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The goal of the present research was to clarify conceptual issues in the assessment of effortful control in children and to examine the role of effortful control in the development of internalizing behaviors. Effortful control was assessed through both inhibition and activation components. Differential patterns of these abilities were examined in relation to subsequent internalizing problems. Furthermore, social competence was examined as a possible mechanism through which effortful control may influence internalizing behaviors. Children were assessed at 4-, 5.5- and 7.5-years on measures of inhibition/activation, social competence and internalizing behaviors. Results showed main effects for inhibition and activation on internalizing behaviors and supported a main effect for activation ability on kindergarten social competence ratings. Implications for future research examining effortful control and social and emotional outcomes were discussed.

EFFORTFUL CONTROL AND INTERNALIZING BEHAVIORS: CLARIFYING  
CONCEPTUALIZATION AND EXAMINING SOCIAL COMPETENCE  
AS A MEDIATING MECHANISM

by

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To my parents, Joanne and Michael Moore. Thank you for your never ending love,  
inspiration, and support.

APPROVAL PAGE

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## CHAPTER I

### INTRODUCTION

Effortful control is conceptualized as one's ability to inhibit a dominant response and/or activate a subdominant response by voluntarily modifying one's own attention and behavior (Rothbart & Bates, 1998). As a temperamental marker of personality, a child's underlying effortful control ability develops between 6 and 12 months of age (Posner & Rothbart, 2000) and typically stabilizes as a salient predictor of social and emotional outcomes within early childhood (Kochanska & Knaack, 2005). Developmentalists have increasingly recognized the integral role of effortful control in the emergence of adaptive and maladaptive behaviors and its implication for a child's socioemotional outcomes (Eisenberg, Smith, Sadovsky, & Spinrad, 2004). Over the past decade, research has broadly shown that children high in effortful control ability demonstrate more social competence, prosocial behavior, empathy and conscience. Conversely, children low in effortful control generally display greater externalizing behaviors including negative emotionality, aggression, problem behaviors, and maladjustment (Calkins & Dedmon, 2000; Eisenberg et al., 2000; Eisenberg et al., 2001; Kochanska, Murry, & Coy, 1997; Rubin, Coplan, Fox, & Calkins, 1995).

Although effortful control is conceptualized in terms of individual differences on levels of inhibition and activation, much of the research examining effortful control typically focuses on two regulatory processes: attentional control and inhibitory control.

Attentional control is defined as one's ability to focus and shift attention (Derryberry & Reed, 2001; Eisenberg et al., 2004). Similarly, inhibitory control is defined as one's ability to appropriately inhibit behavior (Eisenberg et al., 2004). Moreover, although there is strong evidence supporting the influence of effortful control on the development of externalizing behaviors (Derryberry & Rothbart, 1997; Eisenberg et al., 2001), research investigating the association between effortful control and internalizing behavior has shown inconsistencies in both direction and existence of a significant association. For example, within a community sample of school-aged children (ages 8-13), attentional control was negatively related to internalizing symptomatology (Muris, de Jong, & Engelen, 2004). Similarly, lower levels of attentional control have been associated with shyness (Eisenberg, Fabes, & Murphy, 1995). However, this association differs depending on which reporters are used (Eisenberg, Shepard, Fabes, Murphy, & Guthrie, 1998; Eisenberg et al., 2001; Eisenberg et al., 2005). For instance, whereas internalizing symptoms were negatively associated with teacher-reported attentional control, a positive association was found when parents were the raters (Eisenberg et al., 1998). Similar discrepancies are evident within the inhibitory control literature. Some studies report that children rated as anxious did not differ from controls on inhibitory control ability (Öosterlaan & Sergeant, 1996); however, others reported that internalizing behaviors were positively related to inhibitory control (e.g. Murry & Kochanska, 2002). Thus the role of inhibitory control and the direction of effects with regard to internalizing behavior is not clear.

Clarification of the role of effortful control in the development of internalizing behaviors is especially important given the risk early internalizing behavior poses for subsequent social and emotional maladjustment in later life (e.g. increased anxiety and depression, peer difficulties, and academic problems, Rubin et al., 2005; Feng, Shaw, & Silk, 2008). As such, the primary purpose of the present research was to examine the role of effortful control in the development of internalizing behaviors. To accomplish this, conceptual issues regarding the construct of effortful control were first addressed.

#### *Issues with current conceptualization*

Developmental research traditionally assesses effortful control according to attentional and inhibitory control ability. Within this research paradigm, children with higher attentional control ability are conceptualized as able to control their emotional states through distraction or the disengagement of focus from aversive stimuli (e.g. inhibition of focus), whereas children with deficits in attentional control ability are thought to be more vulnerable to aversive stimuli, as they lack the ability to distract and disengage focus as a coping mechanism. Similarly, when faced with an emotionally arousing environment, it is assumed that children with higher inhibitory control have the ability to mask negative and inappropriate behavioral reactions, such as aggression, and inappropriate facial and verbal reactions. However, children lacking inhibitory control may not be able to inhibit these same negative reactions and will likely display both verbal and nonverbal aggression (Liew, Eisenberg, & Reiser, 2004).

Although Rothbart and Bates' (1998) conceptualize effortful control with both activation and inhibition components, within research, the current conceptual application

of this construct focuses on mainly inhibitory control and attentional control ability, which primarily assess only the inhibition component. As previously stated, effortful control is defined as one's ability to inhibit a dominant response and/or *activate* a subdominant response (Rothbart & Bates, 1998). Therefore, an examination of effortful control in development calls for a comprehensive evaluation of both inhibition and activation processes. However, in general, research has not incorporated the activation component in empirical work. Thus, our current understanding of the role of effortful control in development is incomplete and more representative of a child's ability to inhibit rather than activate behavior and attention.

Given this, it is not surprising that the association between externalizing behaviors and effortful control has been more consistent relative to research examining effortful control and internalizing behaviors (Derryberry & Rothbart, 1997; Eisenberg et al., 2001; Öosterlaan & Sergeant, 1996; Murry & Kochanska, 2002). Externalizing behaviors are associated with impulsivity, a construct that directly relates to lowered ability to inhibit a dominant response (e.g. Eisenberg et al., 2001). Thus, the current conceptualization of effortful control, although incomplete, may be most relevant to the dominant behavioral patterns inherent in externalizing tendencies.

In contrast, inconsistencies within the current literature examining the association between effortful control and internalizing behaviors suggest that one's ability to inhibit attentional and behavioral responses does not fully capture this relation. Instead, the pattern of behavior associated with internalizing symptoms (e.g. withdrawal and inhibition, Mun, Fitzgerald, Von Eye, Puttler, & Zucker, 2001) may be more strongly

related to individual differences in specific patterns of both inhibition *and* activation. For example, a child who struggles to activate a behavioral response but is capable of inhibiting a dominant response may appear withdrawn, because they can successfully inhibit inappropriate behavior; but at the same time struggles to exhibit a more appropriate behavior. In contrast, a child capable of both inhibiting and activating behavior may appear more well-adjusted, as they are able to regulate behavior adaptively and engage appropriately with the world around them. Therefore, the activation component of effortful control may be particularly important to consider as a regulatory precursor associated with internalizing behaviors. More specifically, a child's ability to activate behavior may qualify risk for internalizing tendencies associated with early inhibition ability, such that in the context of low activation ability, inhibition becomes maladaptive.

Given this issue, one possible explanation for the above outlined inconsistencies is that inhibition must be interpreted within the context of activation. As such, the first objective of this paper was to examine the inhibition and activation components of effortful control in tandem as a predictor of internalizing symptoms in middle childhood.

#### *Mediating role of social competence*

A second aim of the present research was to examine the role of social competence as a mediator in the relation between patterns of inhibition and activation and internalizing behaviors. Past research has provided substantial evidence for the role of social competence (e.g. one's success in interpersonal relationships) in the development of adaptive and maladaptive behavioral trajectories (Hymel, Rubin, Rowden, & LeMare,

1990; Rubin et al., 2005; Margolin, 2007; Burt, Obradovic, Long, & Masten, 2008; Kochanska, Murray, & Harlan, 2000). Whereas socially competent children typically experience increased peer acceptance and satisfaction within the peer network (Cassidy & Asher, 1992; Johnson, Ironsmith, Snow, & Poteat, 2000), children with deficits in social competence and socially adaptive behavior report greater feelings of loneliness and social dissatisfaction (Cassidy & Asher, 1992; Crick & Ladd, 1993) and are rated as more anxious and depressed by others around them (Gazelle & Ladd, 2003; Margolin, 2007; Burt et al., 2008).

The extant literature has demonstrated that a child's general effortful control ability is associated with a host of social indices, including the development of conscience, guilt, and morality (Kochanska et al., 1997; Kochanska & Kaack, 2003; Rothbart, Ahahi, & Hershey, 1994), and is also related to the development of social competence and success in peer relationships (Eisenberg, et al, 1993; Raver, Blackburn, Bancroft, & Torp, 1999; Eisenberg et al., 1997). For example, Raver and colleagues (1999) reported that children who used attentional regulation strategies in preschool demonstrated higher teacher-reported social competence and were more likely to be rated as popular or average by their peers than rejected or neglected. Similarly, Eisenberg and colleagues reported that preschool teacher's rating of attentional control for boys was positively related to subsequent teacher assessment of social competence and peer sociometric status (Eisenberg, et al, 1993). Consistent with these findings, Eisenberg and colleagues (1997) reported that children's teacher-rated attentional control was positively related to peer sociometric status and teacher social competence ratings from

kindergarten through second grade. Similarly, inhibitory control was also positively related to social competence and peer experiences. That is, children who have the ability to control behavioral responses have the capacity to act more appropriately and demonstrate higher levels of social competence. Lengua (2003) reported that children with higher levels of inhibitory control were rated by self and mothers as more socially competent than children with lower levels of inhibitory control. Moreover, Kochanska and colleagues (1997) found that inhibitory control was positively related to prosocial behavior in a sample of children between toddlerhood and preschool.

Based on the evidence reviewed above, one can conclude that effortful control, as currently defined, is an important component in the development of social competence and positive peer relationships. Furthermore, there is strong evidence to support the link between social competence and risk for subsequent internalizing problems (Hymel et al., 1990; Gazelle & Ladd, 2003; Margolin, 2007; Burt et al., 2008). However, to date, although social competence has been examined as a mediator between some risk factors and subsequent internalizing behavior (e.g. Nangle, Erdley, Newman, Mason, & Carpenter, 2003; Kim & Cicchetti, 2004; Shonk & Cicchetti, 2001), no work has examined social competence as a possible mechanism explaining the association between effortful control and internalizing problems.

At a theoretical level, having the ability to inhibit a dominant response in order to perform a subdominant response is an important interpersonal tool. Using the examples of inhibition and activation patterns outlined above, a child who is able to inhibit but who has deficits in activation may chronically miss important social skill building

opportunities because they are likely withdrawn from their peers and their larger social network. This behavioral pattern may increase risk for symptoms of internalizing behaviors, such as lowered self esteem, social anxiety, and loneliness, through repeated unsuccessful interpersonal experience and negative interpersonal feedback (e.g. Cole, 1991). In contrast, a child who can inhibit inappropriate social behavior while also activating socially appropriate responses may be more likely to follow a path of normative social and emotional development. Therefore, a similar pattern of risk for deficits in social competence may also be associated with different patterns of inhibition within the context of activation.

### *Hypotheses*

The primary purpose of the present research was to clarify the relation between effortful control and subsequent internalizing behaviors by improving upon possible conceptual issues apparent within the existing literature. Accordingly, differential patterns of inhibition and activation ability were examined in relation to subsequent internalizing problems. Furthermore, social competence was examined as a possible mechanism through which individual differences in effortful control (specifically deficits in activation) may influence internalizing behaviors.

Using a sample of children between the ages of 4 and 7.5 from an ongoing longitudinal study, three hypotheses were tested:

1. Children with higher inhibition ability but with deficits in activation ability at 4 years will display higher internalizing symptoms at 7.5 years relative to children with high levels in both inhibition and activation ability.

2. Children with higher inhibition ability but with deficits in activation ability at 4 years will be rated as lower in social competence by their kindergarten teachers relative to children with higher levels of both inhibition and activation ability.

The relation between effortful control (specifically deficits in activation) at 4 years and subsequent internalizing behaviors at 7.5 years will be partially explained by children's level of social competence in kindergarten.

## CHAPTER II

### METHOD

#### *Recruitment and Attrition*

The current sample utilized data from three cohorts of children who are part of an ongoing longitudinal study. The goal for recruitment was to obtain a sample of children who were at risk for developing future externalizing behavior problems, and who were representative of the surrounding community in terms of race and socioeconomic status (SES). All cohorts were recruited through child day care centers, the County Health Department, and the local Women, Infants, and Children (WIC) program. Potential participants for cohorts 1 and 2 were recruited at 2-years of age (cohort 1: 1994-1996 and cohort 2: 2000-2001) and screened using the Child Behavior Checklist (CBCL 2-3; Achenbach, 1992), completed by the mother, in order to over-sample for externalizing behavior problems. Children were identified as being at-risk for future externalizing behaviors if they received an externalizing T-score of 60 or above. Efforts were made to obtain approximately equal numbers of males and females. A total of 307 children were selected. Cohort 3 was initially recruited when infants were 6-months of age (in 1998) for their level of frustration, based on laboratory observation and parent report, and were followed through the toddler period (see Calkins, Dedmon, Gill, Lomax, & Johnson, 2002, for more information). Children whose mothers completed the CBCL at 2-years of age were included in the current study ( $n = 140$ ). Of the entire sample ( $N = 447$ ), 37% of

the children were identified as being at risk for future externalizing problems and 15% ( $N = 447$ ) were identified as being at risk for future internalizing problems. There were no significant demographic differences between cohorts with regard to gender,  $\chi^2(2, N = 447) = .63, p = .73$ , race,  $\chi^2(2, N = 447) = 1.13, p = .57$ , or 2-year SES,  $F(2, 444) = .53, p = .59$ . Cohort 3 had a significantly lower average 2-year externalizing T-score ( $M = 50.36$ ) compared to cohorts 1 and 2 ( $M = 54.49$ ),  $t(445) = -4.32, p < .001$ .

Of the 447 original screened participants, 6 were dropped because they did not participate in any 2-year data collection. At 4-years of age, 399 families participated. Families lost to attrition included those who could not be located, who moved out of the area, who declined participation, and who did not respond to phone and letter requests to participate. There were no significant differences between families who did and did not participate in terms of gender,  $\chi^2(1, N = 447) = 3.27, p = .07$ , race,  $\chi^2(1, N = 447) = .70, p = .40$ , 2-year SES,  $t(424) = .81, p = .42$ , or 2-year externalizing T-score,  $t(445) = -.36, p = .72$ . At 5-years of age, 365 families participated, including four that did not participate in the 4-year assessment. Again, there were no significant differences between families who did and did not participate in terms of gender,  $\chi^2(1, N = 447) = .76, p = .38$ , race,  $\chi^2(1, N = 447) = .17, p = .68$ , 2-year socioeconomic status,  $t(424) = 1.93, p = .06$ , and 2-year externalizing T-score,  $t(445) = -1.73, p = .09$ . At 7-years of age, 350 families participated, including 19 that did not participate in the 5-year assessment. Again, there were no significant differences between families who did and

did not participate in terms of gender,  $\chi^2(1, N = 447) = 2.12, p = .15$ , race,  $\chi^2(3, N = 447) = .60, p = .90$  and 2-year externalizing T-score,  $t(445) = -1.30, p = .19$ . Families with lower 2-year socioeconomic status were less likely to continue participation at the 7-year assessment,  $t(432) = 2.61, p < .01$ .

### *Participants*

The current study focused on children from cohorts 2 and 3 with complete data from 4-year temperament, 5.5-year kindergarten and 7.5-year school and laboratory assessments. Cohort 1 was excluded from this study because this group did not receive any self-report measures of internalizing behavior at the 7.5-year laboratory visits. At recruitment, 13 % of the subsample ( $N = 256$ ) was identified as being at risk for internalizing problems with CBCL-Internalizing scores above or equal to 60. At 4-years of age, 245 families participated in the laboratory visit. There was a trend for significant differences between families who did and did not participate in terms of 2-year SES,  $t(292) = -1.926, p = .055$ . No differences were apparent between families who did and did not participate in terms of gender,  $\chi^2(1, N = 292) = .161, p = .69$ , race,  $\chi^2(3, N = 292) = 1.54, p = .67$ , 2-year internalizing T-score,  $t(254) = -.303, p = .76$ , or 2-year externalizing T-score,  $t(254) = .096, p = .92$ . At 5.5-years of age, 177 families agreed to participate in the kindergarten school assessments. Families who did not participate were of lower SES  $t(292) = -3.63, p < .05$ . No differences were apparent between families who did and did not participate in terms of gender,  $\chi^2(1, N = 292) = .682, p = .41$ , race,  $\chi^2(3, N = 292) = 1.85, p = .60$ , 2-year internalizing T-score,  $t(254) = -.205, p = .84$ , or 2-year externalizing T-score,  $t(254) = .283, p = .78$ . Finally, at 7.5-years of age, 151

families agreed to participate in the 7.5-year laboratory and school assessments. Families who did not participate were of lower SES,  $t(292) = -3.55, p < .05$ . No differences were apparent between families who did and did not participate in terms of gender,  $\chi^2(1, N = 292) = .299, p = .58$ , race,  $\chi^2(3, N = 292) = 3.206, p = .36$ , 2-year internalizing T-score,  $t(254) = -.731, p = .47$ , or 2-year externalizing T-score,  $t(254) = .375, p = .71$ . Missing data were due to parents or principals not giving consent for research participation, schools being too far away, or teachers not completing questionnaires.

### *Procedures*

*4-year Assessment.* Two years after the original assessment, the families were contacted by mail and phone and asked to participate in a follow-up study. Families who agreed to participate in the follow-up came to the laboratory when their children were four years-old, at which time mothers completed a number of questionnaires and children participated in a battery of behavioral assessments.

The task utilized in the current study included the puppet task from the Effortful Control Battery (Kochanska et al., 1997). During this task, the experimenter introduced a pig and an iguana hand puppet. Children were instructed to listen to the commands given by the “nice pig” and to ignore the commands given by the “mean iguana.” After instructions were provided, children completed a practice session during which time the experimenter provided feedback on command mistakes and ensured understanding of task directions. Upon completing the practice session, children were presented with 16-20 commands (half from the pig and half from the iguana). An example trial command is “touch your nose.” No feedback was provided after the initial practice session.

*5.5-year (kindergarten) Assessment.* At 5.5 years, families were re-contacted for follow-up data collection. Parent consent was obtained in order to collect behavioral ratings from each child's kindergarten teacher. Upon consent, teachers were given a battery of questionnaires regarding the target child's social, emotional, and academic behavior.

*7.5-year Assessment.* At 7.5 years, families were re-contacted for follow-up data collection. Parent consent was obtained in order to obtain ratings from peers and teachers in second grade, respectively. School and classmate consents were then attained so that peer ratings could be conducted. Using a modified version of the Coie et al. (1982) sociometric interviews, trained graduate research assistants interviewed each classmate using unlimited nominations of peers, as recommended by Terry (2000). To increase and ensure understanding, each child was required to correctly use the response scale (three subsequent correct responses to sample questions) before obtaining peer nominations. Finally, research assistants used photos of each child as visual prompts in interviews to promote the accuracy and integrity of the measure.

Additionally, within a separate laboratory visit, examiners administered a battery of questionnaires to mothers while each child participant was individually interviewed in a separate room.

### *Measures*

*Inhibition and Activation.* A behavioral measure of effortful control was used to isolate inhibition and activation ability separately. Children's performance on each command given by the pig puppet was rated as 3 (fully correct response), 2 (partial

response), 1 (wrong response). or 0 (no response). Conversely, children's performance on each command of the iguana was rated as 3 (no response), 2 (partial response), 1 (wrong response), and 0 (fully correct response). Ratings were given by two independent coders who met project criteria for reliability ( $\kappa > .75$ ). Ratings for pig command trials were averaged to create a mean activation score. Higher average scores reflect greater ability to appropriately activate a response across commands. Rating for iguana trial commands were averaged to create a mean inhibition score. Higher average scores reflect greater ability to appropriately inhibit across commands. To assess construct validation, face valid items from the Child Behavior Questionnaire (CBQ; Goldsmith & Rothbart, 1991; Rothbart, Ahadi, Hersey, & Fisher, 2001), given at the 4-year visit, reflecting inhibition and activation skills were selected and used as measures of convergent validity.

*Social competence.* Teacher report of social competence was obtained using the Social Skills Rating System (SSRS-Teacher form; Gresham & Elliott, 1990). The SSRS-Teacher form is a 39-item rating scale that asks items across four domains: cooperation, assertion, responsibility, and self-control. Teachers rate how often specific skills occur on a scale of 0 (never), 1 (sometimes), and 2 (very often). Scores are summed to form a total raw score from which a standardized total social skills score is derived. Percentile rankings for standardized total scores were used. Higher scores represent higher levels of social skills. The SSRS is a well known assessment device with adequate internal consistency and reliability ( $\alpha = .71$ ; Gresham & Elliott, 1990).

*Internalizing behavior.* An initial parent report of internalizing behaviors at recruitment (2 years) was obtained using the Child Behavior Checklist (CBCL; Achenbach, 1992) in order to control for the effects of early problem behaviors predicting later adjustment. The CBCL is a 99-item parent report questionnaire of child behavior problems. The CBCL includes two broadband subscales: the Internalizing and Externalizing subscales. The Internalizing CBCL subscale consists of 36 items that include 4 subgroups of symptoms: emotional reactivity, anxious/depressed, somatic complaints, and withdrawn. The measure produces age and gender normed *t*-scores. The CBCL is a well known assessment device with adequate internal consistency and reliability ( $\alpha = .92$ ; Achenbach, 2000).

To measure internalizing behaviors as an outcome, a multi-informant approach was employed. Reports from home and school contexts, as well as other and self perspectives, were obtained via parent, teacher, peer and self reports at the 7.5-year laboratory and school visits.

Parent and teacher reports were obtained using the internalizing subscale of the Behavior Assessment Scale for Children Second Edition (BASC-PRS, BASC-TRS; Reynolds & Kamphaus, 1992). The BASC is a widely used 148-item measure (for children ages 6-11) that assesses a wide range of problem behaviors. Parents and teachers were asked to rate the frequency of anxious and depressive behaviors described using a likert-type rating ranging from 1 (never) to 4 (almost always). The measure produces age and gender normed *t*-scores for each subscale assessment. The BASC is widely used across research domains and exhibits well established internal consistency,

reliability, and validity. The alpha and test-retest reliability for the internalizing subscales have been reported at .70 and .78, respectively (Reynolds & Kamphaus, 1992; 2002).

Peer report of internalizing behavior was obtained through peer nominations. Using a modified version of Coie et al.'s (1982) sociometric rating procedure, peers in each child's immediate second grade classroom environment were asked to nominate classmates regarding a number of behaviors and peer-status items. Of particular interest to the present study were peer nominations of children who are perceived as "shy" and "who cry." Nomination scores for each child are summed and standardized according to classroom size.

Self report of internalizing behaviors was obtained using the Multidimensional Anxiety Scale for Children (MASC; March, Parker, Sullivan, & Stallings, 1997) and the Child Depression Inventory (CDI; Kovas, 1985). The MASC is a 39-item measure of physical symptoms of anxiety, social anxiety, harm avoidance, and separation anxiety for children between the ages of 8 and 19 years (this current sample was, on average 6 months younger than the suggested age range). Each item is rated on a likert scale ranging from 0 (never true about me) to 3 (often true about me). An overall age-normed anxiety *t*-score is produced. Research examining the psychometric properties of the MASC has demonstrated strong support for its internal consistency, reliability, and validity (Baldwin & Dadds, 2007; March & Parker, 2004). Chronbach's alpha for the current sample was  $\alpha = .846$ .

The CDI is a 27-item global measure of depressive symptoms for children between the ages of 7 and 17 (Kovas, 1985). Items are presented as statements representing degrees of specific symptoms. Children rate each item by choosing the symptom statement that best describes them over the previous two weeks. A representative item is “I have fun in many things,” “I have fun in some things,” “Nothing is fun at all.” An overall age-normed *t*-score is produced, with higher scores reflecting greater depressive symptoms. Chronbach’s alpha for the current sample was  $\alpha = .839$ .

#### *Data Reduction*

Consistent with current research practice, this study incorporated multiple-informant measurement methodology. Currently, the common practice for using and interpreting multi-informant methodology is unstandardized. In most cases, separate analyses are conducted and interpreted for each reporter, although in some cases researchers have attempted to combine reports. However, there is no systematic way of using or interpreting multi-informant data. Targeting this problem, Kraemer and colleagues (2003) proposed a theoretical approach that considers timing, context and perspective in a systematic manner. According to this approach, measurement of a construct is dependent on a relevant time span in which it is stable, the contexts in which it may occur (e.g. home, school etc.), the perspectives that observers may take (e.g. self vs. other), and measurement error. The authors suggest that orthogonal (discrepant) reports are valuable as they contribute a unique observation (context x perspective) in three-dimensional space of a true construct. According to this theory, the minimum number of informants needed is based on the contexts (*c*) and perspectives (*p*) possible

within a discrete period of time ( $c + p - 1$ ). For example, within middle childhood, internalizing behavior can be observed across school and home contexts, and from a self and other perspective. Accordingly, at least 3 reporters are needed. This approach requires informant reports be combined using a principle components analysis that is validated within the same population. Three factors are expected; the first, according to the authors, reflects the true construct, and the remaining two reflect variance attributed to context and perspective. To address this issue, the present study employed Kraemer and colleagues' (2003) approach to analyzing multi-informant data for the 7.5-year internalizing behavioral outcome.

## CHAPTER III

### RESULTS

Preliminary descriptive analyses were conducted to test for normative distribution of each measure. Table 1 lists descriptive information for dependent and independent variables. Because both inhibition and activation mean scores were negatively skewed (skewness = -2.006 and -2.786, respectively), each measure was dichotomized into groups reflecting mastery (mean scores = 3) vs. emergence (mean scores < 3). Further preliminary analyses investigated differences between mastery and non-mastery inhibition/activation groups across demographic variables. Of the 245 children who were seen at the 4-year visit, 54.7 % and 42.4 % were in the non-mastery inhibition and activation groups, respectively. There were no differences between activation groups across race, gender, SES, or 2-year internalizing scores. Similarly, no differences were found between inhibition groups on gender, SES or 2-year internalizing scores; however, there were differences between inhibition groups across race, such that children in the non-mastery inhibition group were more likely of non-white status,  $\chi^2(2, N = 144) = 8.069, p < .05$ . As such, race was entered into subsequent analyses as a control variable.

Table 2 displays correlations between all independent and dependent variables. Activation and inhibition were not related to any single reporter rating of depression or anxiety. As expected, parent, teacher and self report of anxiety and depression were not

or only moderately correlated. Agreement between reporters ranged from  $r = -.009$  to  $r = .347$ .

To validate the behavioral measure activation, groups were compared on face-valid items of the CBQ as a method of testing convergent validity. Item 20 (“Is good at games like ‘Simon Says,’ ‘Mother, May I,’ and ‘Red Light, Green Light’”) and item 4 (“can lower his/her voice when asked to do so”) were chosen as face-valid measures of activities that tap both inhibition and activation skills (e.g. item 20) and inhibition skills in isolation (e.g. item 4). Independent samples  $t$ -tests were run on both items to test for mean differences across non-mastery and mastery activation groups. As expected, there were significant mean differences between non-mastery and mastery groups for activation across item 20, such that non-mastery groups ( $M = 4.961$ ) scored lower than mastery groups ( $M = 5.426$ ) on this item,  $t(288) = -3.145$ ,  $p < .05$ . Consistent with expectations, there were no differences between activation groups on item 4.

*Data reduction.* Parent, teacher, peer and self reports for internalizing behaviors were reduced according to Kraemer and colleagues’ (2003) suggested methodology. Peer reports for “who is shy” and “who cries” were averaged to create one peer-report composite. Similarly, self report total MASC and CDI scores were standardized and averaged to produce one self-report measure of internalizing problems. Each report was entered into a principal components analysis for a random 50 % of the sample and then re-run on the entire sample for validation with orthogonal (varimax) rotations. Contrary to Kraemer and colleagues’ (2003) expectations, factor loadings for teacher, peer, parent, and self report of internalizing symptoms yielded only one factor with an eigenvalue

above 1 ( $\lambda = 1.558$ ). This factor explained 38.94 % of the total variance across measures for this sample. Table 3 lists factor loading for each report. All reporters loaded positively, with loadings ranging from .532 to .747. This factor was interpreted to represent an underlying broad internalizing dimension. Individual factor scores were saved and used in subsequent analyses as the outcome internalizing measure.

*Activation/inhibition as predictors of internalizing behavior.* To test the hypothesis that children high on inhibition but low on activation would be at greater risk for subsequent internalizing behaviors relative to children who were high on both inhibition and activation, a hierarchical linear regression was conducted with saved individual internalizing factor scores as the dependent variable. Because race differed across inhibition groups, it was entered into the first step as a control variable. Additionally, in order to assess change in internalizing behavior over time, 2-year recruitment internalizing scores were also entered at the first step as a control variable. Then, inhibition and activation group scores (coded as 0 or 1) were entered in the next step. Finally, the interaction term for inhibition x activation groups was entered at the last step. Table 4 lists beta weights and significance levels for each step. Contrary to hypotheses, results for the interaction were not significant. However, main effects for both inhibition,  $t(128) = 2.065, p < .05$ , and activation,  $t(128) = -2.962, p < .05$ , were noted, such that children in the non-mastery inhibition groups had lower internalizing scores than the mastery inhibition group, whereas children in the non-mastery activation group had higher internalizing scores than those in the mastery activation group,  $R^2 =$

0.176. Figure 1 depicts mean differences on internalizing scores for inhibition and activation groups.

*Mediation analysis.* To test the mediating role of social competence in the relation between effortful control and internalizing behaviors, a series of hierarchical regression analyses was performed according to a procedure specified by Baron and Kenny (1986). Because there was no significant interaction for inhibition and activation, social competence as a mediator for both main effects was examined. Table 5 shows beta weights and significance levels for regression analyses.

In the first analysis, inhibition and activation were regressed onto kindergarten SSRS-TR total social competence percentile scores. Race and 2-year internalizing were entered at the first step as control variables. Activation and inhibition group membership was entered as the second step. Results showed a main effect for activation only,  $t(138) = 2.055, p < .05$ , such that children in the non-mastery activation group had lower teacher ratings for social competence than those in the mastery activation group. Figure 2 shows mean differences for social competence across activation groups.

The second regression analysis examined the relation between social competence and internalizing behaviors. Kindergarten SSRS-TR scores were regressed onto 7.5-year Internalizing scores. Race and early internalizing were entered at the first step as control variables and SSRS-TR percentile scores were entered at the second step. Results revealed a trend for a main effect for social competence,  $t(117) = -1.92, p = .057$ , such that children with higher ratings of social competence had lower subsequent internalizing scores.

In the final regression analysis, activation scores were regressed onto internalizing behaviors, while controlling for social competency in kindergarten. Race, 2-year internalizing scores and SSRS-TR ratings were entered at the first step as control variables. Activation group membership was entered in the next step. A main effect for activation remained after controlling for social competence scores,  $t(107) = -2.016, p < .05$ . Contrary to the hypothesis, subsequent analysis did not support social competence as a mediating mechanism within this relation, Sobel = -1.281, *ns*. Figure 3 shows the change in beta associated with activation when social competence is added to the model.

## CHAPTER IV

### DISCUSSION

The present study sought to clarify the relation between effortful control and subsequent internalizing behaviors in early and middle childhood by incorporating a comprehensive assessment of effortful control. Specifically, patterns of inhibition and activation ability were examined in relation to subsequent internalizing problems. Results indicated that children with higher inhibition ability and children with lower activation ability were independently at increased risk for the development of subsequent internalizing problem behaviors in middle childhood. No evidence for an interaction between inhibition and activation was evident.

As a secondary aim, social competence in kindergarten was examined as a possible mechanism explaining the relation between early patterns of inhibition and activation ability and subsequent internalizing symptoms. Results indicated that children with higher activation ability were rated as having higher levels of social competence by their kindergarten teachers. However, results did not support the hypothesis.

Interestingly, preliminary analyses revealed differences with regard to race across inhibition groups, such that children of minority status were more likely to be in the non-mastery inhibition group. This finding was unexpected and in contrast to the little research that has directly examined differences in development of effortful control across racial and ethnic groups, where no differences in effortful control were found across

African America, Latino, and Anglo American preschoolers (Li-Grining, 2007). However, as racial variables are seldom examined within this literature, the patterns found in this paper suggest a need for further evaluation of race and ethnicity in the development of effortful control.

These findings are a first step to clarifying the relation between effortful control and internalizing behaviors. Although traditionally underrepresented in the assessment and conceptualization of effortful control, the ability to activate a response has important implications within emotion regulation theory (Rothbart & Bates, 1998). This lack may be responsible for past patterns of inconclusive findings regarding effortful control and internalizing symptoms (Eisenberg et al., 1998; Eisenberg et al., 2001; Eisenberg et al., 2005; Muris et al., 2004; Murry & Kochanska, 2002). These findings highlight the importance of considering activation ability when examining effortful control as a construct, especially as it relates to internalizing problem behavior and social competence.

More broadly, these results imply a need for research within the field to incorporate a more comprehensive approach to examining effortful control as it relates to adjustment. Recent work examining the association between effortful control and academic competence has begun (although infrequently) to include activation ability within measurement and conceptualization (e.g. Valentine et al., 2008). However, to date, research has not consistently incorporated both inhibition *and* activation ability within a broader measurement of effortful control. The consistent influence of activation ability within our results suggests a need for a systematic shift toward measurement and

methods that routinely include both inhibition and activation within the assessment of effortful control.

Although results did not support an interaction between inhibition and activation ability in the development of social competence or internalizing behavior, it is imperative to note that future work is needed to replicate and further define this association.

Theoretically, it has been noted that different patterns of inhibition and activation have different implications for both social and emotional outcomes. Specifically, examining effortful control as a precursor for internalizing behavior, a chronic pattern of inhibition and lowered activation may place a child at greatest risk for internalizing problems.

Children with this pattern of ability are likely neglected by their peers and larger environment as they are unlikely to create a stimulus for social interaction. Over time, this interpersonal experience may place a child at increased risk for internalizing symptoms such as lowered self-esteem and social anxiety.

Given this rationale, additional work should be undertaken to further clarify the association between effortful control and subsequent internalizing outcomes. However, we also acknowledge the limitations of our measurement of inhibition and, particularly, activation. Within our sample, the majority of children scored perfectly or within a 90 - 100 % & correct range on both inhibition and activation tasks. This pattern suggests that our assessment may have been more informative if administered at an earlier age, when the majority of children have not yet mastered this task. Although effortful control ability has theoretically stabilized by the preschool period (e.g. Posner & Rothbart, 2000; Kochanska & Knaack, 2005), a more challenging task employed to assess activation and

inhibition at this stage in development may more accurately address these underlying abilities. This adjustment in measurement may yield more variable results and provide a larger group of children who fall into the low activation and high inhibition group. Thus, future work should incorporate a more developmentally appropriate (i.e. challenging) measurement of activation within the assessment of effortful control.

In addition, it is also important to note that neither inhibition nor activation was examined under an emotionally arousing context. As effortful control is theorized to act as a socioaffective regulatory system, theoretically separate from the processes of executive functioning on cognitive regulation (Blair & Razza, 2007; Zelazo & Cunningham, 2007), measurement of this ability within an emotionally arousing environment may more accurately assess inhibition and activation ability as an emotion regulation construct and thus provide a better picture of how these constructs interplay as they relate to problem behaviors.

Additionally, although the present results did not provide support for social competence as a mediator, evidence for the association between activation and social competence was established. Further research may re-examine this construct as a mediational mechanism between effortful control and internalizing behaviors later in development. Recent longitudinal work has shown that the association between social competence and subsequent behavior problems differs across development (Burt et al., 2008). Whereas in early and middle childhood, social competence is strongly related to externalizing behaviors, this association weakens over time as deficits in social competence become more strongly related to internalizing symptoms in adolescence and

adulthood. A re-examination of this model as it relates to social skills and internalizing problems in later childhood and/or adolescence may yield a different pattern of results.

Finally, it is important to note that these results are limited to the context of the sample that was tested. Recruitment in this sample was aimed to over-represent early externalizing behaviors. As such, internalizing symptoms among participants fell within normative and subclinical ranges. Future research incorporating the activation component of effortful control is needed to examine patterns of inhibition and activation with a clinical sample.

Despite these limitations, the present study offers an important contribution to the extant literature. This was the first to specifically incorporate both inhibition *and* activation ability within the measurement and conceptualization of effortful control and subsequent social and emotional behaviors. Results demonstrated that activation ability has implications within the development of both social competence and internalizing behaviors. Children with lowered activation ability showed lowered ratings of subsequent social competence and greater levels of internalizing behaviors in middle childhood. This finding has important implications on our current conceptualization of effortful control, as well as our understanding of effortful control in the process of adjustment.

Given the importance of identifying early risk for maladjustment, this work provides initial evidence for the implication of inhibition and activation skills as targets for prevention and early intervention. Although an important first step, future work is needed to replicate these results and further clarify this association. Developing a more

precise measurement of activation within emotionally provocative and age-appropriate tasks may be a primary aim. Moreover, given the unexpected differences across racial groups, our findings support the need for further investigation regarding racial and ethnic differences in the development of effortful control. Finally, additional work is also needed to examine differential patterns of inhibition and activation within clinical samples and across later childhood and adolescence.

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APPENDIX. TABLES AND FIGURES

*Table 1. Descriptive Statistics for Independent and Dependent Variables*

	Mean	SD	Min	Max	N
1. Mean Inhibition	2.50	0.86	0.00	3.00	245
2. Mean Activation	2.75	0.51	0.00	3.00	245
3. SSRS-TR	53.97	26.61	2.00	98.00	173
4. Parent BASC Internalizing	43.61	8.39	29.00	82.00	222
5. Teacher BASC Internalizing	48.02	9.49	39.00	84.00	190
6. Peer report “who cries”	0.10	0.80	-1.28	3.35	178
7. Peer report “who is shy”	-0.18	1.08	-1.64	3.77	178
8. MASC	56.61	10.11	31	82	204
9. CDI	47.34	8.71	35	84	204

Note. \* $p < .05$ , \*\* $p < .01$ .

*Table 2. Correlation Coefficients for Independent and Dependent Variables*

	1	2	3	4	5	6	7	8
1. Mean Inhibition								
2. Mean Activation	.068							
3. SSRS-TR	.042	.117						
4. Parent BASC Internalizing	.083	-.110	-.006					
5. Teacher BASC Internalizing	-.029	-.046	-.243**	.200**				
6. Peer report "who cries"	.015	-.013	-.431**	.094	.269**			
7. Peer report "who is shy"	-.011	-.093	-.103	.074	.037	.186*		
8. MASC	-.057	-.080	-.006	.170*	.233**	.151	-.028	
9. CDI	-.076	-.092	-.157	.032	.161*	.048	-.042	.384**

*Table 3. Principal Components Analysis Factor Weights*

	Full sample	Validation Sample
Parent BASC Internalizing	.574	.635
Teacher BASC Internalizing	.747	.772
Mean Peer report	.532	.522
Mean Self report	.570	.579

Table 4. Inhibition and Activation Groups Regressed Onto 7.5 Year Internalizing Behaviors

Model		$\beta$
<b>Step 1</b>	$R^2 = .096, p < .05$	
CBCL 2year Internalizing		3.117 **
Race		.2052*
<b>Step 2</b>	$\Delta R^2 = .079, p < .05$	
CBCL 2year Internalizing		.300**
Race		.225**
Inhibition		0.730*
Activation		-0.243**
<b>Step 3</b>	$\Delta R^2 = .001, ns$	
CBCL 2year Internalizing		3.626**
Race		2.724**
Inhibition		2.067
Activation		-2.478*
InhibitionXActiavtion		.379

Note. \* $p < .05$ , \*\* $p < .01$ .

Table 5. Regression Coefficients for Meditational Analyses

Model		$\beta$
<b>1. Step 1</b>		$R^2 = .066, p < .05$
	CBCL 2year Internalizing	-.209*
	Race	-.145
	<b>Step 2</b>	$\Delta R^2 = .029, p < ns$
	CBCL 2year Internalizing	-.216*
	Race	-.152
	Inhibition	.022
Activation	.170*	
<b>2. Step 1</b>		$R^2 = .125, p < .01$
	CBCL 2year Internalizing	.320 **
	Race	.146
	<b>Step 2</b>	$\Delta R^2 = .029, p = .057$
	CBCL 2year Internalizing	.284**
	Race	.136
	SSRS-TR	-.175, $p = .057$
<b>3. Step 1</b>		$R^2 = .151, p < .01$
	CBCL 2year Internalizing	.274**
	Race	.141
	SSRS-TR	-.179, $p = .057$
	<b>Step 2</b>	$\Delta R^2 = .032, p < .05$
	CBCL 2year Internalizing	.288**
	Race	.162, $p = .075$
SSRS	-.150	
Activation	-.183*	

Note. \* $p < .05$ , \*\* $p < .01$ .

Figure 1. Mean differences on internalizing scores for inhibition and activation groups.

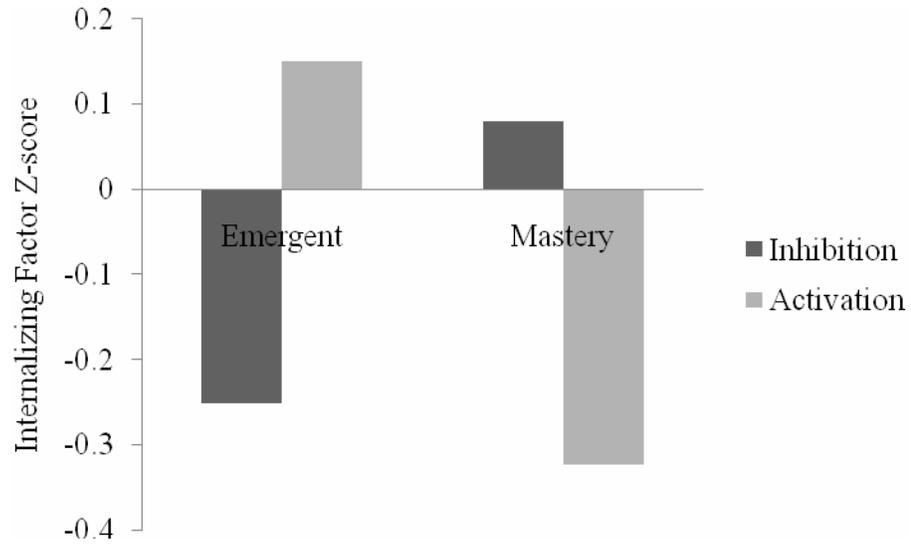


Figure 2. Mean differences for social competence across activation groups.

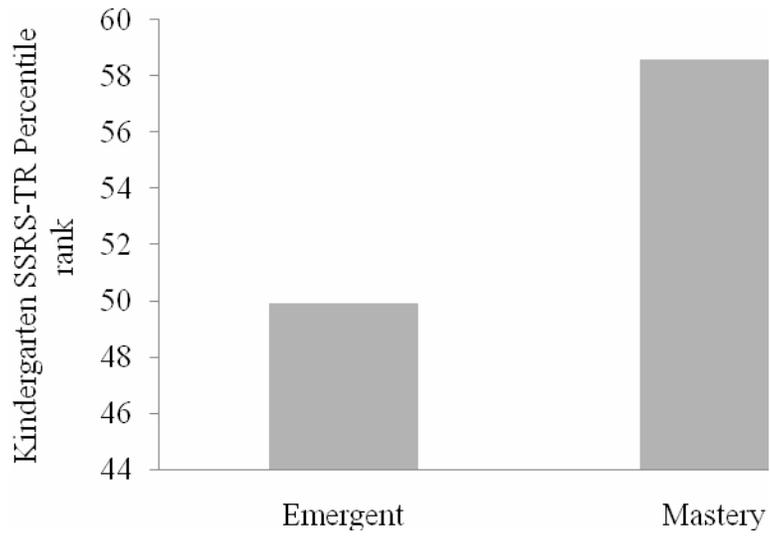


Figure 3. Mediation model with beta weights and significance levels.

