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Change in Maternal Criticism and Behavior Problems in Adolescents and Adults With Autism Across a 7-Year Period

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In a previous study, high levels of maternal criticism predicted increased behavior problems in adolescents and adults with autism spectrum disorders (ASD) over an 18-month period (Greenberg, Seltzer, Hong, & Orsmond, 2006). The current investigation followed these families over a period of 7 years to examine the longitudinal course of criticism and behavior problems, to assess the association between their trajectories, and to determine the degree to which change in each of these factors predicted levels of criticism and behavior problems at the end of the study period. A sample of 118 mothers coresiding with their adolescent and adult children with ASD provided open-ended narratives about their children and reported on the children's behavior problems at 4 waves. Maternal criticism was derived from expressed emotion ratings of the narratives. Criticism exhibited low but significant stability over the 7-year period, and behavior problems exhibited high stability. Through latent growth curve modeling, (a) criticism was found to have increased over time, but only for the group of families in which the sons or daughters transitioned from high school services during the study period; (b) individual changes in criticism and behavior problems were positively correlated over the 7-year period; and (c) changes in criticism predicted levels of behavior problems at the conclusion of the study. Changes in behavior problems were not predictive of end levels of criticism. Implications for intervention and prevention efforts are discussed.

Keywords: parenting, autism, expressed emotion, criticism, behavior problems

Autism spectrum disorders (ASD) are neurodevelopmental disorders involving core impairments in social functioning and communication (Dawson, 2008; Landa, Holman, & Garrett-Mayer, 2007). Support for a largely biological basis of autism (Folstein & Rosen-Sheidley, 2001; Szatmari, Jones, Zwaigenbaum, & MacLean, 1998), perhaps in combination with a reaction to early discredited theories speculating that autism resulted from poor parenting (Bettelheim, 1967), has led to a relative focus on child-driven effects in research on autism and parenting (e.g., Davis & Carter, 2008; Ekas & Whitman, 2010; Tomanik, Harris, & Hawkins, 2004). However, emerging evidence suggests that pa-

rental behavior may influence the development of the autism phenotype from the toddler years through adulthood (e.g., J. K. Baker, Messinger, Lyons, & Grantz, 2010; Greenberg, Seltzer, Hong, & Orsmond, 2006; Siller & Sigman, 2008). In the present study, we examined the interrelation over time between one aspect of parenting, maternal criticism, and behavior problems in adolescents and adults with ASD over a 7-year period.

Parental Negativity and Behavior Problems

Behavior problems may be the most powerful challenge for parents of children and adults with developmental disabilities, with these difficulties often more strongly related to parental stress than are core symptoms of the disability per se (B. L. Baker, Blacher, Crnic, & Edelbrock, 2002; Davis & Carter, 2008; Ekas & Whitman, 2010; McIntyre, Blacher, & Baker, 2002). Although relatively little research has addressed how parenting influences behavior problems in adults, much is known regarding relevant processes for children and adolescents. Child frustration resulting from core ASD-related social and communicative deficits, and the behavioral rigidity associated with these conditions, no doubt contribute greatly to the emergence of behavior problems in children with ASD (Whitman & Ekas, 2008). However, it is well documented in non-ASD populations that parental reciprocation of child negative affect can amplify children's initial tendencies toward dysregulation, resulting in the development of more serious behavior problems (Granic & Patterson, 2006; Reid & Patterson, 1989; Snyder, Stoolmiller, Wilson, & Yamamoto, 2003). The potential for parent negativity to foreshadow increased behavioral

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disturbance has led to interventions aimed at reducing parents' negativity and criticism toward their children and adolescents with behavior problems (e.g., Barkley, Edwards, & Robin, 1999; Eyberg, 1988). Recognizing the potential for parent negativity to exacerbate or maintain behavior problems in individuals with developmental disabilities, researchers have recently applied similar frameworks to families of children with developmental problems (McIntyre, 2008; Solomon, Ono, Timmer, & Goodlin-Jones, 2008).

Most work in the parenting of adults has focused on families in which the offspring requires considerable caregiving later in life due to impairing mental or physical conditions. Examination of negative parenting environments in clinical adult populations has focused predominantly on the construct of *expressed emotion* (EE), which tends to predict relapse in psychiatric disorders such as schizophrenia and depression and is proving relevant to a number of other health-related problems (McFarlane, 2002; Wear-den, Tarrier, Barrowclough, Zastowny, & Rahill, 2000). EE assesses aspects of caregiving criticism and emotional overinvolvement, constructs thought to be particularly relevant to the caregiving of individuals with chronic disorders marked by cognitive impairment, behavioral disturbance, and/or impairment in daily living (Tarrier et al., 2002). As a group, individuals with ASD exhibit difficulties in all three of these areas, suggesting that EE may be important for this population as well.

The construct of criticism has proven more applicable than overinvolvement in studies of children and studies of individuals with disabilities and/or chronic illness (e.g., Hastings, Daley, Burns, & Beck, 2006; Peris & Baker, 2000; Wamboldt, O'Connor, Wamboldt, Gavin, & Klinnert, 2000), and some investigators have directly questioned the validity of overinvolvement ratings for certain vulnerable populations for whom high levels of involvement may be more normative (Wamboldt et al., 2000). Indeed, ratings of positive remarks, which are typically used to calculate excessive praise for the overinvolvement code, have been associated with better functioning in certain populations (Smith, Greenberg, Seltzer, & Hong, 2008; Wamboldt et al., 2000). Considered from an EE perspective, criticism indexes the degree of disapproval that a caregiver or relative exhibits toward the individual. Although criticism is coded indirectly through parent narrative, scores derived from this method correspond with behavioral observations of criticism and interactive negativity in families (see Hooley, 1998; McCarty, Lau, Valeri, & Weisz, 2004), leading some to conclude that EE-based criticism is a good index of problematic family interaction (McCarty et al., 2004).

Research on various clinical populations suggests that heightened criticism may occur in reaction to child behavior but that reductions in EE may also ameliorate child difficulties (Brewin, 1994; Butzlaff & Hooley, 1998; King, 2000; Kuipers, 2006; McFarlane, 2002; McFarlane et al., 1995; Miklowitz, 2007). Bidirectional effects are similarly thought to be present in families of individuals with disabilities, whereby behavior problems stemming from developmental difficulties may tend to elicit criticism from parents, which, in turn, could exacerbate behavior problems in the individual (Hastings & Lloyd, 2007). EE-based criticism appears to vary as a function of the degree to which caregivers attribute responsibility for problem behavior to the individuals in their care (Barrowclough & Hooley, 2003; Tarrier et al., 2002; Weisman, López, Karno, & Jenkins, 1993). Little is known about

parental attributions of problematic behavior in adolescents and adults with autism. It is likely that these parents vary considerably in their understanding of their children's behavior problems and, in turn, in criticism. Caregiver criticism in non-ASD families is believed to develop as an attempt to coerce an individual to exert more control over his or her behavior (Tarrier et al., 2002). Parents of individuals with ASD may be particularly vulnerable to the development of criticism given that leading treatments for children with ASD (i.e., behavioral interventions) rely upon the children gaining control over their cognitive, behavioral, and adaptive difficulties—with considerable evidence that many are able to do so (Howlin, Magiati, & Charman, 2009). As individuals with ASD age, parents may be particularly conflicted as to the degree to which they should accept versus attempt to alter their children's behavior. In this way, it is useful to think of criticism as an understandable reaction to the demands of caring for an individual with a disability, but with an appreciation that high levels of criticism may not be optimal for individual and family functioning (Hastings & Lloyd, 2007).

Maternal Criticism and Behavior Problems in Individuals With Developmental Disabilities

Two research groups recently extended the investigation of maternal criticism and behavior problems to populations with developmental disabilities. Hastings et al. (2006) examined maternal criticism toward children and adolescents with intellectual disabilities, and others have investigated these links in adolescents and adults with ASD (Greenberg et al., 2006; Orsmond, Seltzer, Greenberg, & Krauss, 2006). These studies reported strong concurrent associations between maternal criticism and behavior problems, but differences emerged across the studies from the two groups regarding prediction over time. Hastings et al. (2006) found that criticism did not predict change in behavior problems over a 2-year period in families of children with intellectual disability. In contrast, Greenberg et al. (2006) found that maternal criticism predicted behavior problem change in adolescents and adults with autism over 18 months. Importantly, behavior problems did not likewise predict change in criticism, suggesting a potentially stronger causal role for criticism in change over time.

Change Over Time in Criticism and Behavior Problems

The current study extended the investigation by Greenberg et al. (2006) to examine linked trajectories of criticism and behavior problems over a much longer period. Extending the initial 18-month period presented by Greenberg et al., the current study included four waves and spanned 7 years in the lives of adolescents and adults with autism. This extension provided additional information on questions addressed by the original study, but also aimed to examine new questions regarding change over time.

It is generally agreed that criticism, as measured by EE, shares both state- and traitlike qualities (Hooley, 1998). Indeed, EE has been linked to both personality traits of the respondent and aspects of the environment (see Hooley, 1998), and criticism seems to demonstrate both stability and change over time (e.g., Hastings et al., 2006; Peris & Baker, 2000). In the previous study on which the current study is based, Greenberg et al. (2006) found moderate

stability of criticism over 18 months ($r = .36$). To our knowledge, the current study is the first to examine the stability of EE-based criticism across four time points and for a period as long as 7 years.

In addition to individual change, longitudinal studies can also provide information about how a construct changes over time for groups of individuals. This is a particularly important issue for criticism, as it has been argued that the length of time caring for an individual may influence criticism more powerfully than characteristics of the person measured at any given point in time (Hooley, 1998). Although it is possible that caregivers may become habituated to the stress of caregiving, resulting in less criticism over time, evidence suggests otherwise. Hooley and Richters (1995) used a cross-sectional design and found a dose-dependent pattern of association between the amount of time caregivers spent dealing with an individual's illness and the caregivers' level of criticism—with the lowest ratings observed in caregivers with durations of less than 1 year, moderate scores in caregivers of 1–3 years, and the highest ratings among those who were caregivers for 5 or more years. The potential “wear and tear” of caregiving over time (Townsend, Noelker, Deimling, & Bass, 1989) has been suggested by previous findings that mothers of adolescents with ASD reported more anger than mothers of toddlers with ASD (Smith, Seltzer, Tager-Flusberg, Greenberg, & Carter, 2008), and mothers of adolescents and adults with ASD plus histories of behavior problems demonstrated a “biological signature” of chronic stress in the form of hypoactivation of morning cortisol (Seltzer et al., 2010). With regard to EE specifically, findings from the initial longitudinal study on which this study is based were generally consistent with the wear-and-tear hypothesis in that many families increased from low to borderline criticism over 18 months (Greenberg et al., 2006). The likelihood of increases in maternal criticism over time is intriguing, given previous work with our sample showing that behavior problems of the sons and daughters tended to decrease, rather than increase, over time (Shattuck et al., 2007; Taylor & Seltzer, 2010a).

Greenberg et al. (2006) investigated whether initial levels of criticism and behavior problems (Time 2 in our ongoing longitudinal study; Seltzer et al., in press) predicted change in these factors over an 18-month period (Time 2–Time 3). Change was the dependent variable, but the study did not investigate the predictive potential of change in these factors. Level versus change is not a trivial distinction for criticism. In an in-depth discussion of EE in families of individuals with psychopathology, Hooley (1998) suggested, “Certain characteristics of relatives may incline them to *become* [emphasis added] critical when they are exposed to a *marked change* [emphasis added] in behavior in someone they interact with on a regular basis” (p. 640). This suggests that parents may respond less to the level of behavior problems in their children (i.e., whether they are high or low compared with other children), but rather to increases or decreases in problems relative to the individual's previous functioning. A similar process may also apply to a son's or daughter's reaction to maternal criticism in that the level of criticism may be less important than whether the criticism has recently increased or decreased. In the current study, we examined trajectories of change in criticism and behavior problems using latent growth curve (LGC) modeling to determine whether these two factors changed together over the 7-year period.

Complementing findings from the earlier analysis that initial levels of criticism predicted change in behavior problems across

18 months, we also examined whether change in either criticism or behavior problems predicted the levels of these factors at the end of the study period. Hastings et al. (2006) did not find that change in criticism predicted change in behavior problems over a 2-year period. However, these authors calculated a change score for criticism, and the sample included mostly children with intellectual disability and not ASD, so it remains possible that these processes may be observed with more advanced modeling over a longer period and with a sample of adolescents and adults with ASD.

Hypotheses

Hypothesis 1

We predicted that criticism would demonstrate low to moderate stability over the 7-year period examined (Time 2–Time 5).

Hypothesis 2

Concurrent positive associations between maternal criticism and the behavior problems of sons and daughters were expected at each wave.

Hypothesis 3

Behavior problems in our sample are known to have decreased between Times 1 and 4 (Shattuck et al., 2007), thus we expected a similar linear decrease during the longer period examined here. However, consistent with (a) the wear-and-tear hypothesis, (b) cross-sectional evidence from non-ASD populations (Hooley & Richters, 1995), and (c) preliminary patterns observed over the initial 18-month period (Greenberg et al., 2006), we predicted that criticism would increase over time for the sample as a whole.

Hypothesis 4

We expected that positive correlated change would be observed between the two factors such that individual increases in criticism would be accompanied by increases in behavior problems and decreases in criticism would be associated with decreases in behavior problems.

Hypothesis 5

We expected change in criticism over the 7-year period to predict the levels of behavior functioning for sons and daughters at the end of the study period. Although initial levels of behavior problems did not predict change in criticism in our sample once earlier criticism was controlled (Greenberg et al., 2006), it remained possible that change in behavior problems, in addition to correlating with change in criticism, would also predict end levels of criticism.

Hypothesis 6

We also considered whether criticism might increase more substantially over time for families of individuals exiting high school services during the study period. Transition from high school is arguably the most significant developmental milestone for adolescents and adults with autism, and recent evidence sug-

gests that current service systems may be inadequate to accommodate the needs of these individuals (Taylor & Seltzer, 2010b), potentially increasing reliance upon the family for support and structure. Individuals with ASD as a group also exhibit a slowing of improvement in certain behavior problems at this point as compared with pretransition developmental course (Taylor & Seltzer, 2010a). As noted by Taylor and Seltzer (2010a), this attenuation of improvement, accompanied by a host of new family challenges, is likely to present considerable distress to these already stressed families. Relevant parent cognitions may even predate the transition itself, as anticipation of this “turning point” (Taylor & Seltzer, 2010a) may create anxiety and stress in parents as they consider their own and their children’s future roles and face uncertainty as to how to prepare for the transition (Fong, Wilgosh, & Sobsey, 1993; Thorin, Yoyanoff, & Irvin, 1996). Related to criticism specifically, it is likely that increasing anxiety about how problem behaviors may affect the future functioning of the sons and daughters, coupled with a slowing of behavioral improvement, may eventuate in increased criticism during the broader transition period, as parents try to urge the individuals to move toward independence and exert more control over their behavior (see Barrowclough & Hooley, 2003, for a discussion of the role of anxiety, attributions of undesirable behavior, and control in EE).

Method

Participants

Data were drawn from an ongoing longitudinal study of 406 families of adolescents and adults with ASD residing in Wisconsin ($n = 202$) and Massachusetts ($n = 204$; see Seltzer et al., in press). Five waves of data were completed at the time of the present study, with criticism collected at four of these waves: Time 2 (collected in 2000–2001), Time 3 (2002–2003), Time 4 (2004–2005), and Time 5 (2007–2008). For the present sample, Times 2 and 3 were separated by an average of 18 months ($SD = 2.4$), Times 3 and 4 were separated by 20 months ($SD = 3.0$), and Times 4 and 5 occurred approximately 45 months ($SD = 2.6$) apart. The total period examined for families in the present study (Time 2–Time 5) averaged 7 years ($M = 7.00$, $SD = 0.34$).

Criteria for inclusion at Time 1 were (a) the family had a son or daughter age 10 years or older; (b) the child received a diagnosis of an ASD by a medical, psychological, or educational professional, as per parent report; and (c) administration of the Autism Diagnostic Interview–Revised (Lord, Rutter, & Le Couteur, 1994) supported the autism spectrum diagnosis. The previous longitudinal examination of criticism in this sample (Greenberg et al., 2006) included a subsample of 149 families in which the son or daughter with ASD coresided with the mother from Time 2 to Time 3 and for whom necessary data were available at both waves. Greenberg et al. (2006) chose only coresident families because the effects of EE require high levels of face-to-face contact between parent and child (Leff & Vaughn, 1985). This sample of 149 families has been characterized in detail in other reports (see Greenberg et al., 2006; Smith, Greenberg, et al., 2008). Briefly, Greenberg et al. excluded families with children who lived away from home at Time 2 or 3, families in which the father was the primary informant, families that refused participation or could not be located at Time 2 or 3, families in which the mother or child

died between Times 1 and 3, and families for which data were missing at either Time 2 or Time 3.

The present sample was generally consistent with that of Greenberg et al. (2006) with two exceptions. First, the families with missing data at either Time 2 or Time 3 were considered for potential inclusion in the present study because of our plan to estimate missing data. Second, consistent with Greenberg et al., we continued to require coresident status throughout the target period, thereby excluding 35 families in which the sons or daughters were known to have relocated between Times 3 and 5 and families in which the mother ($n = 5$) or child ($n = 2$) died during the study period. The final sample for the present study therefore included 118 families, seen across four waves. Consistent with issues related to residence and death, mothers and children in the present study were younger than the remainder of the original sample (mother: $t = 5.48$, $p < .001$; child: $t = 6.27$, $p < .001$), and the mothers were more likely to be married ($\chi^2 = 7.82$, $p < .01$). However, participating families did not differ in initial levels of criticism or behavior problems compared with the remainder of the original sample.

Adolescents and adults with ASD in the present study ranged in age from 11.3 to 48.2 years at Time 2, with a mean age of 19.77 years ($SD = 6.72$, $Mdn = 17.72$). Approximately three quarters of these individuals (77%) were male. Mothers ranged in age at Time 2 from 33.9 to 78.8 years ($M = 49.06$, $SD = 7.86$, $Mdn = 48.04$). Eighty-six percent of mothers were married, and 90% of mothers reported that they were Caucasian and not Hispanic. All mothers completed high school, and about half (49%) held college degrees. Mean and median annual family income in 2000–2001 fell between \$45,000 and \$59,999, with 15% of families reporting less than \$30,000 and 42% reporting over \$70,000. No family or maternal demographic variable related to criticism or behavior problems at any time point, with one exception: Maternal age was significantly correlated with child behavior problems at Time 3 ($r = -.19$, $p < .05$). Maternal age was not controlled, however, because of the high likelihood that this association emerged by chance and because maternal age was unrelated to any other variable of interest. Child demographic variables were considered in the primary analyses and are discussed below.

Procedures and Measures

Each wave of data collection involved participation by mothers in a 2- to 3-hr face-to-face interview and completion of questionnaires containing standardized measures.

Criticism. Five-Minute Speech Samples (FMSSs) were rated for levels of criticism. Mothers were asked to speak about their son or daughter for 5 min without interruption, and the speech sample was recorded and transcribed for rating. Mothers were rated as *high* (5), *borderline* (3), or *low* (0) in criticism, under procedures developed by Magaña et al. (1986). These ratings were recoded into 0 (*low*), 1 (*borderline*), and 2 (*high*) for use in analyses. Respondents were rated high on criticism if they (a) made a negative opening remark, (b) described their relationship with their son or daughter in negative terms, or (c) made one or more criticisms about their son or daughter during the course of the speech sample. Mothers were rated borderline on criticism if they did not satisfy the above requirements but made one or more statements of dissatisfaction about their relationship with their son

or daughter. Ratings of low criticism were given if no critical comments were present in the speech sample. The FMSS has been used to obtain valid and reliable ratings of EE in a variety of diagnostic groups (Moore & Kuipers, 1999; Van Humbeeck, Van Audenhove, De Hert, Pieters, & Storms, 2002) including families of individuals with developmental disabilities (Beck, Hastings, Daley, & Stevenson, 2004; Hastings et al., 2006). Ratings for this study were performed by a rater with over 20 years of experience coding the FMSS for all aspects of EE. Reliability between the primary rater and an experienced secondary rater for 30 families was reported at 83.3% agreement ($\kappa = .67$; Greenberg et al., 2006; Orsmond et al., 2006). Although the FMSS has been used in several studies of EE, it may have a tendency to underestimate high levels of EE and is generally regarded as less reliable than the longer Camberwell Family Interview, which lasts up to 2 hr. However, the FMSS has shown reliability and predictive validity in several studies and is considered appropriate for larger samples and for studies with repeated measurement of EE (Hooley & Parker, 2006). Furthermore, FMSS-based criticism ratings have demonstrated “reliable and consistent” concordance with observed ratings of antagonism, negativity, disgust, and harshness in parent-child interactions among non-ASD families (McCarty et al., 2004, p. 91).

Behavior problems. The General Maladaptive Index of the Scales of Independent Behavior-Revised (Bruininks, Woodcock, Weatherman, & Hill, 1996) was used to measure behavior problems exhibited by the sons and daughters at each wave. This rating reflected the presence of behaviors considered hurtful to self, unusual or repetitive, withdrawn or inattentive, socially offensive, uncooperative, hurtful to others, destructive to property, and/or disruptive. Mothers were asked to indicate whether a particular behavior occurred within the last 6 months and, if so, to rate the frequency (1 = *less than once a month*, 5 = *one or more times an hour*) and the severity of the behavior (1 = *not serious*, 5 = *extremely serious*). The Scales of Independent Behavior is reliable and valid (Bruininks et al., 1996) and has exhibited stability and convergent validity in our sample across the first two waves considered in the present study (Greenberg et al., 2006; Smith, Greenberg, et al., 2008). The scale generates a range of scores from 90 to 174. A score of between 90 and 110 reflects behaviors that are not considered clinically significant, and scores above 111 are considered to reflect marginally serious (111–120), moderately serious (121–130), serious (131–140), or very serious behavior problems (above 141).

Intellectual disability. Procedures for assessing the presence of intellectual disability in our sample have been reported in detail in previous studies (see Orsmond et al., 2006; Smith, Greenberg, et al., 2008). Briefly, intellectual disability was considered present if the individual obtained a standard score below 70 on both the Wide Range Intelligence Test (Glutting, Adams, & Sheslow, 2000) and the Vineland Scales of Adaptive Behavior-Screener (Sparrow, Carter, & Cicchetti, 1993). For individuals who scored between 71 and 75 on one or both measures, or for whom either of the measures was missing, review of additional records and clinical consensus was used. Of the participants in the present study, 67 (57%) were considered to have had an intellectual disability.

High school exit. High school exit was defined as the time that the individual stopped receiving services through the secondary school system. A previous detailed record review provided

information about school service status at each wave (see Taylor & Seltzer, 2010a); these data were used to determine whether the individual with ASD exited school services during the study period (coded 1) or did not (coded 0). Data on high school exit were not available for 22 of the families, either because the children were in school at the initial wave and the families were not reachable at Time 5 ($n = 19$) or because the transition was complicated by issues of home schooling ($n = 3$). Of the 96 families with transition data, approximately half (52%) the children exited high school during the study period. Of the 46 individuals who did not exit during the study period, 37 (80%) had already exited high school at the first criticism assessment, and nine (20%) children were still receiving secondary school services at the end point of the current study.

Results

Analytic Plan and Overview of LGC Modeling

Correlations were examined in order to assess the stability of criticism and behavior problems over time (Hypothesis 1) and to investigate relations between these factors at each wave (Hypothesis 2). Remaining hypotheses were tested with LGC analysis in Mplus (Muthén & Muthén, 2006). This method integrates individual growth modeling and structural equation modeling and is well suited for examining change over time. LGC provides estimates of mean structure at particular waves (intercepts) as well as change in factors over time (slopes). Multivariate LGC allows for simultaneous consideration of two related processes (in this case criticism and behavior problems), allowing one to examine associations between the intercepts and the slopes of each (Bollen & Curran, 2006).

Two unconditional LGC models (one model for criticism and one model for behavior problems) were used to characterize the slope of each of the factors over time (Hypothesis 3). Models were constructed such that latent variables represented the intercept and slope of each factor. Criticism and behavior problem data from each wave of the study served as indicators for both the intercept and the slope of the relevant factor. Pathways between all indicators and the relevant intercept variable were set at 1. Because we were most interested in predicting levels of criticism and behavior problems at the final measurement period, we centered the intercepts at Time 5 (Biesanz, Deeb-Sossa, Papadakis, Bollen, & Curran, 2004). Pathways between the indicators and the relevant latent slope variables were weighted according to the proportion of time that passed between waves (Time 2, -1.85 ; Time 3, -1.45 ; Time 4, -1 ; Time 5, 0). Criticism variables at each wave were specified as ordinal, so the model was estimated with robust weighted least squares estimation. To reduce the number of parameters estimated, thresholds for the criticism variables were constrained to equality, as were the residual variances of the behavior problem measure over time.

To test Hypotheses 4 and 5, we tested a multivariate conditional model that included criticism, behavior problems, and three of the time-invariant child demographic variables (intellectual disability, gender, age). High school transition (Hypothesis 6) was considered in a separate model with a subsample of 96 for whom there were no missing data for the high school exit variable. Factor loadings for the indicators in the conditional models were identical to those

used in the unconditional models, and all latent factors were allowed to covary.

All families had complete data for at least two waves. Between 1% and 33% of data were estimated for any given relation, with the majority of data estimated for the later waves (see Table 1). Sixty-five families (55%) had no missing data for any point during the 7-year period. These 65 families did not differ on any variable of interest, or on any demographic variable, from families for which some missing data were estimated. For all LGC models, adequate model fit was concluded if the chi-square divided by the degrees of freedom was under 2, the comparative fit index (CFI) was over .90, and the root-mean-square error of approximation (RMSEA) was under .08 (Browne & Cudeck, 1993; Carmines & McIver, 1981; Mueller, 1996).

Hypotheses 1 and 2: Stability of Criticism and Behavior Problems Over Time and Concurrent Associations Between the Two Factors

Descriptive data for criticism and behavior problems are presented in Table 1. These data suggest that, in general, criticism increased over time, whereas behavior problems decreased. The statistical significance of change in these factors over time was examined with the unconditional LGC models (below).

Consistent with our first hypothesis, both criticism and behavior problems demonstrated significant stability across time. Correlations between criticism ratings at adjacent waves were moderate in strength, and a low but significant correlation was found across the entire 7-year period. High levels of stability were observed for behavior problems across all waves. As predicted by Hypothesis 2, criticism and behavior problems were significantly and positively related to each other within each wave (see Table 2).

Hypothesis 3: Change in Criticism and Behavior Problems Over Time

The unconditional model for criticism demonstrated good fit, $\chi^2(4) = 3.30$, $\chi^2/df = 0.83$, CFI = 1.000, RMSEA = .000. Parameter estimates are reported in Table 3. As predicted, a positive linear slope for criticism was present, indicating that

criticism increased for the group as a whole over the 7-year period. The size of this effect, which was calculated by dividing the mean change in criticism over the study period by the variance of the criticism intercept, would be considered small ($d = 0.26$; Cohen, 1988). Although the RMSEA for the unconditional behavior problem model suggested mediocre fit (.086), the relative chi-square ($14.96/8 = 1.87$) and the CFI (.970) both indicated good fit, and a mediocre RMSEA in tandem with other indices of good fit can represent an adequate fitting model when sample sizes are relatively small (Brown, 2006). The slope for behavior problems was negative and significant, indicating that behavior problems decreased over time for the sample as a whole (see Table 3; $d = 0.21$). Of note, considerable variability in behavior problem change existed on an individual level, with increases as large as 26 points and decreases as large as 43 points.

Hypotheses 4 and 5: Correlated Change Between Criticism and Behavior Problems, and Associations Between Slopes and Intercepts

The conditional multivariate model for criticism and behavior problems was first tested with the first three time-invariant child demographic variables; however, gender and age were unrelated to any variable of interest, so these variables were excluded from subsequent models. The trimmed model exhibited adequate fit, $\chi^2(11) = 10.93$; $\chi^2/df = 0.99$, CFI = 1.000, RMSEA = .000. A significant positive association was present between the slope of criticism and the slope of behavior problems over time (see Figure 1). The intercepts for criticism and behavior problems, which were centered at Time 5, were also associated with each other. A significant relation was present between the slope of criticism and the intercept of behavior problems, indicating that change in parental criticism over time was associated with the level of behavior problems exhibited by sons and daughters at the last measurement period. In contrast, the slope of behavior problems was not significantly related to end levels of criticism. Intellectual disability (which is not included in the figure for the sake of clarity) was positively related to the intercept of behavior problems ($\beta = .42$, estimate = 8.225, $SE = 2.406$, $p < .001$) and the slope of behavior

Table 1
Descriptive Data for Criticism and Behavior Problems Over Time

Variable	Time 2 (n = 115/117)				Time 3 (n = 106/118)				Time 4 (n = 91/100)				Time 5 (n = 85/89)			
	M	SD	Sample	%	M	SD	Sample	%	M	SD	Sample	%	M	SD	Sample	%
Criticism	0.64	0.77			0.64	0.71			0.71	0.76			0.84	0.80		
Low			62	54			52	49			43	47			35	41
Borderline			32	28			40	38			31	34			29	34
High			21	18			14	13			17	19			21	25
Behavior problems	112.65	9.53			113.47	10.25			111.59	10.18			110.38	10.67		
Nonclinical			55	47			54	46			62	62			57	64
Marginally serious			41	35			38	32			20	20			19	21
Moderately serious			13	11			16	14			12	12			6	7
Serious			7	6			9	8			4	4			5	6
Very serious			1	1			1	1			2	2			2	2

Note. Sample size to the left of the slash represents data available for criticism; sample size to the right of the slash represents data available for behavior problems.

Table 2
Pearson Correlations Among Variables Included in the Model

Variable	1	2	3	4	5	6	7	8	9	10	11	12
1. Time 2 criticism	—											
2. Time 3 criticism	.42***	—										
3. Time 4 criticism	.41***	.34**	—									
4. Time 5 criticism	.22*	.27*	.47***	—								
5. Time 2 behavior problems	.30**	.24*	.34**	.26*	—							
6. Time 3 behavior problems	.21*	.33**	.41***	.36**	.76***	—						
7. Time 4 behavior problems	.22*	.33**	.52***	.42***	.63***	.74***	—					
8. Time 5 behavior problems	.01	.13	.32**	.35**	.59***	.66***	.75***	—				
9. Intellectual disability ^a	.10	.14	.21*	.14	.13	.21*	.40***	.32**	—			
10. Child gender ^b	-.02	.04	.03	-.03	.10	.14	.10	.17	.07	—		
11. Child age	-.01	-.01	-.11	.02	-.09	-.12	-.09	.04	.21*	.00	—	
12. High school exit ^a	-.17	-.15	.13	.24*	.05	.04	.15	.12	.02	-.06	-.35**	—

^a Yes = 1, no = 0. ^b Female = 1, male = 0.
* $p < .05$. ** $p < .01$. *** $p < .001$.

problems over time ($\beta = .37$, estimate = 2.658, $SE = 1.172$, $p < .05$). Intellectual disability status was not significantly related to either the slope or intercept of criticism.

We also tested an additional post hoc LGC model, recentring the intercept of behavior problems at the first wave in order to examine the association between the slope of criticism and behavior problems at that time. If the initial level of behavior problems also significantly related to change in criticism over time, this might suggest that behavior problems were driving change in criticism. However, this was not the case. Analyses revealed that the slope of criticism was not associated with the intercept of behavior problems at Time 2 ($\beta = .05$, ns).

Hypothesis 6: Change in Criticism as a Function of High School Exit

The final conditional model (excluding nonsignificant associations with covariates) was then tested with the addition of high school exit data. The model exhibited good fit, $\chi^2(13) = 14.81$, $\chi^2/df = 1.14$, CFI = .985, RMSEA = .038, and high school exit status related to both the slope ($\beta = .56$, estimate = 0.538, $SE = 0.215$, $p < .05$) and the Time 5 intercept of criticism ($\beta = .40$, estimate = 0.726, $SE = 0.315$, $p < .05$). Criticism increased overall for families of individuals who exited high school during the study period (standardized estimate = 0.89, estimate = 0.408, $SE = 0.195$, $p < .05$), but criticism did not significantly change for the group of families of individuals who did not exit high school during the period examined (standardized estimate = -0.27, es-

timate = -0.131, $SE = 0.236$, ns). The effect size for the growth of criticism in the group of families with children exiting high school was moderate ($d = 0.66$), with the average level of criticism in this group increasing into the borderline range by Time 5 ($M = 1.00$, $SD = 0.80$; Time 2: $M = 0.52$, $SD = 0.74$). High school exit was not significantly related to either the intercept or slope of behavior problems.

Discussion

Despite research demonstrating concurrent associations between parental criticism and behavior problems in individuals with developmental disabilities, little is known regarding how these related processes operate over time. The current study adds to evidence indicating that levels of criticism seem to impact behavior problems over time (Greenberg et al., 2006), by demonstrating that these two factors change together over a much longer (7-year) period. Furthermore, the current study is the first to provide evidence that changes in criticism predict behavior problem levels but that changes in behavior problems are not predictive of criticism.

Findings regarding the longitudinal stability of criticism have been mixed, depending upon the particular study and the analytic method used (Greenberg et al., 2006; Hastings et al., 2006; Peris & Baker, 2000). Our findings suggest moderate stability of criticism across 1.5 to 4 years and low but significant stability over the entire 7-year period. This pattern is consistent with current thinking that criticism has both state- and traitlike qualities (Hooley,

Table 3
Growth Curve Parameters From Unconditional Models ($N = 118$)

Parameter	Estimate	SE	Standardized estimate	Variance estimate	SE
Criticism intercept	0.000	0.000	0.00	.730	0.359
Criticism slope	0.165	0.076	0.34*	.239	0.140
Behavior problems intercept	110.669	1.069	11.25	96.684	17.670
Behavior problems slope	-1.321	0.525	-0.37*	12.850	4.363

Note. Standardized estimates were calculated by dividing the estimated coefficient by the standard deviation of the variable. The mean of the intercept growth factor for criticism was fixed to zero.
* $p < .05$.

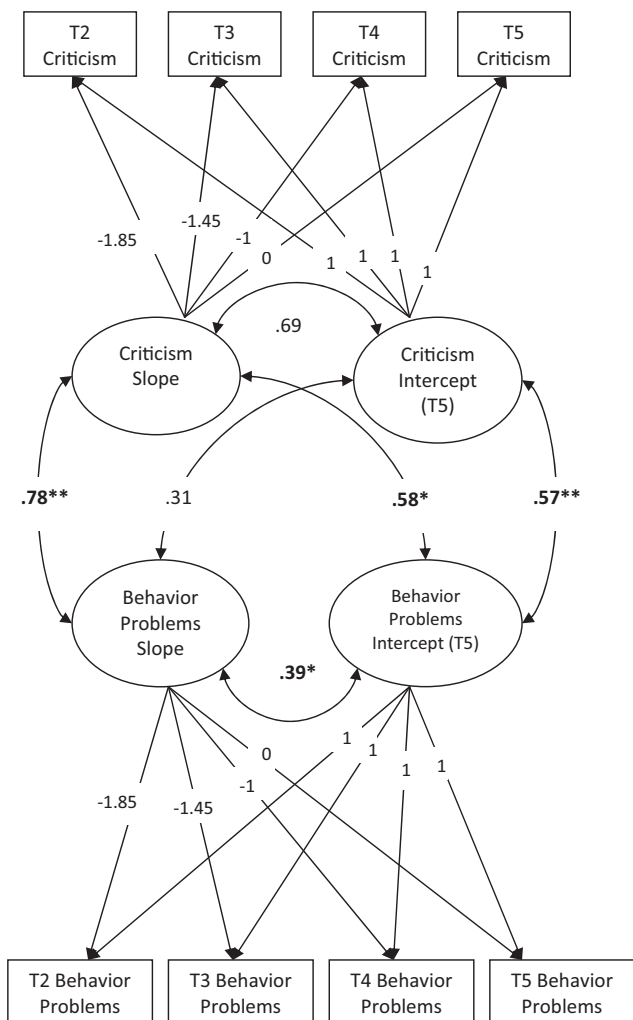


Figure 1. Final growth curve model (covariate not illustrated). Standardized coefficients are presented. * $p < .05$. ** $p < .01$.

1998). Consistent with previous research on EE and individuals with developmental disabilities (e.g., Greenberg et al., 2006; Hastings et al., 2006), criticism and behavior problems were significantly related at each measurement point, further underscoring the linked nature of behavior problems and caregiver critical attitudes in these families.

Perhaps the most powerful contribution of the current study is evidence suggesting not only that criticism and behavior problems are linked at any given time, but that the trajectories of each of these factors are positively associated. These findings provide the clearest evidence that change in one of these factors may result in change in the other. From a systems perspective, it may be reasonable to conclude that, given the linked trajectories, intervention with either criticism or behavior problems would result in improvement for these families. However, our findings, coupled with those of Greenberg et al. (2006), suggest that intervening with family criticism and/or potential contributors to criticism may be a particularly beneficial avenue for promoting positive change in families of adolescents and adults with autism. Interventions aimed

at helping families adapt to stressful caregiving situations have been successful in improving family interaction and reducing problems in other clinical populations (Brewin, 1994; Butzlaff & Hooley, 1998; Miklowitz, George, Richards, Simoneau, & Sudath, 2003). Although replication with a separate sample would be beneficial, findings from our longitudinal study suggest that similar interventions should be helpful for families of individuals with ASD.

As discussed, caregiver attributions regarding the behavior of the individuals in their care have been identified as important to criticism. It is possible that variations in attributions may have attenuated longitudinal pathways from behavior problems to criticism in the current study (Barrowclough & Hooley, 2003). Given the length of time that the mothers had been dealing with their children's condition (relative to other clinical populations in which the age of onset is later and the course more variable), it is possible that many mothers in our sample attributed behavior problems to their children's autism rather than to a lack of motivation. Thus, increased variation in attributions by our mothers (some attributing behavior problems to autism, some perceiving the problems as controllable) may have moderated the effects of behavior problems on criticism to the extent that a significant main effect was not observed. Future studies examining parental attributions of the behaviors of individuals with ASD is an important step in understanding potential pathways from behavior problems to criticism in this population.

Although behavior problems did not relate to change in criticism, the exiting of high school services by the individual with autism was associated with increases in criticism. Interestingly, this association was not accounted for by change in behavior problems during this period, suggesting the potential importance of parent cognitive factors. Our analyses indicate that the impact of exiting high school on maternal criticism might be different from its impact on child behavior problems. Criticism increased linearly across a period that included the anticipation of the transition from services and the transition itself. Behavior problems instead seem to pivot around this transition, with slowing of improvement after high school exit (Taylor & Seltzer, 2010a). Future research should focus on the specific implications of high school exit for family functioning, separate from (and in addition to) the ways in which it affects the child with ASD. Finally, our transition variable was moderately confounded with child age; however, the lack of association of child age with criticism and behavior problems in the current study suggests that the transition itself is likely important.

The finding from our initial unconditional model, that criticism increased over time for the group as a whole, appeared to support a wear-and-tear hypothesis of caregiving and criticism. However, subsequent analyses revealed that families whose children did not exit high school did not increase in criticism as a group, suggesting either a lack of vulnerability to time or that opposing forces (e.g., wear and tear and habituation and acceptance) may operate simultaneously within this population—or even within a particular family—to maintain stasis.

In the present study, we found that criticism tended to increase for a large subset of the families and that change in maternal criticism predicted later behavior problems. In combination, these findings suggest that many families that are low in criticism are at risk for becoming more critical and that such an increase would likely increase or maintain behavior problems in the individual

with ASD. It is therefore important to consider the potential benefit of prevention of criticism, in addition to intervening with highly critical families. Such programs would be particularly useful for families of adolescents and young adults preparing for the transition from high school services, and might focus on criticism indirectly through helping families prepare for, and cope with, the uncertainty and challenges that accompany this important turning point (Taylor & Seltzer, 2010a).

The current study was longitudinal and used complex statistical models, thereby providing some support for causal interpretation. However, experimental studies in which groups are randomly assigned and criticism is directly manipulated (e.g., through intervention) would provide more conclusive evidence for criticism as a driving force in criticism–behavior problem links. Our primary constructs of interest were both measured through the perspective of the mother, thus potentially increasing shared reporter variance. However, criticism was coded from mothers' narratives rather than through report and by an expert who was blind to the behavior problem data, and this method has been linked to observed behavior in other studies (Hooley, 1998; McCarty et al., 2004). Although the FMSS is considered a less accurate measure of EE than the Camberwell Family Interview, the primary drawback of the FMSS concerns the underidentification of high EE, leading some to conclude that any significant findings involving the FMSS would most likely have been found using the Camberwell Family Interview (Hooley & Parker, 2006). This notion supports the significance of our findings but also suggests that bidirectional relations (i.e., behavior problems in turn predicting criticism) might emerge with more extensive measurement of criticism.

Although the parameter-to-participant ratios for our models were generally within what is considered to be an acceptable range (Bentler & Chou, 1987), our sample was relatively small for LGC modeling. Participating families were also fairly homogeneous with regard to race and socioeconomic status, so replication with a larger and more diverse sample is necessary. Likewise, the current study examined only mothers. Although mothers tend to be the primary caregivers in these families, investigating the direct and indirect role of fathers' criticism would contribute important information, as would assessment of related aspects of the family system (e.g., marital stress). Our findings speak only to families of adolescents and adults with ASD, and it is possible that different causal relations between criticism and behavior problems (i.e., behavior problems predicting criticism) may operate during the early childhood years. Indeed, our findings suggest that similar to studies examining EE in other clinical populations, the timing of when EE is assessed appears important (e.g., at relapse or hospitalization in schizophrenia), and systematically focusing on additional periods in the developmental course of individuals with ASD and their families would be informative. Finally, the construct of EE has only recently been applied to families of individuals with disabilities, and more research is needed to fully understand the nature of criticism in this population (Hastings & Lloyd, 2007).

The present investigation and previous findings from Greenberg et al. (2006) suggest that maternal criticism is an important factor shaping the ASD phenotype in adolescence and adulthood. Increases in criticism seem to impede the improvement in behavior functioning noted in this population as a group. Conversely, reductions in criticism may catalyze decreases in behavior problems,

suggesting the importance of intervening in this area and requiring additional research into family factors that allow parents to abstain from criticism in the context of a demanding caregiving situation.

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