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# Changes in maternal depression are associated with MST outcomes for adolescents with co-occurring externalizing and internalizing problems

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A B S T R A C T

The efficacy of Multisystemic therapy (MST) in treating adolescent aggression has been established, however, not all youth and their families benefit from MST. One reason for this treatment variability could be the failure to distinguish between different aggressive subtypes with different risk factors, developmental prognoses and treatment needs. We investigated whether changes in maternal depression over MST would lead to different outcomes for two aggressive subtypes: pure externalizers (EXT) and mixed externalizers/internalizers (MIXED). Forty-two EXT and 27 MIXED youth and their families underwent MST for six months. Maternal depression, youth externalizing and internalizing behaviour were assessed before and after MST. Results showed a marginally greater change in externalizing for EXT youth. In addition, reductions in maternal depression were related to successful treatment outcomes for MIXED youth only. Our findings have implications for MST clinicians, namely the importance of reducing depressive symptoms in mothers of MIXED youth to improve their outcomes.



Multisystemic therapy (MST) was developed to treat aggressive behaviour in adolescents by targeting some key predictors of serious violent behaviour that are found within the youth's family and ecological context. Randomized control trials have demonstrated the efficacy of MST (Borduin et al., 1995; Henggeler, Melton, & Smith, 1992; Leschied & Cunningham, 2002; Ogden & Halliday-Boykins, 2004), however, not all youth and their families benefit from this treatment (Littel, 2006). One reason for the variability in treatment outcome could be the failure to distinguish between subtypes of aggressive youth who undergo MST. At least two aggressive subtypes have been identified: children and youth who exhibit externalizing behaviour only (EXT) and children and youth who exhibit both internalizing and externalizing symptoms (MIXED). Epidemiological research has found that a large proportion of aggressive children and youth also exhibit co-occurring symptoms of internalizing behaviour (Gould, Bird, & Jaramillo, 1993). In addition, symptoms of conduct disorder and depression/anxiety co-occur at higher rates than would be expected by chance (Zoccolillo, 1992), and rates of co-occurrence between these two disorders increase in adolescence (Angold & Costello, 2001).

The distinction between these two subtypes is supported by research demonstrating that EXT and MIXED children and youth have distinct etiologies, long term outcomes and treatment responses (Capaldi, 1991, 1992; Capaldi & Stoolmiller, 1999; Cole & Carpentieri, 1990; Kovacs, Paulauskas, Gatsonis, & Richards, 1988). Studies have found that, compared to EXT children, MIXED children exhibited poorer academic performance, more substance abuse problems (Capaldi, 1991) and were more socially rejected or "controversial" with their peers (Cole & Carpentieri, 1990). Regarding outcomes, it has been found that

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MIXED youth tended to have more maladaptive developmental outcomes than EXT youth (Capaldi, 1992; Capaldi & Stoolmiller, 1999; Kovacs et al., 1988; Oland & Shaw, 2005). For example, MIXED children were more likely to have suicidal ideations, be arrested (Capaldi, 1992) and to affiliate with deviant peers and engage in delinquent behaviours (Talbott & Fleming, 2003) in adolescence. Regarding adult outcomes, Capaldi and Stoolmiller (1999) found that MIXED youth were more poorly adjusted than EXT youth as young adults. Finally, studies comparing treatment responses in the two subtypes have found that MIXED tended to fare better in Parent Management Treatment (PMT) than EXT children and youth (Beauchaine, Gartner, & Hagen, 2000; Beauchaine, Webster-Stratton, & Reid, 2005; Costin & Chambers, 2007; Kazdin & Whitley, 2006).

Taken together, there is some convincing evidence suggesting that MIXED and EXT youth represent two different subgroups. The risk factors leading to the distinctions between MIXED and EXT children and youth are less clear. In the current study, we explored whether maternal depression was a key factor that distinguished subtypes of aggressive adolescents. In addition, we examined whether changes in maternal depression following MST were related to aggressive outcome differently in the two subtypes.

Two studies have examined the possibility that maternal depression differentiates MIXED and EXT youth (Ge, Best, Conger, & Simmons, 1996; Kopp & Beauchaine, 2003). Kopp and Beauchaine (2003) reported higher levels of maternal depression in youth with co-occurring conduct disorder and depression (MIXED), compared to youth with conduct disorder only (EXT). Further, they found that as the severity of mothers' depression increased, so did the risk of children developing their own depressive symptoms. In another study, Ge et al. (1996) found that lower levels of maternal warmth and higher levels of hostility (affective parenting dimensions) increased the risk for co-occurrence of conduct disorder and depression in children, as compared with the risk for developing conduct disorder only or depression only.

One reason why maternal depression might be a risk factor for MIXED, but not EXT, youth could be the higher rates of internalizing problems among children of depressed mothers. Various mechanisms of transmission, including parenting style, discipline practices and genetics, have been identified to explain how a child with a depressed mother can become depressed themselves (for a review, see Goodman & Gotlib, 1999).

If maternal depression is a risk factor for the development of adolescents' MIXED symptomatology, it may be that a reduction in maternal depression following treatment is related to positive outcomes in MIXED youth. Several studies have examined the impact of reducing mother's depression on children's externalizing behaviour (Forman et al., 2007; Lee & Gotlib, 1991; Modell et al., 2001). However, results have been mixed: some studies have demonstrated that reducing maternal depression had a positive impact on children's externalizing problems (Modell et al., 2001), and others have failed to find an association (Forman et al., 2007; Lee & Gotlib, 1991). The mixed findings may be attributable to the fact that these studies did not distinguish between aggressive subtypes. Further, these studies investigated programs where the sole focus was to treat mother's depression (e.g., anti-depressant medication), and not the child's aggressive behaviour.

In MST, the goal is to treat adolescent aggression by intervening directly in the key social systems in which youth are embedded (i.e., family, peer group, neighbourhood). Processes and risk factors within these contexts are targeted and altered using empirically-based therapeutic interventions, for example, marital therapy, cognitive-behavioural therapy (CBT) and PMT. MST clinicians work closely with the youth's family to support and empower family members to change the factors that promote and maintain adolescent aggression. These factors can be found outside of the family context (e.g., deviant peers), however, often times they are found within the family context (e.g., negative parenting practices, poor family relations). A major strength of MST is that each youth and their family receive a unique treatment plan depending on their specific needs. For example, if a youth's mother is depressed, the MST clinician is trained to identify the depression as well as whether it is contributing to the child's problems (e.g., risk factor). If the mother's depression is indeed a risk factor, the clinician would then execute an empirically-validated treatment approach (e.g., CBT) to target the depression. The success of MST has been attributed to the highly individualized, comprehensive and intense nature of the treatment. In addition, MST therapists carry low caseloads, are available around-the-clock, are supervised weekly and strictly adhere to the nine treatment principles that operationalize MST (Rowland et al., 2000).

To date, there are no studies that have examined the impact of reductions in maternal depression on child behavioural outcomes in MST. However, some studies that have explored PMT as a prevention program for problems in at-risk children have examined the impact of improvements in maternal depression on child impairment (DeGarmo, Patterson, & Forgatch, 2004; Patterson, DeGarmo, & Forgatch, 2004; Shaw, Dishion, Connell, Wilson, & Gardner, 2009). Patterson et al. (2004) found that improvements in maternal depression were associated with positive externalizing outcomes, however, this association was mediated by improvements in child internalizing problems. DeGarmo et al. (2004) found that improvements in child antisocial behaviour preceded reductions in maternal depressive symptoms and, like the results in Patterson et al. (2004), this association was mediated by improvements in child internalizing behaviour. The authors also found that the association between changes in maternal depression and child externalizing behaviour was mediated by improvements in parenting skills. Finally, Shaw et al. (2009) found that reductions in maternal depression mediated improvements in child externalizing behaviour, however, this mediation effect was small in magnitude. Results of the PMT studies suggest a weak link between improvements in maternal depression and externalizing outcomes. The weak or mixed findings linking improvements in maternal depression and children's externalizing problems may be attributed, at least in part, to the lack of attention that has been paid to the heterogeneity of these children. Our aim was to address this gap by examining differences between subtypes.

The main objective of the present study was to explore maternal depression as a factor related to externalizing improvements over the course of MST in MIXED and EXT youth. Two hypotheses were tested: (1) it was expected that there would be higher rates of depression among mothers of MIXED compared to mothers of EXT youth at the beginning of

treatment and (2) a reduction in maternal depression from pre- to post-treatment was hypothesized to be related to a reduction in externalizing behaviour in MIXED, but not EXT youth.

## Method

### *Procedure*

Data for the present study were taken from an ongoing program of research that is being conducted at The Hospital for Sick Children in Toronto, Ontario. Between October 2004 and September 2007, families who participated in MST therapy across five agencies in Ontario, Canada were asked if they wanted to participate in a research study. No control group was included because our primary goal was to identify differential treatment processes related to positive outcomes among subtypes of clinical youth who underwent MST. If a family agreed to participate, they were contacted by a research assistant and interviews were conducted with the youth's parent over the telephone. The research assistant was blind to the study's hypotheses and treatment effects. Measures assessing demographics and parental depression were administered to the youths' mothers by telephone interview at pre-treatment and post-treatment (approximately 6 months after pre-treatment). Internalizing and externalizing behaviour were rated by MST clinicians at pre- and post-treatment.

### *Participants*

Participants included 69 adolescents and their families receiving MST across 5 agencies in Ontario. To be included in the study, adolescents must have exhibited physical aggression at home and in school or in the community, been at risk for out-of-home placement and they must have been arrested at least once. Originally, there were 106 families who met eligibility criteria and began study participation. Seven of these families were excluded from data analysis for the following reasons: new therapist was assigned to the family ($n = 3$), child moved away from home where parent participating in therapy resided ($n = 2$), therapy discontinued for summer break ($n = 1$), or parent chose to discontinue participation ($n = 1$). Of the remaining 99 families, 17 were excluded from data analysis either due to poor timeliness in the collection of the outcome measure at post-treatment (e.g., collected eight months after pre-treatment), or due to missing post-treatment data. In addition, 10 families were excluded because youth were under 10 years of age. Finally, three adolescents could not be classified as MIXED or EXT because of minimal or no impairment in externalizing behaviour at pre-treatment; these three families were also excluded from data analysis. There were 69 families included in the final sample.

### *Measures*

The Centre for Epidemiologic Studies Depression Scale (CES-D; Radloff, 1977) was used to measure the severity of depressive symptoms experienced by the youth's mother in the past week. The CES-D is a 20-item instrument that requires a response to each item (e.g., "I thought my life had been a failure"; "My appetite was poor") using a four-point scale, indicating whether depressive symptomatology was experienced none of the time or rarely (0) to most or all of the time (3). Elevated scores on the CES-D serve to identify which individuals might be depressed. CES-D has been widely used in epidemiological research studies, and is a well-established instrument that demonstrates good reliability (e.g., Cronbach's alpha at $\alpha = .85$ in the general population; Radloff, 1977). Following the recommendations of Santor and Coyne (1997), we used a shortened version of CES-D which includes 9 specific items chosen from the original 20 items. Shortened versions of CES-D have retained high internal consistency (Cronbach's alpha ranging from .76 to .84; Andresen, Malmgren, Carter, & Patrick, 1994). In the current study, the internal consistency of the CES-D scale at pre-treatment is $\alpha = .85$.

To examine our first hypothesis that MIXED youth would be more likely than EXT youth to have depressed mothers, a cut-off score of 4 on the 9-item CES-D was used to classify mothers as depressed versus non-depressed (Santor & Coyne, 1997). Mothers who scored at or above this cut-off on the CES-D were deemed depressed, and those who scored below this cut-off were deemed non-depressed. Santor and Coyne (1997) found that a cut-off point of 4 on the shortened version yielded a similar degree of sensitivity and a 20% improvement in specificity when compared to the original CES-D with a standard cut-off of 16 (notably, a well-established cut-off for identifying clinical cases of depression; Radloff, 1977).

The Child and Adolescent Functional Scale (CAFAS; Hodges & Wong, 1997) is a clinician-rated instrument that measures the degree of functional impairment across eight behavioural and emotional domains in children and youth between the ages of 6 and 17 years. Before they can administer the CAFAS, clinicians undergo a training period conducting by a CAFAS-certified trainer. Clinicians can become CAFAS-certified only after they achieve a pre-specified level of reliability on a number of vignettes they must score following the training period. To rate the youth, clinicians gather information from multiple informants in various settings, including parents, teachers, school counsellors and grandparents. When scoring the instrument, each of the eight domain/subscale items is categorized as Severe (30), Moderate (20), Mild (10) or Minimal (0), reflecting impairment in functioning. A total externalizing outcome score was calculated by summing impairment in functioning scores for each of the following four externalizing subscale items: Home (e.g., running away from home, disruptive behaviour at home), School (e.g., truancy, disruptive behaviour at school), Community (e.g., delinquent activity) and Behaviour towards Others (e.g., harm towards other people or animals). A total internalizing score was calculated by summing two internalizing subscale items: Moods and Emotions (e.g., symptoms of anxiety and depression) and Self-Harm Behaviour (e.g., self-destructive behaviour, suicidal ideation).

The instrument has been shown to be both valid and reliable (Hodges & Gust, 1995; Hodges & Wong, 1996). Specifically, Hodges and Wong (1996) demonstrated good reliability across raters for: CAFAS total scores (intraclass correlations ranging from .92 to .95), a subscale combining School, Home and Community items (.79–.90), Behaviour towards others (.83–.93) and Moods/emotions (.74–.94). Similarly, test-retest for the above scales and subscales showed good reliability (Hodges & Wong, 1996). CAFAS has also been shown to be sensitive to clinical change over time (Hodges, Wong, & Latessa, 1998).

Other researchers have cut across CAFAS subscales to create various client typologies and to examine externalizing and internalizing problems in children and youth (Hodges & Wotring, 2000; Hodges, Xue, & Wotring, 2004; Lewis et al., 2008). Further, it is noteworthy that CAFAS total and subscale scores have been shown to be related to the Internalizing and Externalizing subscales of the well-established Child Behavioural Checklist (CBCL; Achenbach, 1991; Hodges & Wong, 1996; Rosenblatt & Rosenblatt, 2002). In the current study, the internal consistency of the CAFAS externalizing scale at pre-treatment is $\alpha = .65$ and the CAFAS internalizing scale at pre-treatment is $\alpha = .59$.

### *Classification criteria*

Adolescents were classified as either MIXED or EXT based on CAFAS scores at pre-treatment: youth who were moderate or severe on any of the four externalizing subscales and moderate or severe on any of the two internalizing subscales were classified as MIXED. EXT youth were those who were moderate or severe on any other four externalizing subscales, and minimally or not impaired on both internalizing subscales.

Of the 69 adolescents in our sample, 42 were pure externalizers (EXT) and 27 were internalizers/externalizers (MIXED). Youth were between the ages of 10 and 17 years. Of the EXT youth, 29 were male and 13 were female; 22 MIXED youth were male and 5 were female. The majority of the youth were Caucasian, and more than half of the parents were either married or living common-law with their partner. There were no significant differences found between EXT and MIXED in age, gender, ethnicity, parents' marital status, household income and mother's education (see Table 1 for means and percentages).

## Results

### *Preliminary analyses*

Concerning the entire sample, repeated measures ANOVA revealed a significant reduction in externalizing behaviour, $F(1, 66) = 207.75$, $p < .001$, partial $\eta^2 = .76$ from pre- to post-treatment. Results also indicated a significant reduction in maternal depression over the course of treatment, $F(1, 68) = 7.92$, $p < .01$, partial $\eta^2 = .10$.

When we compared the two subtypes on pre-treatment levels of impairment, ANOVAs revealed that MIXED and EXT youth did not differ in externalizing symptoms at pre-treatment, and that, by definition, MIXED youth had significantly more internalizing symptoms than EXT youth at pre-treatment, $F(1, 67) = 121.67$, $p < .001$, partial $\eta^2 = .65$.

While each subtype showed a significant reduction in externalizing behaviour from pre- to post-treatment, there was a trend towards an interaction between Aggressive subtype and pre- to post-externalizing change, $F(1, 65) = 2.85$, $p < .10$, partial $\eta^2 = .04$ indicating a tendency towards greater change for EXT youth (see Fig. 1).

### *Hypothesis 1: testing pre-treatment differences between subtypes on maternal depression*

An ANOVA revealed no significant differences between EXT and MIXED on maternal depression at pre-treatment. However, when we classified mothers as depressed or non-depressed, chi-square analysis revealed a significant difference in the proportion of depressed mothers in the MIXED and EXT groups at pre-treatment, $\chi^2(1) = 5.02$, $p < .05$. As expected, mothers of MIXED youth were more likely to be depressed than mothers of EXT youth (see Fig. 2).

### *Hypothesis 2: testing the relationship between changes in maternal depression and changes in externalizing behaviour for the two subtypes*

To test our second hypothesis that a reduction in maternal depression would be related to a reduction in externalizing problems for MIXED, but not EXT youth, a moderator analysis was conducted using EXT/MIXED classification as the moderator variable (Aggressive Subtype). Using guidelines outlined in Baron and Kenny (1986), a two-way ANOVA was conducted to investigate whether there was a statistical interaction between Aggressive Subtype (dichotomous moderator) and externalizing change[2] on the dependent variable (post-maternal depression, controlling for pre- maternal depression). A significant interaction would indicate that aggressive subtype moderates the relationship between maternal depression change and externalizing change, warranting separate linear regression analyses for each subtype.

[2] Externalizing change was calculated using the raw difference score method (pre-treatment scores minus post-treatment scores).

**Table 1**
Age, gender, ethnicity, parent marital status, parent education and household income for MIXED and EXT youth.

| Variable | MIXED ($n = 27$) | EXT ($n = 42$) | $\chi^2/F$ |
|---|---|---|---|
| Age (SD) | 13.41 (*1.95*) | 14.05 (*1.56*) | 2.28[a] |
| Gender (%) | | | |
| Male | 81.5 | 69.0 | 1.32 (1) |
| Female | 18.5 | 31.0 | 7.22 (7) |
| Ethnicity (%) | | | |
| White | 74.1 | 71.4 | |
| Black | .0 | 9.5 | |
| Hispanic | .0 | 2.4 | |
| Aboriginal | 3.7 | 2.4 | |
| South Asian | 3.7 | 2.4 | |
| Southeast Asian | .0 | 4.8 | |
| West Asian or Arabic | 3.7 | .0 | |
| Other (including mixed) | 14.8 | 7.1 | |
| Parent marital status (%) | | | 5.86 (3) |
| Married or common-law | 59.3 | 54.8 | |
| Separated or divorced | 14.8 | 31.0 | |
| Single | 25.9 | 9.5 | |
| Other (e.g., deceased) | 4.8 | 4.7 | |
| Parent education (%) | | | 4.90 (7) |
| Grade 8 or less | 7.4 | 2.4 | |
| Some high school – did not graduate | 14.8 | 19.0 | |
| Graduated from high school | 25.9 | 16.7 | |
| Some community college | 22.2 | 14.3 | |
| Graduated from community college | 14.8 | 26.2 | |
| Some university | .0 | 4.8 | |
| Graduated from university | 11.1 | 14.3 | |
| Post-graduate or professional degree | 3.7 | 2.4 | |
| Household income (%) | | | 10.98 (7) |
| Under $10,000 | 7.4 | .0 | |
| Between $10,000 and $14,999 | 3.7 | 17.5 | |
| Between $15,000 and $19,999 | 7.4 | 15.0 | |
| Between $20,000 and $29,999 | 18.5 | 5.0 | |
| Between $30,000 and $39,999 | 14.8 | 10.0 | |
| Between $40,000 and $49,999 | 14.8 | 7.5 | |
| Between $50,000 and $59,999 | 14.8 | 12.5 | |
| $60,000 or more | 18.5 | 42.5 | |

[a] Indicates *F*-statistic reported. Degrees of freedom for chi-square presented in brackets.

The moderator analysis demonstrated a significant interaction effect between Aggressive Subtype and externalizing change on maternal depression change, $F(6, 47) = 4.20$, $p < .01$, partial $\eta^2 = .35$ indicating that the association between a change in maternal depression and externalizing change was different for EXT and MIXED youth.

To examine this association more closely by subtype, separate linear regression analyses were performed. Results showed that, for MIXED youth, externalizing change accounted for an additional 40% of the variance in post-treatment maternal depression, controlling for pre-maternal depression. For EXT youth, externalizing change did not account for any additional variance in post-maternal depression, controlling for pre-maternal depression. These results support our second hypothesis that improvements in maternal depression are related to reductions in externalizing behaviour for MIXED, but not EXT youth. Table 2 presents the separate linear regression results for MIXED and EXT youth.

*Supplementary analysis*

Thus far, we have been defining improvements based on externalizing change because the adolescents in our study were initially referred for their externalizing problems. However, it seems important to examine changes in internalizing behaviour over treatment in MIXED youth given their co-occurring internalizing problems. Repeated measures ANOVA showed that internalizing behaviour improved significantly from pre- to post-treatment in MIXED youth, $F(1, 23) = 36.49$, $p < .001$, partial $\eta^2 = .61$. Concerning the relationship between changes in maternal depression and internalizing outcome, linear regression analysis revealed a trend towards an association between a reduction in maternal depression and improvements in youth

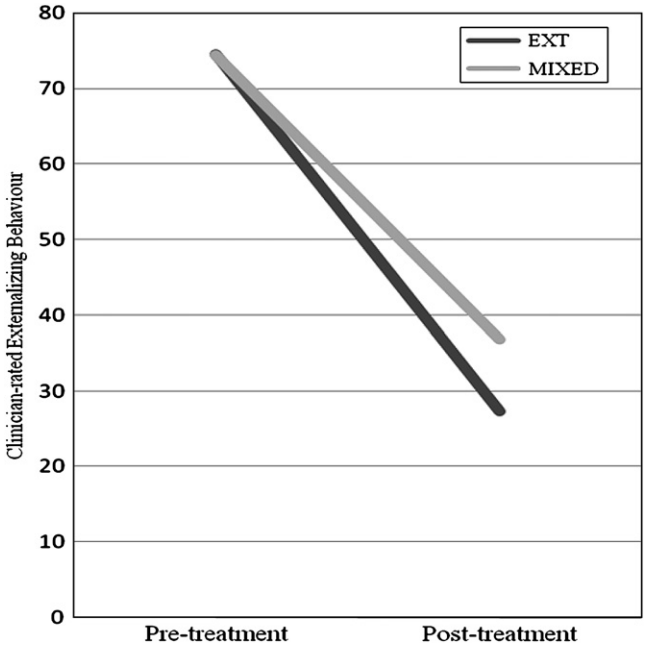


**Fig. 1.** Externalizing behaviour from pre- to post-treatment in MIXED and EXT youth.

internalizing behaviour – internalizing change accounted for an additional 12% of the variance in post-maternal depression above and beyond pre-maternal depression, $R^2$ change = .12, $F(1, 21) = 3.15$, $p < .10$. However, when externalizing change was entered into the regression model first, internalizing change did not account for any additional variance in post-maternal depression (controlling for pre-maternal depression), $R^2$ change = .01, $F(1, 20) = .51$, ns.

## Discussion

Overall, both MIXED and EXT showed significant improvements in externalizing behaviour over the course of MST. Although both subtypes demonstrated significant improvements in externalizing behaviour, the trend towards greater improvements in the EXT group was inconsistent with previous research showing that MIXED demonstrate more positive outcomes in treatment than EXT youth (Beauchaine et al., 2005; Costin & Chambers, 2007; Kazdin & Whitley, 2006). One reason for our finding may be because MST was developed to treat serious violent behaviour in youth and, therefore, may lead to more positive outcomes for EXT youth whose problem behaviours are primarily antisocial. Nonetheless, MIXED youth still showed a significant reduction in their externalizing behaviour over the course of MST. We hypothesized that maternal depression was a factor related to reductions in aggressive behaviour in this subtype.

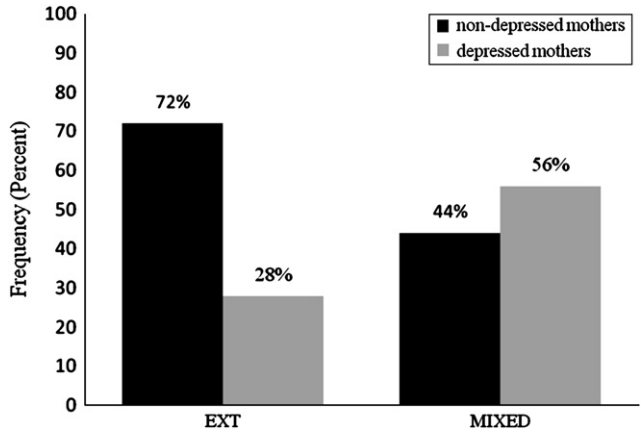


**Fig. 2.** Frequency of maternal depression in MIXED and EXT youth.

**Table 2**
Linear regression results for externalizing change predicting post-treatment maternal depression in MIXED and EXT youth.

| Variable | MIXED ($n = 42$) | | | EXT ($n = 27$) | | |
|---|---|---|---|---|---|---|
| | *B* | SE *B* | $\beta$ | *B* | SE *B* | $\beta$ |
| Model 1 | | | | | | |
| Pre-maternal depression | .22 | .19 | .24 | .63 | .13 | .61** |
| Model 2 | | | | | | |
| Pre-maternal depression | .21 | .15 | .23 | .63 | .13 | .61** |
| Pre- to post-externalizing Δ | −.06 | .02 | −.64* | .01 | .02 | .04 |
| $R^2$ (Model 1) | | .06 | | | .38 | |
| *F* (Model 1) | | (1,40) 1.36 | | | (1,23) 24.03** | |
| $R^2$ (Model 2) | | .46 | | | .38 | |
| *F* (Model 2) | | (1,39) 16.44* | | | (1,22) .11 | |

Note. For externalizing change, a positive score reflects improvement from pre- to post- and a negative score reflects increased impairment. For maternal depression at pre- and post-, higher positive score reflects more impairment. Degrees of freedom for the *F*-statistic are presented in brackets. **$p < .0001$; *$p < .001$, two-tailed.

*Maternal depression as a risk factor in MIXED versus EXT youth*

First, we wanted to ascertain that maternal depression was a risk factor for MIXED youth. Supporting our first hypothesis, we found that a higher proportion of mothers of MIXED adolescents were depressed, compared to mothers of EXT youth. This finding is consistent with the literature showing that maternal depression and related affective parenting dimensions (e.g., low warmth, high hostility) are more strongly associated with MIXED, than EXT, youths' problem behaviours (Ge et al., 1996; Kopp & Beauchaine, 2003).

*Maternal depression as a factor related to reductions in externalizing behaviour in mixed youth*

If maternal depression is a risk factor for the MIXED subgroup, we expected that reductions in maternal depression following treatment would be related to greater reductions in externalizing behaviour in MIXED youth. Our results supported this hypothesis. Given that our measurements were collected concurrently, however, the direction of causality is unclear. Drops in maternal depression could have influenced adolescents' improvements, but the opposite could explain the data: youths' improvements in externalizing behaviour may have caused levels of maternal depression to decrease. Of course, a reciprocal relationship between changes in maternal depression and changes in child behavioural problems is also possible. During treatment, improvements in mother's depression may positively affect the child's behaviour (e.g., via better parental monitoring; child is more motivated because of their mother's efforts). At the same time, improvements in the children's behaviour are likely to make their mother feel better (about herself, her child and/or her parenting), thus positively affecting her mental health. The influence of the child's behaviour on the mother's mental health is consistent with DeGarmo et al. (2004) who found that changes in child externalizing problems over PMT preceded mother's improvements in depression, as well as other research demonstrating that mothers' depression is influenced by their child's aggression (Elgar, McGrath, Waschbusch, Stewart, & Curtis, 2004; Pelham et al., 1997).

Another possibility is that, for MIXED youth, reduced maternal depression is related to a third variable such as improvements in internalizing symptoms, which may then pave the way for externalizing changes (DeGarmo et al., 2004; Patterson et al., 2004). For example, observing that their mother is less depressed may reduce anxiety or increase optimism and positivity in MIXED youth. These internalizing changes may then lead to improvements in externalizing behaviour (i.e., less sadness to lash out over; relief and then momentum to make behavioural changes). These speculations about internalizing change prompted a supplementary regression analysis for the MIXED subgroup. However, we found that a reduction in maternal depression was more strongly associated with externalizing change (than internalizing change) in MIXED youth.

*Limitations*

The current study is limited by a number of factors that require some discussion. First, the sample size was small and, further, the size of the MIXED subgroup was especially small. Thus, our conclusions regarding group differences were limited; replication in a larger sample is necessary to arrive at more definitive conclusions. Second, our research was conducted in partnership with community agencies to demonstrate how MST works in "real world" settings. Although this is one of the strengths of our study, it also serves as a limitation in that a randomized control trial was not feasible, rendering it difficult to demonstrate definitively whether the treatment caused reductions in youth problems and maternal depression. Third, we assessed adolescent problems based solely on reports from clinicians. It would have been optimal to assess adolescent outcomes and classify subtypes based on information from multiple raters (e.g., youths, teachers, peers). By using multiple raters, a more complete picture of emotional and behavioural problems across different contexts could be obtained. However, bias due to shared method variance is reduced in the current study because different reporters assessed maternal depression

and youth problems. Fourth, it is noteworthy that alpha coefficients for the CAFAS externalizing and internalizing subscales were low, raising the question about whether CAFAS subscales are reliably assessing these constructs. Fifth, although the 9-item CES-D cut-off score of 4 efficiently identifies cases of depressed individuals (Santor & Coyne, 1997), there are some problems associated with dichotomizing the CES-D (e.g., loss of power). Sixth, our study examined clinical change, and factors associated with this change, concurrently (at pre- and post-treatment). As a result, causal conclusions about the direction of influence cannot be drawn from our research. Also, we measured externalizing change using raw difference scores. This method of analyzing change has been criticized for its problems with low reliability and validity (especially when alpha levels at specific time points are low) and because there are often correlations between change and initial levels (Rogosa, Brandt, & Zimowski, 1982). One alternative to the raw difference score method is to use latent change models (Beyers & Goossens, 2008; McArdle, 2009). This method resolves the issue of measurement error – a key problem associated with the raw difference score method. Finally, we acknowledge that there are many other youth characteristics that could be studied in relation to maternal depression and outcome (e.g., school achievement). However, we chose to examine MIXED versus EXT youth because subtyping based on the presence of co-occurring symptoms has been one of the most common strategies for classifying aggressive children and youth.

*Future directions and clinical implications*

Despite the above limitations, our results point to the potential importance of maternal depression in the development and treatment of MIXED youth. To better understand the process by which reductions in maternal depression are related to externalizing changes in youth, future research should focus on mediators of this relationship in MIXED youth, namely changes in internalizing behaviour and parenting practices. In addition, future research should elucidate whether changes in maternal depression precede child externalizing changes, whether child changes precede maternal depression changes, or whether the relationship is reciprocal. Finally, it is also important for researchers to investigate what works for EXT youth in order to enhance outcomes for this subtype. Regarding clinical implications, our results will help inform MST clinicians on how to best tailor treatment to suit the distinct needs of aggressive youth with co-occurring internalizing problems. Specifically, reductions in maternal depression may be especially important for improving MIXED adolescents' clinical outcomes.

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## Further Reading

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