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Emotional competence, behavioural patterning, and executive functions

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ABSTRACT
The importance of social-emotional competence, executive functioning, and behavioural recognition of patterns by young children is receiving increased attention from researchers, schools, parents, and teachers due to the beneficial outcomes of children who have skills in each. This paper presents studies of the correlations between these variables in the fall and again in the spring of a preschool year, and culminates in a time-lagged comparison of the relationships between these skills during one preschool year. The most clear-cut findings were (1) that there is a successive, but not simultaneous, relation between emotional development and behavioural patterning, and (2) that the ability to inhibit natural responses is a forerunner to emotional development.

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Emotional competence, executive functioning, and patterning

Emotional competence is one of the key components of healthy development and child well-being. It is comprised of three aspects: appropriate emotional expression, understanding other's emotions as well as one's own, and emotion regulation (Denham, Bassett, & Wyatt, 2007). More specifically, emotional expressiveness describes the emotion a child actually displays. A child's abilities to distinguish and understand different emotions, not just their own, but those of others as well, and to also comprehend the probable causes and consequences of these various emotions in various situations is termed 'emotion understanding' (Denham et al., 2007). Emotion understanding also includes being able to understand that even within the same given context, that two people can have different emotions. Finally, emotion regulation refers to children's abilities to either heighten or inhibit internal and external emotional expressions to be appropriate for a certain situation. In other words, emotion regulation is the ability for children to handle their emotions in productive and appropriate manners (Denham et al., 2007; Denham, Bassett, & Zinsser, 2012). Emotional competence, including emotional expressiveness, affects the process of emotion regulation, and the reverse is also true. Denham, Bassett, Way, et al. (2012) showed in a longitudinal study that emotional competence and self-regulation are correlated, and that there is a bidirectional relationship between the two; competency in one skill can either promote or hinder the development in the other skill.

A child's daily experiences are saturated with emotions and these experiences can either expedite or impede learning, depending on the child's levels of emotional and cognitive competence. Understanding one's own emotions, those of others, and their appropriateness, as well as cause-effect relationships involving emotions requires sufficient cognitive functioning for such comprehension. Cognitive competence can be expressed and measured in many ways, among which are executive

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functions (EFs) such as working memory, inhibition, and cognitive flexibility. These EF components are correlated but distinguishable (Miyake et al., 2000). Working memory is defined as the immediate processing and updating of one's thoughts and knowledge, inhibition is defined as the ability to resist automatic responses and impulsive behaviour, and cognitive flexibility is defined as the ability to shift between thinking based on current rules and demands (Duan, Wei, Wang, & Shi, 2010). These EFs are embedded in the neurological functioning of the brain. Consequently, their development depends on the interaction between maturation and experience (Piaget, 1963/1936).

Ferrier, Bassett, and Denham (2014) examined the relationship between EF and emotional competence in preschoolers and found that there was a significant directional relationship between the two; initial emotional competence positively predicted later EF. Denham, Bassett, Brown, Way, and Steed (2015), later found that for its part EF played an important and significant role in children's acquisition of emotional competence. For example, self-regulation includes the ability to regulate one's own emotions and behaviours in prosocial and productive manners, both by being cognizant of one's feelings and by adjusting them based on the knowledge of the situation. Self-regulation also includes the ability to express emotions in socially appropriate manners. This involves one's level of emotional competence and inhibition, which is one of the primary EF (Denham, Bassett, Mincic, et al., 2012). Hence, inhibition is important in self-regulation. A child who is highly self-regulated must not only possess emotional competence but also possess sufficient inhibition to resist his or her impulses to react automatically to a given situation, and instead, regulate their emotions and behaviours in order to act appropriately.

In preschool, children are constantly faced with situations where their emotional competence and executive functioning skills are tested. For example, Johnny sees that Sally is unknowingly playing with his toy that he brought from home, so he angrily snatches it back from her saying, 'That's mine, you can't play with it!' Sally must now exhibit emotional competence by correctly identifying Johnny's emotion and the situation which provoked it. She must then also regulate her own emotions, to react appropriately. She must understand Johnny's point of view, which requires cognitive flexibility. Thus, in order for a child to correctly identify other's emotions, the child must recognize the situation and compare it to others which differ in details but involve the same principles. This also requires a level of working memory – neurological development – sufficient for the child to be able to mentally compare different emotional perspectives and situations. In order for the child to express certain emotions while suppressing others, and to appropriately behave in social situations, the child must also be able to practice inhibition, which is usually a function of cortical development. All of the above are necessary in situations where a child must solve a problem at hand, especially those involving emotions (Von Salisch, Haenel, & Denham, 2015). Children who lack skills in any one of these aspects of emotional competence or executive functioning experience higher internalizing and externalizing behaviours, subsequent peer rejection, and consequently a higher risk of disengaging from school (Domitrovich, Cortes, & Greenberg, 2007).

EF skills such as working memory, inhibition, and cognitive flexibility have also been found to play a role in preschoolers' understanding of simple patterns of items. At the preschool level, in an effort to help the children understand that there ARE such things as patterns, patterns of objects, shapes, and colours are typically taught as some form of simple A follows B sequences.. Lessons in comprehending these types of patterns are almost universal in preschools and kindergartens in English-speaking countries, with the goal of improving children's cognitive functioning. In the U.S.A., such 'patterning' instruction has been recommended by such national organizations as the National Council of Teachers of Mathematics and the National Association for the Education of Young Children as shown in their joint position statement (National Council of Teachers of Mathematics/National Association for the Education of Young Children, 2002/2010), and has been part of the Common Core. Comprehending such patterns may be important in understanding patterns of emotional behaviour. Children's understanding of behavioural patterns and their understanding of socio-emotional interactions are probably related – a proposition that has not yet been tested.

Certainly understanding patterns of items and EFs are related. Collins and Laski (2015) found that preschoolers' inhibition and working memory were correlates of their ability to comprehend such patterns. Ponitz et al. (2015) corroborated these results for working memory, and also found that cognitive flexibility significantly predicted proficiency in patterning. They were, however, unable to show an effect for inhibition. The findings from these studies provide evidence that children seem to need a level of cognitive flexibility to be able to shift their attention between the varying aspects of patterns, and also need a level of working memory to be able to update the knowledge in their minds, so that they can accurately identify and predict what comes next in a patterning sequence (Bock et al., 2015). Both of these would result from children's increasing maturation, in terms of neurological development, and the interplay of that development with their increasing experience with their environment (Piaget, 1963/1936) as well as their own efforts to explore the latter (Vygotsky, 1978). Hence, in theory, there should be a link between EFs, which result from neurological development and express themselves behaviourally through working memory, cognitive flexibility, and inhibition, and behaviours which require these EFs. One behaviour in question is understanding patterns of items, which is thought to be an expression of cognitive development (Clements & Sarama, 2007a, 2007b) and has been shown to be related to EF (Bock et al., 2015; Collins & Laski, 2015; Miller, Rittle-Johnson, Loehr, & Fyfe, 2015). Others are understanding expressions of emotions, understanding one's own emotions, and understanding the emotions of others, which together comprise emotional competence. These behaviours depend to some extent upon understanding patterns of responses to emotion-arousing situations, and have been shown to related to EF (Denham, Bassett, Mincic, et al., 2012; Denham et al., 2015; Lee, Ng, Pe, & Ho, 2014). Hence, understanding of patterns, EF, and emotional competence should all be interrelated. One goal of the present study was to identify, in the same sample of children, the relationships between EFs, emotional competence and comprehension of patterns as measured by well-known tests. A second was to determine their stability over a preschool year. We hoped to confirm previous reports that EF were related to emotional competence, and to test whether these relationships persisted for at least a year. We also hoped to develop more evidence of what relationships exist between EF and understanding patterns by preschoolers. There is a discrepancy between the findings of Collins and Laski (2015) and Miller et al. (2015) on the role of inhibition in understanding patterns, although the two studies agreed in finding positive correlations for working memory. We also intended to determine whether whatever relationships our measures revealed persisted for at least a year. Finally, we planned to examine the relationship between understanding patterns and emotional competence, which has never been tested. We focused on emotion understanding, as measured by tests widely used with preschoolers, and again wished to determine whether the relationships, if any, lasted for a year.

Method

Participants

The participants were 13 boys and 14 girls enrolled in a private preschool in a suburb in northern Virginia. Demographically, 47.1% were white, 29.5% were Asian, 12.6% were Hispanic, 6.2% were African-American, and 4.6% were unknown or other.

Instruments

Affect knowledge test (AKT). This measure assesses the child's understanding of emotion using puppets and flannel faces displaying happy, sad, angry, and scared emotions (Denham, 1986). Children first identify how each face feels (expressive knowledge), then point to the face corresponding to the emotion that the researcher names (receptive knowledge). Finally, children watch 20 vignettes with vocal and visual affective cues that the researcher enacts using the puppets. In eight vignettes, the puppet depicts an emotion that most people would feel during that situation (i.e. scared during a nightmare). This portion of the AKT tests whether children understand the emotions that other people typically feel when they are similar to the child's own. For the remaining 12 vignettes, the puppet depicts the emotion opposite to what the child would normally feel (as reported by their parents). This portion of the AKT tests the child's ability to understand the emotions of other people when they feel differently than the child does in a given situation (Denham, 1986). Cronbach's alpha is .87 (Denham, Bassett, Way, Mincic, et al., 2012). These scores are summed to provide a global measure of emotion understanding.

Challenging situations task (CST). This is a forced-choice measure of emotion understanding where children are read hypothetical peer-oriented scenarios in random order with corresponding picture cards to help visualize the story. The first part to each scenario is used to score children's emotions (emotion measure), and the second part to each scenario is used to score children's reactions (reaction measure). Children are asked how they would feel in the given provoking situation (choices include happy, sad, angry, or just okay), and what they would then do (choices are prosocial, aggressive, avoidant, or crying responses). The child's choice for their emotion and the child's choice for their reaction are recorded. An emotional response of 'happy' for to a provoking situation is considered incorrect while 'angry,' 'sad,' and 'just ok' are considered correct. For the reactions, a prosocial choice is considered correct while aggressive, avoidant, and crying are considered incorrect. Children are asked how they would feel in the given situation (choices include happy, sad, angry, or just okay), and what they would do (choices are prosocial, aggressive, avoidant, or crying responses). Each possible choice is represented with a picture to help children visualize the emotional and behavioural response (Denham, Bouril, & Belouad, 1994). Cronbach's alpha is .55, with significant inter-item correlations (Denham, Bassett, Mincic, et al., 2012).

Assessment of basic language and learning skills – revised (ABLLS-R). The child was shown individual patterns consisting of various geometric shapes, one at a time. There were four of each of the following pattern types: ABAB, AABAAB, ABBABB, ABCABC, and AABBAABB. The child was to replicate the first 10 patterns, and extend the last 10 patterns. Correct responses are summed for a total score on patterning. The validity of the ABBLS-R is high, with a correlation coefficient of .83 with the Vineland Adaptive Behavior Scales age equivalents and a correlation coefficient of .90 with the Mullen Scales of Early Learning age equivalents.

Dimensional change card sort (DCCS). This task (Zelazo, 2006), has three different sets of cards with different colours and shapes, and was used to measure cognitive flexibility. First, the child was asked to sort the three sets of cards separately based on the colour dimension. Then, the child was asked the child to sort the same three sets of cards by shape. Scores for each sort were either 0 (sorted randomly), 1 sorted correctly but with 1-2 mistakes, or 2, a 100% correct sort. With three sets of cards, each sorted twice, the highest score possible is 12. Children were also scored for speed in sorting. Test-retest reliability correlation for the DCCS is .48 (Meador, Turner, Lipsey, & Farran, 2013).

Day/night inhibition (D/N). The child was shown 10 pictures of suns and moons in a counterbalanced order, and told to say 'day' whenever the moon was shown, or 'night' whenever the sun was shown. This is a test of the child's ability to inhibit their normal response. The number of correct responses was added to get a total score on this task. The time to complete the task (in seconds) was also recorded. The rate of performance was further calculated by dividing the total time in seconds by the total correct responses. A low rate indicates that the child took less time for each correct response. Kuder-Richardson reliability is .93 (Chastiosis, Kiessling, Hofer, & Campos, 2006).

Procedure

Subjects were pretested individually on the ABLLS-R patterning test, the DCCS, the Day Night test, the AKT, and the CST in counterbalanced order during the fall and retested, again in counterbalanced order, on all five measures during the spring.

Table 1. Descriptive statistics for pre- and posttest variables.

	Mean time 1	SD	Mean time 2	SD
Patterning	0.73	0.25	0.79	0.25
D/N total	12.71	4.49	14.35	2.15
DN time	85.63	27.36	65.38	28.22
D/N rate	10.33	17.14	4.73	2.25
DCCS total	2.89	0.31	2.96	0.20
DCCS time	171.93	100.55	140.92	40.53
AKT	31.63	2.50	32.62	2.50
CST emotions	0.93	1.21	0.64	1.12
CST reactions	1.96	1.48	2.36	1.47

Results

Descriptive statistics are given in Table 1. Correlations between measures in the fall are shown in Table 2; correlations in the spring are shown in Table 3, and cross-correlations are shown in Table 4.

Fall correlations

The correlation between the CST and AKT did not approach significance, indicating that these two tests measure different aspects of emotional development.

In the fall, children who expressed more negative emotions (which would be appropriate) in challenging situations (CST) showed more cognitive flexibility, being both more accurate, $r(25) = .495$, $p < .01$, and faster, $r(25) = -.347$, $p < .05$ in sorting on the DCCS. (The negative correlation indicates that it took them less time to complete the test.) On the other hand, children's knowledge of their own and other children's emotions (AKT) did not correlate with the cognitive flexibility measures; it correlated only with one of the inhibition measures (the time to complete the day/night task), $r(25) = -.386$, $p < .05$.

Also in the fall, total scores on the DCCS (cognitive flexibility) correlated with patterning, $r(26) = .368$, $p < .05$. This was the only measure to correlate with patterning.

Correct sorting on the DCCS and the time the children took to complete this cognitive flexibility measure were correlated, $r(26) = -.639$, $p < .001$, as might be expected. Cognitive flexibility as measured by the DCCS total for correct responses also correlated with two day/night measures of inhibition: correct responses, $r(26) = .475$, $p < .01$, and response rate $r(25) = -.672$, $p < .001$. (A negative correlation means that children were able to respond quickly.) There were no other correlations between EF measures.

According to Cohen (1992), r is the effect size and these were medium, $.30 < r < .50$, or large, $r > .50$. Small effect sizes, $.10 < r < .30$ could not be detected for a sample of 28 children. The square of the correlation coefficient gives the coefficient of determination, which expresses the proportion of children's differences (variability) on one measure can be linearly predicted from the other.

Table 2. Correlation matrix for fall variables.

	D/N			DCCS		AKT	CST	
	Total	Time	Rate	Total	Time		Emotion	Reaction
Patterning	.227	.124	−.103	**.368***	−.286	−.052	.193	.044
D/N total		.079	**−.684****	**.475****	−.231	.036	−.030	.211
D/N time			.152	−.078	−.020	**−.386***	.254	−.282
D/N rate				**−.672****	−.043	.104	.168	−.194
DCCS Total					**−.639****	−.158	**.495****	.090
DCCS Time						.090	**−.347***	−.304
AKT							−.150	.277
CST Emotion								.174

*$p < .05$.
**$p < .01$.

Table 3. Correlation matrix for spring variables.

	D/N			DCCS		AKT	CST	
	Total	Time	Rate	Total	Time		Emotion	Reaction
Patterning	−.267	−.204	−.043	.236	**−.403***	.001	−.029	.020
D/N total		−.036	**−.524****	−.157	.008	−.168	−.081	−.106
D/N time			**.857****	−.135	.220	−.125	.057	−.185
D/N rate				−.047	.208	−.019	.131	−.140
DCCS Total					**−.468****	.213	−.067	−.091
DCCS Time						−.049	.235	−.195
AKT							.239	.189
CST Emotion								**.448***

*$p < .05$.
**$p < .01$.

Spring correlations

In the spring, there again was no significant correlation between the CST and AKT, and neither correlated with any measure of cognitive flexibility or inhibition. The two CST measures, emotions and reactions, were correlated, $r(23) = .448$, $p < .05$, which had not been the case in the fall.

The correlation between cognitive flexibility and patterning remained significant, $r(24) = -.403$, $p < .001$, but this time it was the children's speed on the DCCS, rather than their accuracy, which was correlated with patterning.

There were also correlations within (but not between) the EF measures. The DCCS cognitive flexibility measures of accuracy and time to complete the task were again correlated, $r(24) = -.468$, $p < .01$. Likewise, the D/N (inhibition) total for correct responses and time to completion both correlated with D/N response rate, $r(24) = -.524$, $p < .01$, and $r(24) = .857$, $p < .01$. There were no other correlations between spring measures.

Cross-correlations

A time-lagged (cross-lagged) analysis showed that fall scores on the CST emotions measure correlated with spring patterning, $r(24) = .385$, $p < .05$, but the converse was not true, $r(23) = .053$, $p > .05$. Hence, it appears that children who appropriately identified negative emotions as likely to occur in challenging situations subsequently developed a better understanding of patterns over the course of the preschool year. There were no cross-correlations between patterning and the CST reactions measure or the AKT.

Table 4. Time-lag correlation matrix.

	Spring								
		D/N		DCCS				CST	
Fall	Pattern	Total	Time	Rate	Total	Time	AKT	Emotion	Reaction
Patterning	**.722****	−.192	−.012	.108	**.384***	**−.341***	.171	.053	.046
D/N total	.016	−.154	.130	.211	.229	−.148	−.059	−.028	.074
D/N time	.060	−.263	−.124	.052	.040	.060	**−.490****	−.139	**−.437***
D/N rate	−.130	.141	−.044	−.091	.006	.094	.071	.199	**−.371***
DCCS total	**.487****	−.158	.020	.083	−.058	−.066	−.163	**.368***	.176
DCCS time	**−.382***	−.101	.287	.270	−.186	.150	.170	.081	−.088
AKT	.095	.023	.135	.113	−.201	−.121	.143	.176	**.343***
CST emotion	**.385***	−.132	.133	.194	−.006	**−.469****	.074	.321	−.060
CST reaction	.035	.307	−.015	−.165	−.147	−.322	.120	.301	**.460****

Notes: Rows show correlations from Fall to Spring; for example, Patterning scores in the Fall correlated −.341 with DCCS Time scores in the Spring. Columns show the Spring to Fall correlation; for example, Patterning scores in the Spring correlated −.382 with DCCS Time scores in the Fall.
*$p < .05$.
**$p < .01$.

The picture was not so clear for the relation between cognitive flexibility and the CST emotion measure. Children with high CST emotion scores in the fall performed more quickly on the DCCS spring cognitive flexibility time measure, $r(24) = -.469$, $p < .01$; there was no relation between the spring CST emotion scores and this cognitive flexibility measure (DCCS time) in the fall, $r(23) = .081$, $p > .05$. Thus, better emotion understanding in the fall predicted *quicker* sorting in the spring. But children with high (accurate) DCCS scores in the fall scored better on the CST emotion understanding measure in the spring, $r(23) = .368$, $p < .05$. There was no relation between fall CST emotion understanding scores and the accuracy of the DCCS spring sorting $r(24) = -.006$, $p > .05$. Hence, more *accurate* sorting in the fall predicted better emotional development in the spring. This suggests a complicated and probably reciprocal relation between cognitive flexibility as measured by the DCCS and emotional development as measured by the CST emotion understanding measure. But there were no correlations between cognitive flexibility and the CST reactions measure at any time.

There were no relations across time for cognitive flexibility and the AKT.

A clearer pattern emerged when cross-correlations for inhibition were examined. There were no correlations across time for any inhibition measure and either patterning or cognitive flexibility. However, inhibition measures did correlate with the measures of emotion understanding . The speed of performance on the fall D/N inhibition measure predicted spring AKT scores, $r(24) = -.490$, $p < .001$, but not vice versa, $r(24) = .113$, $p > .05$. Hence, good performance on this fall inhibition measure predicted better spring AKT scores. Likewise, the speed of performance on the D/N inhibition measure in the fall predicted spring scores on the CST reaction measure. $r(23) = -.437$, $p < .05$, but not vice versa, $r(24) = -.015$, $p > .05$ Hence, the ability to quickly inhibit natural responses was predictive of later understanding of emotions on both measures of emotional development. For the CST, this relationship held only for the reaction measure.

The cross-correlations also provide pretest–posttest reliability measures. These are quite low for most measures, indicating that the children underwent substantial and variable changes in both cognitive and emotional development over the course of the preschool year. The most consistent result was for patterning, $r(24) = .722$, $p < .001$. Hence, the ABBLS-R has adequate pretest–posttest reliability, in addition to the validity measures reported earlier. The CST positive reaction measure also produced a significant correlation between fall and spring administrations, $r(23) = .460$, $p < .01$. This is, to our knowledge, the only pretest–posttest reliability measure ever reported for the CST.

Finally, two of the cognitive measures, patterning and cognitive flexibility, were correlated with each other from fall to spring and vice versa; correlations were comparable in both directions, as shown in Table 4.

Discussion

These results were inconsistent with the hypotheses based upon previous literature. First, the relations between measures of EF and measures of emotional development were not consistent. Second, there were not many significant correlations between measures in the spring. However, the correlations that did appear confirmed that there are relationships between EF and emotion understanding at the outset of preschool. It also showed that these relations become insignificant as the children complete their year in preschool. This result was unexpected, but Cartwright's (2012) review indicated that EF change rapidly in such young children, as do many aspects of children's development. In general, the neurological underpinnings of emotional and cognitive development are different, and may develop at different rates, which may account for the disappearance of some relationships as the children matured.

In spite of this fluidity, in the simultaneous relations between EF and the emotion measures, some prediction of spring development from fall measures was possible. Inhibition measures did predict the children's later standing on both the CST and AKT, and the predictions were unidirectional.

This indicates that the quickness with which children can inhibit unproductive responses leads to better emotional development. The direction of the relationship makes sense. Being fast at substituting the right response to a situation for a natural but unproductive response would produce more successes in the social challenges young children encounter, in turn leading to more opportunities to engage other children positively, identify their emotions, and identify their probable emotional reactions. This in turn would lead to more learning opportunities, in a positive feedback loop. Such learning could be self-directed (Piaget, 1963/1936), but could also be assisted by adult suggestions and explanations (Vygotsky, 1978).

Better inhibition of undesirable responses in the fall was accompanied by better cognitive flexibility, with some variance across measures. Hence both types of EF would contribute to the development of emotional competence later in the preschool year, and the effect of cognitive flexibility, as shown by the DCCS accuracy measure, was unidirectional and in the same direction as the inhibition measures. However, the opposite relationship was found for the other (speed) cognitive flexibility measure. Better emotional development as measured by one CST scale was a prequel for better performance on this measure of cognitive flexibility, the opposite of the relation found for the accuracy measure of cognitive flexibility and inhibition. Hence, cognitive flexibility could help but also be helped by better understanding of emotions.

The relation between cognitive flexibility and patterning persisted, and echoes that reported by Bock (2015) and Schmerold et al. (2017) for older children (first-graders) and by Miller et al. (2015) for preschoolers. It is evident, from studies by different researchers using different measures, that the ability to comprehend different patterns requires cognitive flexibility. The present study was conducted in part to test the hypothesis that understanding patterns would be related to emotion understanding, because there are simple patterns in events that lead to emotions. There was a relation, but the direction was opposite to that hypothesized; better understanding of emotions led to better understanding of patterns, rather than vice versa. This is similar to the finding for the speed measure of cognitive flexibility. Hence, better early development of emotion understanding (as measured by the CST but not the AKT) leads to better understanding of patterns. However, the two were uncorrelated both times they were measured simultaneously; it is clearly a successive relationship.

Patterning was not related to inhibition as measured by the day/night measure in this study. The finding parallels that of Bock (2015) for the same measure with first graders, that of Schmerold et al. (2017) who used the Stroop with first graders, and that of Miller et al. (2015) who used Luria's Hand Game (Hughes, 1996), to measure inhibition by preschoolers. It conflicts with the report of Collins and Laski (2015) who used the head-toes-knees-shoulders (HTKS) game (Zelazo, 2006) to measure inhibition by preschoolers. Both of the latter 'games' are reverse Simple Simon games; the child must do the opposite of what the researcher does. It seems likely that the relation between patterning and inhibition is tenuous. Perhaps the HTKS is the most sensitive measure, if sample differences do not account for the differences in results of these studies.

These results suggest that investigation of the relations between EF and emotional development are likely to yield different results with different samples of preschoolers. Even within the same sample, relations were not consistent from fall to spring; with different samples, more inconsistency can be expected. There certainly are relationships between EF and emotional development, as Carlson and Wang (2007) and Denham, Bassett, Thayer, et al. (2012) and others have reported. However, the picture that emerges in the present research is that the relations existing at one time are not those that will exist a few months later. Instead, child developmentalists can expect fluid, ever-changing interrelationships, even when the same measures are used on the same preschoolers at different points in time. This is a challenge which suggests that the relations between early cognitive development and early emotional development will be difficult to establish with studies that measure these developments at one point in time. Longitudinal measures, especially those with relatively short time spans between measures, seem likely to be most productive.

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