Understanding Treatment Effectiveness for Aggressive Youth: The Importance of Regulation in Parent-Child Interactions

by

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Reviews summarizing hundreds of studies cite Parent Management Training (PMT) and Cognitive-Behaviour Therapy (CBT) as some of the most effective interventions for aggressive youth (e.g., Brestan and Eyberg, 1998). However, variability in outcomes persists, and we have yet to understand why certain interventions only produce behaviour change in some children. Using a clinical sample of 57 children (53 boys, 4 girls) and their mothers enrolled in a combined PMT/CBT program, the current study examined the relation between changes in real-time parent-child interactions, and children’s externalizing outcomes from pre- to post-treatment. Results showed that dyads who were regulated in their interactions over time reported greater reductions in externalizing symptoms from pre- to post-treatment compared to dysregulated dyads. Changes in mean levels of affective content (e.g., negativity) were not associated with aggressive outcomes. Findings suggest that dyadic regulation may be an important process associated with treatment success for aggressive youth.
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Understanding Treatment Effectiveness for Aggressive Youth: The Importance of Regulation in Parent-Child Interactions

Children and adolescents with aggressive and antisocial behavioral problems constitute approximately one-half of all referrals to children’s mental health clinics (Patterson, Dishion, and Chamberlain, 1993; Stouthamer-Loeber, Loeber, and Thomas, 1992). Despite being one of the most thoroughly investigated childhood disorders with regard to etiology and long-term outcomes, much remains to be understood about childhood aggression, particularly in terms of treatment. A number of successful intervention programs have been developed to treat childhood aggression; however, even among the most effective programs (e.g., Parent Management Training, Brestan and Eyberg, 1998) variability in outcomes persist, and effect sizes tend to be moderate at best (Kazdin, 2001; Kazdin, 2002). We have yet to understand this variability in treatment outcome because (1) studies tend to focus on outcomes rather the processes associated with change, and (2) most studies rely on questionnaire data, whereas observations may be better suited for tapping into processes underlying treatment-related changes (Gardner, 2000; Hinshaw, 2002; Kazdin and Nock, 2003). To understand why certain interventions only produce behaviour change in some children, we must extend our research efforts into naturalistic settings, and seek to answer the question, “what changes when treatment is effective?”

1.1 Objectives

The purpose of the current study was to extend previous findings in the intervention literature on childhood aggression by examining the relation between processes of change in parent-child interactions and children’s aggressive behaviour outcomes. Using a clinically referred sample of youth and their parents enrolled in a combined Parent Management Training – Cognitive-Behaviour Therapy (PMT/CBT) program, I sought to investigate how structural changes in the real-time interactions of parents and children, rather than changes in the overall affective content of interactions, were associated with changes in children’s externalizing outcomes from pre- to post-treatment. Specifically, I aimed to explore the influence of dyadic regulation (i.e., the ability of dyad members to operate in affective harmony over time) as a potential process of change associated with treatment success for childhood aggression.
1.2 Family Processes and Childhood Aggression

A well-established body of research has linked poor parent-child relationships with childhood behaviour problems (e.g., aggressive behaviour; Dishion and Patterson, 2006; Dumas and LaFreniere, 1993; Harrist, Pettit, Dodge, and Bates, 1997; Loeber and Hay, 1997, Patterson, 1982; Snyder, Reid, and Patterson, 2003). On a broad level, harsh and inconsistent parenting practices (e.g., coercive discipline) have been linked to elevated levels of aggressive and antisocial behaviour in children (Granic and Patterson, 2006; McKee, Colletti, Rakow, Jones, and Forehand, 2008; Nicholson, Fox, and Johnson, 2005; Patterson, Reid, and Dishion. 1992), while positive and contingent parenting (e.g., warmth, responsiveness, and monitoring) has been associated with positive social, emotional and behavioral adjustment, as well as lower levels of externalizing problems (Aunola and Nurmi, 2005; Finkenauer, Engels, and Baumeister, 2005; Martinez and Forgatch, 2001). However, further research is needed to explain how these global, broad-based measures of parenting manifest in the day-to-day interactions of parents and their children.

1.3 Micro-level Processes of Change in Child Aggression

From a developmental psychopathology perspective, the moment-to-moment, everyday interactions of a dyad are one of the proximal forces driving large-scale developmental changes (Granic, 2006; Granic and Hollenstein, 2006; Snyder and Stoolmiller, 2002). It is through the repeated engagement in particular microsocial interaction patterns (e.g., everyday parent-child interactions) from which particular behavioral outcomes are thought to arise. From this perspective, the development of childhood aggression can be conceptualized as a dynamic process in which the interactional history of a parent-child dyad is an essential force that shapes children’s broader aggressive behaviour patterns (Dumas and LaFreniere, 1993; Granic, 2000; Granic and Patterson, 2006; Patterson, 1982). To understand the development of aggressive behaviour in children, we must first understand the everyday, dyadic interaction patterns that lead to such behavioral outcomes.

Patterson’s (1982) coercion theory provides a classic example of how micro-level parent-child interactions contribute to the development of children’s broader patterns of aggressive behaviour. According to Patterson and colleagues (Granic and Patterson, 2006; Patterson, 1982; Patterson, et al., 1992; Patterson, et al., 2000), childhood aggression evolves out of hundreds of brief, yet aversive, everyday interactions between parents and children, in which parents and
children mutually teach each other to behave in ways that increase the likelihood that children will develop aggressive behaviour problems. For example, a child throws a temper tantrum when his mother tells him that it is time for bed. His mother eventually becomes frustrated with the child’s acting out behaviour, and subsequently capitulates to the child’s demands, allowing him to stay up past his bedtime. By giving into her child’s demands, the mother negatively reinforces the child’s behaviour, and the child learns that his behavioural outbursts will get him what he desires. Additionally, the mother learns that she can prevent her child’s behaviour from escalating by giving in to his demands. When parents and children repeatedly engage in these coercive interaction patterns, they create a context that facilitates the development of aggressive behaviour patterns (Granic, 2006; Granic and Patterson, 2006; Patterson, 1982; Patterson, et al., 1992).

Given that family variables (e.g., family functioning, parenting skills) are often a core consideration and target for change in intervention programs for childhood aggression (Brestan and Eyberg, 1998; Eyberg, Nelson, and Boggs, 2008; McMahon, Wells, and Kotler, 2006), it is important (both in terms of practicality and resources) to identify the specific family processes that lead to the greatest behaviour changes in children. By investigating the moment-to-moment changes in parent-child interactions in naturalistic settings, we can enhance our understanding of the real-world, everyday factors that contribute to the emergence and maintenance of aggressive behaviour. Furthermore, micro-level analyses of the patterns that characterize the interactions of different subtypes of parent-child dyads may also help to elucidate some of the seemingly basic, yet significant, changes that need to occur in everyday parent-child interactions (e.g., increased flexibility among dyad members; Granic, O’Hara, Pepler and Lewis, 2007; Hollenstein, Granic, Stoolmiller and Snyder, 2004) in order to reduce children’s aggressive behaviours.

1.4 Structural Changes and Childhood Aggression

In contrast to broad measures of content (e.g., mean frequencies of positive/negative affect), structural changes in dyadic interactions refer to the fine-grained, timed-based patterns that emerge and fade over the course of an interaction. Instead of asking, “Is the interaction pattern of this dyad positive, negative, or neutral?” researchers who are interested in understanding structural changes in dyadic interactions ask, “How do the affective expressions of this dyad change and unfold over time?” Thus, whereas a content-based measure might classify a dyad’s interaction pattern as overall “negative,” a structural analysis of that same dyad’s interaction pattern might reveal a consistently negative response style for the child, but a
fluctuating positive/neutral response style from the mother. Recent empirical work on parent-child interactions and childhood behavioural problems (e.g., Granic, et al., 2007; Hollenstein, et al., 2004; Harrist, Pettit, Dodge, and Bates, 1994; Harrist and Waugh, 2002) has begun to extend the research focus beyond an examination of the broad, content-related changes in parent-child interactions toward a more fine-grained analysis of the structural changes that are associated with reductions in children’s problem behaviour. In these studies, a coherent pattern of results has emerged.

Utilizing dynamic systems principles and methodology (see Granic and Hollenstein, 2006, for review), researchers such as Granic et al. (2007), and Hollenstein et al. (2004) have utilized process-level accounts of parent-child interactions to highlight the relationship between structural changes in dyadic interactions and changes in children’s long-range behavioural outcomes. Specifically, these researchers have examined changes in the structural characteristic of dyadic flexibility (i.e., ability of dyad members to display a broad emotional repertoire, work through negative emotional states, and return to neutral or positive ways of interacting with one another; Granic et al., 2007; Hollenstein et al., 2004), and have found meaningful links between this process-level construct and children’s behaviour problems. For instance, Hollenstein et al. (2004) found that emotional rigidity in parent-child interactions (i.e., limited capacity to display, use, and regulate a range of emotions) was associated with elevated levels of externalizing problems among children. Corroborating these results, Granic et al. (2007) found that increased flexibility in the emotional interactions of mother-child dyads was associated with reductions in children’s externalizing behaviour problems. Using a clinical sample of aggressive youth and their mothers, Granic et al. (2007) found that the dyadic interaction patterns of mothers and children who improved after treatment increased in flexibility, whereas the interactions of mothers and children who did not show improvement after treatment actually increased in rigidity (i.e., dyad members tended to become “stuck” in particular emotional states, such as mutual negativity). Interestingly, neither Hollenstein et al. (2004) nor Granic et al. (2007) found mean levels of expressed emotions to be associated with externalizing outcomes.

Additional studies that have explored the relationship between dyadic structure variables and childhood behaviour problems include investigations of contingent responsiveness (i.e., the joint ability of dyad members to adapt individual affective responses to support the affective responses of their partner; Dumas and LaFreniere, 1993) and dyadic synchrony (i.e., mutually focused and reciprocated interactions between partners; Harrist et al., 1997). Comparable to
examinations of dyadic flexibility, research on contingent responsiveness and dyadic synchrony highlights the importance of fine-grained, time-sensitive measures in understanding developments and changes in children’s problem behaviour. For instance, Dumas and LaFreniere’s (1993) observational study of contingent responsiveness found that the interaction patterns of well-adjusted children and their mothers were highly reciprocal and positive, but included instances of negative affect (e.g., disapproval). Conversely, researchers found that the interaction patterns of aggressive children and their mothers were often characterized by indiscriminate responsiveness (e.g., mother responding positively to a child’s negative affect at one time, then aversively to the child’s expressed negative affect at another time; Dumas and LaFreniere, 1993). Thus, it was not the overall affective tone of the interaction, but rather how well mothers and children responded to and validated the affective responses of one another, that was central to the understanding of children’s behavioural adjustment.

Somewhat similarly, Harrist et al.’s (1997) investigation on the role of dyadic synchrony in predicting kindergarten adjustment (1997) found that high levels of positive synchrony (i.e., dyad members are mutually positive, connected, and engaged over time) were associated with low levels of kindergarten adjustment problems (e.g., withdrawn and aggressive behaviours). In contrast, high levels of negative synchrony (i.e., mutual negativity among dyad members throughout the interaction) and non-synchrony (i.e., disconnected interaction in which dyad members express divergent affects) were associated with reports of childhood aggression and social withdrawal. Thus, comparable to the studies outlined previously, the investigation by Harrist et al. (1997) went beyond an examination of content to demonstrate the important links between the structure of parent-child interactions and children’s behavioural outcomes.

1.5 The Role of Emotion Theory

From an emotion theory perspective, it makes sense that the structure, rather than the overall content, of parent-child interactions would be most influential for children’s behavioural development. According to emotion theorists (e.g., Izard, 1977; Tomkins, 1963), all emotions serve important and adaptive purposes, when they are expressed in the appropriate context. The key to successful development is learning how to regulate (i.e., how to control and adapt) one’s emotions (Denham et al., 2003; Southam-Gerow and Kendall 2002). In fact, research has linked poor emotion regulation with many forms of childhood psychopathology, including aggression (Eisenberg et al., 2001; Southam-Gerow & Kendall, 2002).
Extending the literature on emotion regulation to the intervention context, it would seem that a truly effective treatment program for aggressive youth should aim to teach parents and children strategies to regulate their emotions and interactions with one another. Instead of striving to eliminate negative parent-child interactions and to replace them with positive, happy interactions, an effective treatment program might teach parents and children skills such as: how to preemptively manage conflict situations, how to control their own emotional and behavioral expressions in conflict situations, and how to respond effectively to the affective responses of their partner. With respect to treatment evaluation research, this means that measuring changes in the overall content of parent-child interactions (e.g., changes in overall expressed negativity from pre-to post-treatment) may not be as meaningful as examining how the interaction patterns of parents and children change and unfold over time.

One of the difficulties in investigating structure-related changes in parent-child interactions is developing a temporally sensitive measure that captures the evolution and changes in parent-child interaction patterns over time (e.g., across the course of a conversation). In the current study, I adapted a methodological strategy originally developed by Gottman and Levenson (1992) to categorize marital interaction patterns. I applied this technique to investigate the real-time, affective interaction patterns of parents and children enrolled in a community-based treatment program for aggressive behaviour. The purpose of my investigation was to extend the work on parent-child interactions and childhood aggression by investigating whether changes in a dyads’ abilities to regulate their affective response patterns during everyday interactions were linked to changes in children’s externalizing behaviors.

1.6 Regulation in Parent-Child Interactions

Gottman and Levenson (1992) originally introduced the concept of dyadic regulation in their seminal investigation on the processes predictive of marital satisfaction/dissolution. In a series of observational studies (see Gottman, 1994, for review), they found that couples whose interaction patterns were regulated over time (i.e., overall mutually positive, despite instances of negativity and neutrality) were more likely to stay together and express greater marital satisfaction than non-regulated couples (i.e., couples who were discrepant in their response patterns, or mutually negative over time). Although developmentalists agree that parent-child interactions are one of the most influential contexts for the learning, development, and refinement of children’s emotion and behaviour regulation skills (see Morris, Silk, Steinberg, Myers and Robinson, 2007, for review), most of the research on dyadic regulation and its
implications for childhood development has been limited to investigations during infancy and childhood (Harrist and Waugh, 2002). Thus, applying the work of Gottman and Levenson (1992) to the interactions of parents and school-aged children, the current study sought to examine the role of dyadic regulation in predicting children’s aggressive behavioral outcomes.

Consistent with Gottman and Levenson’s (1992) conceptualization of dyadic regulation, I defined dyadic regulation as a dyad’s ability to operate in affective harmony, such that dyad members are able to express an array of affective states, but are mutually positive in their interactions over time. Conversely, I considered dyads to be dysregulated when their interactions were characterized by affective disharmony, such that dyad members were either discordant in their affective expressions over time (e.g., mother was more positive over time, while child was more negative over time), or mutually negative throughout the course of their interactions. The guiding hypothesis behind my investigation was that regulation in parent-child interactions, rather than changes in mean levels of positive or negative affect, is a critical factor in distinguishing between children who benefit from treatment and those who do not.

1.7 Parent Management Training/Cognitive Behavioural Therapy

All participants in the current study were enrolled in a community-based intervention program for aggressive youth and their families. The program consisted of a combination of Parent Management Training (PMT) and cognitive-behavioral therapy (CBT), two of the most well recognized, evidenced-based interventions for childhood aggression (Brestan and Eyberg, 1998; Eyberg, et al., 2008). Studies have demonstrated the effectiveness of PMT and CBT as stand-alone treatments for childhood aggression (e.g., Costin and Chambers, 2007; Eyberg et al. 2008). In addition, there is evidence to suggest that for children between the ages of 5 and 12, combined PMT/CBT programs are most effective in reducing children’s aggressive behaviour problems (Kazdin, Siegel and Bass, 1992; Lochman and Wells, 2004; Webster-Stratton and Hammond, 1997).

1.8 Design and Hypotheses

Research assistants collected home observations of parent-child discussions before and after a 12-week evidence-based intervention program. During each videotaped observation, the parent and her child engaged in a problem-solving discussion regarding a topic of conflict identified by that dyad (e.g., completing homework, getting into fights at school). A team of four trained observers then coded the videotapes, second-by-second for parent and child separately, using the Specific Affect Coding system (SPAFF; Gottman et al. 1996a, b). Using these coded
data, dyads were then classified as either regulated or dysregulated based on an adaptation of Gottman and colleagues’ methods for studying the real-time interaction patterns of married couples (Gottman, 1979; Gottman, 1993; Gottman and Levenson, 1992).

Externalizing outcomes of regulated parent-child dyads were compared to those of dysregulated parent-child dyads. Based on previous literature, the following predictions were made:

1) Changes in the overall content of dyadic interactions (i.e., mean frequencies of positive and negative affect) will not be associated with changes in children’s externalizing symptoms from pre- to post-treatment.

2) Changes (from pre- to post-treatment) in dyadic regulation status (i.e., regulated versus dysregulated) will be associated with changes in externalizing symptoms, such that regulated dyads will demonstrate greater reductions in children’s externalizing symptoms from pre-to post-treatment compared to dysregulated dyads.

3) Changes (from pre- to post-treatment) in the real-time affective trajectories of dyad members will predict externalizing symptoms at post-treatment, such that positive changes in affective trajectories will predict lower levels of externalizing symptoms at post-treatment.

Methods

2.1 Participants

Parents and children were recruited from two children’s community mental health agencies offering the same combined PMT/CBT treatment program for aggressive children and their families. Parents were approached during the intake stage of the treatment programs, and asked if they would be willing to speak to a research assistant to obtain more information about the study. If a family agreed to be contacted, a research assistant explained the study and asked if the parent and child were willing to participate. Families were offered $10.00 for each home visit.

Seventy-six children (69 boys, 7 girls) and their mothers, who had been referred by either a mental health professional, teacher, or parent, participated in the current study. The children ranged in age from 7 to 11 years ($M = 9.20, SD = 1.23$). To be included in the study, children had to score within the clinical range (98th percentile) on the Externalizing subscale of the Child Behavior Checklist (CBCL), and had to have completed the pre- and post-treatment observation sessions. Mothers and children needed to have sufficient command of the English language in order to complete the questionnaires without the assistance of an interpreter. In addition, the
child had to be currently living with his or her mother. Children were excluded from the study if they were diagnosed as having an intellectual disability or if they had a pervasive developmental disorder. Twenty-one families missed one of the observation sessions, and were thus eliminated from analyses. Thus, the total sample for the current study consisted of 57 children (53 boys, 4 girls) and their mothers. T-test and chi-square analyses revealed no differences between the dropped and included participants on any of the demographic variables (i.e., age, ethnicity, family income, parent’s marital status, and mother’s highest level of education) or pre-treatment levels of impairment (Externalizing Symptoms).

With regard to socioeconomic status, 35.1% of the children resided in intact families, 40.4% in single parent homes (exclusively maternal), 14.1% in blended families, and 8.8% in other family configurations (e.g., with grandparents). Based on parent-identified ethnicity, 78.9% were European-Canadian (Caucasian), 12.3% African or Caribbean, 1.8% Asian, 1.8% Latin American, and 5.3% were of mixed backgrounds. With regard to family income, 20.0% earned under $20,000 per year, 21.8% earned between $20,000 and $39,000, 25.5% earned between $40,000 and $59,000, and 32.7% earned over $60,000 per year.

2.2 Intervention

Participants were enrolled in a treatment program called SNAP™ (Stop Now and Plan; Earlscourt Child and Family Centre, 2001a, b), which is an evidence-based intervention for aggressive children between the ages of 6 and 12, and their parents. The SNAP™ program offers a combination of PMT for parents and CBT for children, and is delivered by a team of social workers, child-care workers, and/or M.A. or PhD level clinical psychology students. The program is delivered over the course of 12 weeks, in which participants meet in a group format, one night each week, for three hours. Comparable to most social welfare programs in Canada, families were not charged for participation in the treatment program.

Over the course of the 12 weeks, children in CBT groups were taught to identify and modify their aggressive behaviours and negatively-biased cognitions, using evidence-based strategies, such as behaviour management, role-playing, and cognitive restructuring (Barkley, 2000; Bloomquist and Schnell, 2002). Concurrently, parents in PMT were taught to replace coercive or lax discipline practices with mild sanctions that contingently targeted problem behaviour (e.g., time outs; Forehand, 1986). In addition, parents were encouraged to utilize more positive parenting practices such as skill encouragement (e.g., contingent praise for success), problem solving, and monitoring (Forgatch & DeGarmo, 1999). To ensure that the program
maintains the fidelity of the original PMT model, the clinical directors of the SNAP™ program have been in consultation with the original developer of PMT (Marion Forgatch of the Oregon Social Learning Centre) for over 10 years. In addition, weekly fidelity checks were made by the clinical supervisors at each of the community agencies.

2.3 Procedure

Data were collected before the start and following the completion of the 12-week treatment program. In accordance with the clinical agencies’ regular intake and post-treatment procedures, parents completed measures of the child’s emotional and behavioural functioning. In addition, an independent research team collected videotaped observations of parent-child interactions within the home at pre- and post-treatment. Children residing in two-parent families were videotaped with their mothers because a) mothers were identified as the primary caregivers, and b) to maintain consistency with children from single-parent families (which were solely mother-led). All mothers and children were asked to complete consent forms (assent forms were completed for the children) before the videotaping commenced. Children and parents also completed a modified version of the Issues Checklist (Robin & Weiss, 1980) before each videotaped session for the purposes of selecting a conflict discussion topic. Participants were seated across from one another (e.g., at a kitchen table). All interactions were recorded on a digital video camera that was set up in the room with the participants.

During each of the videotaped observations, parents and children engaged in three separate discussions. A research assistant provided instructions before each discussion topic, and then left the room. The first discussion was about a positive, hypothetical topic, such as winning the lottery or planning a dream vacation together. These positive topics were randomly assigned by the research assistant and were counterbalanced across participants. The second discussion, known as the conflict discussion, was based on a procedure developed by Forgatch and colleagues (1985) for studying problem-solving processes in families of antisocial children. The topic for the conflict discussion was selected by a research assistant based on the parent and child ratings of topics from a modified version of the Issues Checklist (Robin & Weiss, 1980). The research assistant selected the topic that the parent and child agreed to be the most anger provoking and was currently unresolved. After being assigned their conflict topic, the dyad was instructed to try to solve the problem as best they could, and to end the discussion on a positive note. Upon completion of this discussion, the dyad was immediately assigned another positive topic to discuss. The positive discussions (first and third discussions) were four minutes in
length, and the conflict discussion (second discussion) was six minutes in length. For the purposes of the current study, only observational data from the conflict discussion was utilized.

2.4 Coding Procedures

Conflict discussions were coded using Noldus Oberserver 5.0. A team of trained observers entered codes for each participant (i.e., parent and child separately), in real time, producing two synchronized streams of continuous data. Coders used a modified version of the Specific Affect Coding System (SPAFF; Gottman et al. 1996a, b), which consisted of ten mutually exclusive affect codes: contempt, anger, fear/anxiety, sad/withdrawn, whine/complain, neutral, interest/curiosity, joy/excitement, humour, and affection. Each code was based on a gestalt combination of facial expressions, gestures, body posture, verbal content, vocal tone, and speech rate that holistically captured the affective tone of each second of behaviour. For analysis purposes, the ten affective codes were then collapsed into three global affective categories: positive (interest/curiosity, joy/excitement, humour, affection), negative (contempt, anger, fear/anxiety, sad/withdrawn, whine/complain), and neutral.

Before commencing coding of the videotaped interactions, all observers underwent intensive training for three months, in which they were required to reach a minimum criterion of a) 75% agreement and 0.65 kappa using a frequency/sequence-based procedure and b) 80% agreement using a duration/sequence based comparison (Noldus Observer 5.0). Both reliability methods were utilized in order to ensure accuracy in the coding of both the onset and duration of events. To counteract against the potential effects of coder drift, weekly recalibration training was conducted. In addition, during 20% of the sessions, a file of one of the four observers was selected and compared to a “gold standard” file of the same session that was jointly coded by the two coding supervisors. Observers were blind to which sessions were chosen to assess observer agreement. The average coder agreement using the gold standard method was 81%. Average coder agreement was .88 kappa for the frequency-based method, and .92 for the duration-based method.

2.5 Measures

Problem Solving Discussion Topic. Topics for the conflict discussion were selected from a modified version of the Issues Checklist (Robin & Weiss, 1980). The Issues Checklist lists a variety of common conflict issues for parents and children, such as going to bed on time, lying, and getting into fights at school. In the current study, parents and children separately completed identical versions of the checklist. Participants were asked to specify whether they had argued
about each issue within the past two weeks, and if they had, how “hot” the discussion was (using a 5-point scale ranging from calm to angry). Participants also indicated whether or not the issue was resolved. A research assistant selected the hottest topic that was left unresolved (as indicated by both parent and child reports) for the conflict discussion.

**Parental Report of Externalizing Behaviour.** Parents rated their child’s emotional and behavioural problems using the parent version of the Child Behavior Checklist (CBCL; Achenbach, 1991). The CBCL consists of 113 items that assess multiple problem areas on a three-point scale ranging from 0 (Not at all) to 2 (Often). Parents rated their child’s behaviour for the month prior to the start of treatment, and again for the month after the treatment program ended. The CBCL is a standardized, reliable and valid measure of children’s emotional and behavioural functioning. The CBCL yields a standardized T-score for Externalizing Problems.

### 2.6 Group Classification using Time Series Analysis

Dyads were first classified as “Regulated” (REG) or “Dysregulated” (DREG), based on methods developed by Gottman and colleagues to study the real-time interaction patterns of married couples (Gottman, 1979; Gottman, 1993; Gottman and Levenson, 1992). Gottman distinguished between “regulated” and “nonregulated” couples by observing couples as they participated in a discussion and coding the affective valence of each speaker turn (i.e., each time a dyad member spoke). Cumulative sum plots were then created for each dyad; the valence of each dyad member’s conversational turns was plotted separately. Dyads in which both partners showed an overall positive slope of expressed affect were classified as “regulated.” Dyads in which one or both partners did not demonstrate an overall positive trajectory of expressed affect were classified as “nonregulated.” Subsequent work by Gottman (Gottman & Levenson, 1992) found that couples who were “regulated” in their marital interactions were less likely to divorce or separate four years later than “non-regulated” couples. The current study sought to examine the same types of response trajectories, but with parent-child dyads, and I used the time-based classification system to predict treatment success/non-improvement.

In the current study, time-series plots were constructed for each dyad, with parent and child trajectories plotted separately. Cumulative positive/negative affect was plotted on the Y-axis, and duration was plotted on the X-axis. Figures 1, 2, and 3 show examples of time-series graphs for a regulated dyad, a dysregulated dyad with discrepant trajectories, and a dysregulated dyad with negative trajectories, respectively. Linear regression analyses were then conducted to calculate a slope value (standardized beta) for the trajectory of each dyad member. Each
participant was assigned a slope value at pre- and post-treatment. Consistent with Gottman’s classification scheme (Gottman, 1979) dyads in which both the parent and child had significantly positive slopes were classified as regulated dyads (REG). Dysregulated dyads (DREG) were classified on the basis that at least one partner’s slope was not significantly positive.

I classified dyads as REG and DREG at pre-treatment and then again at post-treatment. Then, in order to capture how dyads’ response trajectories changed over the course of treatment I

Figure 1. Cumulative sum plot for a regulated dyad.

Figure 2. Cumulative sum plot for a dysregulated dyad with discrepant trajectories.

Figure 3. Cumulative sum plot for a dysregulated dyad with negative trajectories.
grouped dyads into one of four categories: Consistently Regulated (CREG; i.e., regulated at pre and post), Became Regulated (BREG; i.e., dysregulated at pre but regulated at post), Consistently Dysregulated (CDREG; i.e., dysregulated at pre and post), or Became Dysregulated (BDREG; i.e., regulated at pre but dysregulated at post). These four categories served as the focal comparison groups for the current study.

Results

3.1 Preliminary Analyses

Before proceeding with the main analyses comparing regulated dyads to dysregulated dyads, differences on the CBCL externalizing subscale were investigated for the entire sample. According to a paired-sample t-tests, there was a significant decrease from pre- to post-treatment on the Externalizing subscale mean scores, \( M_{\text{pre}} = 72.70, SD = 6.90, M_{\text{post}} = 66.74, SD = 11.02; t(56) = 6.30, p < .001 \). Thus, on average, the intervention seemed to have been successful in decreasing levels of externalizing behaviour for the sample as a whole.

Demographic differences were also examined for the four comparison groups at pre-treatment. A one-way ANOVA revealed no significant differences between comparison groups with regard to child age \( (M = 9.33, SD = 1.15) \), or mother age \( (M = 38.22, SD = 6.80) \). In addition, Chi-square comparisons on the categorical variables of ethnicity, mother’s highest level of education, and parent’s marital status, revealed no significant differences between regulated (CREG, BREG) and dysregulated (CDREG, BDREG) dyads.

3.2 Regressions with Content

To test the first hypothesis that mean frequencies of positive and negative affect will not predict treatment outcomes, I investigated the effects of affect change scores on post-treatment externalizing symptoms. A Positive Affect Change score and a Negative Affect Change score were calculated for each dyad member separately by subtracting the total frequency of the Pre-Tx affect (i.e., either Positive or Negative) from the total frequency of the Post-Tx affect. Then, a series of two-step hierarchical regressions were conducted to examine the effects of affect change scores on post-treatment externalizing symptoms. For each analysis, Pre-Tx Externalizing Symptoms was entered as a first predictor. Positive Change and Negative Change (for either the mother or child) were entered second.

Pre-Tx Externalizing Symptoms positively predicted Post-Tx Externalizing Symptoms, \( R^2 = .60, F = 82.68, p < .001 \). When entered second, neither Child Positive Change nor Child Negative Change was a significant predictor of Post-Tx Externalizing Symptoms \( (R^2 = .62, \)
$R^2$ Change = .02; $\beta_{\text{positive}} = -.10, t = -1.14, p = \text{ns}; \beta_{\text{negative}} = .07, t = .83, p = \text{ns}$). In terms of mothers’ expressed affect, neither Mother Positive Change nor Mother Negative Change were significant predictors of Post-Tx Externalizing Symptoms, after controlling for pre-treatment levels of externalizing behaviour ($R^2 = .61, R^2 \text{ Change} = .01, \beta_{\text{positive}} = -.05, t = -.57, p = \text{ns}; \beta_{\text{negative}} = .10, t = 1.17, p = \text{ns}$). Thus, as expected, the content of parent-child interactions (i.e., mean frequencies of positive and negative affect) was not a significant predictor of Post-Tx Externalizing Symptoms, after controlling for levels of Pre-Tx Externalizing Symptoms (See Table 1 for descriptive statistics).

**Table 1.** Content means and standard deviations at pre- and post-treatment.

<table>
<thead>
<tr>
<th></th>
<th>Pre-Treatment</th>
<th>Post-Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Positive Affect</td>
<td>Negative Affect</td>
</tr>
<tr>
<td>Mother (n = 57)</td>
<td>13.33 (5.39)</td>
<td>1.02 (1.51)</td>
</tr>
<tr>
<td>Child (n = 57)</td>
<td>2.40 (2.43)</td>
<td>3.02 (3.75)</td>
</tr>
</tbody>
</table>

Note. Means are displayed in regular type, and standard deviations are indicated in parentheses.

### 3.3 Treatment Outcomes

To examine changes in Externalizing Symptoms (i.e., from pre- to post-treatment) among the four comparison groups, a one-way repeated-measures ANOVA with a between-subjects factor was conducted (See Table 2 for descriptive statistics). Results revealed a significant Time effect for Externalizing Symptoms, indicating an overall decrease in children’s Externalizing Symptoms from pre- to post-treatment, Wilks’ Lambda = .51, $F (1, 53) = 5.13, p < .001$. In addition, a significant Time-by-Regulation Group interaction effect was found, Wilks’ Lambda = .81, $F (3, 53) = 4.27, p < .01$, indicating differences among the four comparison groups with regard to treatment outcome. The interaction results are presented in Figure 4. Follow-up comparisons were conducted to further investigate the significant interaction effect. As predicted, significant differences in mean levels of Externalizing Symptoms from pre- to post-treatment were found between CREG and CDREG dyads ($M_{\text{Difference}} = -.78, p = .033$),
CREG and BDREG dyads ($M_{\text{Difference}} = -10.08, p = .007$), and BREG and BDREG dyads ($M_{\text{Difference}} = -9.77, p = .012$), with regulated dyads showing a greater reduction of Externalizing Symptoms from pre-to post-treatment in all cases. In addition, there was a marginally significant difference between BREG and CDREG dyads ($M_{\text{Difference}} = -7.57, p = .055$), with BREG dyads showing a greater reduction in Externalizing Symptoms from pre- to post-treatment than CDREG dyads. Thus overall, REG dyads (i.e., CREG and BREG) showed a greater reduction in Externalizing Symptoms from pre- to post-treatment than DREG dyads (CDREG, BREG).

Table 2. Externalizing means and standard deviations at pre- and post-treatment by comparison group.

<table>
<thead>
<tr>
<th></th>
<th>Pre-Treatment Externalizing Symptoms</th>
<th>Post-Treatment Externalizing Symptoms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consistently Regulated (n = 12)</td>
<td>69.33 (7.18)</td>
<td>59.50 (9.10)**</td>
</tr>
<tr>
<td>Became Regulated (n = 11)</td>
<td>69.36 (8.87)</td>
<td>60.09 (14.98)*</td>
</tr>
<tr>
<td>Consistently Dysregulated (n = 20)</td>
<td>74.60 (4.66)</td>
<td>70.00 (7.91)**</td>
</tr>
<tr>
<td>Became Dysregulated (n = 14)</td>
<td>75.50 (5.91)</td>
<td>73.50 (6.10)</td>
</tr>
</tbody>
</table>

Note. Means are displayed in regular type, and standard deviations are indicated in parentheses. ***Significant change from pre- to post-treatment at the $p < .001$ level. **Significant change from pre- to post-treatment at the $p < .01$ level. *Significant change from pre- to post-treatment at the $p < .05$ level.

Figure 4 provides a graphic illustration of the interaction findings, and highlights the disparities between REG dyads (CREG and CDREG) and DREG dyads (CDERED and BDREG) with regard to Externalizing Symptoms at pre- and post-treatment. Although both REG and DREG dyads reported clinical levels of Externalizing Symptoms ($T > 64$) at pre-treatment, REG dyads reported fewer Externalizing Symptoms than DREG dyads, $M_{\text{REG}} = 69.35, SD = 5.14$, $M_{\text{DREG}} = 74.97, SD = 74.97, 7.84$; $M_{\text{Difference}} = 5.62, t (34.71) = 3.03, p < .01$. At post-treatment, REG dyads also reported significantly fewer Externalizing Symptoms than DREG dyads,
$M_{\text{REG}} = 59.78, \ SD = 11.98, \ M_{\text{DREG}} = 71.44, \ SD = 7.33; \ M_{\text{Difference}} = 11.66, \ t(33.13) = 4.17, \ p < .001$. By post-treatment, mean levels of Externalizing Symptoms for REG dyads were well below the clinical cutoff, whereas mean levels of Externalizing Symptoms for DREG dyads remained above the clinical cutoff. Thus, initial levels of Externalizing Symptoms do seem to have an effect in determining who benefits most from treatment. Based on the current results, it seems that dyads who come into treatment with fewer externalizing difficulties are more likely to be regulated in their interactions, and show greater reductions in externalizing symptomatology over time.

![Figure 4](image.png)

*Figure 4. Changes in externalizing symptoms from pre- to post-treatment by comparison group.*

### 3.4 Predictive Value of Slope Change Measures

In addition to the categorical approach I have taken (i.e., classifying dyads as REG and DREG), another way to examine the predictive value of dyads’ trajectories of affect over time is by deriving a continuous measure that summarizes these trajectories. To this end, I investigated the effects of slope change scores on post-treatment outcomes. Recall that I obtained slope
values by running regressions on the time-series data; slope scores were the standardized beta from these regression analyses. Slope Change scores were calculated for each dyad member by subtracting their post-treatment slope value from their pre-treatment slope value. A positive Slope Change value indicates that despite having some instances of negativity, the trend for the dyad member over time was to become cumulatively more positive. In contrast, a negative Slope Change value indicates that the dyad member became cumulatively more negative over the course of their interactions from pre- to post-treatment.

To examine the effects of slope change scores on post-treatment Externalizing Symptoms, a series of two-step hierarchical regressions were run. For each analysis, Pre-Tx Externalizing Symptoms was entered as a first predictor, and Slope Change (for either the mother or child) was entered second.

Pre-Tx Externalizing Symptoms positively predicted Post-Tx Externalizing Symptoms, $R^2 = .60$, $F = 82.68$, $p < .001$. When entered second, Child Slope Change was a significant predictor of Post-Tx Externalizing Symptoms, $R^2 = .63$, $R^2$ Change $= .03$, $\beta = -.18$, $t = -2.06$, $p = .04$. Thus as expected, Child Slope Change was a significant predictor of Post-Tx Externalizing Symptoms, after controlling for levels of Pre-Tx Externalizing Symptoms. The inclusion of Mother Slope Change as a second predictor of Post-Tx Externalizing Symptoms was in the predicted direction, but failed to reach significance, $R^2 = .62$, $R^2$ Change $= .02$, $\beta = -.13$, $t = -1.58$, $p = \text{ns}$. Based on these results, it appears that positive changes in children’s expressed affect over time are significantly related to decreased levels of externalizing problems at post-treatment.

Discussion

The primary objective of the current study was to investigate the role of dyadic regulation as a process associated with treatment success for aggressive youth. I expected that parents and children who were regulated in their interactions over time would show greater reductions in externalizing symptoms from pre-to-post treatment compared to dysregulated dyads. Moreover, I did not expect changes in the mean content of parent-child interactions to be associated with treatment outcomes. Overall, the results supported my hypotheses.

4.1 Mean Affective Content and Externalizing Symptoms

As hypothesized, results revealed that changes in the overall affective content of parent-child interactions were not associated with reports of externalizing symptoms at post-treatment. Thus, consistent with emotion theories (Izard, 1977; Tomkins; 1963) that recognize the adaptive
and important functions of all emotions, the current findings show that a) negativity in parent-child interactions is not necessarily linked to pathogenic outcomes, and b) dyads with the highest levels of positive affect are not necessarily the best functioning families. The current results also corroborate findings from previous investigations of structural changes in parent-child interactions, which have found null relationships between the content of dyadic interactions and children’s behavioural outcomes (e.g., Granic et al., 2007; Hollenstein et al., 2004). With regard to the treatment of childhood aggression, these findings suggest that the overall reduction or elimination of negative affect (and subsequent increase of positive affect) in parent-child interactions may not be the primary process of change underlying successful PMT/CBT programs.

4.2 Dyadic Regulation and Externalizing Symptoms

With regard to my second and focal hypothesis, results supported the prediction that regulated dyads would show greater reductions in externalizing symptoms from pre-to post-treatment compared to dysregulated dyads. Although the treatment program was effective in reducing externalizing symptoms from pre- to post-treatment for the sample as a whole, there was variability in treatment outcomes. I was able to predict the extent to which children’s behaviour improved based on whether or not their parent-child interactions were regulated. Parent-child interactions are one of the most influential contexts for the development of children’s broader social, emotional, and behavioral patterns (Morris et al., 2007); therefore, regulation in parent-child interactions may be an important process underlying treatment success for aggressive youth. When a dyad is regulated in its interaction patterns, a safe context is created for children, in which they can be negative, but also learn how to effectively regulate or dampen that negativity. As the content results showed, negativity was equally present in the interactions of both regulated and dysregulated dyads. However, expressed negativity was not problematic for regulated dyads because parents and children in this group learned how to be negative without becoming entrenched in it. Parents and children in regulated dyads could appropriately express and respond to negativity, such that over time, they were able to work through instances of negativity and return to more positive and/or neutral ways of interacting with one another. Thus, consistent with studies of dyadic flexibility (Granic et al., 2007; Hollenstein et al., 2004), contingent responsiveness (Dumas and LaFreniere, 1993), and dyadic synchrony (Harrist et al., 1997), these results highlight the importance of examining dyadic structure variables (i.e., how interactions unfold over time), rather than content variables that
collapse those patterns into average scores, when trying to understand changes in children’s problem behaviour.

Interestingly, however, a time by regulation group interaction effect was found for externalizing symptoms, such that regulated dyads reported lower (albeit clinically significant) pre-treatment levels of externalizing symptoms, and demonstrated clinically more significant treatment gains compared to dysregulated dyads. One interpretation that may be drawn from these results is that children who come into treatment with lower levels of externalizing problems are more amenable to change both in terms of their aggressive behaviours and in their abilities to become regulated in their interactions with their parents. Research has shown that aggressive behaviours that begin early in life, and are severe, varied, and displayed frequently in multiple contexts, tend to be more stable over time (Loeber, 1998; Moffitt, 1993). Thus, perhaps a more intensive and multisystemic intervention is needed for those individuals who begin treatment with the highest levels of externalizing symptomatology.

Another possibility is that children who came into treatment with lower levels of externalizing problems also had more supportive parent-child relationships to begin with. With the additional support and guidance from the intervention program, these initially supportive dyadic relationships may have become even more supportive and conducive towards behavioural improvement. Because warm and supportive parent-child interactions are known to facilitate the development of prosocial behaviours, and mitigate the development of problem behaviour (Aunola and Nurmi, 2005; Finkenauer et al., 2005), increased support within the dyadic context may have made it easier for some dyads to incorporate new skills. A relatively safe and flexible parent-child relationship may have provided just the right context to practice the new parenting skills and cognitive-behavioural strategies that were introduced in the treatment program. In contrast, children with more severe externalizing problems at pre-treatment may have also had less supportive parent-child relationships at pre-treatment, thus making it difficult to incorporate and practice all that was learned throughout the course of the intervention. This may be why those children who began treatment with high levels of externalizing behaviours were also more likely to have dysregulated interactions with their mothers.

4.3 Individual Trajectory Changes and Externalizing Symptoms

Finally, my prediction that positive changes in the real-time affective trajectories of dyad members would predict lower levels of externalizing symptoms at post-treatment was partially supported. Positive changes in children’s affective trajectories were significantly related to
externalizing outcomes at post-treatment. For mothers however, findings were in the right direction, but not significant. Several interpretations may be drawn from these results.

First, it may be that children’s abilities to become regulated in their interactions make their behaviour more malleable compared to their mothers. In contrast to adults, children are in a constant state of growth and development, and have had less time and experience to become entrenched in particular behaviour patterns. Therefore, children may be more open to, and capable of, the cognitive and behavioral changes required to become regulated in their interactions (e.g., learning to change negative thought patterns, attribution tendencies, and acting out behavioral patterns; Dodge et al., 2006; Rubin, Bream, and Rose-Krasnor, 1991).

In addition, it may be that changes in children’s affective trajectories are more salient indictors of behaviour improvement than mothers’ trajectories. Given that the outcome measure was children’s externalizing behaviours, it seems likely that changes in the child’s own abilities to regulate his interactions with another would be most closely linked to his improvement. Research suggests that aggressive children often misinterpret the thoughts and intentions of others and/or lack the ability to consider the feelings, thoughts, and intentions of others (see Dodge et al., 2006; Loeber & Hay, 1997, and Rubin, et al., 1991, for reviews). Thus, learning how to operate in harmony with another person (i.e., becoming regulated in interactions with others) may be an indication that children are developing the prosocial cognitive and behavioural skills that are targeted in CBT interventions (e.g., changing hostile attributions and impulsive behaviour patterns), and are closely linked to behaviour improvement.

Alternatively, it may be that the changes in mothers’ affective regulation trajectories were more idiosyncratic than changes in children’s trajectories. Perhaps it was important for some mothers to become more neutral and contingent with children’s negative expressions, rather than more positive over time, in order to reach a state of dyadic regulation. For instance, Denham (1993) found that mothers’ calm and neutral responses to children’s anger were associated with lower levels of expressed anger in alternate contexts. Conversely, other mothers may have needed to become increasingly more positive throughout the course of their interactions with their children in order to reach a state of dyadic regulation. Because the children in the SNAP™ program were referred on the basis of their negativistic and aggressive behaviour patterns, it was very important that they learned how to manage their aggressive tendencies and to become more positive in their interactions over time. For mothers, however, the necessary changes to achieve a state of dyadic regulation may have been more variable.
4.4 Implications

There are some important implications for clinical practice that can be drawn from the findings in the current study. First, by showing that negativity is a normal component of parent-child interactions, these findings can help parents and children develop a more realistic understanding of what a “healthy” family interaction is like. Instead of striving to obliterate all expressions of negativity through treatment (a virtually impossible task), clinicians can work with parents and children to help them understand that some degree of negativity is appropriate within the interaction context, as long as you learn how to cope with it effectively (i.e., regulate it within the course of the total interaction). Second, focusing on the development of dyadic regulation skills in PMT programs may help parents become more forgiving of themselves, and less likely to “give up” or feel like bad parents when negative or angry outbursts do arise. An understanding of dyadic regulation and its implications for children’s behavioral development may in fact instill a sense of competency and empowerment on the part of the parent as she tries to apply the teachings of PMT in her efforts to help mitigate her child’s aggressive behaviour problems.

Finally, because an increasing proportion of aggressive behaviours become targeted toward dyadic relationships during the elementary school years, (Coie et al., 1999), learning to become regulated in dyadic interactions is likely an important skill for children to develop. Although I did not explore the generalization of dyadic regulation to other contexts outside of mother-child interactions (e.g., peer interactions), other studies have shown that adaptive interaction patterns within the family are linked to children’s functioning in social contexts outside the home (e.g., Dumas & LaFreniere, 1993). Thus, helping parents and children create a safe context that facilitates the development of dyadic regulation skills may help children become more regulated in their interactions with their peers, teachers, and other adults, and less likely to resort to aggressive means.

4.5 Limitations and Future Directions

There are a number of limitations to the current study that must be acknowledged. First, because all of the measures were collected concurrently, I cannot infer causation regarding the relationship between dyadic regulation and childhood aggression. Longitudinal designs are needed to elucidate the direction of influence so that we can determine whether dyadic regulation is a mechanism of change facilitated by treatment, a corollary of behaviour improvement, or part of the larger transactional relationship between parent-child interactions and child behavioral
outcomes. Follow-up studies should address these questions, as well as examine whether the changes and relationships found in the current study are maintained over the long-term (e.g., at one-year follow-up).

Second, I did not employ a randomized control design in my investigation because I was interested in examining individual differences in treatment success, rather than the efficacy of a particular treatment approach or method. Without a comparison control group, I cannot sufficiently conclude that the reported changes in externalizing behaviours were due to treatment efforts. However, a number of randomized control studies conducted on PMT and CBT programs have demonstrated their efficacy in treating childhood aggression (see Brestan and Eyberg, 1998, and Eyberg et al., 2008, for reviews).

Third, due to the small number of girls in the sample, I was unable to explore gender differences in the current study. Given that recent research has drawn attention to the differences in aggressive behaviour between girls and boys (Broidy et al., 2003; Dodge, Coie, & Lynham, 2006, for review), future studies should seek to explore these differences within the intervention context. Finally, despite being one of the strengths of the current study, the real-world nature of this investigation invites some limitations. These include, but are not limited to, attrition and difficulty in obtaining full sets of measures from participants at all time points.

4.6 Conclusion

While facilitating the development of dyadic regulation skills may not be an explicit goal in treatment programs for aggressive youth, the current findings suggest that regulation in parent-child interactions may be a key process underlying treatment success for aggressive youth. Although the findings in this study are preliminary, they contribute to the growing body of research examining structural changes in parent-child interactions, showing that how parent-child interactions unfold over time is important to understanding the manifestation and reduction of children’s aggressive behaviour patterns.


