Neuro emotional literacy program: Does teaching the function of affect and affect regulation strategies improve affect management and well-being?

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Abstract. Although research on Emotion Regulation (ER) is developing at a rapid rate, much of it lacks a clear theoretical framework and most focuses on a narrow set of ER strategies. This work presents the details of a pilot project, the Neuro Emotional Literacy Program (NELP), designed for parents and based on the Somatic Appraisal Model of Affect (SAMA). This 6-week parent program used two self-report questionnaires, the Positive Negative Affect Schedule Short-Form (PANAS-SF) and the newly created Personal Affect Regulation Capacity Inventory (PARCI) to collect pre- and post-workshop data. Pilot project data analysis indicates that parents' knowledge of the function and actuation of brain-body affect and expansion of their practice to include several ER strategies helps improve emotion management and promotes positive affect, as measured by PANAS-SF and PARCI.

Keywords: affect, affect regulation, emotional literacy, emotion regulation, emotion regulation strategies, emotion regulation assessment, parenting, positive affect

Introduction

Emotion regulation is a burgeoning field of research (Bariola, Gullone & Hughes, 2011; Dennis O'Toole & De Cicco, 2013; Rawana et al., 2014). What appears to be lacking is clarity about what constitutes emotion and emotion regulation, and a concomitant need for a theoretical model that clarifies the types of emotion and related strategies of management. Emotion regulation in itself is a misnomer, despite attempts to define it (e.g., Thompson, 1994; Eisenberg & Spinrad, 2004; Gross, 2002) and distinguish its components (Goldsmith & Davidson, 2004; Gross & Thompson, 2007; Koole, 2009). Firstly, emotion is too broad a term and researchers tend to use it as a catch-all phrase that broadly refers to what the Somatic Appraisal Model of Affect (SAMA) clarifies as various types of affect (Patten, 2010; 2011).

The SAMA, based on Damasio's Somatic Marker Theory (Damasio, 2003), is the theoretical underpinning of the Neuro Emotional Literacy Program (NELP), which aims to teach parents the neuroscience and neuropsychology of affect, to provide knowledge and practice in phenomenon related to affect, and to improve affect management through analysis and experience, with the goal of improving familial positive affect. SAMA presents affect as a multi-faceted range of emotive function in the brain/body that is mitigated by a return to biological homeostasis. A person may experience various aspects of affect triggered by stimuli at different levels in both the brain and/or other aspects the body, either unconsciously or consciously, enabling a reversion of the brain/body to normal functioning or homeostasis, thereby promoting longitudinal well-being. These various aspects or types of affect include: 1) dispositions or moods; 2) basic emotions, namely happiness, sadness, anger, surprise, fear and disgust; and 3) feelings: both a) basic emotions that evolve into conscious feelings, and b) secondary feelings that are cognitively derived (Figure 1).

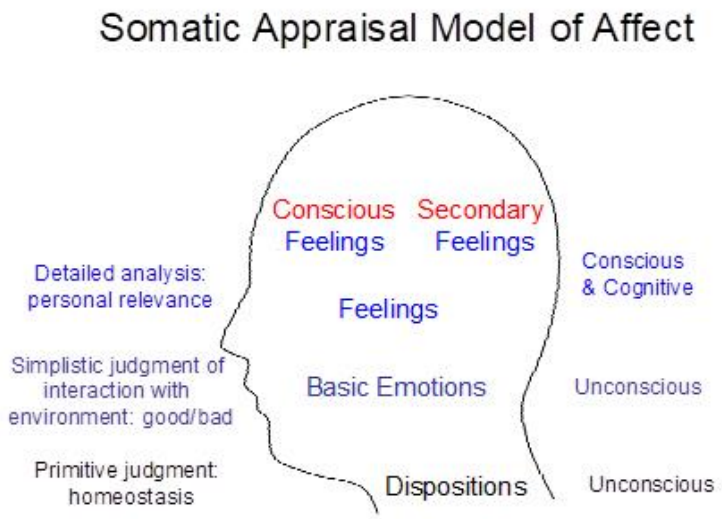

Figure 1. SAMA (Patten, 2010)

These types of affect are differentiated by ontogenetic development, brain function, and conscious awareness. Dispositions or moods are largely unconscious; they are brain/body states composed in the basal ganglia and limbic regions of the brain that reflect composite mind/body expressions of regulatory status in regard to homeostasis. Because of their largely unconscious nature, dispositions are not readily cognitively acknowledged, and therefore, less likely to be managed. Basic emotions are primitive, simple, and present at birth; they originate in the limbic system and are unconscious until they reach a threshold of physiological, chemical, and neural excitation (Damasio, 2003). When basic emotions reach this threshold, they become conscious and cognitive and are termed "conscious feelings". When conscious feelings are recognized by the brain, they are appraised or evaluated in relation to knowledge, personal goals, social and cultural norms, family values, a sense of self, and context. The other type of feelings, secondary feelings, involve both emotive and cognitive brain function, both the limbic system and the prefrontal cortex. Secondary feelings, for example shame, pride, guilt, and jealousy, are more sophisticated and involve cognitive evaluation or appraisal in their very formation (Figure 2).

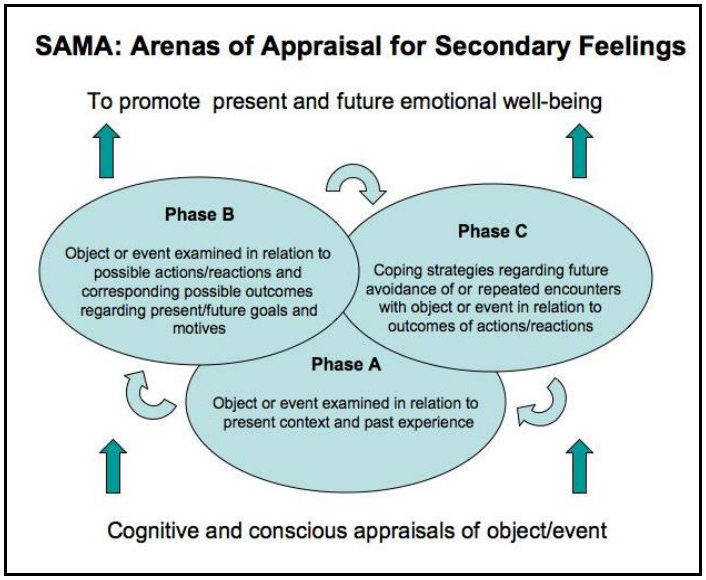

Figure 2. SAMA Arenas of Appraisal (Patten, 2010)

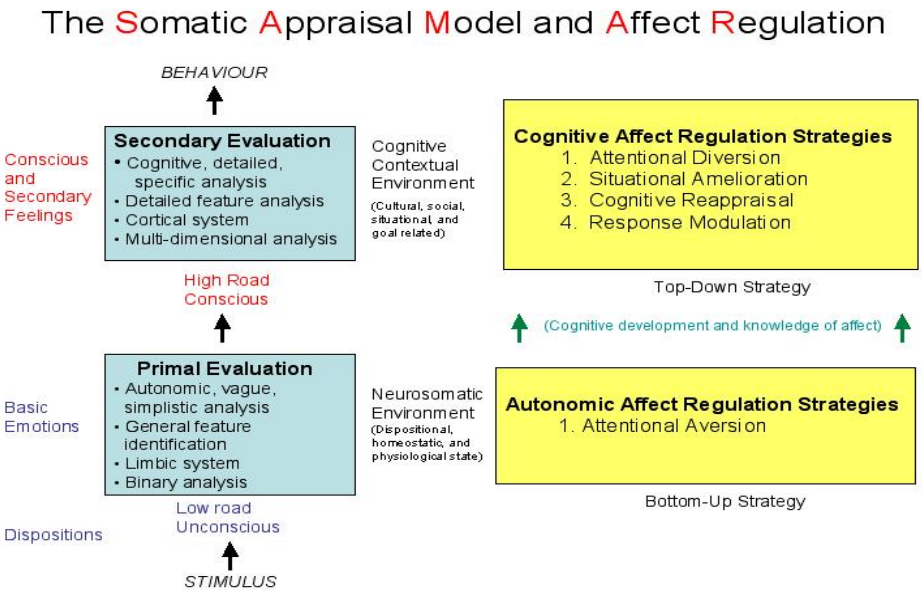

Figure 3. SAMA and AR (Patten, 2010)

Secondary feelings are rooted in evaluations involving knowledge, personal goals, social and cultural norms, family values, a sense of self, and context. They are not present at birth. Because different types of affect require different types of interventions in order to be managed, it is critical to specify what type of affect is to be regulated.

The SAMA framework accommodates two different kinds of Affect Regulation (AR): 1) autonomic and 2) cognitive (Figure 3).

Autonomic AR is simplistic, immediate, and instinctive. It consists of involuntary attentional diversion, is provoked by the limbic system, specifically the amygdalae (plural of the Latin amygdala); and is unconscious in origin. Autonomic AR, such as immediately diverting gaze or closing eyes when one sees a gory scene, occurs without conscious planning or instigation. In comparison, cognitive AR involves conscious appraisal and reaction formation. In order to cognitively manage a certain type of affect, that affect must be conscious and connected to personal purposes, whether they be emotional, social, or physical. If expression of a type of affect does not cognitively matter to the individual, the need or desire will not be there to manage it.

Cognitive AR includes 1) cognitive attentional diversion, 2) situational amelioration, 3) cognitive reappraisal, and 4) response modulation (Patten, 2010). Firstly, cognitive attentional diversion is based on detailed analysis that is purposeful and conscious and based on personal context, such as closing eyes when confronted with nudity. Secondly, situational amelioration consists of avoiding or changing a situation to alter its impact. It includes a) situation selection, b) situation modification, and c) situation intervention. Situation selection is proactive and may involve predicting situations and creating plans to avoid them, such as not watching movies that are rated "restricted." Situation modification is reactive and involves altering the affective impact of a stimulus, such as making a joke about nudity. Situation intervention occurs when a person changes a situation, such as switching movies to avoid further nudity. Thirdly, cognitive reappraisal is internal and reactive and involves purposefully reinterpreting the meaning of an object or event that is affectively salient in a way that changes its affective or emotional impact. An example of cognitive reappraisal would be for the individual to convince him/herself that the extent nudity is not sexual, but rather a sensual artistic form. In this case, the appraisal may occur retroactively in an effort to diminish feelings of shame. The fourth major category of AR

strategies, response modulation, is also reactive and cognitive. Response modulation does not involve suppressing a feeling, but rather suppression or alteration of expression and/or behaviour related to reacting to the stimulus. An example would be to not gasp in surprise or giggle in embarrassment when confronted with nudity, but to suppress any reaction and pretend the stimulus was insignificant. Response modulation may not only include suppression of expression or behaviour, but also amplification of expression or behaviour. For example, if the individual was with peers who expected appreciation of nudity, the individual might be certain to guffaw the loudest to win peer acceptance.

Clearly, if certain types of affect are not conscious, if they are not present in cognitive thought, they cannot be cognitively managed or regulated. If affect, such as mood and basic emotions, begin in the limbic system and are unconscious, they cannot be consciously regulated. Only autonomic regulation can control unconscious affect, and that control is limited (Damasio, 1999). However, if mood and emotions become powerful enough to evoke conscious recognition, then these affects or feelings can be managed, for instance, by shortening the duration, and/or lessening the intensity of those feelings. Conscious affect, namely conscious feelings and secondary feelings, register in the prefrontal cortex and are cognitive; they can be managed at their onset with more sophisticated cognitive strategies that can be identified, taught, and practiced in order to improve emotional well-being.

While Thompson's excellent definition of Emotion Regulation (ER), "internal and external processes involved in initiating, maintaining, and modulating the occurrence, intensity, and expression of emotions" (1994, p. 27), acknowledges the many facets of ER, it does not acknowledge the origins or goal of ER, which is to promote the return to homeostasis after experiencing a powerful emotion (Damasio, 2003). SAMA disambiguates the origins and various types affect: namely, dispositions or mood, basic emotions, and conscious and secondary feelings. It also clarifies the autonomic and cognitive levels of AR, and how appraisal and reappraisal can be applied to the management of conscious affect.

Given the theoretical framework of SAMA, AR will be defined here as "a neural, somatic, and behavioural phenomena that involve the automatic and/or purposeful managing of affect, both pro-active and retro-active, involving both appraisal and reappraisal functions and occurring both intrapersonally and interpersonally in order to promote positive homeostasis and affect" (Patten, 2010, p. 169).

While several studies have examined children's ER in regards to maternal attachment (Coppola et al., 2016; Gresham & Gullone, 2012; Roque et al., 2013; Waters et al., 2010) and children's ER as related to maternal interaction (Feldman et al., 2010; Roque & Verissimo, 2011; Shortt et al., 2010), studies focussing on parental ER strategies as influencing their children's ER are rare (Snyder et al., 2003). No studies found ae based on educating the parents about affect and AR in order to improve personal and familial AR.

Rationale

NELP was conceived in light of studies that indicate instruction in affect function and affect management techniques improves functioning in positive affect (Goldin & Gross, 2010), aids stress management (McCraty, Atkinson & Tomasino, 2003) and improves affect regulation (Morris et al., 2007). Research also indicates that affect regulation is an essential component in children's development (Denham et al., 2003) that poor affect regulation in regards to anger and sadness are linked to emotional and behavioural psychopathology (Frick & Morris, 2004; Silk, Steinberg & Morris, 2003; Morris et al., 2007), that training in AR

strategies improves self-esteem and reduces depressive symptoms (Goldin & Gross, 2010), and also improves working memory (Evans & Fuller-Rowell, 2013).

Morris, Silk, Steinberg, Meyers and Robinson's Tripartite Model of Impact on the Family on Children's Emotional Regulation and Adjustment (Morris et al., 2007) identifies three key influences on children's AR skills: 1) the emotional modelling of primary care givers; 2) the parents' emotional practices and behaviours; and 3) the emotional climate of children's environment. These three key factors of parental influence help determine children's AR strategies and management of emotional behaviour. Morris and her colleagues argue that early childhood AR skills are significant and "set the foundation for later socialization and related developmental changes" (2007, p. 2). For small children, much of their early AR occurs through guidance and interventions of others, most notably their parents or primary caregivers. As children mature, they tend to rely less on their parents and more on their peers for emotional guidance. For this reason, it is crucial that parents are knowledgeable about the function of affect and are competent managers of their own affect so that they can be good models and guides and can provide a healthy positive emotional environment for their children (Bariola et al., 2011; Davis, Suveg & Shaffer, 2015), beginning at birth. Overall, AR is a key component in Emotional Literacy (EL), and closely related to positive affect.

Positive Affect (PA) has been broadly defined as mood reflecting "high energy, full concentration, and pleasurable engagement" (Watson, Clark & Tellegen, 1988, p. 1063), whereas Negative Affect (NA) is mood "characterized by subjective distress and unpleasurable engagement" (Watson et al., 1988, p. 1063). PA has been defined more recently in terms of physiological and psychobiological functions related to both brain and body (Childre & Rozman, 2005; Childre et al., 2016). There is an important distinction between PA as a state and PA as a trait. We define the state of PA as the brain/body state of homeostasis typified by coherent heart rhythms; coherent cognition; and positive affect, such as love, compassion, care, and gratitude. Closely linked is PA as a trait, which we define as the ability of an individual to shift, whether consciously or unconsciously, heart rhythms back to coherence and to focus on positive feelings, attributes, events and/or outcomes. Simply put, the trait of PA is the ability to invoke and maintain the state of PA consistently.

Some individuals develop this ability to invoke the state of PA inherently, without being overtly taught; they may typically mimic someone with PA trait. Others can learn how to provoke PA, by practicing and learning effective AR strategies. Research reveals that teaching emotional self-management or affect management, and specifically PA, is highly beneficial (McCraty et al., 1999, Childre et al., 2016). Studies have linked persons who are labelled as predominately PA trait to a) well-being and better ability to manage NA (Ambrona & Lopez-Perez, 2014; Hanley, Warner & Garland, 2014; Lyubomirsky, King & Diener, 2005; McCraty et al., 2003); b) improved immune responses, more balanced hormonal and nervous system function, and alleviated pain (McCraty et al., 1996; McCraty & Atkinson, 2003; McCraty & Childre, 2002; Rein, Atkinson & McCraty, 1995); and c) improved academic engagement and academic success (Graziano et al., 2007; King et al., 2015). The state of PA has been related to cognitive performance in many ways: improved motivation, attention, information processing, and task performance (Brose, Louden & Schmiedek, 2014). Lack of affect management also contributes to "behavior problems in young people and creates physiological conditions that inhibit learning and potentially increase the risk of disease in later life," (Brose et al., 2014, p. 246). Since managing NA requires a range of strategies and behaviours (Larsen, 2009), and PA is linked to a range of benefits, it makes sense to assess and teach a range of affect management skills and strategies (McCraty et al., 1999) in an emotional literacy program.

Research in neuroscience and neuropsychology reveals that children who have caregivers (i.e. parents, day care workers, teachers) who have knowledge about emotional literacy and who practice and model effective AR strategies: are more empathetic and less likely to bully, are better able to cope with stress (McCraty et al., 1999), less likely to suffer from depression (Garnefski et al., 2007; Joorman & Gotlib, 2010) and experience higher degrees of emotional and physical well-being (Gross & John, 2003). In addition, emotional processes play a key role in children's abilities to remember knowledge, transfer knowledge, and to predict what actions are emotionally, socially, and physiologically beneficial (Immordino-Yang & Damasio, 2007). With this in mind, teaching parents about affect function and giving them the knowledge, tools, and practice to improve their AR strategies will improve not only their own emotional and physical health, but also the emotional well-being and learning capacity of their children.

EL is defined by educational neuroscience to be the ability of an individual to a) understand the neuroscience and neuropsychology of affect and its brain/body functions and concomitant behaviours b) recognize and analyse emotional triggers, c) recognize physical signs and behaviours that homeostasis is negatively affected, d) identify and develop an awareness of AR strategies, e) effectively utilize a range of AR strategies, and f) model this improved affective behavior for the benefit of others. While EL is an essential part of early childhood education (Figueroa-Sanchez, 2008), we argue that EL skills should begin in infancy, before the child enters the school system. This means that parents and other early childhood caregivers should become emotionally literate to enhance the emotional development of pre-school age children. The goal of NELP is to address all of the above components of EL in order to improve the EL of parents, which will enable them to be better models, guides, and teachers of affect for their children. EL is a construct preferred to emotional intelligence, as EL is a more comprehensive term that includes: 1) understanding how affect arises and actuates in the brain/body, 2) comprehending, assessing, learning and modifying AR strategies, and 3) modulating and modelling affect to promote a positive effect on others. In addition, SAMA disputes the theory of emotional intelligence (Patten, 2010), arguing that affect is not a type of intelligence and not a type of cognition. Regarding affect as a subset or even type of cognition denies the neuroscience that affect arises from differing neural substrates (Childre et al., 2016; Damasio, 1998; 2000; 2001; 2003; Davidson et al., 2000; Davidson, 2004; Ledoux, 1994; Zajonc, 1984) and chemical states (Panksepp, 1990) than cognition. EL is not simply a condition, state, or ability; it is the perception that one can improve personal happiness and have a positive effect on one's community.

Method

Participants

Participants in this pilot project were parents who had at least one child attending an elementary school considered by the partnered district to be an "inner city school," with special funding and programs such as breakfast and lunch programs. The socio-economic status of the neighbourhood is classified as low to middle income, with many single parents and a significant portion of the population considered to be living in poverty. Of the thirteen parents attending the sessions, twelve were female. Six of the thirteen parents were single mothers. Teachers and administrators were given an overview of the program so that they could choose parents whom they thought would benefit from the program on EL. Parents were invited by teachers and administrators to attend an informational meeting where the program was explained, rationale given, timelines confirmed, and concerns addressed according to the guidelines of Simon Fraser University Office of Research Ethics.

Participants were cognizant that consent for data collection was not mandatory to participate, but if they chose to consent, both pre- and post- data would be collected using the Positive Negative Affect Schedule Short-Form (PANAS-SF) and the Personal Affect Regulation Capacity Inventory (PARCI). Informed consent and data was obtained from eleven participants. To encourage participation in the workshops and to make it practical for parents to attend, healthy after-school snacks were served, childcare was provided during the workshops, and dinner meals were served to the families after the workshops. It was also explained that a voluntary support group would be established following conclusion of the workshops.

Instruments

The questionnaires selected for pre- and post- data collection were the Positive and Negative Affect Schedule–Short Form (PANAS-SF) and the Personal Affect Regulation Capacity Inventory (PARCI). The PANAS-SF (see Appendix A) is a ten-item Likert-scale self-report whose measurement of positive and negative affect is well documented (Gray & Watson, 2007; Thompson, 2007). The short form was selected as it has been proven to be an instrument whose validity is established and its brevity would mediate any participant fatigue or feelings of being overwhelmed by too many items and instruments. The PARCI (see Appendix B) is a 20-item self-report instrument designed specifically for the NELP by Patten to measure the capacity of abilities of participants to a) understand the brain/body function of emotion, b) express emotions appropriately, and c) use a range of AR skills to control affect in order to improve PA.

While there are other questionnaires available to measure various aspects of emotion/affect, each one addresses specific skills, but not knowledge or understanding of affect function, nor do they query a range of AR strategies. The Emotion Regulation Questionnaire (ERQ) (Gross & John, 2003) examines individual differences in expression suppression and cognitive reappraisal of affect. The Acceptance and Action Questionnaire (AAQII) measures individual differences in willingness to accept and deal with personal thoughts and feelings in pursuit of valued goals (Hayes et al., 2004). The Affective Style Questionnaire (ASQ) examines the abilities to conceal, adjust and tolerate affect, but does not measure knowledge of affect (Hoffman & Kashdan, 2010). The Cognitive Emotion Regulation Questionnaire (CERQ) (Garnefski et al., 2007) looks at only one type of AR, coping skills. The MSCEIT (Mayer et al., 2003) measures the accuracy, reliability and factor structures of the concept and theory of emotional intelligence, which is not the focus of NELP. While the ERQ, AAQII, ASQ, CERQ, and the MCEIT devices are designed to measure specific AR skills and styles and the concept of emotional intelligence have their qualified uses, they do not measure the broader range of phenomena required to indicate an improvement in understanding, assessing, and managing affect that was desired in this project. The Difficulties in Emotion Regulation Scale (DERS) (Gratz & Roemer, 2004) is a multi-dimensional assessment of emotion regulation and dysregulation. It measures various ways people find themselves unable to regulate negative emotional experiences, and considers factors other than specific AR strategies. The Scale of Positive and Negative Experience (SPNE) (Javanovic, 2015), published since the inception of NELP, could be investigated as an option to PANAS-SF, as it is not culture specific and presents additional variance regarding depression, well-being, and life satisfaction as compared to PANAS.

PARCI intends to measure a wider range of phenomena; not just AR skills, but knowledge and understanding of how affect works, based on the premise that knowledge leads to fuller understanding and understanding promotes skill and competency. PARCI is not just a device to measure AR skills and is not intended to measure emotional intelligence, but EL,

which covers a broader range of understanding as well as ability related to affect. PARCI includes 20 Likert-scale self-report statements intended to evaluate if workshop participants' knowledge, understanding, and control of affect has improved as a result of attending six workshops on selected topics related to affect and affect management. While in its infancy, the more encompassing PARCI is compared to PANAS-SF in order to ascertain if it has validity in measuring the phenomenon of PA, which is resultant of well-managed affect/emotion (e.g., McCraty et al., 1999; Kim & Hamman, 2003).

Procedure

Before beginning the NELP workshops, and after completion, participating parents were administered both the PANAS-SF and the PARCI. Data were collected anonymously. The parents attended six 2-hour workshops, once a week for a period of six weeks. These workshops covered a variety of topics:

- importance of emotion to human functioning
- primacy of emotion over cognitive function; how emotion functions in parallel assessment of stimuli in both the limbic system and prefrontal cortex
- definition of affect and SAMA's distinction of the three levels of affect
- relationship between affect and homeostasis, as well as how to recognize lack of homeostasis in self and children
- emotion related phenomena and how they relate to adults and children: emotional hijacking, emotional contagion, delayed gratification, positive and negative affect, neural plasticity
- affect improvement activities to help children: create awareness of body language, acknowledge emotions, accept emotions, discuss and guide emotions
- define AR, both instinctive and cognitive; types of AR and corresponding brain functions
- how to mediate the affect of others; how to set positive emotional tone at home; how to model AR strategies and guide children
- factors related to AR skills and practice: epigenetics, genetics and trauma, including trauma assessment and remediation; definition of self-esteem and sense of self and how they influence affect
- documented/researched AR strategies, self-assessment of usage, and guided practice, including how to meditate using the Heartmath lab method (Childre & Rozman, 2005, Childre et al., 2016)
- how to practice and improve PA.

A licensed counsellor was available on site for parents during and following the workshop sessions on trauma.

Preliminary Data Analysis and Results

As this is a pilot study, there is insufficient data for a comprehensive statistical analysis; therefore, just some preliminary comparative analysis is provided here. Both the PANAS-SF and PARCI scores indicated some improvement in affect (Tables 1 and 2).

Change in positive affect was defined as post- workshop PANAS-SF score minus pre-workshop PANAS-SF score, as lower scores indicated improvement. Eight of the eleven participants showed a measurable increase in positive affect as measured by the PANAS-SF. One participant showed no change, and two scored minimally lower scores; one point lower, and two points lower respectively (Table 1).

Table 1. Pre- and Post- PANAS

Participant #	Pre-	Post-	Difference
1	35	33	2
2	35	32	3
3	42	43	-1
4	41	39	2
5	43	32	11
6	33	33	0
7	40	42	-2
8	43	30	4
9	39	30	9
10	38	33	5
11	38	35	3
Average	38	34.7	3.3
GeoMean	37.9	34.5	3.4
Range	10	13	13

The average improvement in score for the group was 3.3 points out of a possible 50 points. The improvement ranged from +11 to -2, the latter indicating deterioration in PA. Change in AR capacity was defined as post-workshop PARCI score minus pre-workshop PARCI score, as higher scores indicated improvement. Nine participants' scores improved on the PARCI scale, and two participants' scores remained the same. None of the participants' PARCI scores indicated less ability in AR capacity after the workshops. The average improvement in AR capacity was 8.6 points out of 100 possible points. The improvement ranged from 19 to 0 points in PARCI score (Table 2).

Table 2. Pre- and Post- PARCI

Participant #	Pre-	Post-	Difference
1	62	52	10
2	67	48	19
3	50	45	5
4	66	53	13
5	52	37	15
6	60	55	5
7	70	65	5
8	60	51	9
9	74	74	0
10	50	40	10
11	39	39	0
Average	59.1	50.8	8.3
GeoMean	58.2	49.8	8.4
Range	35	37	19

Table 3. Comparing PANAS to PARCI

Initial Data Collection Results: Pre- to Post Workshops	
PANAS Data	PARCI Data
Total items: 10	Total items: 20
Likert Scale: 5 = Always	Likert Scale: 1 = Always
Best possible score: 50	Worst possible score: 100
Improvement	Improvement
Mean: 3.4	Mean: 8.4
Mode: 3	Mode: 5
Range: 13	Range: 19

Summary of Improvement Pre- to Post Workshops		
	PANAS	PARCI
Total inventory items	10	20
Total inventory items values (pts)	50	100
Mean improvement	3.4	8.4
Mode improvement	3	5
Range of improvement	13	19

Comparing Coherent Ratios of Improvement PANAS/PARCI		
Mean	Raw/Converted 3.4:4.2	Ratio 0.8095
Mode	Raw/Converted 3.0:2.5	Ratio 1.2000
Range	Raw/Converted 13:8	Ratio 1.1625

Comparing coherent improvement scores (Table 3), namely adjusting for the fact that PANAS is a 10-item self-report and PARCI is a 20-item self-report, indicates that the mean ratio of change PANAS/PARCI, is .8095. The ratio of modes of coherent improvement scores, PANAS/PARCI, is 1.2; and the ratio of ranges of coherent scores, PANAS/PARCI, is 1.1625. These ratios indicate that there is some coherence or compatibility between the two self-reporting devices in regards to improvement of affect as measured by PANAS and PARCI.

Looking at item-by-item self-reported scores, certain items on the PANAS and PARCI show more improvement among the group of participants than other items. On the PANAS, the specific items where 5 or 6 of the 11 participants improved indicated that these individuals experience 1) less hostility, 2) less shame, 3) less nervousness, 4) more determination, and 5) being more active. These feelings/states are linked to PA, and may be related to the NELP workshops which introduced and encouraged use of strategies to improve PA, addressed the detrimental effects of self-recrimination or ruminating, encouraged participants to record PA in daily journal writing, specifically addressed the positive aspects of regular exercise on mental and physical well-being, and encouraged participants to keep track of daily exercise in their journals. As well, the SAMA framework provides information that our emotions are unconscious and often elevated in intensity due to environment, memories of trauma, and to some degree inherited excitability of the amygdalae; and thereby not controllable, until they become conscious, or reach the level of feelings. This information provides relief that participants' current emotional feelings of being out of control are not a conscious choice, but a primitive limbic system response to stimuli. By learning to become more self-aware of what they are feeling, participants are more empowered to learn strategies to regulate conscious feelings and cognitively promote return to homeostasis, which SAMA argues is the goal of AR and the basis of emotional and physical well-being.

Regarding the PARCI, specific items where over half of the total 11 participants reported improvement include items #5, 6, 7, 8, 10, 11, 14, and 16. Six participants reported

improvement in coping well with everyday events (Item #5), interacting well with family (Item #6), having close friends with whom they could share their feelings (Item #7), and feeling less stressed (Item #10).

Pertaining to and reinforcing this data, during the course of the workshops, nine of the 11 participants orally shared extensive details of their private traumas and troubles on many occasions. The two who did not share as much were a couple, mother and father. The nine participants who shared personal situations and past trauma developed friendships within the group and informally reported meeting outside of workshop time to take walks together, meet for coffee, and exchange child-sitting to enable each other to have personal time for such activities as going to the gym and attending counselling. The same nine respondents also casually reported gathering regularly, in small groups and in large family barbecues, over the summer after the workshops concluded and before support group met formally in the fall. Four of the participants shared verbally and informally that they had found "best friends" within the workshop group.

Seven participants reported improvements in handling emotional situations (Item #8) and feeling less overwhelmed by situations (Item #11). The NELP workshops included roleplaying in how to effectively handle emotionally charged situations as part of the practice of learning new AR strategies. Eight participants reported feeling less negative about events in their pasts (Item #16), and this may be related to the workshop discussions on how to deal positively with past trauma and troubles, the detriments of ruminating over negative events, and the benefits of practicing PA. All of the 11 participants reported improvements in understanding how their emotions worked (Item #11). During group discussion, one of the moms shared how her new understanding of emotions and how they work made her feel that she now had power over her emotions and feelings; others in the group agreed. PARCI items # 5, 6, 8, 10, and 11, indicate coping better, interacting with family better, handling emotional situations better, feeling less stressed, and feeling less overwhelmed by situations, respectively. All of these PARCI items (#5, 6, 8, 10, and 11) were reported by more than six of the participants to be areas of improvement. These items on the PARCI may relate to the items on the PANAS, namely reported improvements involving less shame, less hostility, and less nervousness, all feelings that are considered NA, that were reported by five or six of the 11 participants on the PANAS. Data from the pilot project of NELP reveals that participants noted improvement in aspects of their lives that are affect-related. Data sets from future workshops would be used to determine if this apparent connection between data from PARCI and PANAS are consistent and persistent.

Discussion and Considerations

While all participants' scores in the workshops indicated some improvement in at least one of the two measurement devices, the changes were not always congruent with both scales. This may be a validation that the items in the scales (PANAS-SF and PARCI) indeed do not measure the same factors: namely PA and AR capacity respectively. Further item-by-item analysis would be needed to ascertain if the two scales are congruous in measuring particular like-features of affect. Obviously, more data collection with further workshop groups is needed to create more robust numbers. Validating PARCI with a larger sample size and item-by-item analysis requires further data collection and perhaps comparison to other questionnaires related to AR, such as DERS.

As well, it is duly noted that self-reporting scales, as personal reports, are open to subjective bias. Having the workshop coordinator or others, such as a significant other, also report on changes in AR may provide more validity to the improvements noted by the participants.

Also, since self-reporting is by nature conscious, and we assume there are unconscious changes that correspond to improved PA, it would be beneficial to design situations that would reveal indications of changes in AR as physiologically based data, such as electroencephalography, skin conductance, and/or heart rate.

As for the few scores that deteriorated in the PANAS-SF, it is possible that lack of knowledge and lower self-awareness of the topic may have inflated first report scores. This may also be true of all respondents. What matters here is that all participants showed improvement in one of the two scales. As this was the pilot project, it behoves the researcher to continue to conduct further sets of workshops and collect additional data.

Other factors that were not included in research, such as informal feedback from members of the group that they formed important and lasting friendships within the group, that the group organized and shared a joint camping trip with their families three months after the last workshop, and that all but two of the original group were still meeting as a support group over a year later, indicates that the workshops have had a positive impact on parents. Parents unanimously agreed with one mother that "every parent should take this course," and several indicated that taking the course was life changing. Teachers and administrators also verbally commented on the positive impact of the workshops on both parent-staff interactions and parent-child interactions. Further studies would benefit from monitoring the changes in participants' children's abilities to regulate affect and to determine if these changes are correlated to parents' self-reported improvements in AR.

References

Ambrona, T., & Lopez-Perez, B. (2014). A longitudinal analyses of the relationship between positive and negative affect and health. *Psychology,* 5(8), 859-863.

Bariola, E., Gullone, E., & Hughes, E.K. (2011). Child and adolescent emotion regulation: The role of parental emotion regulation and expression. *Clinical Child Family Psychology Review,* 14, 198-212.

Brose, A., Louden, M., & Schmiedek, F. (2014). Daily fluctuations in positive affect positively co-vary with working memory performance. *Emotion,* 14(1), 1-6.

Childre, D., & Rozman, D. (2005). *Transforming Stress: The HeartMath Solution for Relieving Worry, Fatigue, and Tension.* Oakland, CA: New Harbinger Publications.

Childre, D., Martin, H., Rozman, D., & McCraty, R. (2016). *Heart Intelligence: Connecting the Intuitive Guidance of the Heart.* Buffalo, NY: Waterfront Press

Coppola, G., Ponzetti, S., Aureli, T., & Vaugh, B.E. (2016). Patterns of emotion regulation at two years of age: Associations with mothers' attachment in eliciting situation. *Attachment & Human Development,* 18(1), 16-32.

Damasio, A. R. (1998). The somatic marker hypothesis and the possible functions of the prefrontal cortex. In A. C. Roberts, T. W. Robbins & L. Weiskrantz (Eds.), *The prefrontal cortex: Executive and cognitive functions* (pp. 36-50). New York: Oxford University Press.

Damasio, A. R. (1999). *The feeling of what happens: Body and emotion and the making of consciousness*. New York: Harcourt Press.

Damasio, A. R. (2000). Neurobiology of emotion at a systems level. In J. C. Borod (Ed.), *The neuropsychology of emotion* (pp. 194-213). New York: Oxford University Press.

Damasio, A. (2001). Fundamental feelings. *Nature*, 413(6858), 781.

Davis, M., Suveg, C., & Shaffer, A. (2015). The value of a smile: Child positive affect moderates relations between maternal dysregulation and child adjustment problems. *Journal of Child & Family Studies,* 24, 2441-2452.

Dennis, T.A., O'Toole, L.J., & De Cicco, J.M. (2013). Emotion regulation from the perspective of developmental neuroscience: What, where, when, and why. In K.C. Barrett, N.A. Fox, G.A. Morgan, D.J. Fidler & L.A. Daunhauer (Eds.), *Handbook of self-regulatory processes in development: New directions and international perspectives* (pp. 135-172). New York: Psychology Press.

Damasio, A. R. (2003). *Looking for Spinoza: Joy, sorrow, and the feeling brain*. New York: Harcourt.

Davidson, R. J. (2004). Well-being and affective style: Neural substrates and biobehavioral correlates. In F. A. Happert, N. Baylis & B. Keverne (Eds.), *The science of well-being* (pp. 107-283). Oxford, UK: Oxford University Press.

Davidson, R., Jackson, D., & Kalin, N. (2000). Emotion, plasticity, context, and regulation: Perspectives from affective neuroscience. *Psychological Bulletin*, 126, 890-909.

Denham, S.S., Blair, K.A., DeMulder, E., Levitas, J., Sawyer, K., Auerbach-Major, S., & Queenan, P. (2003). Preschool emotional competence: Pathway to social competence? *Child Development,* 74(1), 238-256.

Eisenberg, N., & Spinrad, T. (2004). Emotion-related regulation: Sharpening the definition. *Child Development,* 75(2), 334-339.

Evans, G.W., & Fuller-Rowell, T.E. (2013). Childhood poverty, chronic stress, and young adult working memory: The protective role of self-regulatory capacity. *Developmental Science,* 16(5), 688-696.

Feldman, R., Dollberg, D., & Nadam, R. (2010). The expression of and regulation of anger in toddlers: Relations to maternal behaviour and mental representations. *Infant Behavior and Development,* 34, 310-320.

Frick, P.J., & Morris, A.S. (2004). Temperament and developmental pathways to conduct problems. *Journal of Clinical Child & Adolescent Psychology,* 33(1), 54-68.

Garnefski, N., Rieffe, C., Jellesma, F., Meerum Terwogt, M., & Kraaij, V. (2007). Cognitive emotion regulation strategies and emotional problems in 9-11-year-old children: The development of an instrument. *European Child & Adolescent Psychiatry*, 16, 1-9.

Goldin, P.R. & Gross, J.J. (2010). Effects of mindfulness–based stress reduction (MBSR) on emotion regulation in social anxiety disorder. *Emotion,* 10(1), 83-91.

Goldsmith, H.H., & Davidson, R.J. (2004). Disambiguating the components of emotion regulation. *Child Development,* 75(2), 361-365.

Gresham, D. & Gullone, E. (2102). Strategy use in children and adolescents: The explanatory roles of personality and attachment. *Personality and Individual Differences,* 52(5), 616-621.

Gross, J.J. (2002). Emotion regulation: Affective, cognitive, social consequences. *Psychophysiology,* 39, 281-291.

Gross, J.J., & John, O.P. (2003). Individual differences in two emotion regulation processes: Implications for affect, relationships, and well-being. *Personality and Social Psychology,* 58(2), 348-362.

Gross, J.J., & Thompson, R.A. (2007). Emotion regulation: Conceptual foundations. In J.J. Gross (Ed.), *Handbook of Emotion Regulation* (pp. 3-24). New York: Guildford Press.

Gratz, K.L., & Roemer, L. (2004). Multidimensional assessment of emotional regulation and dysregulation: Development, factor structure, and initial validation of the diffieuclties in the emotion regulation scale. *Journal of Psychopathology and Behavioural Assessment*, 26(1), 41-54.

Gray, E.K., & Watson, D. (2007). Assessing positive and negative effect versus self-report. In J.A. Coan & J.J.B. Allen (Eds.), *Handbook of Emotion Elicitation and Assessment* (pp.171-183). New York: Oxford University Press.

Graziano, P.A., Reavis, R.D., Keane, S.P., & Calkins, S.D. (2007). The role of emotion regulation in children's early academic success. *Journal of School Psychology,* 45, 3-19.

Hanley, A., Warner, A., & Garland, E.L. (2014). Associations between mindfulness, psychological well-being, subjective well-being with respect to contemplative practice. *Journal of Happiness Studies,* 16, 1423-1436.

Hayes, S.C., Strosahl, K., Wilson, K.G., Bissett, R.T., Pistorello, J., Toarmino, D., Polusny, M.A., Dykstra, T.A., Batten, S.V., Bergan, J., Stewart, S.H., Zvolensky, M.J., Eifert, G.H., Bond, F.W., Forsyth, J.P., Karekla, M., & McCurry, S.M. (2004). Measuring experimental avoidance: A preliminary test of a working model. *The Psychological Record,* 54(4), 553-578.

Hoffman, S. G., & Kashdan, T.B. (2010). The affective style questionnaire: Development and psychometric properties. *Journal of Psychopathological Behavior Assessment,* 32, 255-263.

Immordino-Yang, M., & Damasio, A. (2007). We feel, therefore we learn: The relevance of affective and social neuroscience to education. *Mind, Brain, and Education,* 1(1), 3-10.

Javanovic, V. (2015). Beyond the PANAS: Incremental validity of the Scale of Positive and Negative Experience (SPANE) in relation to well-being. *Personality and Individual Differences,* 86, 487-491.

Joormann, J., & Gotlib, I.H. (2010). Emotion regulation in depression: Relation to cognitive inhibition. *Cognition and Emotion,* 24(2), 281-298.

Kim, S.H., & Hamman, S. (2003). Neural correlates of positive and negative emotion and negative emotion regulation. *Journal of Cognitive Neuroscience,* 19(5), 776-798.

King, R.B., McInerney, D.M., Ganotice, F.A., & Villarosa, J.B. (2015). Positive affect catalyzes academic engagement: Cross-sectional, longitudinal, and experimental evidence. *Learning and Individual Differences,* 39, 64-72.

Koole, S.L. (2009). The psychology of emotion regulation: An integrative view. *Cognition and Emotion,* 23(1), 4-41.

Larsen, R. (2009). The contributions of positive and negative affect to emotional well-being. *Psihologijske Teme,* 18(2), 247-266.

Ledoux, J. (1996). *The Emotional Brain: The Mysterious Underpinnings of Emotional Life*. New York: Simon & Schuster.

Lyubomirsky, S., King, L., & Diener, E. (2005). The benefits of frequent positive affect: Does happiness lead to success? *Psychological Bulletin,* 131, 803-855.

Mayer, J.D., Salovey, P., Caruso, D.R., & Sitarenios, G. (2003). Measuring emotional intelligence with MCEIT V2.0. *Emotion,* 3(1), 97-105.

McCraty, R., & Atkinson, M. (1996). Music enhances the effect of positive emotional states on salivary IgA. *Stress Medicine,* 12(3), 167-175.

McCraty, R., & Atkinson, M. (2003). *Psychophysiological coherence.* Boulder Creek, CA: HearthMath Research Center, Institute of HeartMath, Publication No. 03-016.

McCraty, R., Atkinson, M., Rein, G., & Watkins, A.D. (1996). Music enhances the effect of positive emotional states on salivary IgA. *Stress Medicine,* 12(3), 167-175.

McCraty, R., Atkinson, M., & Tomasino, B.A. (2003). Impact of a workplace stress reduction program on blood pressure and emotional health in hypertensive employees. *Journal of Alternative and Complementary Medicine,* 9(3), 255-369.

McCraty, R., Atkinson, M., Tomasino, D., Goelitz, J., & Mayrovitz, H.N. (1999). The impact of an emotional self-management skills course on psychosocial functioning and automatic recovery to stress in middle school children. *Integrative Physiological and Behavioral Science,* 34(4), 246-268.

McCraty, R., & Childre, D. (2002). T*he appreciative heart: The psychophysiology of positive emotions and optimal functioning*. Boulder Creek, CA: HearthMath Research Center, Institute of HeartMath, Publication No. 02-026.

Morris, A.S., Silk, J.S., Steinberg, L., Meyers, S.S., & Robinson, L.R. (2007). The role of the family context in the development of emotion regulation. *Social Development,* 16(2), 361-368.

Panksepp, J. (1990). Gray zones at the emotion/cognition interface: A commentary. *Cognition and Emotion,* 4(3), 289-302.

Patten, K.E. (2010). Toward a neuropedagogy of emotion: Paradigm for educational neuroscience and neuropsychology. *Dissertation Abstracts International,* 71(4-A), 1238.

Patten, K.E. (2011). The Somatic Appraisal Model of Affect: Paradigm for educational neuroscience and neuropsychology. In K.E. Patten & S.R. Campbell (Eds.) *Educational neuroscience: Initiatives and emerging issues* (pp. 86-96). Chichester, UK: Wiley-Blackwell.

Roque, L., & Verrissimo, M. (2011). Emotional context, maternal behaviour and emotion regulation. *Infant Behavior and Development,* 34, 617-626.

Roque, L., Verrissimo, M., Fernandes, M., & Rebelo, A. (2013). Emotion regulation and attachment: Relationships with children's secure base during different situational and social contexts in naturalistic settings. *Infant Behavior and Development,* 36(3), 298-306.

Rawana, J.S., Flett, G.L., McPhie, M.L., Nguyen, H.T., & Norwood, S.J. (2014). Developmental trends in emotion regulation: A systematic review with implications for community mental health. *Canadian Journal of Community Mental Health*, 33(1), 31-44.

Rein, G., Atkinson, M., & McCraty, R. (1995). The physiological and psychological effects of compassion and anger. *Journal of Advancement in Medicine,* 8(2), 87-105.

Shortt, J.W., Stoolmiller, M. Smith-Shine, J.N., Eddy, J.M., & Sheeber, L. (2010). Maternal coaching, adolescent anger regulation, and siblings' externalizing symptoms. *Journal of Child Psychology and Psychiatry,* 51(7), 799-808.

Silk, J.S., Steinberg, L., & Morris, A.S. (2003). Adolescents' emotion regulation in daily life: Links to depressive symptoms and behaviour. *Child Development,* 74(6), 1869-1880.

Snyder, J., Stoolmiller, M., Wilson, M., & Yamamoto, M. (2003). Child anger regulation, parental responses to children's anger displays, and early child antisocial behavior. *Social Development,* 12(3), 335-360.

Thompson, R.A. (1994). Emotion and self-regulation: A theme in search of a definition. In N.A. Fox (Ed.), *Monographs of the Society for Research in Child Development* (pp. 25-52). Chicago, IL: University of Chicago Press.

Thompson, E.R. (2007). Development and validation of an internationally reliable short-form of the Positive and Negative Affect Schedule (PANAS). *Journal of Cross-Cultural Psychology,* 38(2), 227-242.

Waters, S.F., Virmani, E.A., Thompson, R.A., Meyer, S., Raikes, A., & Jochem, R. (2010). Emotion regulation and attachment: Unpacking two constructs and their association. *Journal of Psychopathology and Behavioral Assessment,* 32, 37-47.

Watson, D., Clark, L.A., & Tellegen, A. (1988). Development and validation of brief measurement of positive and negative affect: The PANAS scales. *Journal of Personality and Social Psychology,* 54(6), 1063-1070.

Zajonc, R. B. (1984). On the primacy of affect. *American Psychologist*, 39(2), 117-123.

Appendix A. PANAS-SF

International Positive and Negative Affect Schedule

Short Form

(PANAS-SF) Question, Measure, and Item Order

Participant # _____Date: _____

Question: (Please circle the appropriate number for each feeling)

Thinking about yourself and how you normally feel, to what extent do you generally feel:

	Never				Always
Upset	1	2	3	4	5
Hostile	1	2	3	4	5
Alert	1	2	3	4	5
Ashamed	1	2	3	4	5
Inspired	1	2	3	4	5
Nervous	1	2	3	4	5
Determined	1	2	3	4	5
Attentive	1	2	3	4	5
Afraid	1	2	3	4	5
Active	1	2	3	4	5

Appendix B. PARCI

Personal Affect Regulation Capacity Inventory (PARCI)

Participant # _____Date: _____

Likert Scale: 1) Always 2) Often 3) Sometimes 4) Hardly ever 5) Never

Directions: Circle the number that best represents occurrence of the following:

1.	I experience emotional reactions that do not match the situation.	1	2	3	4	5
2.	I can cheer myself up if I need to.	1	2	3	4	5
3.	When I am in an emotional situation, I know what to do.	1	2	3	4	5
4.	I feel sympathetic toward others.	1	2	3	4	5
5.	I cope well with everyday events.	1	2	3	4	5
6.	I interact well with my family.	1	2	3	4	5
7.	I have close friends with whom I can share my feelings.	1	2	3	4	5
8.	I can handle emotional situations.	1	2	3	4	5
9.	I have positive interactions with my peers/coworkers.	1	2	3	4	5
10.	I feel stressed.	1	2	3	4	5
11.	I feel overwhelmed by situations.	1	2	3	4	5
12.	I recover quickly from emotional trauma.	1	2	3	4	5
13.	I suppress my feelings.	1	2	3	4	5
14.	I understand how my emotions work.	1	2	3	4	5
15.	I cope well when in a crisis.	1	2	3	4	5
16.	I think about negative events in my past.	1	2	3	4	5
17.	I feel anxious when others are emotional.	1	2	3	4	5
18.	I express my feelings appropriately.	1	2	3	4	5
19.	I can control my emotions.	1	2	3	4	5
20.	I try not to show my emotions.	1	2	3	4	5

To cite this article: Patten, K. E., Campbell, S. R. (2016). Neuro Emotional Literacy Program: Does Teaching the Function of Affect and Affect Regulation Strategies Improve Affect Management and Well-being? *Themes in Science and Technology Education*, 9(2), 93-108.

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