

Classroom Management Strategies and Executive Function Development:
A Cross-Cultural Comparison Between U.S. and Chinese Kindergarten Classrooms

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Abstract

Children's executive function (EF) skills predict their academic success, and previous research suggests that schooling experiences influence the development of these skills. This study investigated different teacher behavioral management strategies in China and the United States and their association with children's growth in 408 children in twenty-one U.S. classrooms and fourteen Chinese classrooms. Teachers' proactive and reactive management strategies were coded from videotaped observations; children's EF skills were assessed in individual sessions. Results revealed that U.S. teachers gave more directions overall than Chinese teachers and there was a moderate relation between children's skills and teachers' use of reactive strategies in Chinese classrooms. Culture was the only significant predictor of children's growth in EF throughout the school year. This study lays the groundwork for future research in this area and could be useful in finding a way to reduce problem behavior in the classroom.

Keywords: cross-cultural comparison, executive function, kindergarten, classroom management

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The development of executive function (EF), comprised of cognitive flexibility, working memory, and inhibition is an extremely important contributor to several realms of a child's life (Anderson, 2002; Miyake, Friedman, Emerson, Witzki, & Howerter, 2000). These three components of EF have been found to be separate but related and contribute to a child's ability to shift between tasks, control their attention, manipulate information in the working memory, and inhibit dominant or automatic responses when needed (Miyake et al., 2000). All of these executive function processes are influential in a child's cognitive functioning, relationships with peers, behaviors and ability to control emotions (Anderson, 2002).

EF skills have also been shown to be strong predictors of children's academic achievement and success in a school environment. EF skills, which aid in children's ability to consciously control their thoughts and behaviors in the classroom, help them keep teachers' directions in mind (working memory), pay attention in class (attention control), and keep themselves from talking to other students or speaking out in class (inhibition). Performance on inhibition tasks has been found to predict scores on simple math problems, and scores on attention control tasks predicted overall academic achievement (Lan, Legare, Ponitz, Li, & Morrison, 2011). Other research has also shown inhibition and working memory skills in kindergarten students to be an important predictor of their math, reading and writing achievement at the end of first grade (Monette, Birgras, & Guay, 2011). Research on children in other cultures has established a similar pattern. One study found that Chinese kindergarten students' EF skills were directly related to their scores in vocabulary and word recognition (Chung & McBride-Chang, 2011).

Typical Development of Executive Function

Various components of EF have been found to have differing trends of development, all occurring between early childhood and adolescence (Huizinga, Dolan Maurits, & van der Molen, 2006). A review of the literature by Diamond (2002) describes a rapid improvement in cognitive tasks requiring children to hold given information in mind and inhibit dominant behavior between the ages of three and five. After age five, children continue to improve in speed and accuracy. From age seven through early adulthood, improvement continues in several categories including processing speed, strategy use, manipulating information in the working memory, and exercising inhibition while holding information in mind (Diamond, 2002). Although development of the different components of EF including working memory, task shifting, and inhibition, differ slightly, typically developing children generally meet adult levels of performance in all three around age twelve (Huizinga et al., 2006).

Numerous studies have displayed cross-cultural differences in the development of EF skills with children in Asian cultures outperforming children in Western cultures on different components of EF (Lan et al., 2011; Oh & Lewis, 2008). Research on preschool age children in Korea, China and the U.S. found that children in Asian cultures had higher scores than children in Western cultures in inhibition and attention control tasks but very small (Oh & Lewis, 2008) or no differences in working memory (Lan et al., 2011). Another study found that preschool children in Beijing performed better than children in the U.S. on inhibition as well as general executive function tasks (Sabbagh, Xu, Carlson, Moses, & Lee, 2006). These differences in EF skills as well as the connection between EF and academic achievement may help to explain the achievement gap between students in the U.S. and students in Asian cultures (Chen & Uttal, 1988; Stevenson et al., 1990).

The Effects of Schooling on Executive Function Development

In order to gain insight into the possible reasons for these cross-cultural differences, it is important to consider environmental factors that may influence EF development. Multiple studies have looked at the influence of factors within a students' classroom because (1) children's early school years are a crucial period for the development of EF and (2) children spend a large amount of their time in school after reaching school age (Epsy, 1997; Diamond, 2002). Previous research has shown that schooling does in fact have an influence on several components of EF, including working memory, inhibition (Burrage et al., 2008) and cognitive flexibility (McCrea, Mueller, & Parrila, 1999).

A study by McCrea and colleagues (1999) looked at the effects of schooling on EF development by using a school entrance cut-off design. This type of design allows researchers to look at developmental differences based on children's age and other environmental factors versus the direct effects of schooling. The design examines differences in growth between children who are basically the same age but started kindergarten during different years because of their state's cut-off date for starting kindergarten. The participants in this study consisted of children in grades one through four and ages seven through nine. The results show a moderate effect of schooling between grades two and three but not between grades one and two or three and four. Although this study shows overall effects of age, which is consistent with typical development of EF skills, it also shows a direct effect of schooling on a task that measured children's cognitive flexibility (McCrea et al., 1999).

Another study by Burrage and colleagues (2008) also used a school entrance cut-off design and expanded on the study by McCrea and colleagues (1999) by looking at a younger age group. This study focused on the development of working memory and response inhibition in

kindergarten and pre-kindergarten students. Kindergarteners showed an advantage in the working memory task throughout the school year and in the inhibition task in the fall but not by the spring. Overall these results do suggest that both kindergarten and pre-kindergarten have an influence on the development of children's EF skills, and that they affect different components of EF in different ways (Burrage et al., 2008).

While these studies show that formal schooling can have an influence on children's development of EF, other research has looked at specific factors in the school environment that may influence development. The results show that various factors within the classroom can influence children's ability to regulate their behavior and the amount of time they spend on-task (Clunies-Ross, Little, & Keinhuis, 2008; Rimm-Kaufman, Curby, Grimm, Nathanson, & Brock, 2009). A child's ability to regulate their behavior and stay on task is related to their executive function skills and undoubtedly contribute to a their academic performance.

A study looking at overall "classroom quality" examined how certain factors that affect the environment of a classroom can influence children's adaptive behavior, or ability to handle challenges they encounter in the kindergarten classroom (Rimm-Kaufman et al., 2009). Classroom quality was based on several factors, including emotional support, instructional support, and classroom management. Emotional support was defined as the teacher's sensitivity towards students and effort to modify lessons to fit students' individual emotional needs. Instructional support included practices such as scaffolding, allowing students to ask questions, and providing feedback. Finally, well-managed classrooms were defined as classrooms where teachers provided clear and stable routines for children, used more proactive approaches and consistently monitored their students' work and progress (Rimm-Kaufman et al., 2009). Using a more proactive approach is considered attempting to prevent problem behaviors before they

occur, by explicitly explaining rules and identifying or praising desired behaviors. Conversely, reactive strategies are a response to undesirable behaviors that have already occurred (Safran & Oswald, 2003). The results show that classroom management was an important predictor of a child's adaptive behavior, especially their cognitive and behavioral self-control, and their ability to stay on task. Teachers in classrooms with higher instructional support actually rated their students as having lower cognitive self-control and levels of emotional support were not found to have a significant influence on children's adaptive behavior (Rimm-Kaufman et al., 2009). Therefore, the results of this study suggest that teachers' classroom management strategies can influence the overall classroom environment, which can then influence the development of children's behavior regulation.

Another study looking specifically at teachers' use of proactive and reactive strategies found that the amount and type of strategies that teachers used were related to students' behavior in the classroom (Clunies-Ross et al., 2008). Clunies-Ross and colleagues (2008) looked specifically at the use of these types of directions in primary school and used the Observing Pupils and Teachers in Classrooms Schedule to code for student behavior (OPTIC; Merrett & Wheldall, 1986). The system included a 30-minute observation of both teacher and child behavior in each classroom. While coding, the observer alternated between the teacher and children every three minutes resulting in a total of 15 minutes for each (Merrett & Wheldall, 1986). The results show that the use of reactive strategies was a predictor of negative outcomes including student off-task behavior. However, the use of proactive strategies was only mildly related to on-task behavior (Clunies-Ross et al., 2008).

Previous research has also looked at the use of different behavior management strategies across cultures. In a study looking at the behavioral engagement of Chinese and American

students during a first grade math lesson, the results show that overall, Chinese students were engaged more often than American students. Time sampling was used to code teacher and student behavior and found that Chinese students were engaged in 96% of the time slots, whereas American students were engaged in only 61% (Lan et al., 2009). This study also looked at different types of teacher regulatory instruction and found that teachers gave very different amounts and types of instructions across cultures. The results show that when looking at time intervals, Chinese teachers gave proactive instructions in 33% of intervals where American teachers did in only 11%. In regards to total numbers of instructions given, Chinese teachers gave proactive instructions 69% of the time whereas American teachers gave them 48% of the time. Reactive instructions however were very similar for Chinese and American teachers when looking at time intervals but when looking at total number of instructions, American teachers gave significantly more reactive regulatory instructions than Chinese teachers. In classrooms where more reactive instructions were given, there was lower behavioral engagement (Lan et al., 2009).

Similar to the findings of Clunies-Ross and colleagues (2008), these results show that only reactive instructions predicted children's engagement in both cultures. Lan and colleagues (2009) suggest that reactive instructions may be predictive of off-task behavior because they indicate off-task behavior that is already occurring as well as distract other students and cause further off-task behavior. These results represent the complex relationship between a teacher's behavior management strategies and their student's initial skills and behavior.

Bi-directional Relationship Between Student Skills and Teacher Strategies

While teachers' skills at managing children's behavior effectively have been shown to influence children's engagement in the classroom, it is also possible that children's behavior

influences the type of management strategies teachers use. In order to look further into this relationship it is necessary to use a transactional model, which looks at both individual characteristics and the context of the situation (Sameroff & Mackenzie, 2003).

Sameroff & Mackenzie (2003) describe how theories of development are used to describe patterns in groups of people but do not necessarily apply to specific individuals. In reality a person's development is much more complicated and is influenced by both their individual characteristics and their social context and environment. Past research on parent-child interactions show that children with difficult temperaments sometimes elicit maladaptive parenting techniques, which then contribute to further problems for the child later in life. In other words, children are in some ways influenced by their environment, but their individual characteristics also work to shape their environment. This bidirectional relationship between a child's individual characteristics as well as other environmental factors including parts of their school experience work together to influence their development of executive function (see Figure 1 for a conceptual model). Therefore, a child's development of EF skills is affected by their school experience, but their school experience may differ depending on their initial skills (Sameroff & Mackenzie, 2003).

Rationale & Hypotheses

The aim of the current study is to look deeper into the bidirectional relationship between the development of children's EF skills and teachers' use of proactive and reactive behavioral management techniques in the classroom. The influence of teachers' management techniques on children's EF development is important to understand because it may also be related to children's academic achievement and possibly the achievement gap between children in the U.S. and China.

This study will expand on previous research in this area by using more in-depth methods. While the study by Lan and colleagues (2009) also looked at behavior regulation strategies, it looked strictly at a math lesson. This study will look at a wider variety of classroom activities. It will also expand on the study by Clunies-Ross and colleagues (2003) by using a different coding method and extending these findings to kindergarten, an earlier grade level than previous studies. Kindergarten is the first year of formal schooling in the U.S., and it is important to determine how teacher directions differ when children are first learning how to behave in a classroom. Kindergarten is also an important time in children's EF development. This study will not only look at how schooling affects EF development, but how students' EF skills influence the behavior management strategies their teacher chooses to use. Finally, the complex association between student characteristics, EF skills, and teacher behavior management strategies will be considered as well as how this influences students' growth throughout the school year.

This study will focus on inhibition, one component of executive function. A child's ability to inhibit undesirable responses would most likely influence the amount of time they spend on-task in school and their ability to control their attention and behavior. Therefore, the development of inhibition skills is extremely important for all children in a school setting and has been shown to differ between children in the U.S. and China (Lan et al., 2011).

Based on previous research, it is expected that there will be significant differences in the amount of proactive and reactive directions given by Chinese and U.S. teachers (Lan et al., 2009). Secondly, teachers whose students have higher inhibition skills at the beginning of the school year are predicted to give more proactive directions. This is expected because teachers who find that their students are able to keep directions in mind, stay on task and inhibit undesired behavior may find it more useful to use proactive strategies. They may also need to use fewer

reactive strategies because their students are not off-task as often. Conversely, teachers whose students have lower inhibition skills will give more reactive directions due to their students' more frequent off-task behavior. The third prediction is that students whose teacher gives more proactive directions will show greater growth in inhibition skills over the school year than students whose teacher gives more reactive directions.

Method

Participants

This study was conducted using data from a larger cross-cultural study examining the differences in executive function (EF) skills between Chinese and U.S. kindergarteners and the classroom processes that predict these differences. This study consisted of observations of teachers and assessments of students in fourteen kindergarten classrooms in Beijing and twenty-one classrooms in the U.S. The number of children per classroom ranged from 5-13 in U.S. classrooms and 9-21 in Chinese classrooms. The sample consisted of 408 children overall who were 51% male and had an average age of 5 years and 5 months at the time of their fall EF assessment (see Table 1 for a breakdown of age and gender by culture). Children in the U.S. sample were from diverse socioeconomic backgrounds and were from urban, suburban and rural areas in the Midwest. Maternal education was used as a proxy for children's socioeconomic status (SES) however, this information was not available for every participant. The average number of years of education was 14.27 for U.S. mothers ($N= 158$) and 14.13 for Chinese mothers ($N=186$) (see Table 2 for a detailed breakdown of Maternal Education for U.S. mothers). Students in the U.S. sample were 72% white and 12% African American (see Table 3 for a more detailed racial breakdown). Students in the Chinese sample were 89% Han and 11%

other. All kindergarten teachers in both cultures were female and all of the U.S. teachers were Caucasian.

Procedure

Each kindergarten classroom was videotaped during the first academic hour of the school day at the beginning and end of the school year. Two video cameras were used, one focusing on the children participating in the study and one focusing on the teacher. The current study used only the teacher videos from the fall observations. Children participating in the study were also given brief assessments of their EF skills. The task used for this study was the Woodcock-Johnson pair cancellation task, which assesses cognitive inhibition and attention control (Woodcock & Mather, 2000). In this task children were given a sheet of paper with 300 small pictures, all of which were a cup, a ball or a dog. They were then asked to circle every pair in which a ball was followed by a dog and were given three minutes to find as many pairs as possible. This task assessed children's EF skills by asking them to keep a given rule in mind, focus on the task at hand as well as filter out irrelevant pictures. A team of researchers in Beijing completed the same EF assessments and observations in Chinese kindergarten classrooms.

The parents of children participating in the study were asked to fill out a questionnaire including information about their child such as their age, gender, number of siblings and preschool experience. Parents were also asked about their age, educational experience, current employment and salary. This information was used to report the demographics of the sample and to control for variables such as SES in the final analysis. These questionnaires were given to children at school to take home and sent directly to parents in the mail. For U.S. parents, some questionnaires were completed over the phone.

Measures

The videotaped observations were analyzed using Noldus Observer software. Coders counted the number of instances of proactive and reactive directions in each classroom observation. The goal of this coding system was to get an accurate count of the number of proactive and reactive directions each teacher gave on a typical day while doing activities the class would normally do. Therefore, directions explaining the presence of the video cameras or the researchers were not coded.

A proactive direction was coded for any direction given before a misbehavior or mistake occurred or an effort to prevent an undesired behavior. Proactive directions included specific directions for how to behave throughout an activity or how to complete a task, and directions that told children how they should always behave in certain situations (see Table 4 for more detailed descriptions and examples). Reactive directions were coded for any directions that were given after or in response to a misbehavior or mistake. Directions coded as reactive were not necessarily a response to “bad” behavior, but rather a behavior that the teacher wanted to correct. For example, a reactive direction would be coded when a teacher instructed a child to “speak louder so everyone in the class can hear you.” Directions were coded as reactive when the coder could identify the behavior that the teacher was responding to. These behaviors most often consisted of: (1) the teacher calling a child’s name to get their attention during an activity, (2) gesturing to a child or the entire class to be quiet, (3) or specifically indicating the behavior that they were responding to. For example, instructing a child to, “Go back and walk this time.”

The observations were conducted during the first hour of the school day in an attempt to ensure that children would be doing similar types of activities in each observation. A second coding system was developed in order to look at whether the activities were in fact consistent between classrooms and cultures. The amount of time spent on instructional activities including

language arts and mathematics was recorded along with time spent on non-instructional activities such as free play, snack, transitioning between activities and other class rituals. Activities where the teacher was the primary director of children's attention were also distinguished from activities where children were in control of their own focus of attention.

Researchers at the University of Michigan coded the observations of both U.S. and Chinese classrooms for both of these coding systems. All coders were trained on the same U.S. videos and then Mandarin-speaking coders coded the Chinese observations. The intraclass correlation (ICC; Shrout & Fleiss, 1979) was used to assess reliability on the statement codes using eight observations (23% of the total sample). Coders coded six training videos, discussing and recoding the observations until they agreed on a minimum of 80% of the codes. Coders then coded two test videos, with no recoding allowed. The ICC for proactive statements based on these eight observations was .94; the ICC for reactive statements was .862. Cohen's Kappa was used to assess reliability on the time codes. Coders coded six videos together while developing the time coding system, agreeing on the final codes for these observations. Coders then coded three test videos, with no recoding allowed. The average Kappa value for these three videos was .74.

Data Analysis

Each observation was approximately one hour long, but due to the slightly different lengths, the counts of each type of direction were divided by the observation length in order to calculate rates per minute. Because the rates of proactive and reactive directions given in each classroom were based on counts of the number of instances of each type of direction, it was not expected that these rates would have normal distributions. Since the distributions were not normal, a non-parametric test, the Mann-Whitney U Test, was used to compare rates across

cultures. Spearman's correlation was used to examine the relationship between children's inhibition skills at the beginning of the school year and teacher's use of proactive and reactive directions. This non-parametric, rank-based correlation was also used to account for the non-normal distribution of the proactive and reactive rates.

Finally, multilevel modeling was used to look at whether teachers' use of proactive and reactive directions predicted students' growth in inhibition throughout the school year. This technique was used in order to take into account children's individual differences, as well as differences that were due to the particular classroom the child was a part of. This analysis looked at how children's inhibition scores at the end of the school year were influenced by characteristics of the child (fall inhibition score, age at assessment, and SES) in addition to characteristics of the child's classroom (teacher's use of proactive vs. reactive directions and culture). Their mothers' level of education was used as a proxy for SES. The control for gender was removed because although there are likely gender differences in the level of inhibition skills at this age, there is no reason to suspect a difference between boys' and girls' growth of these skills. All continuous variables were centered at their grand mean for this analysis. Dummy variables including culture (China = 1, U.S. =0) and gender (male=1, female=0) were entered uncentered.

Results

There were no significant differences across cultures in the amount of time spent in activities where children directed their own attention versus activities directed by the teacher. There were also no significant differences in how the class was grouped throughout the observations (e.g. whether the whole class was engaged in the same activity, the children were working in small groups, or the children were working independently). There was however, a

significant but small difference in the amount of time spent in academic activities, with Chinese classrooms spending 62% of the time in academic activities and U.S. classrooms spending 51%.

The first prediction was that there would be significant differences in the types of directions given by U.S. and Chinese teachers. Consistent with this prediction, the results show that overall teachers did use significantly different amounts of proactive and reactive directions across the two cultures with U.S. teachers giving significantly more of both proactive and reactive directions per minute than Chinese teachers (see Table 5 for means and standard deviations). Different teachers gave a wide range of each type of direction in both the U.S. and China. The amount of reactive directions given ranged from 5 to 115 in Chinese classrooms and the amount of proactive directions ranged from 12 to 43. In U.S. classrooms the amount of reactive directions was 20 in one classroom and 142 in another, and proactive directions ranged from 11 to 106 throughout the observation period. Although the average time for the observations was 60 minutes, the length varied by classroom and the average rate per minute for each type of direction was calculated in order to compare across cultures.

The second prediction was that teachers would use more proactive directions in classrooms where students had higher averages on the inhibition task in the fall. The results show that in U.S. classrooms, this prediction was not supported and there was a non-significant negative correlation $r(21) = -.09, p = .71$ between inhibition scores and proactive directions as well as between children's inhibition scores and reactive directions $r(21) = -.34, p = .13$. Results for Chinese classrooms show a marginally significant negative correlations between child inhibition scores and teachers' use of proactive directions $r(14) = -.50, p = .07$ and reactive directions $r(14) = -.52, p = .06$.

Finally, the third prediction was that teachers' use of proactive and reactive directions would predict students' growth in inhibition over the school year. It was expected that students in classrooms where the teacher gave more proactive directions would show greater growth in inhibition over the school year. First, we ran a fully unconditional model and verified that spring inhibition scores varied by classroom ($ICC = 0.236$). The results show that although culture is a significant predictor of students' growth in inhibition over the school year (Chinese children show greater growth than U.S. children), the rate of proactive directions given by the child's teacher is not (see Table 6 for results). However, the rate of reactive directions given by teachers is a marginally significant negative predictor. Therefore, contrary to our prediction, the number of proactive directions a teacher gave did not predict children's growth in inhibition throughout the school year, but reactive directions did.

Discussion

Previous research shows that environmental factors, such as a child's experience in school, can influence their EF development, which is an important predictor of their academic achievement (Burrage et al., 2008; McCrea et al., 1999). Cross-cultural research has shown that the development of these skills differs across cultures, including between children in China and the United States (Lan et al., 2011; Oh & Lewis, 2008; Sabbagh et al., 2006). This study looked at one particular aspect of children's school experience in these two cultures, the use of proactive versus reactive teacher behavioral management strategies. This aim of this study was to look at the differences in the amounts of proactive and reactive directions given in Chinese and U.S. classrooms and the association between children's EF skills and teachers' use of these strategies. This study also looked at the effect of these strategies on children's growth in inhibition skills throughout the school year.

In order to determine whether students were participating in similar activities during the time we observed in both cultures, we coded the videos for the amount of time spent on academic activities, how the class was grouped for activities, and whether the teacher or child was responsible for directing attention. Our analyses showed no differences in how children were grouped or who directed children's attention in China and U.S. observations. However, Chinese classrooms did spend significantly more time in academic activities than U.S. classrooms. Although this was a significant finding, the discrepancy was small and does not mean that Chinese children are doing more academic work in kindergarten overall, but may just be a function of the time of day when the classroom observations took place. The results of these analyses show that students in U.S. and Chinese classrooms were for the most part, participating in similar activities during the observations used in this study.

Based on previous research, it was predicted that the amounts of proactive and reactive directions teachers gave would vary across cultures. The results were consistent with this prediction and U.S. teachers gave more directions overall than Chinese teachers. These findings could be due to a different teaching approach in U.S. and Chinese classrooms or could be because child behavior differs across these two cultures. Previous research suggests that U.S. teachers may give more reactive directions in response to a greater amount of off-task behavior (Lan et al., 2009). This may also explain why U.S. teachers in this study gave more directions overall, rather than just more reactive directions.

In order to explain the difference in the amount of directions teachers used in the U.S. and China, the association between children's inhibition skills in each classroom and their teachers' management strategies was examined. Teachers whose students had higher averages on the inhibition task in the fall were expected to give more proactive directions because students

would (1) have the skills to keep teachers directions in mind and (2) there would be less off-task behavior to respond to. Although this prediction was not supported in either culture, there was a moderate negative relationship between the amount of both proactive and reactive directions given and children's inhibition scores in China. Although this should be interpreted with caution, it suggests that teachers actually gave fewer of both types of directions in classrooms where children had higher inhibition scores. It is possible that Chinese teachers gave fewer directions overall in response to their children's high inhibition skills rather than giving more proactive directions. This would suggest that the type of behavior management strategies teachers used might have been related to the average inhibition skills of children in their class but not in the way that was predicted.

Lastly, we looked at the association between teachers' behavioral management strategies and children's growth in inhibition skills throughout the school year. It was expected that teachers' use of proactive and reactive directions would predict students' growth in inhibition over the school year and that proactive strategies would elicit greater growth. The results show that although culture was a significant predictor of children's growth, teachers' proactive management strategies were not. Teachers' reactive strategies were, however, a marginally significant predictor. This finding suggests that teachers' use of reactive management strategies, which keep children accountable for their actions and behavior may actually aid in their development of inhibition skills.

The finding that culture was a significant predictor of children's growth is also consistent with the results of previous studies that have found that children in China perform better on EF tasks than children in the U.S. (Lan et al., 2011; Sabbagh et al., 2006). However, culture not only predicted children's level of EF skills but their growth throughout this school year. Various

factors in Chinese children's environment could explain this difference including their interactions with their parents and differences in their schooling experience. Further research is needed in order to explain this difference in growth due to culture.

One possible explanation of the differences in inhibition skills between children in China and children in western cultures could be differing expectations of parents and teachers both in and outside of school. Where students in China are encouraged to restrain or inhibit their personal desires, children in western cultures are encouraged to be assertive and independent (Chen et al., 1998). Lan et al. (2009) argues that this difference could be explained by an emphasis on self-control in Chinese classrooms that is not seen in western classrooms.

Limitations

One limitation of this study is that only one task was used to measure children's EF skills. This task, which was designed to measure cognitive inhibition and attention control, may not measure all of the EF skills that contribute to a child's behavior in the classroom. When doing cross-cultural research, it is also important to consider whether the task is psychometrically equivalent across cultures. Although it is possible that the pair-cancellation task could have been interpreted differently by children in different cultures, the task asks children to circle each pair where a ball is followed by a dog, which would not likely be interpreted differently in the U.S and China.

Another limitation was not having complete data for all children participating in the study. In order to obtain information on the children's background, parents were asked to fill out questionnaires, which asked about their child's preschool experience as well as their own education and income. We were unable to obtain a completed questionnaire from many parents in the U.S. sample after sending copies home with children, mailing them to their home and

calling them at home or work. Parents who did not return the background questionnaire were likely different from parents who had time to fill out the questionnaire or were willing disclose that information. This incomplete data for several students in the study made it difficult to tell what the true demographics were in the U.S. sample.

Conclusions

Despite its limitations, this study provides insight into the types of instruction that are currently being used in classrooms in both the U.S. and China. While previous studies have found that children in China exhibit less problem behavior than American children, this study looks further into how behavioral management strategies differ between Chinese and American teachers. It also builds and expands on previous research on this topic by looking at kindergarten age children and by considering the relation between children's executive function skills and their teachers' behavior management strategies.

Future research on this topic could explore how teachers' behavior management strategies affect other components of executive function. While this study looked at inhibition skills, which are connected to a child's ability to stay on-task in class, future research could look further into how other components of EF influence children's behavior or the amount of time they spend on-task in the classroom. Further research on this topic could lead to finding ways to reduce problem behavior in the classroom and improve the academic achievement of children in both China and the United States.

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Table 1

Students' Gender and Average Age by Culture

	U.S.	China	Total
<i>N</i>	212	196	408
Male	53%	48%	51%
Female	47%	52%	49%
Average Age	5.4	5.5	5.5

Table 2

U.S. Mother's Highest Level of Education

Education Level	<i>N</i>	Percent
Less than high school diploma	12	8%
High school diploma/GED	22	14%
Some college including community college and technical training	46	29%
College degree	45	28%
Education beyond college	33	21%
Total	158	100

Table 3

Racial Breakdown for U.S. Students

Race	<i>N</i>	Percent
White	153	72%
African American	25	12%
Hispanic	7	3%
Middle Eastern	17	8%
Other	10	5%
Total	212	

Table 4

Examples of Proactive Directions

Description	Example
Directions that tell children how to behave throughout an activity or in a future activity or context	"I'm going to choose students who are sitting quietly with their hand raised."
Academic directions that tell children what they should be doing throughout an academic activity or an academic rule they should generalize to other situations	"When you don't know a word you should look at the word wall."
Directions that relate to a behavior that a child should learn to always do in this situation or that they should generalize to other situations	"I like how Jason is sitting quietly."
Directions that include how a child should complete a task	"Put it away nice and neatly."

Table 5

Average Rates of Proactive and Reactive Directions in the U.S. and China

	U.S.		China		Mann-Whitney U Test
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>p</i>
Proactive	0.93	0.55	0.53	0.19	0.031
Reactive	1.06	0.54	0.61	0.45	0.003

Table 6

How Proactive/Reactive Rates and Culture Predict Spring Inhibition Scores

	<i>B</i>	<i>SE B</i>	<i>t</i>	<i>p</i>
<i>Child Level</i>				
Fall Inhibition	0.45	0.05	8.87	.000
Age	0.18	0.11	1.67	.096
Maternal Ed.	0.51	0.125	4.06	.000
<i>Classroom Level</i>				
Proactive Rate	0.72	1.42	0.50	.616
Reactive Rate	1.65	0.91	1.80	.081
Culture	5.48	5.92	5.92	.000

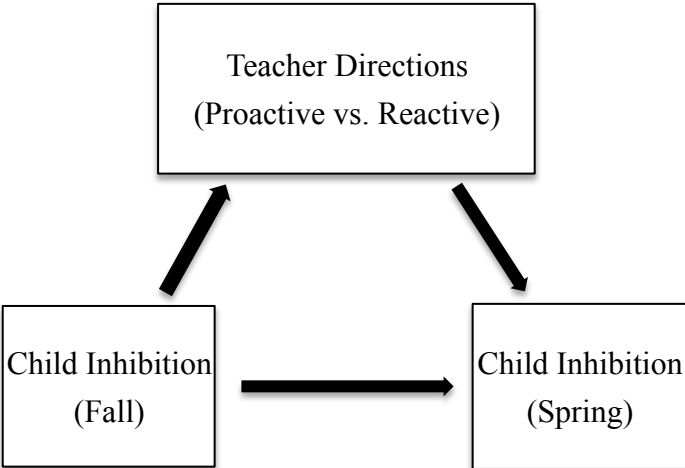


Figure 1. Transactional model of teacher directions and child inhibition skills