

# Mindfulness and Academic Performance: An Example of Migrant Children in China

正念和学习成绩：以中国流动儿童为例

Shuang Lu

Chien-Chung Huang

Juan Rios

Mindfulness emphasizes the awareness of the “here-and-now.” Studies in the recent decade have found that mindfulness can affect positive change in children and adolescents’ school performance. As an emerging field, however, the mechanisms and effects of mindfulness practice on academic performance for children in developing countries have not been well elaborated in previous studies. Using China as an example context, this paper examines the relation between mindfulness and academic performance of migrant children, and, explores the role of executive function in this relation. Through a survey with 219 fifth-graders in two migrant schools in Beijing, this study validates the positive association among mindfulness, executive function, and better school grades in Chinese, math, and English tests. This study adds empirical evidence to the roles of mindfulness in child development. It also sheds lights on the pathway through which mindfulness may positively correlates with academic performance. The findings provide implications for addressing child academic challenges and conducting further research among migrant children in China and beyond.

**Keywords:** mindfulness, executive function, education, academic performance, migrant children, China

## Introduction

Mindfulness, an awareness of focusing on what we are doing while we are doing it and feeling what is happening while it is happening, has become an emerging approach to promote individual well-being (Collard, 2014; Kabat-Zinn, 1994). Mindfulness is found to affect positive change in behavior, emotion, and social relationship of children and adolescents (Napoli, Krech, & Holley, 2005; Snel, 2013). Mindfulness interventions with elementary-school children in the U.S. are found to improve children's selective attention, concentration (Napoli et al., 2005), social skills (Beauchemin, Hutchins, & Patterson, 2008), and classroom behaviors, such as self-control and activity participation (Black & Fernando, 2014).

As an emerging field, however, the effects and mechanisms of mindfulness practice on academic performance have not been well elaborated in previous studies. Mindfulness is also less practiced with vulnerable populations in developing countries. This paper examines the effects of mindfulness on academic performance of elementary-school migrant children in China, who show significantly lower educational achievement than their peers (Hu, Lu, & Huang, 2014; Wei & Hou, 2010). By conducting a survey among students and teachers in two private schools that enroll migrant children in Beijing, this study looks at the relation between mindfulness and child academic performance and explores the roles of executive function in this relation.

## Literature Review

### Academic Challenges of Migrant Children in China

Three decades since China's economic reform, millions of rural laborers have migrated to urban areas with the country's urbanization and industrialization. Today, the number of migrant workers in China—defined as

rural residents who moved within the same county for non-agricultural work or who moved to other counties or provinces for over six months—reaches 277.47 million, or one fifth of the population in mainland China (National Bureau of Statistics of China, 2016). At the same time, migrant children, who live with their parent(s) in cities, have substantially increased. Between 2005 and 2010, migrant children that aged 0–17 years increased by 41.4%. By 2010, there are 35.81 million migrant children in China, or 12.9% of its national child population (All-China Women's Federation, 2013).

Despite their large amount, migrant families (although there are some urban-to-urban and urban-to-rural migration cases, this study focuses on the massive rural-to-urban migration) face significant challenges due to China's *Household Registration System*. Initiated in the 1950s, the Household Registration System aims to control population migration and protects urban economy. The System categorizes all Chinese citizens into *agricultural* or *non-agricultural*, and *local* or *non-local*, typically based on their birthplace. Although the system has been reformed in the following decades, most families' registration status passed between generations. To change registration status requires government approval. The eligibility of the local registration status in urban areas, particularly metropolises such as Beijing, is restricted. The registration system also ties to public welfare provisions (e.g. social security, unemployment insurance, and free public primary education), which favor urban, local residents over rural, non-local residents (Lu, Lin, Vikse, & Huang, 2016; Xu, Guan, & Yao, 2011).

Within the Household Registration and related welfare system, migrant children who live in cities (and some are born in cities) are considered non-local, rural residents based on their

families' registration status. One of the challenges that impact migrant children the most is their limited access to free public education. Public schools may charge migrant students extra fees (Wang & Holland, 2011) and require complicated application documents—to name a few, parents' temporary residence permit, parents' proof of participating social security programs, and rent payment receipts (Lu, 2016).

Migrant children, consequently, have no choice but to attend substandard, private schools, which often feature lower-quality infrastructure and teaching than public schools (Dong, 2010; Wang & Holland, 2011). The institutional inequalities undermine migrant children's educational achievement. They are more likely to discontinue education after middle school than urban children (Lu et al., 2016). They often experience delayed school enrollment, mainly due to their frequent travel with families and limited schooling options (Wei & Hou, 2010). Their school grades and academic achievement are overall lower than urban children (Lu et al., 2016). In addition, migrant children present more behavioral problems that may affect their academic achievement. A study in Wuhan, China, for instance, found that migrant children had significantly more emotional symptoms, conduct problems, hyperactivity and inattention, and peer relationship problems than local children (Hu et al., 2014). These findings call for an approach to address the academic challenges among Chinese migrant children.

### Emerging Mindfulness Practice with Children

*Mindfulness* is defined as "the awareness that emerges through paying attention on purpose, in the present moment, and non-judgmentally to the unfolding of experience moment by moment" (Kabat-Zinn, 2003, p. 145). Mindfulness, in other words,

means to be attentive to what is happening within us, to us, and around us. The concept of mindfulness originates from religions such as Hinduism, Buddhism, and Daoism. It embodies the Hindu “yoga discipline,” the Daoist “qigong,” and the Buddhist meditation (Kang & Whittingham, 2010; Smith, 1994).

In the recent decades, mindfulness practice has been applied in clinical interventions and raised increasing research attention in the U.S. and Europe (Baer, 2003; Burke, 2010). Two types of mindfulness practice, Mindfulness-Based Stress Reduction (MBSR) and Mindfulness-Based Cognitive Therapy (MBCT), are found effective for patients with chronic pain and related stress and major depressive disorders (Kabat-Zinn, 2003; Segal & Teasdale, 2002).

While clinical-setting mindfulness interventions focus on adults, in the recent years, mindfulness practice begins to be applied to children and adolescents in school settings. These practice, some clinical (e.g. interventions for children with behavioral disorders) and some non-clinical (e.g. daily practice for students in general), have shown positive impacts on children’s academic performance and school behavior. For example, a five-week mindfulness training with 409 low-income and ethnic minority students at a California public elementary school significantly improved children’s classroom behaviors, including ability to pay attention, self-control, activity participation, and caring and respect for teachers and peers (Black & Fernando, 2014). Another study that provides 12 biweekly sessions of mindfulness training to 194 1<sup>st</sup>–3<sup>rd</sup> graders showed significant improvements in participants’ test anxiety and selective attention (Napoli et al., 2005). In addition, mindfulness interventions also showed effectiveness among children and adolescents with learning disabili-

ties (Beauchemin et al., 2008), anxiety symptoms (Semple, Reid, & Miller, 2005), attention deficit hyperactivity disorders (ADHD; Singh et al., 2010), and conduct disorders (Singh et al., 2007).

### **Mindfulness, Executive Function, and Child Academic Performance**

The emerging mindfulness practice with children and adolescents warrants examination of its mechanism—for example, why mindfulness improves children’s learning ability? One possible explanation is that mindfulness improves executive function, which is closely related to learning ability.

*Executive function* is an umbrella term that denotes goal-oriented control functions of the prefrontal cortex (Best, Miller, & Jones, 2009). Although the concept is relatively new, executive function is usually considered cognitive processes that relate to planning, working memory, attention, inhibition, self-monitoring, self-regulation, and initiation. It enables human beings to build and carry out plans, regulate emotions, make decisions, solve problems, think flexibly, and prioritize and complete tasks (Goldstein, Naglieri, Princiotta, & Otero, 2014).

Executive function plays a vital role in child academic performance. It may directly affect academic performance as it predicts abilities to remember and process information; it may affect language and reasoning skills, which in turn affect academic performance; it may also indirectly affect learning outcomes through classroom behaviors (Best, Miller, & Jones, 2009). For instance, a study of 119 Chinese and 139 American preschoolers (age 3–5) found that different aspects of executive function (measured by inhibition, working memory, and attention control) significantly predict children’s abilities to count, calculate, and read in both countries (Lan, Legare, Ponitz, Li, & Morrison, 2011). A national study of

1,395 U.S. children and adolescents (age 5–17) found that executive function (measured by abilities to create, apply, and monitor plans) has strong, positive correlation with students’ general reading and math skills (Best, Miller, & Naglieri, 2011). Executive function deficits, in contrast, likely predict poor writing skills (Hooper, Swartz, Wakely, de Kruif, & Montgomery, 2002) and reading difficulties (Protopapas, Archonti, & Skaloumbakas, 2007).

Mindfulness practice, which largely entails attention control, inhibition, and self-monitoring, may effectively improve child and adolescent executive functioning. For instance, a study of 99 Canadian 4<sup>th</sup>–5<sup>th</sup> graders showed that self-reported mindfulness significantly predicted higher level of inhibitory control, an indicator of executive function (Oberle, Schonert-Reichl, Lawlor, & Thomson, 2012). A mindfulness training that included sitting meditation, body scan, and the awareness of self, others, and the environment was provided to 32 second- and third-graders (with another 32 children as control group) in a California elementary school. The eight-week training improved children’s executive functioning (measured by behavioral regulation, metacognition, and overall global executive control scores) at both home and school. Notably, the training was particularly beneficial to those with poorer executive functions before the program (Flook et al., 2010).

In sum, mindfulness has been provided with increasing diverse populations across settings in the U.S. (Baer, 2003; Meiklejohn, Phillips, & Freedman, 2012). As a nascent approach, however, mindfulness practice is less known or applied to populations and regions in developing countries, such as migrant children in China, a vulnerable population that face significant challenges. The emerging field also calls for more empirical research to

explore pathways through which mindfulness exerts its effects (Kabat-Zinn, 2003).

### Research Questions and Hypothesis

Existing research shows that mindfulness, executive function, and academic performance interrelate with each other. To test the effects of mindfulness more globally, this study aims to answer two research questions: how is mindfulness related to Chinese migrant children's academic performance? What role does executive function play in this relation? As shown in Figure 1, our hypothesis is that greater mindfulness is associated with greater executive function, which relates to better academic performance.

### Method

#### Data

Through availability sampling, we selected two elementary migrant schools in Beijing, China, for this study. These two schools represent two ends of migrant schools' quality. School A, an example of large migrant schools that are relatively well-structured, has four classes for each grade on average; while School B, an example of small migrant schools with minimum resources, has only one class for each grade. Considering child cognitive ability, our sample was from the fifth grade rather than the lower ones. All fifth-grade students in School A and B were invited to participate in a survey that was conducted in a classroom setting. The survey questions included self-reported level of mindfulness, executive function, and basic demographic information. Teachers were asked to report the students' Chinese, math, and English test grades. Excluding three students who declined to participate, a total number of 227 students participated in the survey, among which 219 with complete information on all questions were included in our final sample. The students came from five classes; each class had 46, 47,

44, 50, and 32 students respectively.

As shown in Table 1, the sample consisted of 52% boys and 48% girls. The majority of students aged 11 (58%) or 12 (35%) years; a few were 10 or younger (4%) or 13 or older (3%). Most students (65%) were not born in Beijing; the other 35%, although born in Beijing, were enrolled in the migrant schools instead of public schools. Only 23% started elementary education in the current schools; the majority (77%) were transferred from other schools. Most students (94%) were living with both parents at the time of survey; 4% were living with only one parent; 2% were living with people other than parents (e.g. grandparents, extended family members, or other). Students' informed assent was obtained prior to the survey. All participation in this study was voluntary.

#### Measure

The dependent variable, *academic performance*, was measured by students' Chinese, math, and English test grades in the most recent final exam. Ranging from 0 to 100, higher grades represent better performance.

Since persistence and sustained attention are the major components of executive function (Goldstein et al., 2014; Lan et al., 2011), we used the Task Completion and Behavior Scale as an indicator for *executive function* in this study. The scale was modeled after the perseverance scale from the second and third wave of Panel Study of Income Dynamics-Child Development Supplement (PSID-CDS-II & III), developed by Furstenberg and his colleagues (Furstenberg, Cook, Eccles, Elder, & Sameroff, 1999). The scale includes five items that pertain to persistence, sustained attention, and organization: "I stay with a task until I solve it," "Even when a task is difficult, I want to solve it anyway," "I keep my things orderly," "I try to do my best on all my work," and "When I start something, I follow it through to the end."

Students were asked to rate the frequency of these experiences, where 0 = "never," 1 = "rarely," 2 = "sometimes," and 3 = "often." The final score ranged from 0 to 15; higher scores indicate greater ability to complete tasks, or greater executive function. The Cronbach's alpha of these items is 0.77, which suggests good reliability of the scale.

The main independent variable, *level of mindfulness*, was measured by the Mindful Attention Awareness Scale (MAAS), a 15-item scale designed to assess a core characteristic of mindfulness (Brown & Ryan, 2003). Examples of items include "I beak or spill things because of carelessness, not paying attention, or thinking of something else," "I rush through activities without being really attentive to them," and "I do jobs or tasks automatically, without being aware of what I'm doing." The students were asked to report the frequencies of these experiences in their daily lives, from "1" as "almost never" to "6" as "almost always." In the analysis, we reversed the scores; the final score ranged from 15 to 90, with higher scores denoting higher levels of mindfulness. The Cronbach's alpha of these items is 0.83, which shows good reliability of the scale.

In addition, we controlled for children's demographic characteristics, including gender, age, whether born in Beijing, whether transferred from other schools, family type (i.e. living with both parents, one parent, or other), and class (i.e. coming from which of the five classes). All scales and questions were translated to and administered in Chinese by two research team members, who are proficient in both English and Chinese. The language was adjusted with simpler grammar and words considering fifth-graders' reading level.

#### Analytic Strategy

Our analyses began with descrip-

tive analysis of sample characteristics. This was followed by bivariate analysis of executive function and academic performance by level of mindfulness. In the bivariate analyses, level of mindfulness was divided into three groups (i.e. low, medium, and high) based on the 33 and 66 percentile of final sample. Ordinary linear squares (OLS) Regressions were then performed. First, we regressed executive function on mindfulness, controlling for students' demographic characteristics. After that, we regressed academic performance (i.e. Chinese, math, and English grades) on mindfulness and demographic variables, and then added executive function into the regression model.

## Results

### Descriptive Results

On average, the sampled children had high level of mindfulness. They rated themselves 71.3 out of a 15–90 scale, with a standard deviation of 12.2 points. The students' executive function on average was 12.2 points out of a 0–15 scale, with a 2.6 points standard deviation. The average grades were 82.6 points for Chinese, 81.3 points for math, and 76.4 points for English.

### Bivariate Results

Table 2 presents the bivariate results, which show that children's executive function and academic performance significantly vary across levels of mindfulness. With respect to executive function, children with higher levels of mindfulness had greatest executive function. In terms of academic performance, children with highest levels of mindfulness had highest Chinese, math, and English grades. This was followed by children with medium mindfulness, and then those with low mindfulness. For example, the average math grade was 84.6 (out of 100) points for students with high mindfulness, 82.3 points for those with medium mindfulness, and 76.9 for those

with low mindfulness. The group difference was statistically significant.

### Multivariate Results

As shown in Table 3, mindfulness had statistically significant and positive association with children's executive function, controlling for demographic characteristics. Every ten-point increase in mindfulness scale was associated with 0.6-point greater executive function. In addition, executive function differed by gender. Girls showed 1.17 points greater ability than boys. Executive function also differed by class. Compared with Class 1, Class 2 and 4 had greater executive function.

Table 4–6 presents the regression analyses of academic performance on executive function and mindfulness. In each table, model 1 regressed grades on mindfulness and demographic characteristics, while model 2 added executive function, along with all variables in model 1. In terms of Chinese grades (Table 4), every 10-point higher level of mindfulness was related to 1.7-point higher Chinese grade. When factoring in executive function, however, the positive effect of mindfulness was no longer statistically significant. Instead, every one-point greater executive function was associated with 1.25-point higher Chinese grade.

Table 5 shows the regression analyses of math grades. Every 10-point higher level of mindfulness was associated with 2.5-point higher math grade. When controlling for executive function, the positive effect of mindfulness became marginal. Executive function, in contrast, showed strong, positive effects on math grades. Specifically, every one point higher executive function was related to 1.41 points higher math grade.

Finally, the results of English grades (Table 6) followed the same pattern as Chinese and math grades. Every 10-point increase in mindfulness was related to 2.4-point higher English grade; but this effect disappeared after

factoring in executive function. Every one point increase in executive function was associated with 1.78 points higher English grade.

## Discussion

In sum, the results suggest that mindfulness strongly, significantly, and positively correlates with executive functioning, which positively relates to academic performance. In line with previous literature (Flook et al, 2010; Oberle et al., 2012), our study highlights the importance of mindfulness, which helps children concentrate, organize, and persevere. Altogether, these aspects correlate with children's greater executive function and learning abilities. Although the mechanisms of how mindfulness affects child cognitive development are still under research, our study validates the positive relation among mindfulness, executive functioning, and academic performance. As one of the few studies that apply mindfulness concept to Chinese migrant children, our findings illuminate the potential benefits of mindfulness on a global level. This study also suggests possible intervention goals to address migrant children's academic challenges. For instance, culturally relevant, age-appropriate mindfulness training may help them with sustained attention, classroom behavior, and peer interaction.

Our study also carries implications for future research topics. While this study focuses on mindfulness and executive function, it is noteworthy that gender, family structure, and class also play important roles in migrant children's academic performance. Girls had significantly better Chinese and English grades than boys. Compared with children living with one parent, children living with both parents had substantially better Chinese grades (over 10 points difference), math grades (over 20 points), and English

grades (over 20 points). Since children living with one parent were very few ( $n=8$ ) in the sample, this large difference could result from extreme cases. But the relation between family structure and academic performance calls for further study. Also, this cross-sectional study validates the positive correlation among mindfulness, executive function, and academic performance. Future studies can use longitudinal design to establish causation to further explore the pathway among these variables.

The results also suggest a disparity between the two sampled migrant schools. School A enrolls four fifth-grade classes (i.e. *Class 1–4* in Table 3–6) that include nearly 200 students, whereas School B only has one fifth-grade class (i.e. *Class 5* in Table 3–6) and enrolls only 32 students. Class 5 (i.e. School B) showed significantly lower Chinese, math, and English grades than Class 1. This disparity, on one hand, may result from differences in exam questions and grading rubrics. On the other hand, the disparity across migrant schools in Beijing may indicate the diversity of the migrant children population and is worth further investigation of subgroup difference. As a robust test, we ran regressions solely on School A sample; the results were not significantly different from the ones reported here.

This study has several limitations that warrant further exploration. First, our sampling selected schools that resemble two typical environments of migrant children—one in better socioeconomic condition while the other in poorer condition. Our findings, therefore, may not be generalized to Chinese migrant children overall; instead, this study serves as a beginning point to inform future research. Second, we used the Task Completion and Behavior Scale, which measures persistence and organization, as an indicator for executive function. Future studies can

use other measures for the multiple aspects of executive function, such as working memory and inhibition. Finally, we used the Brown and Ryan (2003) Mindfulness Attention Awareness Scale (MAAS) to measure Chinese children's mindfulness. While this scale showed reliability and validity in assessing Chinese college students' mindfulness (Deng et al., 2012), to what extent the scale is age- and culturally-applicable to Chinese children needs further study.

Table 1. Descriptive statistics of sample characteristics

	Mean (S.D.)
Gender [%]	
Male	52.1
Female	47.9
Age [%]	
<=10	4.1
11	58.0
12	34.7
>=13	3.2
Birth Place [%]	
Beijing	35.2
Others	64.8
First School [%]	
Yes	77.2
No	22.8
Family Type [%]	
Two-Parent Family	94.5
Single-Parent Family	3.7
Others	1.8
Mindfulness (15-90)	71.3 (12.2)

Note: N=219. Numbers in the table are means and standard deviations in parenthesis.

Table 2. Outcome variables by mindfulness

	Executive Function		Chinese Grades		Math Grades		English Grades	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
Mindfulness								
Low	11.3	2.6	79.0	17.9	76.9	20.2	71.8	26.3
Medium	12.1	2.9	83.2	12.5	82.3	15.3	76.3	19.1
High	13.3	1.9	85.4	9.5	84.6	10.7	81.0	17.5
All	12.2	2.6	82.6	13.9	81.3	16.1	76.4	21.6
F-Test	12.1 ***		4.1 *		4.5 *		3.4 *	

Note: N=219. Numbers in the table are means and standard deviations (S.D.).

\*  $p < .05$ , \*\*\*  $p < .001$ .

Table 3. Regression analysis of executive function

	Executive Function		
	B	S.E.	P
Mindfulness	0.06	0.01	***
Female	1.17	0.32	***
Age	-0.92	0.26	
Born in Beijing	0.34	0.34	
First School	-0.60	0.41	
Family Type			
Two-Parent	---	---	
Single-Parent	-0.23	0.84	
Others	0.37	1.18	
Class			
1	---	---	
2	1.70	0.48	**
3	-0.77	0.49	
4	0.88	0.48	+
5	-0.82	0.56	
Constant	7.86	1.31	***
Adjusted R-square	0.24		

Note: N=219. Numbers in the table are OLS regression coefficients and standard errors (S.E.).

+ p<.10, \*\* p<.01, \*\*\* p<.001. --- reference group.

Table 4. Regression analysis of Chinese grades

	Model 1			Model 2		
	B	S.E.	P	B	S.E.	P
Executive Function	---	---		1.25	0.36	**
Mindfulness	0.17	0.07	*	0.10	0.07	
Female	7.21	1.69	***	5.74	1.70	**
Age	0.28	1.39		0.40	1.35	
Born in Beijing	-0.61	1.81		-1.03	1.77	
First School	-0.13	2.18		0.61	2.14	
Family Type						
Two-Parent	---	---		---	---	
Single-Parent	-16.89	4.47	***	-16.59	4.36	***
Others	2.76	6.30		2.29	6.14	
Class						
1	---	---		---	---	
2	-4.91	2.58	+	-7.04	2.59	**
3	-0.45	2.63		0.51	2.57	
4	-2.57	2.56		-3.66	2.51	
5	-13.18	3.04	***	-12.16	2.98	***
Constant	70.60	6.98	***	60.77	7.37	***
Adjusted R-square	0.22			0.26		

Note: N=219. Numbers in the table are OLS regression coefficients and standard errors (S.E.).

+ p<.10, \* p<.05, \*\* p<.01, \*\*\* p<.001. --- reference group.

Table 5. Regression analysis of math grades

	Model 1			Model 2		
	B	S. E.	P	B	S. E.	P
Executive Function	---	---		1.41	0.45	**
Mindfulness	0.25	0.09	**	0.17	0.09	+
Female	2.05	2.09		0.40	2.12	
Age	-0.55	1.71		-0.42	1.67	
Born in Beijing	-0.17	2.23		-0.65	2.20	
First School	-0.67	2.70		0.16	2.66	
Family Type						
Two-Parent	---	---		---	---	
Single-Parent	-21.62	5.52	***	-21.28	5.40	***
Others	0.92	7.77		0.39	7.61	
Class						
1	---	---		---	---	
2	-3.05	3.19		-5.45	3.22	+
3	-1.44	3.23		-0.36	3.19	
4	-3.14	3.15		-4.37	3.11	
5	-10.23	3.75	**	-9.07	3.69	*
Constant	67.92	8.61	***	56.84	9.15	***
Adjusted R-square	0.11			0.15		

Note: N=219. Numbers in the table are OLS regression coefficients and standard errors (S.E.).  
+ p<.10, \* p < .05, \*\* p <.01, \*\*\* p < .001. --- reference group.

Table 6. Regression analysis of English grades

	Model 1			Model 2		
	B	S.E.	P	B	S.E.	P
Executive Function	---	---		1.78	0.56	**
Mindfulness	0.24	0.11	*	0.14	0.11	
Female	15.87	2.62	***	13.78	2.64	***
Age	-0.71	2.14		-0.55	2.10	
Born in Beijing	-0.76	2.80		-1.36	2.75	
First School	1.39	3.38		2.44	3.32	
Family Type						
Two-Parent	---	---		---	---	
Single-Parent	-24.0	6.91	**	-23.59	6.77	**
Others	8.25	9.73		7.58	9.53	
Class						
1	---	---		---	---	
2	-3.57	4.00		-6.61	4.03	
3	-0.35	4.06		1.02	3.99	
4	-2.22	3.95		-3.78	3.90	
5	-11.22	4.70	*	-9.76	4.63	*
Constant	56.13	10.79	***	42.11	11.45	***
Adjusted R-square	0.22			0.26		

Note: N=219. Numbers in the table are OLS regression coefficients and standard errors (S.E.).  
\* p < .05, \*\* p <.01, \*\*\* p < .001. --- reference group.



Fig. 1: Hypothesis of the relation among mindfulness, executive function, and academic performance

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華民研究中心  
Huamin Research Center

Rutgers, The State University of New Jersey  
School of Social Work  
390 George Street, Room 503  
New Brunswick, NJ 08901  
848-932-7520, ext. 28256  
[socialwork.rutgers.edu/huamin](http://socialwork.rutgers.edu/huamin)