

AWAKE School Intervention Program: Improving Executive Functions and Reducing Social and Emotional Difficulties in School-Aged Children

Cristina Anamaria COSTESCU*¹

Adrian Nicolae OPRE²

¹ Special Education Department, Faculty of Psychology and Educational Sciences, Babeş-Bolyai University

² Department of Psychology, Faculty of Psychology and Educational Sciences, Babeş-Bolyai University

*Corresponding author:
christina.costescu@gmail.com

Abstract: *This paper reports the results from a school-based intervention for primary and elementary children evaluating the AWAKE project. The AWAKE intervention is a universal program that can be applied by teachers and is designed to improve children's executive functions and well as their social and emotional well-being. 141 children aged from 6 to 14 from Romania and Austria were involved in the study and 50 teachers implemented the intervention. Out of the 141 children 37 of them had some learning difficulties, 25 children had a difficult social background, and 39 of them had some social and emotional problems as identified by their teachers. The intervention program lasted for 10 weeks with sessions implemented twice a week. Our results showed that children improved their working memory, inhibitory control, planning and behaviour regulation. Moreover, they showed great reduction of their emotional problems, as well as decreased behaviour problems and increased social behaviours. Future studies should investigate the potential of such activities for improving children's academic performance, as well as the benefits of including them in the school curriculum.*

Keywords: *school intervention; executive functions; emotional development.*

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Introduction

Executive functions (EF) refer to a set of cognitive processes that modulate attention, control behaviours and help us to achieve our goal (Bailey & Jones, 2019). EF are conceptualized as a single and unitary approach by some researchers, that operates in a top-down process to coordinate the subcomponents of the cognitive processes. Other researchers advance the idea that EF are a set of dissociate components and each of them follow different paths of development (Miyake et al., 2000). Even if there are several alternative models that try to define and explain the main components of executive functioning (Diamond, 2013; Friedman & Miyake, 2017; Miyake et al. 2000; Morrison & Grammer, 2016; Pennington & Ozonoff, 1996) there is a universal agreement on their important role for academic performance at different ages. Poor executive functioning, such as deficits in working memory, inhibitory control, planning and behavioural regulation are linked not only with low academic performance, but also with inefficient social and emotional adjustment (Binderman et al., 2004; Dickson & Ciesla, 2018). Therefore, the numerous studies published in the last decades that emphasize the relation between social and emotional development and EFs and the importance of EFs in academic performance, place this construct as a central point across multiple areas of children development. One recent integrated model proposed by Bailey and Jones (2019) tries to bring together the construct of EF and regulation related construct in a school related setting. In order to develop their integrated model, they base their research on the classic EF models (e.g., Diamond, 2013). In fact, they consider key cognitive processes, such as working memory, attention, inhibition and shifting and emotion regulation, perspective taking theories and social abilities (Hughes, 2011; Sokol et al. 2010) that support complex emotion, cognitive and social regulation. Therefore, our conceptualization of EFs follows their integrated model because we hypothesize that improving children's EF in a school setting will impact their social control and emotional control, which will led to fewer difficulties in that domain. Previous studies have also shown that EFs are linked with academic performance. For example, a meta-analysis developed on 67 studies that included typical developing children aged between 3 and 18 years old found that there are consistent and significant associations between EFs and academic skills, more specific math and reading skills (Jacob & Parkinson, 2015). The relationship between executive functions and emotion regulation and the use of adaptative emotion regulation strategies was also investigated in several studies with neurotypical

development (Rutherford et al., 2016; Mohammed et al., 2022) and apparently it holds across development, meaning that the construct is related from early childhood (Binder et al., 2020) until adulthood (Sperduti et al., 2017). Therefore, EFs play a critical role in children's abilities to regulate their emotions, which can be linked with successful social interactions (Eisenberg et al., 1995).

According to the review developed by Diamond & Lee (2011) computer trainings, aerobic exercises, martial arts, mindfulness practices, and some classroom curriculum (Tools of the Mind, Promoting Alternative Thinking Strategies -PATHS, Chicago School Readiness Project - CSRP) are effective in improving EFs. The main findings that were common among the four curriculum and that the authors underline to be necessary when implementing similar programs are: the programs should reduce the stress in the classroom, promote joy, proud and self-confidence and foster social bonding. Moreover, some school-based emotional learning programs that include a component of EF have revealed positive impacts on behavioural and academic outcomes (Diamond et al., 2007; Raver et al., 2011).

Domitrovich, Cortes and Greenberg (2007) investigated if the program PATHS could improve children's emotional knowledge and their social competences. PATHS is an intervention program that fosters social and emotional competence based on developmental integration of behaviors, affects and cognitive understanding and it is based on the model developed by Greenberg and his colleagues (1993). The program consists of 30 lessons that were delivered once a week for children aged from 4 to 6. The results of the randomized clinical trial suggested that both teachers and parents reported improvements in children's emotional and social skills.

Blair et al., (2018) examined the effect of theory of mind in large-scale randomized controlled trial, the results indicated improvements in self-regulation, social-emotion competence and positive teacher-child relationship. Moreover, the children from the experimental group reduced their behavioural problems. No differences in academic skills were detected. Even though these findings are promising, the effect on the follow up was sustained only for reduces aggression and conduct problems.

Schonert-Reichl et al., (2015) examined the effectiveness of a mindfulness-based curriculum MindUP on a sample of typically developing children aged between 9 and 11 years old. The program consisted of deep breathing practice and is designed with EF and self-regulation as the main outcomes, along with end-of-year math grades. At the end of the program children showed improvements in EFs, self-report measurements of well-being and increased prosocial behaviors. They also tended to show better

math performance compared to children who received the regular school district social responsibility program.

Even if the above-mentioned programs are proven to be effective on improving EFs, a recent review (Baron et al., 2017) shows that no significant improvements are seen on self-regulation when analysing 6 randomized clinical trials that investigate the effectiveness of Tools of the Mind Program. One possible explanation is the fact that self-regulation construct is not well defined in the literature and different studies used different instruments to measure the same construct.

The body of evidence on interventions designed to cultivate EFs and to promote social and emotional well-being in school setting is not very well established. Even if there is some promising evidence of the potential for these interventions to improve children's EFs and the emotional and classroom behaviors, the studies presenting these interventions have some design, methodological and analytic limitations, which limit also our knowledge on the impact of EFs training. Starting from these main findings, in our study we aim to investigate if a school intervention program that is focused on improving EFs may impact children's social and emotional abilities, and to investigate which, among the EFs components, are the predictors of emotional and social abilities in a sample of school-aged children. Another purpose of our study was to identify teachers' perceptions on the AWAKE program and their attitude regarding children's performances.

Thereby, we formulated the following hypothesis: 1. children will have better performances on executive functioning after participating on the AWAKE intervention program compared to their performance before participating to the program; 2. children will have decreased social and emotional problems after participating on the AWAKE intervention program compared to their social and emotional problems measured before participating to the program; 3. there will be a positive association between executive functioning and social and emotional difficulties. Moreover, we formulated some exploratory questions regarding how teachers will perceive the intervention program. One of the questions deals with teachers' satisfaction with the program and the other ones targeted the aspects of the intervention protocol implementation.

Participants

Our study had two target groups, one was the children that received the intervention and one was the teachers. 141 children and adolescents aged between 6 and 14 years old ($M=9.12$, $SD=2.01$) were recruited from primary

and secondary schools from Romania (n=75) and Austria (n=66). Out of the 141 participants 81 of them were boys and 59 of them were girls. Also 70 of the children were from rural area and 68 from urban area. We have included 4 categories of children: children with learning difficulties (n=37), children with a difficult social background (n=25), children with emotional and social problems (n=39) and children with none of the above-mentioned problems (n=40). Regarding children's' parents' marital status 83% of them are declared married, 9.9% are declared divorced, 5% separated and 1,4% single parent families. The study is in conformity with the ethical standards required by the Ethical Committee of Babeş-Bolyai University. Informed consents were obtained from parents or legal guardians for each participant. We also had 50 teachers, who implemented the interventions and who were evaluated in terms of the satisfaction with the protocol. We had 27 Romanian teachers and 23 Austrian teachers.

Instruments

Childhood Executive Functioning Inventory (CHEXI; Thorell & Nyberg, 2008) was used to measure the executive function of participants from our study, which is a 24-item inventory that includes subscales for working memory, inhibition, behavioural regulation and planning. This instrument has previously shown adequate test–retest reliability, as well as good diagnostic and cross-cultural validity (Catale et al., 2015; Thorell et al., 2010; Thorell & Nyberg, 2008). Cronbach's alpha for our group was .94.

Strengths and Difficulties Questionnaire (SDQ; Goodman, 1997) was used to measure social and emotional problems of the participants. SDQ contains 25 items categorized into 5 scales of 5 items each: emotional symptoms, conduct problems, hyperactivity/inattention, peer problems and pro-social behaviour. A total difficulty score can be calculated by summing scores of four difficulties subscales, i.e., except for pro-social behaviour. The pro-social behaviour scale evaluates resources rather than problems. The SDQ enables researchers to classify subjects as normal, borderline, or abnormal, based on cut-off points. Cronbach's alpha for our group was .87.

Procedure

Teachers enrolled were involved in a training session. They received written modules regarding how the brain functions and how can this affect children's performance. For two weeks they read information and asked questions in regard to anatomy of the brain and neurobiology, human brain

structure, linguistics, neural system and neurons and functional structure of the brain. Afterwards they participated to an online meeting where they received feedback in regard to the evaluation and intervention process. The first stage was to obtain the informed consent from parents of the children involved in the study, afterwards they did an initial evaluation of children's executive functions and emotional and social strengths and difficulties. After collecting the demographic data and finished the initial evaluations, they started the intervention. The intervention techniques were applied twice a week and consisted in four modules, the first module was on Speech and consisted of 35 exercises divided into 4 sub-categories Breathing, Auditory perception, Pronunciation and Imitation/Improvisation. The second module was on Motor Skills and had 29 exercises and were divided into 4 sub-categories: Balance and Coordination, Space orientation, Dexterity and Focus and working memory. The third module was on Cognition, and it had 22 exercises divided into 4 sub-categories: Memory, Attention, Reaction Speed and Imagination. The fourth module was on Social behaviour and it had 32 exercises divided into 4 sub-categories: Team Work, Improvisation, Self-perception and Communication. Each teacher completed an intervention sheet listing the number of sessions for each child and the type of exercise they applied. All the techniques description were sent to them and explained by the principal investigator. The intervention lasted 10 weeks, meaning 20 sessions. In week 5 there was a feedback meeting where the teachers share their experience in implementing the exercises and asked questions if they were not sure of certain aspects of the tasks. The last phase was the final evaluation, when the teachers completed again the standardized questionnaires.

Results

Differences between pre-intervention and post-intervention regarding social and emotional problems and executive functioning

Regarding the mean scores of the participants of the study, our results revealed that before the intervention our sample has borderline scores (between the limit of normal and abnormal scores) in terms of emotional and social difficulties, due to the increased mean of the total difficulties (M=12.21, from 12 to 15 is considered borderline issues). The highest score and above the normal limits are the score for conduct problems subscale. That means our participants have problems mainly with temper tantrums, verbal or physical aggressivity, expressing anger, respecting the rules and/or cheating and lying. Our results revealed that after the intervention the mean of the social and emotional difficulties decreased to a mean of 10.80. The results

showed that the intervention was effective in decreasing their social and emotional difficulties to a great high extend and their results are classified after the intervention as normal (0-11). The improvement is visible in each category, especially in conduct problems and hyperactivity.

In terms of their executive functioning, we compared our scores with the mean scores of similar studies (recommended by author of the CHEXI questionnaire Catale et al., 2015), since the authors does not declare any cut-off points. The means and standard deviations for both executive functions and social and emotional are presented in Table 1. The scores of our sample in pre-interventions for working memory WM (combined score of planning and working memory M=32.79, SD=11.47) and inhibition INH (combined scores of behavioural regulation and inhibition, M=25.87, SD=8.07) were above the mean scores of an Belgian sample for working memory: M=23.60, SD=6.12, and below the average for inhibition: M=26.20, SD=7.24. Meaning that in comparison to the Swedish sample, our participants showed increased difficulties in both working memory (M=22.05, SD=7.17) and inhibition (M=20.66, SD=7.41) in pre-intervention phase. The scores from post-intervention decreased for all the subscales, however our sample mean was above the Belgian sample and Swedish sample in working memory difficulties (M=28.89, SD=10.91) and for inhibition difficulties (M=23.36, SD=7.63), we are still above the mean compared to Swedish sample, but below the mean compared to the Belgium sample.

Table 1. Means (M) and standard deviations (SD) for measures of executive functions and emotional and behavioural problems

		Pre-intervention (n=141)	Post intervention (n=141)
CHEXI	Total score	60.80(18.36)	54.23 (17.54)
	Working Memory	22.60 (8.21)	19.92 (7.34)
	Planning	10.18 (3.58)	8.96 (4.41)
	Regulation	13.32 (4.51)	11.97 (4.12)
	Inhibition	12.55 (4.32)	11.38(4.09)
SDQ	Total Difficulties Score	12.21(5.47)	10.80(5.12)
	Emotional problems	2.94 (2.27)	2.63 (1.96)
	Conduct problems	2.04 (1.73)	1.80 (1.64)
	Hyperactivity	4.22 (2.20)	3.53 (1.99)
	Peer problems	3.00 (1.93)	2.84 (1.72)
	Prosocial behaviors	6.00 (2.32)	6.46 (2.31)

When analysing the statistical significance between the two measurements, before and after the intervention, our results revealed that there are significant differences between the two phases regarding all our targeted domains (see Table 2). Therefore, there was a significant statistical difference between the executing functioning (as a unitary construct) from pre-intervention compared to post-intervention ($t(140)=7.05, p<0.01$), there was significant statistical differences between pre- and post-intervention also for each subscale of the CHEXI instrument: working memory ($t(140)=7.40, p<0.01$), planning ($t(140)=4.04, p=0.00$), regulation ($t(140)=5.53, p<0.01$) and inhibition ($t(140)=4.63, p=0.00$). Meaning that children improved their executive function as a result of their participation to the intervention activities.

Similar results were obtained also when measuring their social and emotional abilities. Therefore, children significantly reduced their social and emotional problems in post-test compared to pre-test ($t(140)=4.28, p<0.01$) and increased their prosocial behaviours ($t(140)=-3.83, p<0.01$). Even though there were no significant differences between pre- and post-intervention in the peer problems subscale ($t(140)=1.36, p=0.173$), children showed improvements in their conduct problems ($t(140)=2.57, p<0.01$), hyperactivity level ($t(140)=5.16, p<0.01$) and their emotional problems ($t(140)=2.81, p=0.06$).

In Table 2 we have listed the mean differences also considering the category in which children were placed by their teachers: children with learning difficulties, children with a difficult social background, children with emotional and social problems and children with none of the above-mentioned problems. In the group of children with learning difficulties, our results showed that they significantly improved their working memory and their behaviour regulation, however there were no significant differences in terms of planning ($t(36) = .62, p=0.53$) and inhibition ($t(36)=1.75, p=0.08$). Inhibition and planning are considered to be among the most important executive functions (Diamond, 2013; Goldstein et al., 2014) and usually they are impaired in children with neurodevelopmental disorders. Moreover, children with learning difficulties decreased their hyperactivity level and increased their capacity to finish a task ($t(36)=2.21, p=0.03$). Even though they had high scores of social and emotional problems in pre-intervention ($M=13.27, SD=3.79$) and if their scores improved in post-intervention ($M=12.37, SD=3.78$), there was not a statistically significant improvement.

The group of children with a difficult social background also improved their overall executive functioning ($t(24)=2.18, p=0.03$), however there were no statistical differences between pre- and post-interventions in

behavior regulation and inhibition. The best results can be seen in the working memory ability ($t(24) = 2.58, p < 0.01$) and planning ($t(24) = 4.59, p < 0.01$). Moreover, decreased their hyperactivity level and increased their capacity to finish a task ($t(24) = 2.37, p = 0.02$), and they increased their prosocial behaviors ($t(24) = -1.12, p = 0.27$).

Children with social and emotional problems (perceived by their teachers, issue that was confirmed also by their high scores in social and emotional difficulties score on SDQ, which was classified as borderline, between normal and abnormal $M = 12.89, SD = 5.26$) showed great improvements in their executive functioning. They improved their working memory ($t(38) = 4.21, p < 0.01$), planning abilities ($t(38) = 4.30, p < 0.01$), regulation ($t(38) = 3.92, p < 0.01$) and inhibition ($t(38) = 3.35, p = 0.02$). They also decreased their hyperactivity ($t(38) = 2.58, p = 0.01$) and behavioural problems ($t(38) = 2.39, p = 0.02$) and improved their prosocial behaviour ($t(38) = -3.59, p < 0.01$). One important finding is represented by the fact that this group of children after the intervention moved from the category borderline to the category normal in terms of their social and emotional difficulties ($M = 11.07, SD = 4.58$). Meaning that the activities from the intervention protocol really helped them to improve their abilities.

The category with the highest number of children ($n = 40$) was the group of children that were included in the study without having any problem. Even though they had the lowest score in executing function difficulties ($M = 45.80, SD = 18.78$) out of the four groups they still improved significantly all the measured abilities, such as working memory, ($t(39) = 3.80, p < 0.01$), planning ($t(39) = 4.27, p < 0.01$), behavioral regulation ($t(39) = 2.99, p = 0.005$) and their inhibition capacity ($t(39) = 4.20, p < 0.01$). In terms of their social skills, they decreased significantly their behavioral problems ($t(39) = 2.53, p < 0.01$) and their hyperactivity ($t(39) = 3.45, p < 0.01$). The improvements they made on their emotional skills, were not statistically significant also because they had already in their initial evaluation low scores. The same situation is applicable for the prosocial behavior.

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Table 2. Differences between initial and final evaluation for the four groups of children

	t-test			
	Learning difficulties	Difficult social background	Social and emotional problems	None of the above-mentioned problems
Working memory	$t(36)=4.51, p<0.01$	$t(24)=2.58, p=0.01$	$t(38)=4.21, p<0.01$	$t(39)=3.80, p<0.01$
Planning	$t(36)=.62, p=0.53$	$t(24)=4.59, p<0.01$	$t(38)=4.30, p<0.01$	$t(39)=4.27, p<0.01$
Regulation	$t(36)=3.68, p<0.01$	$t(24)=.53, p=0.59$	$t(38)=3.92, p<0.01$	$t(39)=2.99, p=0.005$
Inhibition	$t(36)=1.75, p=0.08$	$t(24)=.12, p=0.90$	$t(38)=3.35, p=0.02$	$t(39)=4.20, p<0.01$
<i>CHEXI total</i>	$t(36)=3.27, p=0.02$	$t(24)=2.18, p=0.03$	$t(38)=4.64, p<0.01$	$t(39)=4.25, p<0.01$
Emotional problems	$t(36)=1.51, p=0.13$	$t(24)=1.04, p=0.30$	$t(38)=1.74, p=0.09$	$t(39)=1.25, p=0.21$
Conduct problems	$t(36)=-2.15, p=0.83$	$t(24)=.13, p=0.89$	$t(38)=2.39, p=0.02$	$t(39)=2.53, p<0.01$
Hyperactivity	$t(36)=2.21, p=0.03$	$t(24)=2.37, p=0.02$	$t(38)=2.58, p<0.01$	$t(39)=3.45, p<0.01$
Peer problems	$t(36)=0.21, p=0.83$	$t(24)=.62, p=0.53$	$t(38)=1.73, p=0.09$	$t(39)=.34, p=0.73$
Prosocial behaviors	$t(36)=-2.01, p=0.051$	$t(24)=-1.12, p=0.27$	$t(38)=-3.59, p<0.01$	$t(39)=-1.727, p=0.23$
	$t(36)=1.18, p=2.43$	$t(24)=1.23, p=0.22$	$t(38)=2.97, p=0.05$	$t(39)=3.15, p=0.03$

Possible predictors of children’s performance on social and emotional skills, as well as on their executive functioning

We conducted some correlations to see if there were some associations between the children’s demographics and their socio-emotional competence and executive functioning. We found that there were some associations between their age and their conduct problems, $r=-.188$, $p=.025$, meaning that as they grow their conduct problems tend to decrease, with their prosocial behaviour $r=.326$, $p<0.00$, meaning that their prosocial behaviours increase with their age, and with their hyperactivity $r=-2.81$, $p=.001$, which also decreases with their age. Also, their deficit in working memory seems to be related with their age, $r=-.176$, $p=.037$, and the difficulties decrease with age, a similar situation can be found with inhibition, which seems to improve with age $r=-2.07$, $p=.014$. Furthermore, age can be considered a predictor for executive functioning $B=70.45$, $SE=6.77$, $\beta=-.204$ $p<0.01$ as well as for social and emotional skills ($B=15.690$, $SE=1.97$, $\beta=-.210$ $p<.001$). Moreover, the constructs measured in our study seems to be also associates, as can be seen in Table 3.

Table 3. Correlations between social and emotional difficulties, prosocial behaviours and executive functioning

Measure	1	2	3
1. Social and emotional difficulties	1		
2. Prosocial behaviours	-.542**	1	
3. Executive functioning	.598**	-.263**	1

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

Regarding the gender of the children there were some significant differences between boys and girls before the intervention. More exactly boys had more difficulties than girls in both executive functioning (boys $n=81$, $M=63.53$, $SD=17.55$, girls $n=59$, $M=57.01$, $SD=19.07$) and social and emotional areas (boys $n=81$, $M=13.08$, $SD=5.15$, girls $n=59$, $M=11.00$, $SD=5.76$). The significant difference was also present after the intervention in the case of social and emotion problems between boys and girls ($t(138)=2.35$, $p=0.020$) (boys $M=11.35$, $SD=4.81$, girls $n=59$, $M=10.01$, $SD=5.49$). The difference between boys and girls for the executive functioning was insignificant after the intervention.

We found some interesting results when analysing the differences between rural and urban areas in terms of children’s performance.

Therefore, children from urban areas seem to have more difficulties with executive functioning compared with children from rural areas both before (rural $M=15.90$, $SD=1.90$, urban $M=19.80$, $SD=2.4$) and after the intervention (rural $M=16.45$, $SD=1.96$, urban $M=18.13$, $SD=2.19$). There were no significant differences between the two areas in terms of social and emotional problems.

Teachers' satisfaction with the intervention program

During the intervention program teachers applied 871 activities (exercises) in total. Out of the 871 exercises, 391 exercises were applied by the Romanian teachers and 480 were applied by the Austrian teachers. From the cognition domain they applied 135 exercises (64 in Austria, 71 in Romania), from motricity domain 225 (125 in Austria, 100 in Romania), from social domain 211 (118 in Austria, 93 in Romania) and for speech abilities 298 (171 in Austria, 127 in Romania). As our results revealed the most applied category was the speech category and the less applied category was the cognition category in both countries.

Even if there were some small differences in the number of exercises applied between the two countries, we could not find any significant differences between children's results neither on their social and emotional skills ($M=11.65$, $SD=4.10$ for the Austrian sample, $M=10.06$, $SD=5.80$ for the Romanian sample), $t(138)=1.849$, $p=.06$, nor on their executive functioning ($M=53.36$, $SD=13.94$ for the Austrian sample, $M=55.00$, $SD=20.26$ for the Romanian sample), $t(138)=-.551$, $p=.58$) in post intervention evaluations.

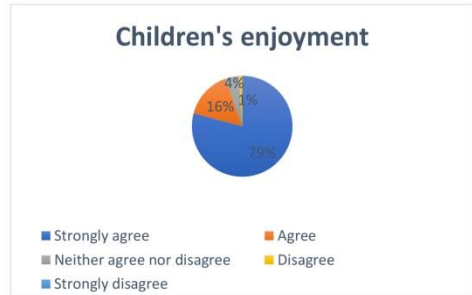
Furthermore, we have investigated if there are differences in the children's performances based on the number of the activities that they attended. The calculated mean for the exercises was 20 exercises per teacher and therefore we used that number to compare the groups (children who attended more than 20 exercises and children who attended less than 20 exercises), but no differences were found between the two categories in none of the measured outcomes (social and emotional skills $t(138)=-.366$, $p=.715$) and executive functioning $t(138)=-.930$, $p=.354$).

The majority of the teachers (35 of them) that implemented the intervention have more than 10 years' experience in the educational domain and only 15 of them have less than 10 years of experience.

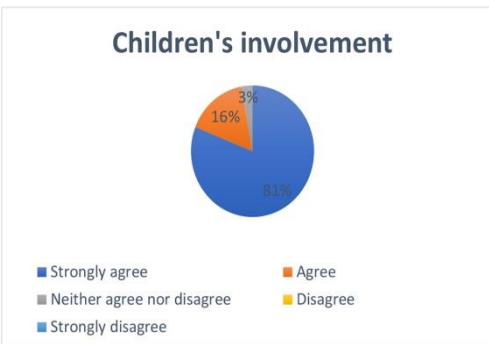
We also tried to identify the satisfaction of the teachers with the protocol implementation, we addressed a set of questions after each activity implemented by the teachers and in Figure 1, we have listed their answers.



The children completed the exercise according to the guidelines.



Children enjoyed the exercise



Children were fully involved during the exercise



The exercise addresses the desired behavioural areas



I believe that I need more training or assistance to implement the plan.



I consider that I did a good job in delivering the exercise.

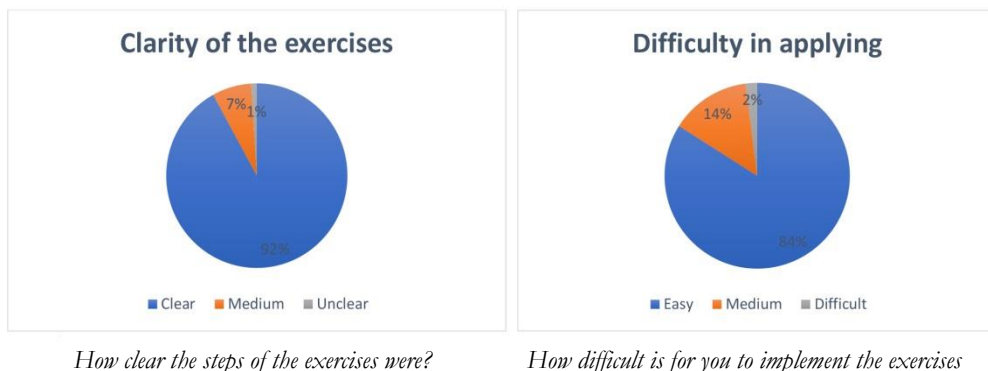


Figure 1. Teachers' perception in regard to the intervention program

Most of the teachers (72%) considered that they did well in delivering the intervention exercises, even if 64 % of them consider that they could benefit from some extra training. The overall satisfaction with program seems to be increased and the way how children perceived the intervention.

Conclusion and discussions

The AWAKE intervention program helped children to improve their working memory, inhibitory control, planning and behaviour regulation. These results are similar with previous research that showed significant effects on EFs for primary school age children that followed a curriculum-based intervention program (PATHS, Riggs et al., 2006). However, there were some slightly different results when analysing different vulnerable groups within our sample. For example, children with learning difficulties did not improve their planning skills significantly, and children with difficult social background did not improve their planning and behaviour regulation skills. As previously mentioned in the literature (Barkley et al., 2001), we also believe that more intensive intervention protocols should be considered for children with clinical elevated symptoms.

One important finding is related to the improvement of emotional and social skills of children. They showed great reduction of their emotional problems, as well as decreased behaviour problems and increased social behaviours. Some previous studies that investigated the effectiveness of the curriculum-based program for increasing executive functioning also reported significant differences in children's social and emotional competence (Domitrovich et al., 2007). Therefore, we can conclude that the Socialization module included in the AWAKE intervention program, but not only, has a

great potential to cause significant changes in negotiation problems with peers, better understanding their emotions and using prosocial behaviours.

Our findings suggest that through EFs training we can improve children's emotional and social abilities, as well as improving their prosocial behaviours, and all this increase the likelihood that children and adolescence to be more successful in social interactions and impact their well-being. Previous studies have shown that when emotional and social skills are trained at children that come from a social disadvantaged family (e.g. low-income) the improvements in social functioning can be also seen in brain functions, which have the potential to divert the developmental trajectories (Fine et al., 2003; Schultz et al., 2001). Therefore, in this light our findings in regard to the group of children that have a difficult social background who significantly improved their prosocial behaviours, working memory and planning can be seen as a major gain for their future social functioning.

Regarding the implementation of the program 95% of the teachers declared that children enjoyed implementing the activities from the intervention program, and 97% of the teachers declared that children were involved in the activities. The majority of the teachers enjoyed the program and were satisfied with the implementation and 89% of them were confident that they implemented correctly the activities from the protocol. According to teachers' children were more cooperative after implementing the activities. As our results revealed the most applied category was the speech category and the less applied category was the cognition category in both countries. However, we have to consider that Speech category was the first one introduced by the teachers and also had the highest number of exercises.

One of the limits of this study is represented by the fact that the impact of the intervention was assessed using data only from one single source. This type of measurement is also vulnerable to bias, considering the fact that the teachers were also the ones who implemented the intervention procedure. Another important limitation of the study is the fact that we didn't have any control group and the effects seen on the standardized instruments can be also influenced by other factors. One possible factor is the fact that the activities took place in the second school semester, when all the activities were face-to-face, compared to the first semester when some of the activities were online due COVID-19 pandemic. Also, we need to consider the fact that executive functioning can also be linked with the age of children, meaning that children may improve their skills as they grow. However, considering the high number of classrooms involved and the high number of teachers, we can conclude that part of the effect was related to the AWAKE intervention program. Another limitation was the lack a

follow-up assessment, unfortunately this was not possible due to the fact that school year finished and the collaboration with the schools and the project itself ended.

Future studies should also investigate the relationship between executive functions, emotional and social competence, and academic performance in a larger study also including a control group and a follow-up measurement. Moreover, this type of protocols should be accessible for every teacher. To increase the accessibility of the training program perhaps a low-cost EF digital intervention program that combines playful activities with educational apps and analogical tools could be developed. All in all, we really consider the AWAKE intervention program to have a great potential of improving children's' and adolescents' executive and social functioning. These kinds of programs can help children to build universal skills that can protect them from future mental health problems as well as to help them better cope with the social challenges that may appear.

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