key principle is supported by research that indicates that cultural practices and symbolic models foster the imitation of peace or violence. Young children, when shown a video of violent cartoon characters will imitate those violent behaviors, particularly if they are already disruptive[8]. Therefore, it is important to be very careful about showing examples of bullying, aggression or teasing to children because they would be very likely to copy those behaviors. PeaceBuilders, therefore, explicitly models positive, peaceful behaviors rather than emphasizing the negative behaviors in stories, pictures or cautionary tales.

The famous anthropological study of two communities of Zapotec Indians, in Southern Mexico, illustrates the importance of positive modeling and reinforcement. Two villages, fictitiously named La Paz and San Andrés, share the same genetic history, tribal affiliation and economic practices. La Paz has had an annual homicide rate of 3.4 per 100,000 people; San Andrés' rate is 18.1. There have been no murders in La Paz in a very long time, versus persistent homicides in San Andrés. Although La Paz does experience conflict, hostilities, and occasional violence, it is significantly less violent than the neighboring community—this is observable even in children's play[9]. One can see this in simple ways. For example, the people of La Paz avoid making disrespectful verbal comments ("put-downs") about others. The adults of La Paz praise their children for restraint from disruptions and disturbances and discourage play fighting. A PeaceBuilders site looks a lot like the village of La Paz, where models for peace, praise and cooperation are common.

Shared vision, goals and a language of belonging change aggressive behavior. A classic experiment, the Robbers Cave study by Dr. Muzafer Sherif, makes the point about the socialization of aggression among children and youth[10]. In this remarkable study, twenty-two 11-year-olds who were "good kids of the day" went to a special summer camp at Robbers Cave in Oklahoma. The boys were randomly divided into two groups, the Eagles and the Rattlers—with corresponding flags and t-shirts. Soon, put-downs and name-calling escalated, followed by raids against each other's group where damage was done to property and personal effects. It was the pre-homicide scene of

Lord of the Flies. Merging the two groups did nothing to the stop the aggression. Aggression only stopped and cooperative behavior started when the two gangs of pre-teens were given super-ordinate goals to solve for common benefit. For example, the Eagles and Rattlers had to work together to obtain water and food for the whole camp. Hungry and thirsty boys dropped their anger to work together for mutual benefit.

In Dr. Embry's work, when the use of language with an adjectival noun related to positive identity such as "I am a Safe Player," better safety-related behavior from children resulted. These findings can be seen in perversity used with street gangs, when youth say, "I am a Blood" or "I am a Crip." In the context of both Sherif's earlier work and the more recent studies by Dr. Embry, PeaceBuilders creates a language for everyone—regardless of age—to work together to build peace. Who can be a PeaceBuilder? Each and every one of us.

6. Peaceful behavior is more likely when strategies are grounded in simple, practical strategies for everyday life instead of those that require extensive lessons or therapeutic training.

Recall the first principle which states that children's behavior is adaptive. From that first principle, it follows that everyday routines will be more likely to change children's development toward the positive. Earlier projects for violence prevention tried to change things like anger or introduce conflict mediation or lessons about the harm of violence. This principle suggests that these are not the cause of violence but the result of exposure to environments that create anger or conflict.

Thus, the sixth principle of grounding in simple, everyday practices for prevention and the promotion of peace is supported by the fact that there is little evidence that exists to support anger management training as a cost-effective universal prevention strategy. One study revealed that the implementation of this training did not yield significant behavior change[11]. Only very small differences in aggression were observed on the playground, which could be more naturally and cost-effectively addressed through structured recess and simple positive reinforcement[12]. Another study showed that children knew more about problem behaviors but did not necessarily behave better as rated by teachers, though again observers noted some changes in disruptions[13]. This reinforces the notion that curriculum approaches for anger management seem to be weak, yet costly, strategies.

The release of anger does not stop violence in children. Having children (or adults) "release their rage" tends to add fuel to the fire[14]. Letting children release anger means they will do more of the same, except in very, very rare cases. This must only be practiced under the supervision of very skilled therapists.

No consistent evidence exists for conflict mediation with elementary school students as a life-long violence prevention strategy. One major group has focused on peer mediation in elementary schools and they show some reductions in suspensions and observed conflict[15]. There are both practical and theoretical problems with the general idea. Much simpler, more natural and less costly strategies appear to provide bigger benefits in reducing all manner of problematic behaviors where large numbers of children are playing or interacting[16]. Where mediation has been more successful, the impact is probably due to giving children meaningful, prosocial roles that foster adult and peer reinforcement. This is clearer when one examines the positive impact of peer coaches (children who reinforce and support positive behaviors) with apparent similar, positive effects with less risk[17]. Peer coaching and support is far more natural than assigning children as quasi-counselors enacting a courtroom scene.

Knowledge-based or curricular approaches change knowledge but not much behavior. Given the review of the behavioral, social, emotional, cognitive and reinforcement histories of children likely to commit violence, studies testing curriculum approaches to violence prevention produced little change in behavior and mostly change in knowledge of violence or aggression[18]. Knowing and doing use two separate parts of the brain, however. A very similar finding exists with substance abuse; knowing about the dangers of drugs and what they are does not do much to deter youth from experimentation.

Curriculum is not particularly useful; however, storytelling about how to live peacefully, resolve conflicts in acceptable ways and create a more positive world for one's self and loved ones is quite effective. The families of La Paz do not have courses in violence prevention. They do tell, act and applaud different daily stories of peace versus conflict, communicating what will be reinforced and esteemed in the village. That is the natural, anthropological way of teaching the values of peace versus aggression.

Thus, PeaceBuilders omits things that have little evidence of effectiveness for young children—such as anger management, conflict mediation and lessons about the harms of violence. Knowing what to exclude is as important as knowing what to include in a powerful prevention practice. PeaceBuilders includes powerful strategies for everyday routines.

7. Children who have been exposed to trauma have experienced changes in certain brain hormones, which may, in turn, produce undesirable behaviors as an adaptive response.

This key principle is emerged from James Wilson's and Richard Herrnstein's classic book, *Crime and Human Nature: the Definitive Study of the Causes of Crime*. This book fundamentally challenged a simplistic response that violence was a learned behavior, suggesting that instead human hormones were changed by social conditions and that change in turn produced criminal behavior. Subsequently, a large number of books and studies have helped explain this better. For example, *Listening to Prozac* by Peter Kramer notes the effects of Prozac and shows how animal studies reveal that serotonin is the brain chemical of belonging, safety and perceived status. Under danger and stress, serotonin goes down. This supports the hypothesis that children's behavior is adaptive and functional. Thus, if children were growing up in a world that was filled with predatory peers or adults, biology and behavior would adapt to maximize success.

Children exposed to histories of perceived violence and human-caused stress shift from delayed gratification to immediate gratification. Delayed gratification is clearly related to social class, lack of exposure to trauma, and perceived safety[19]. This has a number of important implications for prevention:

- Children who are exposed to trauma, neglect, or other stressors will require frequent reinforcement from peers and adults for their "good" behaviors in order for the adaptive mechanisms to shift to delay.

- Children who do not receive increased frequency of positive reinforcement for positive, prosocial behaviors from peers and adults will seek out attention for negative behaviors and have higher risk for substance abuse, driving the children into a path of antisocial behavior.

Children exposed to violence, trauma or chronic stress will be more likely to have early sexual maturity, early sexual behaviors, and more children—arising from changes in the stress axis in the brain. This is likely to increase levels of violence and aggression among individuals with early puberty[20]. This leads to some implications for prevention.

- By lowering perceived threats from peers or adults in the community, children will be less likely to have stress-related illnesses.

- By lowering perceived threats from peers and adults in the community, children will be less likely to engage in early sexual behavior.

These implications, too, have largely proven to be true—regardless of the family circumstances of the child[21].

8. Peaceful, productive behavior is more likely when other adults (not parents) join with a child's vision of meaning, reinforce the child and encourage the child—especially when a child emerges from adversity.

This key principle is supported by Dr. Emmy Werner's study of children raised in adversity, who emerged as capable adults[22]. Dr. Werner found that negative experiences were not a death sentence. Several key findings stood out from her famous long-term study, which are things that can be encouraged as a community-based prevention strategy.

- Children who recruited other adults to help them and give them positive attention did better.

- Children who developed an active approach to solving some of life's inevitable problems did better.

- Children who developed a sense of their ability to have a meaningful life did better.

Overcoming adversity as a child is not the result of some superhuman inner strength. It is the result of a developmental dance of other people reinforcing the child's positive actions and reducing the child's preoccupation with perceived threats. Resiliency is fostered by very simple gifts from other adults noticing a child's spark, and who gently ignite it by some brief kindness. If you are a wise person to children around your home, your work or in your community, you will be building peace in ways you cannot possibly predict.

Adults and children must be recognized and feel reinforced for peace versus aggression or violence. The six PeaceBuilders Principles work in synchrony to achieve this. These six simple behaviors are not things that will be done or have been done; they are things exercised in the present, the now, every day, in every way possible, by as many people as possible, in as many circumstances as possible.

PeaceBuilders puts resiliency research into action by encouraging children to seek wise people and for wise people (like the reader) to praise children for positive behaviors.

9. Peaceful behavior follows a hundred-year old mathematical law.

PeaceBuilders is a recipe. Like most recipes, some folks often change it a bit to their tastes. Thus, one can visit a hundred different PeaceBuilders sites, and each will be somewhat different; yet all will feel, sound, and look distinctly like PeaceBuilders. There are essentials for building peace, rather like the essential ingredients in your favorite recipe.

At its heart is a formula or "recipe" as powerful as Einstein's, $e=mc^2$. The formula goes back, at least, to the writings of a great psychologist who published his work in the same time frame as Einstein. His name was E. Thorndike and he articulated his theory most famously as the Law of Effect[23].

As elegant as $e=mc^2$ is the law of behavior, derived by Thorndike. That mathematical formula, expressed in the most simple way for the presence of persistent peace, is known as the Matching Law, represented here in a stylistic way to better show the variables:

$$PB = \frac{k \star rp}{(rp+rv)}$$

The observed frequency of Peaceful Behavior (PB) in some setting (say a classroom or a neighborhood) equals an asymptotic constant[24] (a sort of limited curve) multiplied by the rate that peaceful behavior is reinforced in that setting. Then, that obtained product, is divided by the sum of the same rate of reinforcement of peaceful behavior plus the rate of reinforcement for the rate of violent, aggressive or hostile behaviors in the setting. In essence, the rate of reinforcement of the undesired behavior (rv) dilutes the reinforcement of the peaceful behavior (rp). You can see this by plugging simple numbers into the formula and ignoring the constant (k) for simplicity. You can easily see the difference in the rate of PB if you keep (rp) at 2 and vary the (rv) from 0 to 4. Accordingly, PeaceBuilders attempts to do both by

1. increasing the rate of reinforcement for PeaceBuilding (rp) directly, and

2. decreasing the rate of accidental reinforcement of non-PeaceBuilding (rv) behaviors.

The Matching Law is powerful, like Einstein's formula[25], and it applies to issues of peace and violence[26]. It can incorporate the effects of medications known to decrease violent behavior, or illegal drug use that increases violence[27]. It can predict behavior in the classroom or the clinic[28]. It can map the behavior of children at home with their parents, dealing with peer pressure, and can explain the dips and lows of highly disruptive, aggressive children[29]. PeaceBuilders applies this law systematically.

Implications of these Building Blocks

Using the theory of the science of PeaceBuilding and these building blocks, come a number of expected findings from studies evaluating the impact of these principles:

- Changing the ratio of reinforcement for peace versus violence will have the largest effect on the most aggressive children[30].

- Increasing recognition and reward of positive, peaceful behaviors will have the most effect on social, emotional competencies[31].

- Children with very high rates of problem behavior will need to have the frequency of accidental reinforcement of disruptive, aggressive, inattentive or hostile behavior reduced more than other children.

- Increases in perceived reinforcement for peaceful behavior and reductions in perceived threat may be associated with improved physical health[32].

- Measures of bullying, weapons carrying, mental-health symptoms (ADHD, conduct problems, depression), substance abuse, property crime and victimization will be positively changed as peace is favored over violence.

- More favorable ratios of reinforcement of peace versus violence will be associated with changes in brain chemistry and measures of brain/cognitive function.

- Children who have certain biological risks will be more positively impacted by increasing ratios of reinforcement for peace versus violence.

There are implications for practice, too, not just science.

It is highly likely that adults in distress, with high levels of perceived threat, and/or with histories low in reinforcement of peace in their own childhoods, will provide low rates of attention to peaceful behavior in children. As this appears to be true based on a variety of studies of parents and teachers[33], it is vital to provide more reinforcement of peace for the adults so that they, in turn, are able to reinforce peace in children. Thus, PeaceBuilders is not just for children; it is for everyone, including adults.

More contexts (like classrooms, schools, community programs, media, and public places such as supermarkets) where differential reinforcement of peace happens will likely result in fewer community-level problems related to violence[34]. Thus, every setting or person can be a PeaceBuilder.

Conclusion

The science of building peace is not finished. When PeaceBuilders started in 1990, no one had really tested these kinds of strategies in any randomized-control trials. Thanks to the U.S. Centers for Disease Control, we were able to do so with powerful results.

From the challenge of a middle-school class who asked Dr. Embry to write a book about how make more peace in the world, the participation of many wise people, and the synthesis of many fields of study and knowledge, the heart (logic model) of PeaceBuilders was formed. The logic model created the framework and understanding of what must be done to intentionally build more peace. The action of building peace is defined by specific, valid behaviors and strategies. Seemingly simple in design and simple to do, PeaceBuilders is built on solid science and has solid results.

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Peace Brain: How the Social Environments Change the Brain and Behavior

by Dennis D. Embry, Ph.D.

Figure 1: Faces of Peace or Pain?

We search our world for signs of peace from other people: a smile, a handshake, a pat on the back, encouraging words for the good we do, an expression of love—even as tiny babies [3-5]. Our brains are wired for peace as a result of receiving such signals and even from sending our own positive signals out, such as smiling back [6-8]. We gravitate to people who radiate signs of peace, and detect genuine signals of peace such as the "Duchenne Smile" [9, 10] versus a threatening or false smile as shown in the figure above. Test yourself. Refer to Figure 1. Which is real, false or threatening?

You probably picked the left-most picture as genuine and the right-most photo as threatening. Why do we seek out genuinely peaceful, nice people? Children almost always pick the left-most, but adults often pick the middle photo—not realizing that the middle smile is contrived, like what a politician does going through a crowd. The children don't miss, though.

Perceived peace brings health [11-19]. Peace brings the ability to concentrate on tasks we enjoy, and peace enables us to learn new things [20-23]. Peace allows us to work together with others to make great things happen. Peace enables us to enjoy the people we love. Peace enables us to prosper. Peace enables people to be really, really happy. That is, a "Peace Brain" enriches all parts of our lives.

The brain watches out for threat, too. Threats get stored and sorted. People, places, and things get coded as dangerous, unsafe, and threatening, even by babies [2, 3]. If too many people, places, and things get coded as threatening or dangerous, then the brain gets wired for sadness, anger, poor
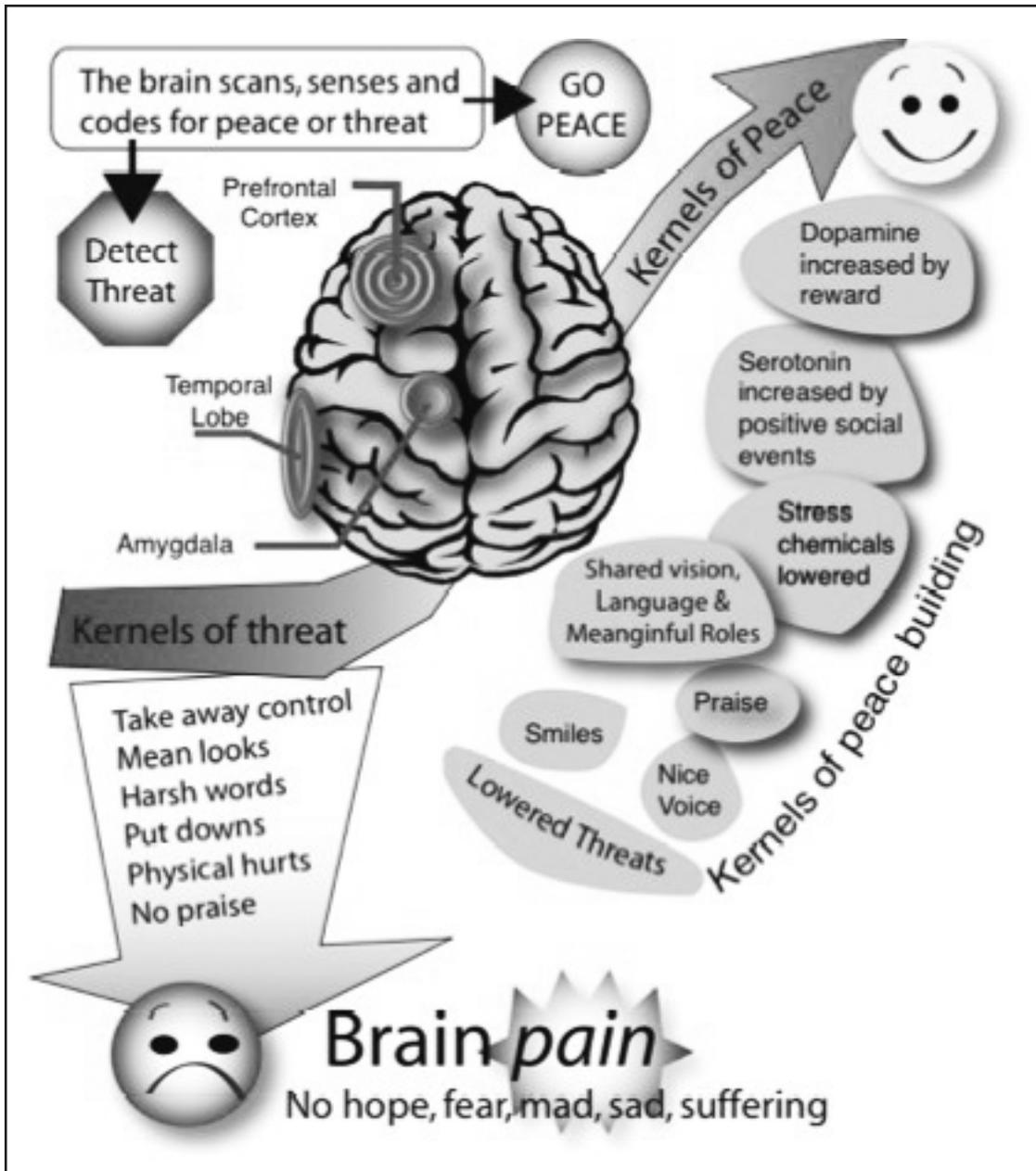
Figure 2: Perceived Pathways for Peace or Pain Brain

health, confusion, or fighting [1, 24]. Brain pain becomes the name of the game [25-27] leading to a "Pain Brain."

The perceptual paths for brain pain or peace can be displayed graphically, as in Figure 2.

Harsh words, barked orders, mean looks, put-downs, lack of attention and praise set the brain on edge, priming the brain for fear and more threats [30]. If more put-downs, hurts, or blows are received, then the brain wires itself for more future pain instead of peace or hope [31]. Numbness seeps out of tiny brain

cells to dull the pain. Our attention jerks to each new warning radar blip as our brain comes to expect the worst [32]. This stress triggers dormant genes—guards from olden times and ghostly wars—to come alive [33, 34]. These awakened genes scurry about building inner forts in the heart, body, and mind for doom and gloom [33]. Soon, the brain cannot tell friend from foe, love from hate, or acts of kindness from hidden threat [35]. A brain of pain tolerates no delay [36, 37]. It must have everything right now, before it is too late. The brain of pain can sense no hope, only fear, danger, and suffering [30]. Paradoxically, startling or unpredictable events can become reinforcing or rewarding to the "pain brain" [38, 39] causing a person to become "addicted to crisis and drama." Rewards and goals must be immediate because there may be no future to enjoy them or time to work towards them [40]. The immediate rewards of alcohol, tobacco and other drugs become very attractive to a "pain brain" [41]. Chronic exposure to threats begins to rewire the brain from a temporary state to a permanent trait [24]. If the person is male, the brain tends to be rewired to a permanent state of sensation seeking, fearlessness and aggression. If the person is female, the brain tends to be rewired for a permanent state of apathy, depression or what is called "borderline personality."

Fightin' Words and Looks

What happens when people are quick to perceive threat or harm? There is exquisite research on the impact of perceived insults and threats on serious violence. Consider this research:

Southern white males are substantially more violent than Northern white males [42].

Specifically, in carefully controlled studies, Southern men are far more likely to respond violently to any perceived insult [42], which is sometimes called the "culture of honor" and whose effects and origins are well documented [43, 44]. What is fascinating about this work is that it provides both an explanation for some of the ecological contexts [43-45] that might have given rise to the clear heritability associations documented in the developmental psychopathology literature [46-49] and possible culturally-based strategies to increase peaceful behaviors [50].

A strong implication from this scientific literature is that creating a culture or milieu that reduces verbal insults (put-downs) should also reduce acts of aggression and violence. Nisbett's work offers clues about other implications that might not seem readily apparent.

- Decreasing the attempts by others to steal or convert property will reduce reactive violence. This, in turn, probably requires that pathways for legitimate reinforcement or rewards to be increased and made more transparent and accessible, which fits the data on the relationships between risk factors of economic disparity, prejudice, and violence [51].

- Stories need to be emphasized about taking action to increase social justice so that one's property and loved ones are safer [52], which aligns better with the ethos of the code of honor [50].

- Increasing roles that involve reciprocity and exchanges so that folks who are different (e.g., a potential threat to safety or wealth) are less likely to be preemptively attacked because of perceived threats.

- Decreasing chances of perceived slights from occurring in the first place, by adopting rituals and routines that are less likely to engage reactive responses [42].

- Creating a language that avoids perceived differences so that "Us" and "Them" are less likely [53], and that avoids blaming others who are seen to be "unworthy" [54].

- Applying the same logic to any situations where wealth is portable and easily stolen, such as the drug culture of gangs (the language of gangs is similar to the "culture of honor").

As this document reveals subsequently, there are powerful research findings to support the potential of using these inferences to increase the peace in homes, schools and the community. The notion of the "culture or code of honor"suggests that an entirely different language frame might be introduced: a "culture or code of peace." Considering that individuals who have committed homicide tend to show disturbances of the language centers of the brain [55] or engage in violent escalation [56], there is further rationale for developing a "culture or code of peace."

Resiliency Experiences Can Change Threat and Risk Bias

Dr. Emmy Werner studied children raised in adversity who emerged as capable adults [1]. Dr. Werner found that negative experiences were not a death sentence [2-5]. Several key findings stood out from her long-term study, which were things that could be encouraged as a community-based prevention strategy [1].
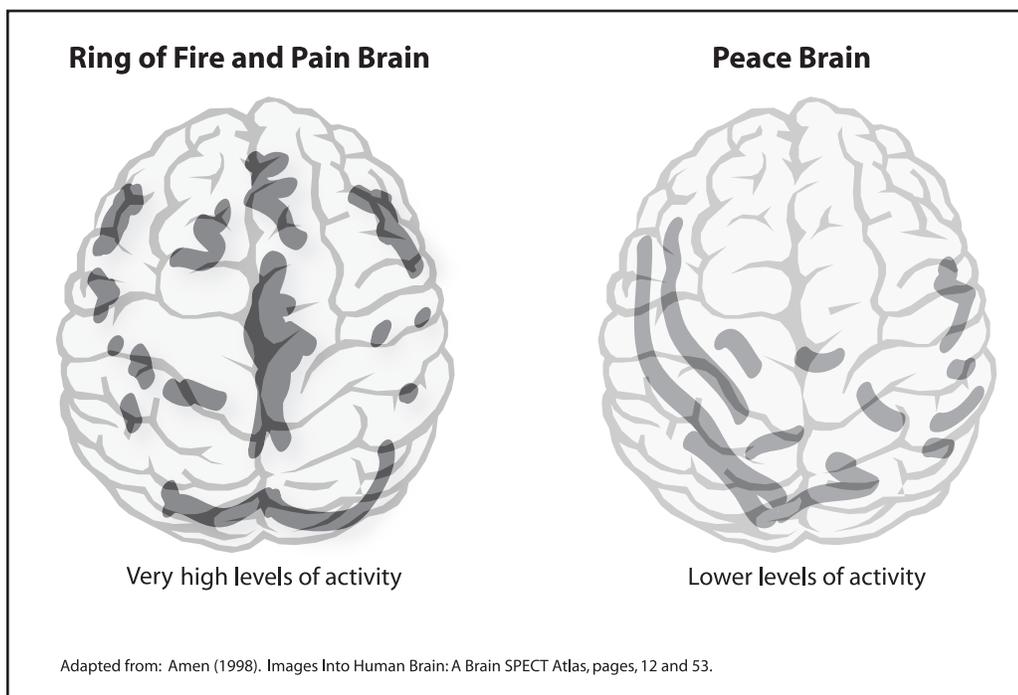
1. Children who recruited other adults to help them and give them positive attention did better.

2. Children who developed an active approach to solving some of life's inevitable problems did better.

3. Children who developed a sense of their ability to have a meaningful life did better.

In most cases [8], overcoming adversity as a child is not the result of some superhuman inner strength of the child or of professional services or pricey programs, even for a child born to alcoholics or drug users [9]. It is the result of a developmental dance of parents and/or other adults reinforcing the child's positive actions and reducing the child's preoccupation with perceived threats [8]. Resiliency is fostered by very simple gifts from other adults who notice a child's spark and gently ignite it by some brief kindness. Are you a Wise Person to children around your home, your work or in your community? If so, you will be applying the science of PeaceBuilders and achieving results you cannot possibly predict.

Pain Brains and Peace Brains Are Different Because of Contextual Experiences

A "Peace Brain" or "Pain Brain" are nature's way of dealing with a world of probable good or a world of unremitting evil. It is important to remember that stories of human violence are very old, even occurring in basic tales of creation such as that of Cain and Abel in the book of Genesis in the Bible. The odd fact is that a brain of peace or pain is not an accident. It is the result of what kind of world we have created around us. The changes in the brain and biology are adaptive

Ring of Fire and Pain Brain   **Peace Brain**

Very high levels of activity   Lower levels of activity

Adapted from: Amen (1998). Images Into Human Brain: A Brain SPECT Atlas, pages, 12 and 53.

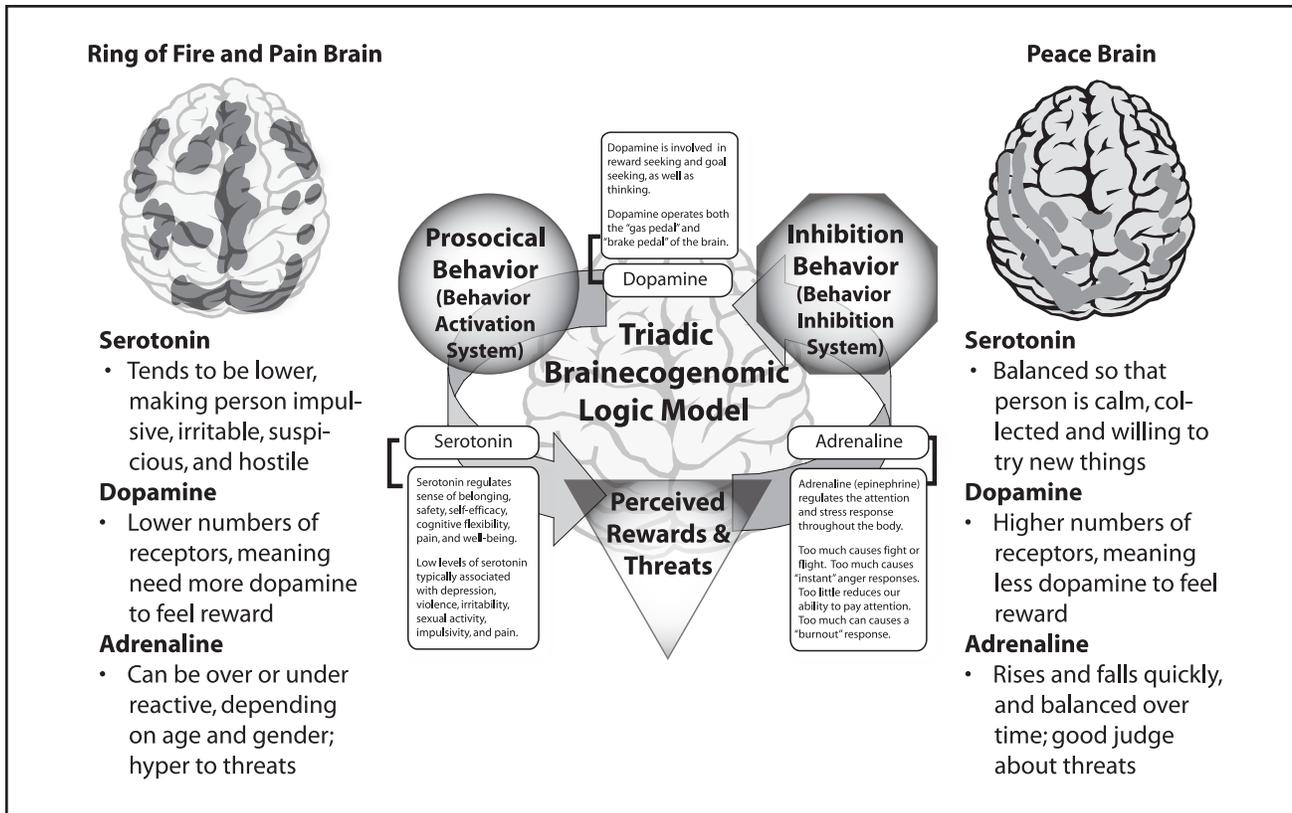**Figure 3: Ring of Fire Affecting Pain Brain**

mechanisms to help people deal with a sane or crazy world. What scientists are coming to understand is this: a "Pain Brain" or "Peace Brain" are encoded adaptations to a cultural context (the daily life of the person) that is violent or peaceful [57-61]. By reframing a "Pain Brain" as a simple result of social and environmental context, as opposed to disease or disorder, we have a greater chance of finding ways to create peace versus pain. Thus, post-traumatic responses by a person, young or old, exposed to war, violence or rape are not a disease or disorder; they are adaptive responses to a world gone mad [62]. Looking directly into brains of peace or pain also reveals potential preventative solutions to our task of consciously building peace.

Today, scientists can actually see the workings of a Peace Brain or Pain Brain. Scientists use instruments that show what parts of the brain light up from living a life of peace or pain [63-66]. Figure 3 is a simple illustration of what the brain of a person who is filled with rage, violence, despair and anger looks like in the example called "Ring of Fire" [67, 68]. Notice the hot spots in the brain, shown in the figure on the left. By comparison a normal person is not "burning up" with such brain pain. The "Ring of Fire" is only one kind of a "Pain Brain." There are other types [69-71], which vary by type of problem, gender, genes and environmental history [69, 70, 72, 73].

Scientists have carefully measured the chemistry in the brain and body related to peace or pain [74, 75]. Adults and children who have experienced exposure to violence and who are prone to commit acts of aggression against other people have been found to have different brain chemistries and structures than those with peaceful brains [3, 76-81]. The figure on the next page provides a simplistic summary of often found key

Ring of Fire and Pain Brain

Serotonin
- Tends to be lower, making person impulsive, irritable, suspicious, and hostile

Dopamine
- Lower numbers of receptors, meaning need more dopamine to feel reward

Adrenaline
- Can be over or under reactive, depending on age and gender; hyper to threats

Prosocial Behavior (Behavior Activation System)

Inhibition Behavior (Behavior Inhibition System)

Dopamine is involved in reward seeking and goal seeking, as well as thinking.

Dopamine operates both the "gas pedal" and "brake pedal" of the brain.

Dopamine

Triadic Brainecogenomic Logic Model

Serotonin

Serotonin regulates sense of belonging, safety, self-efficacy, cognitive flexibility, pain, and well-being.

Low levels of serotonin typically associated with depression, violence, irritability, sexual activity, impulsivity, and pain.

Perceived Rewards & Threats

Adrenaline

Adrenaline (epinephrine) regulates the attention and stress response throughout the body.

Too much causes fight or flight. Too much causes "instant" anger responses. Too little reduces our ability to pay attention. Too much can causes a "burnout" response.

Peace Brain

Serotonin
- Balanced so that person is calm, collected and willing to try new things

Dopamine
- Higher numbers of receptors, meaning less dopamine to feel reward

Adrenaline
- Rises and falls quickly, and balanced over time; good judge about threats

Figure 4: Simplified Brain Chemistry and Social Interaction of Pain Versus Peace Brain

differences. In general, some of the major differences between a "Peace Brain" and a "Pain Brain" are related to serotonin, dopamine, and adrenaline chemistries. These are ancient chemistries that can be found in humans as well as most animals, with similar relationships to behavior across most of Nature's creatures—especially in primates like us [82-85]. Let us briefly review the brain chemistry of peace versus pain in Figure 4, with narrative to follow.

Serotonin is the brain chemical that many of us hear about on TV when the announcer says, "If you experience these effects, then you might have a chemical imbalance." Serotonin was discovered in 1948, but its real impact on our behavior and our responsiveness to social interactions took

decades to be revealed. Like most brain chemicals, it is used for many purposes—since nature tends to adapt.

How does serotonin get unbalanced? One way involves acts of peace or violence. Serotonin changes in reaction to how others of the same species treat each other [82-84, 86]. If we, for example, feel put-down and deprived of status or attacked, our brains react [87-90]. Serotonin levels decrease [91-93]. Increased serotonin makes us feel more powerful and in charge, whereas low-levels of serotonin make us feel harmed [93-96].

Perhaps you've seen the magazine or TV ads for adults with Attention Deficit Hyperactivity Disorder? Perhaps you've noticed that the school nurse's office is filled

with prescriptions for stimulant medications? Those medications generally increase dopamine levels in the brain [97]. Dopamine is the brain chemical related to reinforcement, goal setting, exhibition ("Go") behaviors and inhibition ("Stop") behaviors [97-99] . How do we know this? Some studies have shown that dopamine is released in the reward parts of the brain when children or adults play a video game [98], and guess what they do when they score a win? They press the buttons more often. Scoring food, sex, attention, drugs or a goal all trigger dopamine release [98, 100-102]. When dopamine levels fall in the brain, we search for more reward [103, 104]. Low levels of dopamine in the brain can be caused by genes, toxic exposure (lead, tobacco, alcohol, drugs), exposure to stress or threats, or lack of opportunity to engage in behavior that produces reward [105-110].

Imagine living in a place filled with random or unpredictable acts of violence. Imagine living through the Holocaust. Imagine living through the Rwanda genocide. Imagine living in a neighborhood infested with crime and violence. Or, imagine living in a home filled with violence. Would your stress hormones be off the charts? Of course they would, and that is exactly what careful science documents [111, 112]. Would that change other brain chemistries related to sense of safety, belonging and delay in gratification? Yes, it would [104, 108, 109, 113]. Do such stress hormones interact with sex hormones in negative ways? Yes, they do, with males typically becoming far more aggressive physically and verbally with out-of-control stress chemistries and with females becoming less caring and more depressed or anxious [111, 112, 114-118]. One of the key shifts resulting from these brain chemical changes is behavior that looks like ADHD

(difficulty paying attention, impulsivity)—especially with disruptive or oppositional behavior [119-123], and/or hyper (very high) or hypo (very low) sensitivity to perceived negative stimuli or threats [38, 39, 124, 125].

Language and cognition affect social interactions, and social interactions provide the context for what are called "relational frames." These language frames can actually make us sick, and underlie much mental illness, substance abuse and even violence [126]. Consider an example that resonates after the 911 attacks. The language of the media made it clear that the attackers were Muslim. Many people, upon seeing someone who was Muslim, began to make the following associations:

Muslim extremists attacked the US. Extremists. They are dangerous. He is a Muslim, so all Muslims must be dangerous.

This is logically false, of course, but the mind is predisposed to sort based on potential threats to safety, for obvious survival reasons. The trouble is that the bias or relational frame wherein stimuli become equivalent can be a great source of pain and hurt to self and others [127] and a prime candidate for therapeutic interventions to achieve well-being and peace [128].

Now imagine children and adults exposed on a daily basis to perceived threats from peers or adults in their everyday environment at home, at school, at work or in the community. Under those circumstances, they develop a relational frame of threat and enemies, which can be easily shown in Figure 5.
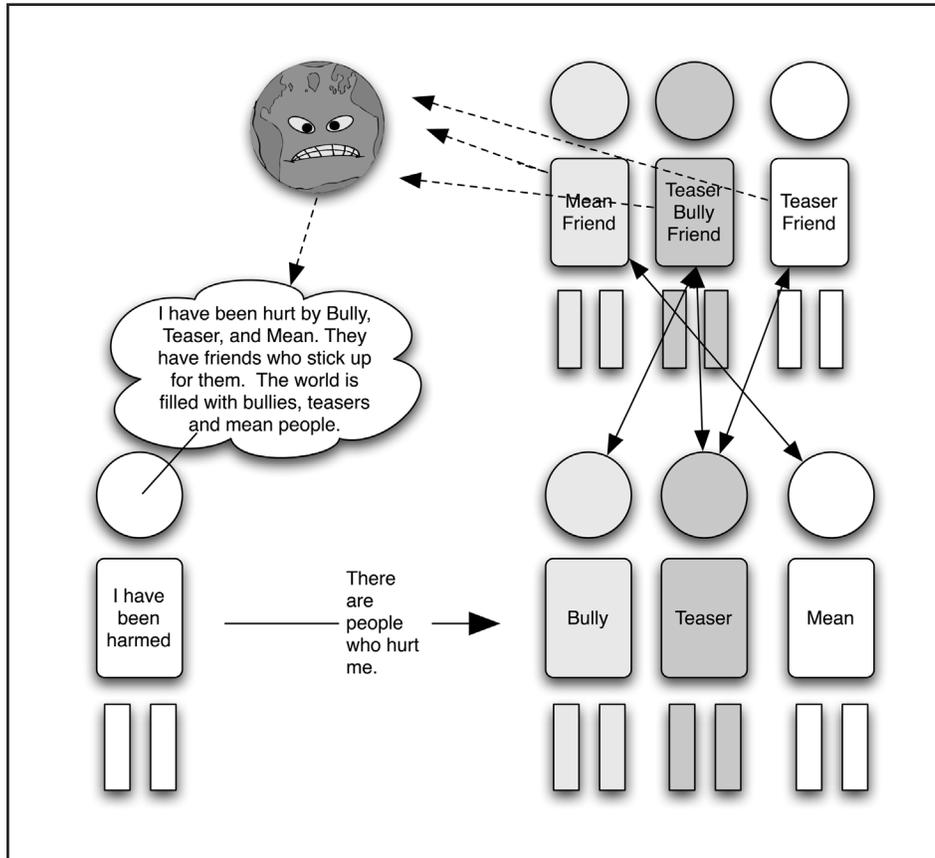
Figure 5: Relational Frame or Cognitive Bias of Threat and Pain

Thus, the mere thought that the world is filled with enemies or violent perpetrators changes behavior within self and to others, creating pain. What is becoming more and more clear is that such thoughts actually change brain chemistry and metabolism related to various forms of mental illness [129-131].

How do social events change brain chemistry? Let's put it in a simple summary based on what is known today, which may change with new findings or insights.

Serotonin Review

- Exposure to trauma lowers serotonin.

- Degrading a person's status or agency (agency = ability to act) lowers serotonin.

- Low serotonin + higher testosterone = aggression.

- Low serotonin + estrogen tends to increase depression, anxiety or challenging behavior.

- Low serotonin tends to increase impulsivity, sadness and hostile cognitive bias.

- Social support, status, touch, repetitive movement and folic acid or Omega 3 increase serotonin.

- Some illegal and legal drugs increase serotonin.

Dopamine Review

- Dopamine is released when we achieve a goal—food, sex, mental or social.

- Release of dopamine increases future behavior similar to the action just rewarded.

- Age, genetics, gender, and perceived stress change how much dopamine is needed to feel rewarded.

- Dopamine can be released for good OR bad behavior.

- Both legal and illegal drugs deliver dopamine, as does social reward.

- Some items in diet such as caffeine, sugar or Omega 3 increase dopamine.

Stress Chemistry Review

- Facial gestures, tone of voice, put-downs, and social slights are perceived threats that trigger stress chemistry in the brain.

- Perceived stress or trauma shoots up brain chemicals like norepinephrine (noradrenaline).

- Acute or chronic perceived human-caused threats can cause genes controlling serotonin or dopamine to reset for a life path adapted to violence, instant gratification or sex, or depression and anxiety.

- Sustained perceived stress can deplete serotonin and dopamine causing apathy or sensation-seeking depending on genes and gender, and extreme perceived stress (measurable by heart rate) reduces mental ability.

- Perceived stress harms the immune system producing illnesses.

- Some legal (e.g., alcohol) and illegal drugs reduce stress.

- Prenatal or early stress exposure (or neglect) primes the brain for pain, which can be accelerated by tobacco use by mother and family adults.

Human Settings Evoke a Peace or Pain Brain

The figures above and abundant science show that a "Peace Brain" versus a "Pain Brain" emerges from interactions with others in our social environment. Thus, we can build peace. Table 1 (next page) gives a simplified table for the situations that create a "Pain Brain" versus "Peace Brain," which is an expansion on the steps noted in Figure 2 (page 14).

Social Environment Can Evoke Peace Brains

Certainly it is true that adverse family events contribute to non-peaceful behavior among children [112, 123]. It is a scientific fact that creating more peace in a home, e.g., more expressed praise, fewer verbal put-downs and less harshness result in positive child, marital and family work related outcomes [133-136]. Caring adults such as teachers and community volunteers, however, often cannot visit or coach families. Thus they ask: "Is there anything I or we can do to tip the balance in favor of peace and positive development?"

Table 1: Contextual Variables That Foster Pain or Peace Brain

	CONTEXTS THAT CREATE PAIN BRAINS	CONTEXTS THAT BUILD PEACE BRAINS
Non-Verbal Cues	angry; ignoring; disrepair and disorder; social threats	smiles and warm greetings; beauty and fluid (not rigid) order; non-threat
Identity Language	I am a victim. "They" want to hurt me.	I am peaceful. "They" are nice.
Relational Frame Language	Attack people who hurt you.	Build peace today.
Private speech	"I am being hurt."	"I am happy."
Public Speech	"You or they are bad."	"You or they did something good."
Symbolism	disorganization; gang signs; warnings of violence or danger; implied threats of punishment	pleasant order, invitations, relaxed, mutual caring and assistance; expressions of beauty and bounty
Contextual Variables	storytelling, symbolic and live models of violence, defeat, danger, and aggression; negative categorical labels	storytelling, symbolic and live models of resiliency or positive coping; success; emphasis on effort not state
Status Exchanges	chronically unstable; one person holding power over another; severe and harsh; consequence focused	fluid and performance driven; reciprocal; polite and warm; motivating
Role Assignments	rigid, fixed; divided between good and bad; upward mobility not possible	fluid, flexible, often random; supported; upward mobility possible
Verbal Interactions	differential attention to negative or bad behavior; laden with heavy negative expressed emotion; blaming, loud reprimands and criticism	differential attention to positive or desired behavior; reinforced inhibition and competencies; soft reprimands
Extrinsic Reinforcement	generally obtained through devious, negative means since positive means are blocked	obtained through effort and perseverance of socially admired behaviors

The answer is "Yes." Consider some other indicators of hope. What is not widely appreciated, because of the emphasis on clinical diagnoses, is that school, community, or peer-related events and interactions can have as much or more impact on evoking a "Peace Brain" or "Pain Brain" in children, adolescents and even adults. Why? Because adults stop attempting to change the immediate environment if they believe that a child or adult can only be helped by a professional. They do not do small things that could dramatically affect peace or violence. Consider these examples briefly:

■ **The Robbers Cave Study.** Randomly assigning perfectly average, normal boys to different camp groups with clearly delineated US versus THEM cues, evoked a "war" between the boys that was only solved by giving the children a common super-ordinate goal to solve that required all to help [137, 138]. A similar experiment in the basement of the Department of Psychology at Stanford University with undergraduates randomly assigned to be either prisoners or guards, resulted in the classic study—the Zimbardo Experiment—regarding roles affecting aggression [53]. Lesson learned: having shared roles, a language of collaboration, and shared common purposes are vital for building a Peace Brain.

■ **The Seattle Child Development Study.** A classic prevention study showed that requiring all elementary school adults to meet and greet several children, not from their own classrooms each day, as well as catching the children being good with special reinforcement tickets dramatically reduced substance abuse and teen pregnancy a decade later [139].

■ **The G. Roy Mayer Studies.** Into an area rife with inner-city disturbances and despair, a pioneering California psychologist sent teams of graduate students to consult with principals, teachers and staff on improving the behavior of disorderly, disruptive and disturbing students by using very simple methods of reinforcement and contextual changes in the schools and classrooms. They used praise notes in the classroom and principal preferrals to the office. In the published studies, vandalism, problem behavior and dropouts were reduced dramatically and academic achievement increased powerfully [140-146] with no interventions in the students' homes or neighborhoods.

■ **The Michael Rutter Study.** In the tough, down-and-out neighborhoods of London, students were randomly assigned to high schools. All the schools used the same curriculum required by the Ministry of Education, but the schools had huge differences in terms of achievement, behavior, attendance and juvenile delinquency [147]. The successful schools did not mount a counseling program or a social services program for families. Rather, the successful schools had many roles for the students to fill, much recognition and reward for behavior, displays of student work on the walls and other simple practices [148-150].

■ **The Baltimore Prevention Trials.** In the crack-cocaine and crime infested areas of Baltimore, where African-American children also had high levels of exposure to lead, a team of scientists from John's Hopkins University implemented a self-control and peer reinforcement game
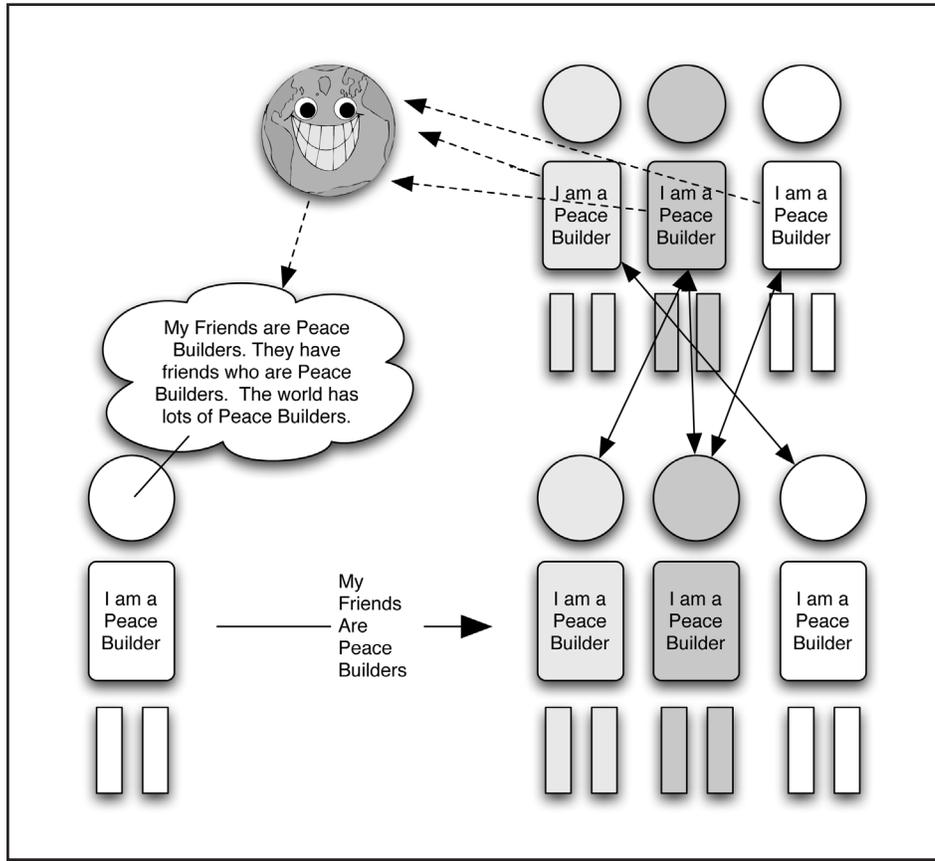
Figure 6: Rational Frame Language for PeaceBuilders

invented by a 4th grade elementary school teacher [151]. Very aggressive primary grade children were randomly assigned to receive this game and teachers were randomly assigned to learn to use it. Twenty years later, students who got this simple game in first-grade were dramatically less likely to use hard drugs like cocaine, be involved with crime or have other serious life problems [152-154]; again there was no intervention in the family or neighborhood was implemented.

■ **The PeaceBuilders Study.** A Southwestern city was gripped by fear of gangs and guns in the mid-1990s. Almost 100 young people had been shot and killed. A survey of elementary students found that 12%

reported having been threatened with a knife or gun during the previous week in this town, which of course made the news. Nearly 80 schools signed up to participate in a violence prevention approach in which students became heroes in their schools for building daily peace [155]. Students wrote notes to each other for building peace. Adults gave notes to students for building peace. Adults praised each other for building peace with kids and each other. The TV network ran daily news stories of the good things the kids and teachers did. Within the 80 schools, eight schools were part of a research study. The eight study schools were randomly assigned half (4) to start this practice immediately and the other

half (4) waited for 18 months to start the same practices. The research study, funded by the Centers for Disease Control and Prevention, showed that students were less aggressive and less victimized, less likely to be injured in fights, and more likely to be socially competent and oriented toward the future [156-158], in schools that used the practices with benefits happening the most to the highest risk students living in the most risky neighborhoods [158]. This study received much positive attention in such mainstream press as People Magazine (April 5, 1999).

The PeaceBuilders study used all these prior studies plus added many other evidence-based kernels or behavioral vaccines such as positive relational frames about peace. The language of PeaceBuilders alone is a powerful intervention, which is depicted in Figure 6 on page 24.

In the context of the relational frame of PeaceBuilders, if one identifies as a PeaceBuilder, then one is obligated by the verbal arrangements of the PeaceBuilders language, and how the brain perceives that, to engage in the six categorical behaviors --Praise People, Give Up Put-Downs, Seek Wise People, Notice Hurts, Right Wrongs and Help Others-- when interacting with others in the present moment. These broad categories of behavior tend to evoke reinforcement and PeaceBuilders behavior from others [159], which in turn promotes generalized PeaceBuilding using scientifically based Principles [160]. One begins to hear overt questions such as, "How would a PeaceBuilder handle this?" One also hears or sees recognition in the "community" such

as: "I liked how you held the door open for me. Thank you for being a PeaceBuilder." The mental map of a more peaceful world becomes real, fostering an ethos of peace. Ethos is the characteristic spirit of a culture, time, or community as manifested in its beliefs, aspirations and daily habits. One can easily construct a negative counterexample to make the point clear.

Imagine a child or youth who identifies as a gang member, "I am a Blood." That means the person never wears blue (Crips color), flashes certain signs or greetings, engages in certain businesses, has certain friends and has many behavioral expectations. So, what do PeaceBuilders do?

In the case of PeaceBuilders, the ethos of peace can be charmingly told in an anecdote from the former mayor of Salinas, California, whose community was featured in the story about PeaceBuilders in People Magazine, April 5, 1999. Mayor Alan Styles was shopping for groceries, with a rather full cart, headed toward the checkout. A young lad—about 8 years old—carrying a carton of milk and loaf of bread arrived at the check out about the same time, obviously on an errand from his mom who was in the car in the parking lot with some other children. The mayor said to the boy, "Please go ahead. I have a lot, and you have just a few things." The boy, having no idea who the mayor was, turned to him and said: "Thank you, you are a real PeaceBuilder."

The mayor—already a supporter of PeaceBuilders coming to his community—became an ardent, passionate supporter after this and went on to tell the story at the

White House when Salinas was honored for its national leadership, by the President of the United States. The data from an independent evaluation of the schools in Salinas showed that the ethos of PeaceBuilding had clearly permeated the lives of the children and adults. Salinas had a Code of Peace.

Behavioral and Neural Mathematics of PeaceBuilding

At the heart of PeaceBuilders is a formula as powerful as Einstein's, $e=mc^2$. The law is a hundred years old. The name of the originator of this psychological law was E. Thorndike [161], and he articulated his theory as: (1) law of effect—responses to a situation which are followed by a rewarding state of affairs will be strengthened and become habitual responses to that situation, (2) law of readiness—a series of responses can be chained together to satisfy some goal, and (3) law of exercise—connections become strengthened with practice and weakened when practice is discontinued. This law has a parallel, called Hebb's Law.

Today, the law goes by another name with a neat algebraic formula, the Matching Law [162, 163], but would not typically be encountered in an introductory course in Psychology or Behavioral Sciences. Few clinical mental health professionals would encounter this law in their training. Yet, this law has produced hundreds of studies, which have proven its power in the classroom for academic tasks at school [164-166], for disruptive or aggressive behavior [167-170], for delinquent and criminal behavior [171, 172], for substance abuse [173, 174], for altruistic and charitable actions [175], for positive or defiant behavior involving parents and children [176], for how primates forage for food in the wild [177], for therapeutic interventions and treatment for mental-health problems [178], for neurochemistry, neural or brain functions [167, 179], or even for the effects of medications such as Ritalin that decrease impulsive or aggressive behaviors [180]. This is nearly as revolutionary as some patent clerk in 1905 saying that pretty much everything in the universe could be related to the constancy of the velocity of light in a simple algebraic formula.

What does the Matching Law mean to the science of building peace?

Translated, it means something very simple: adults and children must be recognized and feel reinforced as opposed to allowing expressions of aggression or violence to be the norm in order to build peace. The six PeaceBuilders Principles work in synchrony to achieve this. Further, these six Principles are *synergistic* in achieving the goal of peace over violence. Finally, these six simple behaviors are not something that will be done soon or have been done recently; they are something exercised in the present: the now, every day, in every way possible, by as many people as possible in as many circumstances as possible.

The mathematical formula for the presence of persistent peace is the Matching Law, represented here in a stylistic way to show the variables better in the equation on the next page. If you wish, anyone may read the discussion and mathematical complexities in Herrnstein's original article on the Matching Law, which is one of the most cited articles in all psychology and available on the Internet [181].

Thus, the observed frequency of Peaceful Behavior (PB) in some setting (say a classroom, or a neighborhood) equals an asymptotic

$$PB = \frac{k^\star rp}{(rp+rv)}$$

Equation 1: Modified Matching Law Formula for Peace

constant (a sort of limited curve) multiplied times the rate that peaceful behavior is reinforced in that setting. Then, that obtained product is divided by the sum of the same rate of reinforcement of peaceful behavior plus the rate of reinforcement for the rate of violent, aggressive or hostile behaviors in the setting. Thus, a very large and diverse number of events may be compressed elegantly (just like Einstein's theory) to predict something key to human survival and happiness: peace versus violence. In essence, the rate of reinforcement of the undesired behavior (rv) dilutes the reinforcement of the peaceful behavior (rp). You can see this by plugging simple numbers into the formula, and then ignoring the constant (k) for simplicity. You can easily see the difference in the rate of PB if you keep (rp) at 2 and vary the (rv) from 0 to 4. Effective implementation of PeaceBuilders does both.

1. Increase the rate of reinforcement for PeaceBuilding (rp) directly, and

2. Decrease the rate of accidental reinforcement of non-PeaceBuilding (rv) behaviors.

Let's review. The Matching Law is a hundred years old, though only applied to issues of peace and violence in the last 20 years at a conceptual level [182]. It can incorporate the effects of medications known to decrease violent behavior or illegal drug use that increase violence. It can enhance behavior in the classroom or the clinic. It can map the behavior of children at home with their parents, or when interacting with peer pressure, and can explain the dips and lows of highly disruptive, aggressive children.

Mirror Neurons: New Discovery About Pain Brain and Peace Brain

When PeaceBuilders was being created, a few laboratory scientists were just beginning to study how neurons fired when primates and humans watched others engage in tasks. These results were buried in very scholarly journals, often in other languages such as French, and they were too preliminary to have obvious applied significance. In the last few years, these studies of "mirror neurons" have started to reach the mainstream media. "NOVA ScienceNOW" by PBS has an excellent video on mirror neurons [183], and some exquisite scholarly web sites exist if the reader is adventurous [184]. By this term, we define neurons that discharge both when the monkey or human performs a particular action and when the person or monkey observes another individual (monkey or human) performing a similar action.

We observe this phenomenon all the time, as "everyday scientists," but we do not have the scientific jargon to label the phenomenon. Have

Figure 7: A Yawn Evokes Contagion in Others as Example of Mirror Neurons

you ever observed that when one person yawns or laughs in a room, many others then either yawn or laugh, too—far more than random chance would predict (see Figure 7). This is the phenomenon of engaging mirror neurons in the brain, which basically only happens in primates (monkeys, apes and humans). Certain parts of the brain fire when we witness others doing certain behaviors, and the firing in our brains "mirrors" the firing in the same part of the others' brain. When we see the other do something that produces a reward, then that action tends—for example—to produce similar "firing" in our brains—though somewhat weaker than the primary actor. If someone does some action that produces pain, our brain fires in a similar way. One might think of this as the neural foundation of empathy, understanding of intention and the regulation of many social interactions.

What does all this mean? First, it means that seeing or hearing (experiencing) peers and others do PeaceBuilding behaviors that elicit smiles, laughter, status, and happiness will likely elicit the same feelings in the viewer. Child and teacher data suggest that this is so. Second, it means the viewer will be more likely to copy the action. When lots of people engage in the same, or watch others engaging in the

same behavior, they can become emotionally "entrained" in a sort of synchronicity. This is the mass emotional effect we feel at a sporting event such as the Olympics, or the horrific visceral feelings of pain and suffering we have watching footage of jet planes crashing into the World Trade Center. A lesson on violence or peace is unlikely to evoke the mirror neurons of peace or pain, *but watching people in our immediate social environments engage in peace or pain is.*

Further, the actual watching of others succeeding, achieving rewards, or escaping punishment or trauma provides a pathway of "resonance" for similar actions of our own. Thus, the phenomenon of mirror neurons helps describe how behaviors—good or bad—become "contagious" in humans. In developing PeaceBuilders, this principle was understood from a social-learning perspective [185], because of the extensive research, undertaken a decade earlier[186-193] on changing childrens' and adults' behavior regarding pedestrian safety and parent-child interaction problems. What we did not know about then was the neural footprint being formed in the brains of others while watching good or bad things happen in their world.

Summary

The brain is the organ designed to process visual, auditory and tactile cues of the promise of peace or pain, especially coming from other human beings. An overload of perceived cues of danger or threat causes the brain to wire for pain—as an adaptation. If, however, the signals coming from the larger social environment—peers, other adults, and neighbors—signal safety, belonging and chance for reward and recognition, then the brain wires for peace.

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