Does metacognition matter in the relationship between mathematics interest and mathematics anxiety?

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Abstract. The purpose of this research is to find out whether there is an influence of mathematics interest on mathematics anxiety mediated by metacognitive knowledge in 5th-grader. The research data collected from 366 5th-grader in South Jakarta obtained using convenience sampling technique. Data collection carried out using questionnaires consists of Modified Abbreviated Math Anxiety Scale (mAMAS), the interest value subscale of the Subjective Task Value Scale, and Metacognitive Knowledge in Mathematics Questionnaire (MKMQ). From the analysis, mathematics interest has a significant effect on mathematics anxiety, and each dimension of metacognitive knowledge mediates them. However, metacognitive knowledge only mediates the influence of mathematics interest on mathematics anxiety partially. This means mathematics interest can affect mathematics anxiety both directly and through metacognitive knowledge variables.

Keywords: Mathematics anxiety, mathematics interest, metacognitive knowledge, elementary school students

INTRODUCTION

The Program Study for International Students Assessment (PISA) study report by the Organization for Economic Co-operation and Development (OECD) shows that Indonesians students' mathematics literacy ability is ranked 63 out of 70 countries participating in the study (OECD, 2018), whereas mathematics literacy is an essential skill for students to cope well in further learning. According to the OECD, mathematics literacy is the ability of individuals to formulate, apply, and interpret mathematics in various contexts, including in mathematical reasoning and in using mathematical concepts, procedures, facts, and in applying mathematical tools to describe, explain, and predict phenomena (OECD, 2013). Therefore, instead of only having the ability to count, students should also have the ability to reason logically and critically in problem-solving (Masjaya & Wardono, 2018).

This low achievement can be caused by a fear of mathematics, which referred to as mathematics anxiety (Maloney et al., 2015). According to Richardson and Suinn (1972), mathematics anxiety is a feeling of tension and anxiety that interferes with the process of manipulating numbers and solving mathematical problems in various contexts of daily life and academic situations. Hopko et al. (2003) define mathematics anxiety as feelings of fear and increased physiological reactivity when a person faces mathematics. For example, when the students has to manipulate numbers, solve mathematical problems, or when they face evaluative situations related to mathematics (Paechter et al., 2017). Meanwhile, Ashcraft and Moore (2009) concluded that mathematics anxiety is a person's adverse affective reaction to situations involving numbers, mathematics, and mathematical calculations.

Based on PISA results in 2012, students who tend to have high levels of mathematics anxiety will also tend to have poor mathematics performance. The negative relationship between mathematics anxiety and performance can also be observed when comparing different students in the same school. The higher the level of mathematics anxiety, the lower the mathematics scores of students (OECD, 2015). In addition to influencing mathematics performance and achievement, mathematics anxiety also influences other things, including

avoiding mathematics-related situations, more often showing postponement of behavior (Akinsola et al., 2007), spending less time and efforts to learn, and difficulty in concentrating and paying attention when learning takes place (Paechter et al., 2017).

Mathematics anxiety is a global problem and affects students of all ages. About 93% of adults in America confessed that they experience mathematics anxiety (Blazer, 2011). In the UK, 30% of adolescents who participated in the study reported having a high level of mathematics anxiety. While PISA resulted in 2012 showed that 59% of all students aged 15-16 who participated in the assessment, stated that they often felt worried that they had difficulties in mathematics; 33% often felt depressed when doing mathematics homework; while 31% feel very nervous when solving mathematics problems (Luttenberger et al., 2018).

The causes of the emergence of mathematics anxiety can be divided into two categories, namely environmental causes and personal causes (Hoorfar & Taleb, 2015; Luttenberger et al., 2018). An example of environmental causes is education or the cultural system and the influence of closest people, such as teachers or parents. Teachers, parents, and other adults who are considered important by students act as models and influence students through their attitudes towards mathematics (Casad et al., 2015). If the teacher spreads the myth that students must have talents to master mathematics or the parents are unsure of the abilities of their children, then it can make a student experiencing mathematics anxiety (Luttenberger et al., 2018).

Meanwhile, personal causes can originate from intelligence, an anxiety trait that has been owned since the beginning, gender, self-efficacy, interest, and knowledge about mathematics (Luttenberger et al., 2018). Among these personal variables, some variables have a reciprocal relationship with mathematics anxiety; one of them is interest (Luttenberger et al., 2018). Mathematics anxiety can result in low mathematics achievement so that it can ultimately make students lose interest in mathematics (Yeh et al., 2019). Nevertheless, on the other hand, supporting students to develop interest and experience positive feelings in mathematics can reduce the negative feelings that exist in students (Hidi & Renninger, 2006).

Interest consist of two kinds, namely situational interest and individual interest (Hidi & Renninger, 2006). Situational interest is an interest that experienced only at certain times and can be a brief experience of increasing attention also affective and evaluative feelings of pleasure in an environment (Høgheim & Reber, 2019). Situational interest can be a trigger for the development of individual interest in a person. Individual interest is the disposition of motivation to follow, continue to engage, and respond positively to specific content, and it can be individual interest in mathematics (Frenzel et al., 2010). Situational interest can be triggered by making students pay attention to the content, and then making that attention lasting by making the students feel happy and feel that mathematics is necessary (Høgheim & Reber, 2019). If efforts to maintain situational interest consistently carried out during lessons, it would support the development of the individual interest in a person (Hidi & Renninger, 2006).

It has been mentioned before that teachers can be the cause of students experiencing mathematics anxiety. However, students' anxiety could start with the lack of students' interest in mathematics because of the mathematics teachers' attitude so far. Teachers who do not care and feel angry or frustrated when the students are difficult to understand mathematics can make students dislike mathematics lessons (Smith, 2004). Making students work on mathematics problems as a punishment for bad behavior can also make students dislike mathematics (Furner & Duffy, 2002). Thus, it can be concluded that students' lack of interest in mathematics can influence mathematics anxiety they experience.

In order for students not to lose interest, the teachers must be creative in carrying out the instruction. The "explain-exercise-remembering" teaching approach are sources of mathematics anxiety and can make students lose interest (Smith, 2004). According to Shields (2005), mathematics anxiety comes from the teacher and the teaching done by the teacher. Teachers who also have anxiety will teach their students with traditional instructional activities, for example, teaching according to textbooks and insisting that there is only one correct way to solve a problem. The culture of the class can also cause students to experience mathematics anxiety. For example, classes that do mathematics learning with a very structured lesson and

classes that very rarely do debates or discussions, only focus on one answer, and not much time provided to reflect on thinking because often what expected is a quick answer, might be perceived uninteresting by the students (Shields, 2005).

Although teachers can be one of the leading causes of the emergence of mathematics anxiety, teachers also have an important role in reducing or preventing students from experiencing mathematics anxiety (Hoorfar & Taleb, 2015). If the teachers can identify students who have mathematics anxiety earlier and provide appropriate interventions, then they would help to reduce the effects of mathematics anxiety (Ramirez et al., 2013). The teachers can do interventions by teaching students to control cognitive resources and to recognize mathematics anxiety before it occurs so that it will not affect their mathematics performance (Lyons & Beilock, 2012). One crucial factor that influences this is metacognition.

The term metacognition first introduced by Flavell (1979). Metacognition is the process of overseeing the thinking while working on a task, or more simply, metacognition is thinking about what someone thinks (Flavell, 1979). Metacognition consists of three aspects, namely metacognitive knowledge, metacognitive regulation, and metacognitive experiences (Efklides, 2008). The focus of this research, metacognitive knowledge, consists of three dimensions, namely self, task, and strategy (Efklides & Vlachopoulos, 2012). Solving mathematics problems is a typical activity carried out in elementary school and it involves a complex cognitive activity. In order to complete assignments successfully, students must integrate cognitive, metacognitive, and self-regulation mechanisms (Cleary & Chen in García et al., 2016).

Lester in Schneider and Artelt (2010) believed that a person's knowledge of their cognition before, during, and after a period of problem-solving and their ability to monitor and regulate themselves can significantly influence their success in solving mathematical problems. Metacognition needed at the beginning of problem-solving when someone makes predictions and builds an appropriate problem representation. After the calculation results made, metacognition in terms of evaluation is important for checking answers (Verschaffel, 1999 in Schneider & Artelt, 2010).

Although many studies look at the relationship between metacognition and mathematics achievement or performance (Desoete et al., 2001; Özsoy, 2011), there are still very few studies on the interaction between metacognition and mathematics anxiety that also has a relationship with mathematics performance (Morsanyi et al., 2019). It has been proven that metacognitive knowledge has a negative relationship with mathematics anxiety (Hoorfar & Taleb, 2015). Morsanyi et al. (2019) see mathematics anxiety as a factor that affects metacognition because mathematics anxiety can interfere with one's efficiency in conducting metacognitive monitoring and control. However, on the other hand, a person can become anxious when they do not have enough knowledge or ability to understand mathematics (Luttenberger et al., 2018). Metacognition can be an effective way to make students successful in learning mathematics (Perry et al., 2019) therefore it can reduce the level of anxiety a person has. This statement is in line with the result from research conducted by Hoffman and Spatariu (2008), that metacognitive knowledge has a positive relationship with learning, and students who know the efficiency of their cognitive and metacognitive strategies tend to be less anxious and more successful in problem-solving.

Decision making in problem-solving is not only involving metacognitive but also influenced by a person's beliefs and values (Schneider & Artelt, 2010). Here comes the role of mathematics interest. If students have a high interest in mathematics, with proper teaching instructions from the teacher, they will be able to carry out learning better and they might have high metacognitive knowledge. This effort will have an impact on students who have low level of mathematics anxiety experienced by these students. However, no research has discussed this relationship so far. Therefore, this study intends to look further at how students' interest in mathematics can affect mathematics anxiety through metacognitive knowledge. The following hypotheses generated to achieve the objectives of this study:

1. There is a significant effect of mathematics interest on mathematics anxiety through the self dimension of metacognitive knowledge.
2. There is a significant effect of mathematics interest on mathematics anxiety through the task dimension of metacognitive knowledge.
3. There is a significant effect of mathematics interest on mathematics anxiety through the strategy dimension of metacognitive knowledge.

METHODS

Research Design

This research is a quantitative study using survey techniques. The sampling technique is done by nonprobability sampling method with a convenience sampling technique. The nonprobability sampling method is chosen because the population is unknown, so the probability of someone selected to become a sample cannot be calculated, and researchers will look for research participants based on the willingness and readiness of the participants that can found (Stangor, 2011).

Participants and Procedures

The design of this study is declared to have passed the study ethics assessment by the Research Ethics Committee of the Faculty of Psychology, Universitas Indonesia. The sample of this study is 5th-grader in South Jakarta obtained by convenience sampling technique. The reason why elementary students chosen to be participants is because students can experience mathematics anxiety very early when they are still in elementary school (Jameson, 2014). At the elementary school level, mathematics anxiety affects mathematics performance not only when they are at that grade but also when they are in the next grade (Skaalvik, 2018). Besides, the development of metacognition begins at the beginning of elementary school age (Neuenhaus et al., 2011). 5th-grader chosen because this age group is old enough to complete standardized tests and questionnaires but is still in the early stages of education (Carey et al., 2017) and students in this group already starting to use their metacognition for academic purposes (Veenman & Spaans, 2005).

Participants recruited after getting approval from the school and their parents by asking parents to sign parental consent before the study conducted. In the end, a total of 371 participants obtained from five elementary schools in South Jakarta: two public schools, two private schools, and one public Islamic school. However, only 366 participants whose data were included in the data processing because five other participants did not fill in the data completely. In table 1, we can see that the majority of participants are girls (56%), and the number of participants who are ten years old (63.4%) dominated the other age groups. In this study, most data obtained from students of public elementary schools (57.1%).

Table 1. *Descriptive data for participants*

Characteristics		N	%
Gender	Boys	161	44
	Girls	205	56
Age	9	22	6
	10	232	63,4
	11	105	28,7
	12	7	1,9
School Type	Public	209	57,1
	Private	157	42,9

5th-grader in Indonesia are generally 10-11 years old at the beginning of the school year because public schools in Indonesia only allow a child to enter elementary school at the age of 7 years old, unlike private schools that allow children aged 5-6 years to start study at their school. A total of 22 participants who were nine years old came from private schools, while 7 participants who were 12 years old all came from public schools. Public schools are usually

stricter in enrollment, causing some of their students to be older than their peer. The data collection is done by using a questionnaire and taken directly by visiting each school. The questionnaire used is a measuring tool for mathematics anxiety, mathematics interest, and metacognitive knowledge.

Measurements

Measurement of Mathematics Anxiety

Mathematics anxiety measured using an adaptation of the Modified Abbreviated Math Anxiety Scale (MAMAS) (Zirk-Sadowski et al., 2014), which is an adjustment of the Abbreviated Math Anxiety Scale (Hopko et al., 2003). This scale made for participants in grade 5 elementary schools in the UK. Adaptation also made by changing the choice of answers that initially took the form of a five-point Likert scale with choices 1 (low anxiety) to 5 (high anxiety) to ☺, ☺, ☺, and ☺ form to facilitate participants when filling the questionnaire.

mAMAS consists of nine items and measures two dimensions of mathematics anxiety, namely evaluation (e.g., "Thinking about a maths test the day before you take it") and learning (e.g., "Having to complete a worksheet by yourself."). Participants asked to rate how they felt when they encountered specific situations, as stated in the questionnaire. The Cronbach's Alpha of the original scale and the adapted scale for this study, respectively, are 0.85 (Carey et al., 2017) and 0.778.

Measurement of Mathematics Interest

Measurement of mathematics interest done by using the interest value subscale from the adaptation of the Subjective Task Value Scale (Wigfield et al., 1997) which consists of two items. The first item is "In general, I find working on math assignments ...", with choice of answers, "very boring", "boring", "interesting", "very interesting". The second item is "How much do you like doing math?", with the choice of answers, "I do not like it very much", "I do not like it", "I like it", and "I like it very much". Wigfield (1997) stated that the internal consistency reliabilities of the interest subscale, measured in the domain of math, reading, and sports, ranged from 0.73 to 0.92. Meanwhile, the Cronbach's Alpha for this scale in the present study is 0.884.

Measurement of Metacognitive Knowledge

Metacognitive knowledge is measured using Metacognitive Knowledge in Mathematics Questionnaire (MKMQ) by Efklides and Vlachopoulos (2012). MKMQ developed explicitly to measure metacognitive knowledge in the field of mathematics. This instrument is adapted so that it easily understood by 5th-grade elementary school students in South Jakarta. The choice of answers that initially took the form of a five-point Likert scale also changed to four points because of children participants' tendency to choose the middle answer (Borgers et al., 2004).

MKMQ measures three dimensions of metacognitive knowledge, namely self, task, and strategy. The self-dimension is about one's knowledge of their fluency in processing mathematical tasks and consists of nine items (e.g., "I solve mathematical problems easily no matter how many operations they require."). The task dimension consists of 10 items asking about how difficult a task in mathematics is for participants (e.g., "How difficult do you think is a problem that has fractions?"). Meanwhile, the strategy dimension is about one's understanding of self-regulation strategies that can improve fluency and improve one's competence in mathematics. This dimension consists of 10 items asking about how often students do what each of the statements describes (e.g., "When I do not understand something, I am aking my teacher to explain it to me so that I can go on my own."). The Cronbach's Alpha for dimensions self, task, and strategy in the present study, respectively, are 0.741, 0.761, dan 0.548.

Data Analysis

Cronbach's Alpha is used to test the reliability of instruments in this study. A validity test is carried out by looking at the value of the corrected item-total correlation. Finally, the research model tested using parallel multiple mediation analysis in the SPSS program and the PROCESS macro add-on developed by Hayes (2018). In this analysis, the independent variable (mathematics interest) modeled as a variable that is directly influencing the dependent variable (mathematics anxiety) as well as indirectly through two or more mediators (Hayes, 2018).

RESULTS

In table 2, a general overview of participants' scores can be seen in each variable. From the mean of each variable, participants seen to have relatively high mathematics anxiety (mean = 20.16) with interest in mathematics that is also quite high (mean = 5.84). Participants consider themselves able to do mathematics problems well (mean = 23.99) and assume that the mathematics tasks they faced are not too difficult (mean = 18.45). For metacognitive knowledge of strategy, participants rated that they had done quite a variety of strategies in working on mathematics problems (mean = 23.67).

Table 2. *Descriptive statistics*

Variable	Min.	Max.	Mean	SD
Mathematics Anxiety	9,00	36,00	20,16	4,92
Mathematics Interest	2,00	8,00	5,84	1,66
Metacognitive Knowledge of Self	9,00	36,00	23,99	4,65
Metacognitive Knowledge of Task	10,00	40,00	18,45	4,24
Metacognitive Knowledge of Strategy	10,00	40,00	23,67	3,82

Meanwhile, the results of a complete multiple parallel mediation test can be seen in Table 3 and Table 4. Based on the results of the study, it appears that there is a significant influence of mathematics interest on mathematics anxiety through all of the metacognitive knowledge dimensions (self, task, and strategy). The higher students' interest in mathematics, their knowledge about their ability to work on mathematics problems will be higher ($a_1 = 1.673$; $p < 0.001$). When the students know that they can do mathematics problems well, it makes them less anxious ($b_1 = -0.285$; $p < 0.001$). Also, based on the value of confidence interval, when controlling for task and strategy dimensions, the indirect effect of mathematics interest on mathematics anxiety through metacognitive knowledge of the self-dimension ($a_1b_1 = -0,477$) does not include zero (-0,715 to -0,260). It means there is an influence of mathematics interest on mathematics anxiety through the metacognitive knowledge of self.

Furthermore, the higher students' interest in mathematics, the more they rated that the mathematics tasks they faced are easier ($a_2 = -1,378$; $p < 0.001$). The more students feel that mathematics tasks are difficult, the higher their mathematics anxiety ($b_2 = 0.210$; $p < 0.05$). Besides, the indirect effect of mathematics interest on mathematics anxiety through task dimension of metacognitive knowledge ($a_2b_2 = -0.290$) does not include zero (-0.492 to -0.081), so there is an influence of mathematics interest on mathematics anxiety through metacognitive knowledge of task.

We also can see that the higher the students' interest in mathematics, their knowledge of strategies in working with mathematics problems is higher ($a_3 = 0.332$; $p < 0.05$). Student's immense knowledge about strategies to solve mathematical problems, causing them less anxious ($b_3 = -0,197$; $p < 0.05$). In addition, based on the value of confidence intervals, when controlling for the dimensions of metacognitive knowledge of the dimensions of self and task, the indirect effect of mathematics interest on mathematics anxiety through metacognitive knowledge of strategy ($a_3b_3 = -0.065$) does not include zero (-0.143 to -0.017). It means that there is an influence of mathematics interest on mathematics anxiety through metacognitive knowledge of strategy.

The total indirect effect of mathematics interest on mathematics anxiety through all dimensions of metacognitive knowledge is -0,832 and is significant because it has a confidence interval ranging from -1,085 to -0,612. However, the total direct effect of mathematical interest on mathematical anxiety turns out to be higher than the total indirect effect, which is -0.974 with a confidence interval ranging from -1.258 to -0.690. That is, metacognitive knowledge only mediates the influence of mathematics interest on mathematics anxiety partially. Thus, mathematics interest can affect mathematics anxiety both directly and through metacognitive knowledge variables.
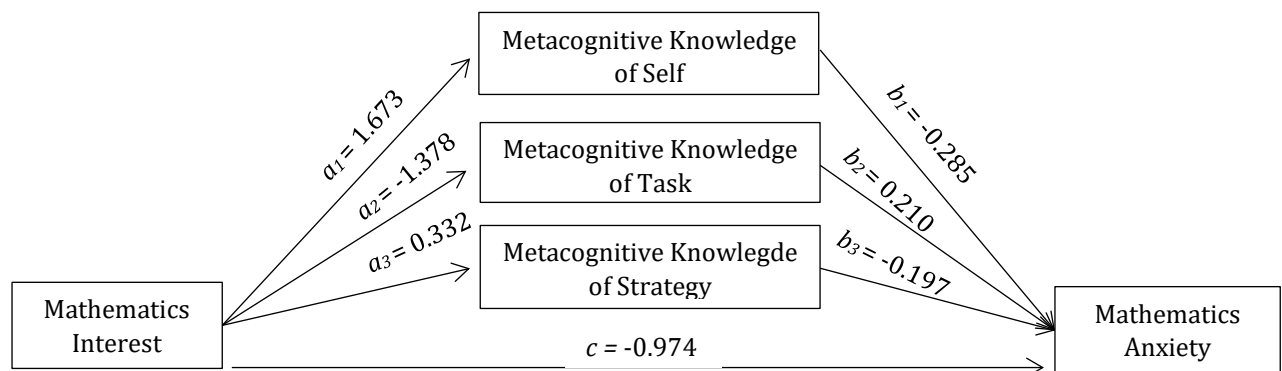

FIGURE 1. *Research model*

Table 3. *Parallel multiple mediation analysis results*

Antecedent		M₁ (Self)				M₂ (Task)				M₃ (Strategy)				Y (Anxiety)		
		Coeff.	**SE**	**p**		**Coeff.**	**SE**	**p**		**Coeff.**	**SE**	**p**		**Coeff.**	**SE**	**p**
X (Interest)	a_1	1.673	0.118	0.000	a_2	-1.378	0.113	0.000	a_3	0.332	0.119	0.006	c	-0.974	0.144	0.000
M₁ (Self)		-	-	-		-	-	-		-	-	-	b_1	-0.285	0.055	0.000
M₂ (Task)		-	-	-		-	-	-		-	-	-	b_2	0.210	0.057	0.003
M₃ (Strategy)		-	-	-		-	-	-		-	-	-	b_3	-0.197	0.049	0.001
Constant	i_{M1}	14.224	0.715	0.000	i_{M2}	26.504	0.685	0.000	i_{M3}	21.738	0.726	0.000	i_y	33.484	2.278	0.000
		$R^2= 0.357$				$R^2= 0.291$				$R^2= 0.021$				$R^2= 0.704$		
		$F_{(1; 364)} = 201.796$				$F_{(1; 364)} = 149.421$				$F_{(1; 364)} = 7.693$				$F_{(4; 361)} = 88.520$		
		$p <0.001$				$p <0.001$				$p <0.05$				$p <0.001$		

Table 4. *Total, direct, and indirect effect of research model*

	Effect	Boot SE	Boot LLCI	Boot ULCI
Total effect	-1.806	0.123	-2.048	-1.564
Direct effect	-0.974	0.144	-1.258	-0.690
Total indirect effect	-0.832	0.122	-1.085	-0.612
Indirect effect through metacognitive knowledge of self	-0.477	0.117	-0.715	-0.260
Indirect effect through metacognitive knowledge of task	-0.290	0.103	-0.492	-0.081
Indirect effect through metacognitive knowledge of strategy	-0.065	0.031	-0.143	-0.017

DISCUSSION and CONCLUSIONS

Previous studies mention that mathematics anxiety experienced by a person can cause a decrease or loss of interest in that person towards mathematics (Otoo et al., 2018) but, not many have examined how mathematics interest can also affect the level of mathematics anxiety in a student. Although mathematics anxiety can result in low mathematical achievement so that it can make students lose interest in mathematics (Yeh et al., 2019), Luttenberger et al. (2018) stated that interest has a reciprocal relationship with mathematics anxiety. The results of the current study indicate that mathematics interest can affect mathematics anxiety, both directly or mediated by metacognitive knowledge.

Interest can be seen from students' participation, experience, and habits when studying and relating to their desires, and it does not emerge immediately (Azmidar et al., 2017). Students' interest in mathematics greatly influenced by the teacher and the approach used in learning (Arthur et al., 2014). If students assume that mathematics only consists of numbers, formulas, and abstract theorems that are difficult to understand, then this can lead to low interest in mathematics (Sousa, 2008) and can lead to the emergence of mathematics anxiety in students.

One theoretical approach that investigates the topic of interest and learning motivation is the theory of self-determination (Heinze et al., 2005). The theory is based on the assumption that someone who has reached the highest level of internalization related to the adoption of specific values or goals tends to integrate goals related to learning topics consistently and permanently into their value and belief systems (Wild, Hofer, & Pekrun, 2001). Interest has a place in this theory as an internal driver of actions taken by someone or also called intrinsic motivation. Hoffmann (1997 in Heinze et al., 2005) assumes that intrinsic learning motivation can lead to the elaboration of more in-depth learning content. Therefore, students who have an interest in mathematics can make themselves have a deeper understanding and high metacognitive knowledge.

As stated by Flavell (1979), metacognitive knowledge consists of knowledge or beliefs about the factors or variables that play a role or interact with tasks and consists of three main categories, namely person/self, task, and strategy. Based on the results of the current study, when students have immense knowledge of these three things, they will feel less anxious in dealing with mathematics than students who have low metacognitive knowledge. At the beginning of the study, it was assumed that mathematics interest would influence mathematics anxiety through metacognitive knowledge, but in fact, the direct effect of mathematics interest on mathematics anxiety was slightly higher than indirect effects via metacognitive knowledge. This result could be due to 5th-grader, or children aged 9-12 years tend to show a metacognitive regulation that is not good when solving mathematics problems (García et al., 2016). Metacognitive regulation is needed so that a student can regulate and improve his cognition by planning, monitoring, and reflecting their learning (White et al., 2009). Although metacognitive knowledge has developed since the age of 6 years (Schraw & Moshman, 1995), students are starting to use their metacognitive regulation for academic purposes in middle and high school (Veenman et al., 2004). So, despite having good metacognitive knowledge, the lack of metacognitive regulation can lead to low achievement (García et al., 2016) and low achievement can also cause students have high mathematics anxiety (Zhang et al., 2019). Therefore, metacognitive knowledge cannot fully mediate the influence of mathematics interest on mathematics anxiety.

Besides being able to influence directly, mathematics interest may have more significant influence if mediated by other variables, for example, an understanding of mathematics. It has been proven that a lack of knowledge or inability to understand mathematics concepts influences one's mathematics anxiety strongly (Blazer, 2011). If someone has a high interest accompanied by good knowledge about mathematics understanding, then the level of mathematics anxiety will be decreased. In addition, research conducted on adolescents and undergraduate students in America shows that mathematics anxiety at a moderate level in an

intrinsically motivated person is associated with increasing that person's mathematics achievement. That is because, for them, the stress is considered a challenge that must face by improving performance actively (Wang et al., 2015). Therefore, it will be interesting to see how is the dynamics between mathematics interests, anxiety, and achievement in elementary school students.

Finally, it can be concluded that in 5th-grader, mathematics interest influences mathematics anxiety negatively. Mathematics interest can also make students have better knowledge about their abilities, consider that the math tasks they face are easy, and know strategies that can help themselves in mathematics. High interest and high metacognitive knowledge cause a decrease in mathematics anxiety in students, although the effect is not as large as the effect of mathematics interest on mathematics anxiety directly. This result can be caused by other metacognitive aspects that needed in solving mathematical problems, namely metacognitive regulation, which has not been well-developed in elementary school students.

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