



ARTICLES

Kindergarten teachers' knowledge of and beliefs in the influence of music and movement on children's self-regulation

Conocimiento y creencias de docentes de Preescolar sobre la influencia de la música y el movimiento en la autorregulación infantil

Siu-Ping Ng¹

Department of Early Childhood Education, The Education University of Hong Kong, Hong Kong SAR (China)

Alfredo Bautista²

Department of Early Childhood Education, The Education University of Hong Kong, Hong Kong SAR (China)

Kate E. Williams³

Centre for Child and Family Studies, Queensland University of Technology (Australia)

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Abstract

Growing evidence indicates that early exposure to music and movement (M&M) positively impacts young children's self-regulation. However, little attention has been paid to what kindergarten teachers know and believe about the relationship between M&M and self-regulation, and even less to how teachers' background in M&M relates to their knowledge and beliefs. This study investigates these topics using survey data from 306 Hong Kong kindergarten classroom teachers. Descriptive, correlation, and independent sample *t*-tests were conducted. Most teachers believed they possessed a high level of understanding on the topic, particularly those with M&M background. These participants held stronger beliefs that M&M fosters children's self-regulation, specifically motor-coordination skills, impulse control, and emotional management. We conclude that kindergarten teachers' knowledge of, and beliefs in the role of M&M to support children's self-regulation are influenced by their own M&M background. Indeed, the more M&M activities teachers have been exposed to, the deeper their understandings on how M&M contributes to children's self-regulatory skills. The main implication is the need to further expose kindergarten teachers to M&M learning experiences, be it formally or informally.

Key words: Early Childhood teachers; music activities; self-regulation; background.

Resumen

Un número creciente de estudios indica que la exposición temprana a la música y el movimiento (M&M) impacta positivamente en la autorregulación infantil. Sin embargo, se ha prestado poca atención a lo que las y los docentes de infantil saben y creen sobre la relación entre M&M y la autorregulación, y menos aún a cómo sus propias experiencias de M&M se relacionan con sus conocimientos y creencias. El presente estudio investiga dichos temas utilizando datos de encuestas de 306 maestros de infantil de Hong Kong. Se realizaron análisis descriptivos, de correlación y pruebas *t* de muestras independientes. La mayoría de participantes creían poseer un alto nivel de comprensión sobre el tema, en particular aquellas con experiencia en M&M. Dichas participantes tenían creencias más sólidas de que M&M fomenta la autorregulación infantil, específicamente las habilidades de coordinación motora, el control de impulsos y el manejo emocional. Concluimos que el conocimiento y las creencias de las y los docentes de infantil sobre el papel de la M&M para apoyar la autorregulación están influenciados por sus propias experiencias de M&M. A mayor experiencia, más profundo será su entendimiento sobre cómo la M&M contribuye a las habilidades de autorregulación infantil. La principal implicación es la necesidad de exponer aún más a las y los docentes de Infantil a las experiencias de aprendizaje de M&M, ya sea de manera formal o informal.

Palabras claves: Docentes de Educación Infantil; actividades musicales; auto-regulación; experiencia.

¹ PhD student, Faculty of Education and Human Development, <https://orcid.org/0000-0002-7565-205X>

² Associate Professor & Associate Head, Faculty of Education and Human Development, <https://orcid.org/0000-0002-5878-1888>

*Contact y correspondence: Alfredo Bautista, Department of Early Childhood Education, Faculty of Education and Human Development, abautista@eduhk.hk, B3-2/F-34 | 10 Lo Ping Road, Tai Po, New Territories, Hong Kong SAR China.

³ Adjunct Professor, School of Early Childhood & Inclusive Education, <https://orcid.org/0000-0001-8983-5503>

1. Introduction

Self-regulation is a set of skills that allows humans to control their own attention, thinking, behaviors, emotional reactions, and social interactions (Da Silva, 2016; Howard et al., 2020). Self-regulatory skills have a pivotal role in children's development and learning. It is vital for children to acquire self-regulatory skills, as these allow them to develop into well-adjusted and successful adults (Moffitt et al., 2011).

Recent studies have showed that music and movement (henceforth M&M) is a powerful tool to foster children's self-regulation, especially during early childhood (Barrett et al., 2018; Roseanne, 2018). Early childhood education (ECE) teachers are therefore in a privileged position to foster early self-regulation by exposing children to a variety of M&M activities in center-based programs (Da Silva, 2016). However, little empirical work has been conducted to investigate what ECE teachers know and believe about the relationship between M&M and self-regulation, and even less to explore how teachers' background in M&M relates to their knowledge and beliefs (Abry et al., 2015). We define M&M background as previous and/or current experience with music, including formal music education experiences (e.g., formal training in musical instruments, singing, or dancing; M&M courses taken in college or university) as well as non-formal and informal music experiences (e.g., engagement in music-making, extracurricular M&M activities, professional development).

This study was conducted with Hong Kong kindergarten teachers. In Hong Kong, kindergartens provide education services for 3- to 6-year-old children. While kindergarten education in this territory is not compulsory, most children attend center-based programs on a half-day basis (3-4 hours) or kindergarten-cum-childcare centers on a full-day basis (7-8 hours) (Education Bureau [EDB], 2020). In the study, we investigated our participants' self-reported knowledge of and beliefs in the role of M&M in children's self-regulation. Additionally, we examined how their knowledge and beliefs were associated with individual differences in M&M background. An enhanced understanding of the ways in which prior training and experiences influences current knowledge and beliefs in teachers is essential to improving uptake of evidence-based M&M approaches. The extent to which teachers are likely to deliver M&M programs will be influenced by the extent to which they 'buy in' to the premise of the program. It may be that different approaches to professional learning and program dissemination will be needed for teachers with different M&M backgrounds.

The literature review consists of three parts. We first describe the key components of self-regulation, explain why they are important for young children, and review some intervention studies that have revealed the positive impacts of M&M on children's self-regulatory skills. In the second part, we review the literature on kindergarten teachers' understandings about self-regulation. Finally, the third part examines the effects of having M&M background on teachers' knowledge and beliefs.

2. Literature review

2.1. Early self-regulation: components, importance, and interventions

Self-regulation is an umbrella term used in various ways across the literature. In this article, we conceptualize self-regulation as including control over our behavior, cognition, and

emotion, as well as the executive functions of working memory, shifting and inhibition. Behavioral regulation is the overt, observable manifestation of executive function abilities in the form of children's gross motor behaviors (Ponitz et al., 2009). Cognitive regulation encompasses both the ability to focus and keep attention and perseverance on a task and the more complex executive functioning abilities (Berthelsen et al., 2017). Emotional regulation is the ability or effort to control one's emotions. More specifically, it refers to an individual's natural reactivity (such as anger, fear, or sadness) and the ability to control such reaction to emotionally eliciting circumstances (Blair et al., 2010). Finally, the executive functions are a complex set of three cognitive processes and mental skills (Blair, 2016), namely:

1. Inhibition, which is the ability to stop prepotent or ongoing responses and resist distractor interference (Kalliontzi et al., 2022).
2. Working memory, a limited capacity system that allows us to take in, keep, and manipulate information for short periods of time (Mooney et al., 2022).
3. Shifting, which is the ability that allows us to move back-and-across different tasks (St Clair-Thompson, & Gathercole, 2006).

Self-regulation skills play a critical role in promoting young children's school readiness and overall well-being (McClelland et al., 2018), and in the longer term predicts physical health, substance dependence, personal finances, and criminal offending outcomes (Moffitt et al., 2011). Young children who struggle with self-regulation may be in trouble at home or in schools. Preventive strategies should be adopted to avoid self-regulation problems. For this reason, scholars have argued that educational interventions addressing self-regulation might "reduce a panoply of societal costs, save taxpayers money, and promote prosperity" (Moffitt et al., 2011, p.2693), as self-regulation is critical for our children to achieve long-term success.

In recent years, researchers have found that M&M constitutes a powerful tool to enhance young children's self-regulation and academic achievement (Barrett et al., 2018; Jauset-Berrocal et al., 2017; Roseanne, 2018; Williams, 2018; Williams, & Berthelsen, 2019). There is a growing number of M&M interventions in the area (Parejo et al., 2020). In 2016, Williams and her colleagues developed an intervention called Rhythm and Movement for Self-Regulation (RAMSR) to provide children (aged 4-6) with the musician advantage and cognitive benefits through rhythm and movement participation (Williams, & Berthelsen, 2019). Children who received eight weeks of RAMSR, compared to peers who did not, showed improvement for emotional regulation and the executive function of shifting for boys (Williams, & Berthelsen, 2019). Rashedi et al. (2021) implemented an eight-week yoga intervention, including songs and yoga-based postures with pre-kindergarten and kindergarten children (aged 4-6) in the United States. Intervention effects were observed on behavioral tasks of self-regulation, as well as reductions in total behavioral problems. Winsler et al. (2011) revealed that 3- to 4-year-old children who participated in a Kindermusik M&M intervention showed better skills in behavioral regulation as compared to the control group. These studies demonstrate the multiple benefits of M&M on children's self-regulation.

2.2. Kindergarten teachers' knowledge and beliefs of self-regulation

In recent years, some studies have suggested that ECE teachers may have a rather limited understanding of the notion of self-regulation. For example, in the United States, Willis et al. (2014) measured the knowledge and understanding of self-regulation in theory and practice of

115 teachers from privately funded early childcare centers using questionnaires. More than half of the teachers expressed that they were not familiar with the term “self-regulation,” and more than two-thirds reported that they had never taken any training or professional development courses on the topic. Moreover, about half of participants viewed behavior in their classrooms in terms of classroom control and behavioral management, rather than as a reflection of children's self-regulatory skills (Willis et al., 2014). Similarly, ECE teachers around the world use music (primarily action songs) to handle classroom routines and transitions and to engage children in their work (Hamilton, & Murphy, 2023; Ho, & Bautista, 2022), rather than as a means of encouraging children's musical creativity and self-expression. In a study conducted in Bangladesh (Islam, 2021), most kindergarten teachers expressed that children were too young to understand self-regulation, which in their view justified their difficulties to self-regulate themselves. The participants believed that children's self-regulation skills cannot be developed without authoritarianism. Further still, they were not aware of any kind of interventions that could aid the development of self-regulation skills in young children (Islam, 2021).

Some studies have shown that while ECE teachers value the importance of self-regulation, they often lack strategies to foster its development in children. For example, Ștefan et al. (2015) found that while kindergarten teachers in Romania recognized the importance of socio-emotional learning for young children, none of them used strategies to enhance children's emotional regulation. Teachers were somewhat biased regarding children's emotional and behavioral difficulties, as they believed that parental conduct was the only factor influencing these areas. Da Silva (2016) examined three early childhood teachers' understanding and practices about emotional self-regulation in the United States. Teachers had difficulties in linking between definitions and actual classroom practices. Their classroom practice was influenced by different learning goals and sociocultural contexts. For example, one of the teachers purposely used strategies to support emotional self-regulation for academic performance enhancement (Da Silva, 2016).

This reality might differ in the Hong Kong context, where kindergarten teachers receive formal training on the notion self-regulation as part of their pre-service and in-service training. In fact, teacher preparation courses offered by main local universities and other tertiary institutions (for example, “Psychological Development of Young Children”, “Developmental Neuroscience”, and “Supporting the Social and Emotional Development of Non-Chinese Speaking Children in Home and Schools”) explicitly cover the topic of self-regulation and related areas (Bautista et al., under review). Furthermore, the Hong Kong's Kindergarten Education Curriculum Guide (Curriculum Development Council (CDC), 2017), which is the official curriculum framework followed by most kindergartens in the territory, alludes to concepts closely related to self-regulation such as self-discipline, self-reflection, self-determination, and self-esteem. Kindergarten teachers in this territory are therefore likely to show higher familiarity with the construct of self-regulation.

2.3. Effects of M&M background on teachers' knowledge and beliefs

To the best of our knowledge, no study has investigated whether having M&M background influences teachers' knowledge of and beliefs in the influence of M&M in children's self-regulation. Scholars have warned about the low preparation of ECE teachers in the area of M&M, due to limited formal and informal training (Barrett et al., 2019; Bautista et al., 2022b). For example, teachers in Australia often receive numerous mathematical or literacy formal

courses but not M&M training or experiences in their education systems (Bainger, 2010). In the United States, about 23% of professionals working in childcare centers and independent settings received no music education training of any type (Lenzo, 2014). In contrast, a recent survey study conducted by Bautista & Ho (2022a) in Hong Kong revealed that half of the kindergarten teachers had learned how to play a musical instrument, sing, or dance for at least two years and/or took formal M&M courses during teacher preparation programs. Note that the percentage of musically trained kindergarten teachers in Hong Kong is higher than in other jurisdictions (Bautista & Ho, 2022a).

Research indicates that teachers' previous M&M background positively impacts aspects such as confidence, self-efficacy, and use of M&M to support children's learning. For example, Lenzo (2014) found that previous participation in musical activities enhanced teachers' beliefs about musical development, teaching, and self-efficacy. Burak (2019) found that participants who had previous or current music experience (such as formal musical tuition) had significantly higher self-efficacy than others in terms of musical abilities and music teaching. Bainger (2010) observed that collaborative professional development involving music specialists and kindergarten teachers can positively influence teachers' music skills, confidence, and willingness to engage in music-making with young children. In the same vein, scholars have suggested that teachers' active participation in music-related informal settings (e.g., music clubs) might lead to increased confidence, sense of empowerment, and musical self-efficacy (Bautista et al., 2022b; Carrillo, & González-Moreno, 2020). Taken together, a range of studies have suggested that training and experiences in M&M are likely to influence teachers' confidence in incorporating music in their practice overall. However, no study has specifically examined the extent to which teachers' prior experience in M&M influences their knowledge of, and beliefs in, its role for the particular developmental area of self-regulation, which is an increasing priority in both the practice and research fields.

3. Goals

To fill the existing gaps in the literature, the present study had two goals. Goal 1 involved the examination of Hong Kong kindergarten teachers' self-reported knowledge of the role of M&M on children's self-regulation. Goal 2 was to investigate teachers' beliefs about the role of M&M on children's self-regulation, specifically in terms of behaviors, emotions, executive functions, and other cognitive functions. In both goals, we analyzed the relationship between teachers' self-reported knowledge and beliefs and their M&M background, including their personal music interests, extracurricular M&M training, and prior formal courses taken.

4. Methods

4.1. Participants

Participants were 306 in-service classroom teachers (94.8% were female), who were selected through convenience sampling. Most participants were 18-24 years old (54.6%), followed by 25-34 years old (42.5%) and 35-44 years old (2.3%). All of them possessed the Qualified Kindergarten Teacher qualification, which is required to work as a kindergarten teacher in Hong Kong (Rao et al., 2018). Regarding academic qualifications, 52.9% of the participants had Higher Diplomas (two years of full-time post-secondary training), 30.4% had Bachelor's Degree, and 16.7% had Postgraduate Degrees. Kindergartens in Hong Kong typically have a

principal (who leads and manages the kindergarten), several senior teachers (who participate in curriculum design and mentoring more junior teachers), and classroom teachers (who interact with children directly on an everyday basis) (Rao et al., 2018). With certain years of teaching experience and further qualifications, classroom teachers are often upgraded to more senior leadership roles, thereby taking care of more administrative duties (e.g., curriculum development, budgets, disciplinary actions, event organization) and fewer teaching duties (Kwan, & Li, 2016). Thus, to ensure that all our participants were full-time classroom teachers, as opposed to school leaders or administrators, we recruited participants with less than 4 years of teaching experience.

Regarding participants' M&M background, around half of the participants (52%) had previously learned how to play a musical instrument, sing, and/or dance. About 31% of them had formal qualifications in instrumental music, singing, and/or dancing. Over half of the participants (54.6%) took formal M&M courses in college or university. Around a quarter (24.2%) played a musical instrument, sang, and/or danced in their personal time when the study was conducted. Only some participants (18.3%) had participated in professional development related to M&M provided by their kindergartens or other organizations.

4.2. Measures

Data were collected using an online survey questionnaire. M&M background was assessed using five binary items (yes/no). Three items referred to formal courses: "Have you ever learned how to play a musical instrument, sing, or dance? (at least 2 years of training)", "Do you have any formal qualifications in any musical instrument, singing and/or dance?" and "Did you take any course/s related to music and movement in college or university?". Two items focused on informal music engagement: "Do you currently play a musical instrument, sing, or dance in your own personal time?" and "Have you done any professional development related to music and movement? (provided by your kindergarten or any other organization)".

Teacher knowledge of the role of M&M in self-regulation development was assessed through two items: "Please rate your level of knowledge on the role of M&M for brain development" and "Please rate your level of knowledge on the role of M&M for self-regulation development in young children". A 5-point Likert scale was used in both items, ranging from 1=very low to 5=very high.

Teacher beliefs about the role of M&M in supporting children's self-regulation was measured with 10 items. We started by providing the stem "In my opinion, M&M...", which was followed by ten items, for instance "... helps children develop and improve their motor-coordination skills". All items are presented in the *Results* section. Teachers responded using a 5-point Likert-scale (1=completely disagree; 5=completely agree). Note that these ten items were previously used by Williams et al. (2022) with satisfactory internal reliability (Cronbach's $\alpha > 0.9$), who adopted seven items from the Music Beliefs Questionnaire (Barrett et al., 2019) and added three items to account for the executive functions (inhibition, working memory, shifting). Confirmatory factor analysis was conducted to assess the construct validity of the Music Beliefs Questionnaire by Barrett et al. (2019). One single factor capturing generalized beliefs and values about the role of music held by early childhood and care educators was identified.

4.3. Procedure

Ethics approval was obtained from the Human Research Ethics Committee (HREC) of the authors' University. We obtained kindergartens' email addresses from the website of the Hong Kong Education Bureau⁴. Invitation emails with a hyperlink to the Qualtrics online survey were sent to the principals of all local kindergartens. Principals were invited to forward the hyperlink to teachers in charge of 3- to 6-year-old children. The survey could be finished in 6-7 minutes. It was available in English, Traditional Chinese, and Simplified Chinese. Teachers were asked to sign a consent form before taking the survey, which informed about data usage, data confidentiality, anonymity, potential benefits, and risks.

4.4. Data analysis

Items related to teachers' M&M background were analyzed using descriptive statistics (percentages). To address Goal 1, we performed descriptive statistics (frequencies and percentages) and independent sample *t*-tests were used to test the significance of any differences in self-reported knowledge between groups of teachers with different M&M backgrounds. To address Goal 2, descriptive statistics (means, standard deviations, frequencies, percentages, maximum and minimum values) are reported. The ten items were then divided into four groups (behavioral regulation, cognitive self-regulation, emotional regulation, and executive functions). Afterwards, the Pearson product-moment correlation coefficient was used to find the linear correlation between items. Independent sample *t*-tests were used to examine whether the beliefs of teachers with different M&M backgrounds were significantly different. Only statistically significant results are reported in the paper. All the statistical analyses were carried out using IBM SPSS (version 27).

5. Results

5.1. Goal 1: Knowledge about the role of M&M for children's brain and self-regulation development

We asked participants "Please rate your level of knowledge on the role of M&M for brain development". Most of them selected "high" (51.6%) followed by "neutral" (25.8%) and "very high" (18.3%) (Table 1). The mean was 3.84 (*SD* = .78, max. value = 5, min. value = 1). Independent sample *t*-tests revealed significant results when considering M&M background. Participants who played musical instruments, sang or danced in their own personal time reported significantly higher level of knowledge, $t(168.06) = 2.455$, $p < .05$, Cohen's $d = 0.279$. In other words, teachers who had M&M background expressed having higher knowledge on the role of M&M for brain development.

For the item "Please rate your level of knowledge on the role of M&M for self-regulation development in young children", most of the participants selected "high" (47.7%) and "neutral" (30.4%) and "very high" (14.7%) (see Table 1). The mean was 3.70 (*SD* = .82, max. value = 5, min. value = 1). Independent sample *t*-test revealed a significant relationship with participants'

⁴ Visit: <https://kgp2021.azurewebsites.net/edb/index.php?lang=en>

M&M background. Teachers who engaged in music-related activities in their own personal time reported significantly higher level of knowledge, $t(304) = 2.056, p < .05$, Cohen's $d = 0.274$.

Table 1. Please rate your level of knowledge on the role of music and movement for...

Item	Brain Development		Self-Regulation Development	
	Count	Percentage (%)	Count	Percentage (%)
Very high	56	18.3	45	14.7
High	158	51.6	146	47.7
Neutral	79	25.8	93	30.4
Low	12	3.9	21	6.9
Very low	1	.3	1	.3

Note. $N = 306$. A 5-point Likert scale was used (ranging from 1=very low to 5=very high).

5.2. Goal 2: Beliefs about the Role of M&M on Children's Self-Regulation

To evaluate teachers' beliefs about the role of M&M on children's self-regulation, the participants were asked to rate their level of agreement in relation to the 10 statements. Table 2 presents descriptive information on each item, with items organized based on its corresponding self-regulation construct and their resulting means (in descending order). Overall, teachers demonstrated largely positive beliefs about the role of M&M in supporting children self-regulation development, with slight variation across the cognitive regulation construct.

Table 2. Means according to the Components of Self-Regulation

Item	Mean	SD	Minimum	Maximum
Behavioral regulation (BR)				
BR1... help children develop and improve their motor-coordination skills	4.30	0.55	1.00	5.00
BR2... support children to learn to control their behavior	4.02	0.63	1.00	5.00
Emotional regulation (ER)				
ER1 ... help children to learn about and understand emotions	4.15	0.60	2.00	5.00
ER2 ... support children's skills in managing their own emotions	4.05	0.68	1.00	5.00
Executive functions (EF)				
EF1... help children develop their memory skills	4.12	0.63	1.00	5.00
EF2... help children learn to be flexible in their thinking	4.02	0.64	1.00	5.00
EF3... help children to learn impulse control	4.01	0.64	1.00	5.00
Cognitive regulation (CR)				
CR1... help develop children's ability to focus their attention	4.26	0.59	2.00	5.00
CR2... help children to persist with challenging tasks	3.94	0.62	2.00	5.00
CR3... help children develop problem-solving skills	3.77	0.73	2.00	5.00

Note. $N = 306$. A 5-point Likert scale was used (ranging from 1=completely disagree to 5=completely agree).

We then ran an exploratory factor analysis. Only one factor was extracted. The solution could not be rotated, which indicated that all the items were measuring the same factor. This finding is consistent with Barrett et al. (2019), who also identified one single factor for the Music Beliefs Questionnaire with 37-items. This factor captured generalised beliefs and values about music's role held by early childhood and care educators.

Additionally, we used Pearson product-moment correlation coefficients to find the linear correlation of any two items (Table 3). The items that we regarded as having similar components of self-regulation showed the highest correlations. For example, there was a strong correlation between teachers' ratings of their beliefs regarding M&M in relation to memory skills

development and flexible in thinking, both representing executive function. There was also a strong correlation between emotional understanding and the management of own emotions, both representing emotional regulation.

Table 3. Correlation between any two items of the role of M&M in supporting self-regulation

Item	BR1	BR2	ER1	ER2	EF1	EF2	EF3	CR1	CR2	CR3
BR1	1.00	0.56	0.53	0.48	0.52	0.50	0.47	0.58	0.32	0.36
BR2		1.00	0.57	0.59	0.40	0.57	0.60	0.57	0.39	0.63
ER1			1.00	0.64	0.51	0.45	0.52	0.59	0.41	0.52
ER2				1.00	0.57	0.56	0.72	0.47	0.44	0.51
EF1					1.00	0.62	0.54	0.47	0.53	0.42
EF2						1.00	0.55	0.44	0.44	0.53
EF3							1.00	0.46	0.50	0.48
CR1								1.00	0.34	0.45
CR2									1.00	0.51
CR3										1.00

Note. Significance at the level of $p < .01$ (2-tailed)

Independent sample t-test revealed a significant relationship between participants' M&M background and their beliefs. Participants who played a musical instrument, sang or danced in their own personal time reported significantly higher level of agreement with the belief that M&M can support impulse control learning, $t(304) = 2.198, p < .05$, Cohen's $d = 0.293$. Additionally, individuals who studied M&M-related courses in higher education agreed significantly more that M&M may assist children in developing and improving their motor-coordination skills, $t(286.12) = 2.162, p < .05$, Cohen's $d = 0.250$. Finally, those who play a musical instrument, sing, or dance in their spare time expressed a significantly higher level of agreement with the belief that M&M could help children manage their emotions, $t(304) = 2.012, p < .05$, Cohen's $d = 0.269$.

6. Discussion and conclusion

The present study examined Hong Kong kindergarten teachers' self-reported knowledge of and beliefs in the role of M&M on children's self-regulation. Regarding Goal 1, we found that most participants believed they had a high level of knowledge on the topic. Moreover, those engaged in music-related activities in their own personal time reported knowing more about the impact of M&M on both brain development and early self-regulation. Regarding Goal 2, we found that teachers largely agreed that M&M can assist children in developing a range of self-regulation and executive functions skills with some slight variations in their endorsements. Specifically, there was slightly higher endorsement for behavioral regulatory skills, particularly motor-coordination skills, followed by emotional regulatory skills. Endorsement of the role of M&M in supporting development of cognitive regulation and executive functions was slightly lower. Finally, we found that teachers who studied M&M-related courses in higher education and engaged in music-related activities in their own personal time had stronger beliefs that M&M may contribute to the development of children's motor-coordination skills, impulse control learning skills, and emotional management skills. As pointed out below, note that these findings may not be generalizable to other teacher populations.

These findings differ from prior studies which showed ECE teachers' partial and superficial understandings of self-regulation (Da Silva, 2016; Ştefan et al., 2015; Willis et al., 2014). In contrast, our findings suggest that teachers had a high level of knowledge and beliefs

about the role of M&M in children's self-regulation. There could be numerous reasons for this. Firstly, our findings could be explained in light of the education received by Hong Kong kindergarten teachers during pre-service teacher education programs. As mentioned in the *Literature Review*, Hong Kong kindergarten teachers typically study the notion of self-regulation in a number of pre-service courses (Bautista et al., under review). Moreover, the importance of self-regulation is somewhat captured in the official curriculum framework (Curriculum Development Council (CDC), 2017). The frequent exposure to this notion could give teachers the impression of having high level of knowledge about self-regulation. Second, our findings could be due to the method employed to collect the data. Because our participants were asked to self-assess their knowledge and beliefs on the topic, there could have overestimated their level of expertise. The third reason is socially desirable responding. As responses were collected using Likert-scales, teachers could have selected high values to give researchers the impression of being highly knowledgeable (Li et al., 2011; Steenkamp et al., 2010).

One innovative finding is that teachers with M&M background recorded higher self-reported knowledge of, and stronger beliefs about the role of M&M on children's self-regulation. More specifically, there was stronger endorsement that M&M can benefit children in developing abilities related to behavioral regulation, particularly skills related to motor coordination. Furthermore, participants with prior M&M background believed that M&M may contribute to develop motor-coordination, impulse control, and emotional management skills. These findings align with Kim and Kemple (2011), who found that personal music experience is one of the factors that influenced the beliefs about the importance of music. However, our findings go beyond and provide new and valuable information specifically about the relationships between teachers' M&M background and training and their self-regulation knowledge and beliefs.

6.1. Limitations and future research

Several limitations need to be acknowledged. First, this article relies on a single data source (namely, self-reported survey data), as the study was conducted in the midst of the global COVID-19 pandemic and additional data sources were difficult to collect due to school closures. Multiple sources of data such as interview, focus group discussions, and observations should be employed in future studies to strengthen and deepen the findings. Second, this study only focused on in-service teachers in Hong Kong, who most likely have completed their pre-service training in this particular context. The findings are unlikely to be representative of other jurisdictions. Similar studies should be conducted with ECE teachers from nations all around the world to support the findings. Finally, while the data here provide useful insights related to knowledge and beliefs, there was no information collected about teachers' actual practices in relation to their use of M&M approaches to support children's self-regulatory skills. While self-reported knowledge and beliefs were relatively high, it is unknown to what extent practices used reflect evidence-based approaches likely to make an important impact for children's development.

6.2. Practical implications

Based on the study findings, we recommend that universities explicitly explain the connections between M&M and self-regulation, so that ECE teachers are fully aware of such connections. This would further convince the teachers that M&M is crucial for numerous reasons, including self-regulation. We also recommend increasing the formal and informal M&M

experiences offered to every kindergarten teacher, to make sure they experience how M&M allows them to improve their own self-regulation skills, such as remaining calm and focusing on work. This may make them aware of the importance of M&M for children's development (Velo, 2020). To achieve this, universities and colleges could organize M&M related courses or activities for teachers (Bautista et al., 2022b), such as music theory and pedagogy courses, training courses in instruments, voice, and rhythmic movement, as well as music performance contests. Participating in these M&M activities would support the building of networks with music educators and experts, which could in turn enhance teachers' M&M knowledge and skills. In addition, teacher education institutions could create mentorship systems that connect pre-service kindergarten teachers with students majoring in music or music education (Bautista et al., 2022b). Such experiences would expand teachers' scope and broaden their horizons in M&M. Over time, such formal and informal learning opportunities will help promote knowledge and beliefs alignment by increasing kindergarten teachers' awareness about the importance of M&M on children's self-regulation. Strong knowledge and beliefs are likely to enhance teacher practices through their ability to infuse everyday teaching with elements of M&M, and through enhancing uptake and high-quality implementation of evidence-based manualized M&M programs available. Exposure to high-quality M&M experiences for young children in all education settings has strong potential to enhance developmental outcomes, and in particular self-regulation.

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