Title: Promoting Mental Well-being in Iranian Children: Assessing the Impact of a Philosophy for Children Program through Behavioral Evaluation

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Abstract

Objective: Given today's intricate individual and societal demands, conventional educational strategies may not adequately meet essential needs. Consequently, alternative methodologies such as 'Philosophy for Children' (P4C) have gained traction. In Iran, P4C has been implemented in the education of young children over the past decade, with a distinct focus on enhancing reasoning and critical thinking skills. The purpose of the current study was to assess the impact of P4C interventions on the mental well-being of children aged 6-13 over a nine-month period. The evaluation included an analysis of conduct problems, social problems, hyperactivity, anxiety levels, and inattention symptoms.

Method: This study included 74 children aged 6–13 years. They were randomly divided into an experimental group (N=37) and a wait-list control group (N=37). Pre- and post-P4C intervention assessments were conducted using the Connors Teacher Rating Scale form and Swanson, Nolan, and Pelham (SNAP-IV) scores administered by teachers. The intervention group engaged in weekly philosophical group discussions for 9 months as part of the study.

Results: The findings indicated that the P4C group showed significant reductions in symptoms of inattention, hyperactivity, conduct problems, social problems, anxiety, and total symptoms compared to the control group. ANCOVA results revealed significant differences between the groups across all domains of Conner's Scale and SNAP-IV, with large effect sizes indicating a strong impact of the intervention on improving behavioral outcomes.

Conclusion: These findings highlight the significant impact of P4C interventions in addressing behavioral challenges in children, emphasizing the importance of integrating philosophy-based approaches in education to promote children's behavioral well-being.

Keywords: Philosophy for Children (P4C); Mental Well-being; Conduct problems; Social problems; Inattention; Hyperactivity; Anxiety

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1. Introduction

Childhood is crucial for building social, emotional, and intellectual abilities. This is due to the high level of brain malleability during this time, which facilitates learning and adjusting to one's surroundings (1, 2). The human mind's capacity to extract, process, store, communicate, and reproduce information from the external world is known as cognitive ability (3). Cognitive ability typically includes verbal skills, numerical skills, technological proficiency, and logical reasoning (4). Individuals with lower cognitive performance during youth have an increased likelihood of mental health problems many years later (5). Cognitive difficulties may involve problems with focus, recollection of information, scheduling, organizing, logical reasoning, and solving problems. These cognitive skills are essential for numerous functional duties like employment, education, social interactions, community participation, and independent living (6). Children and adolescents with higher intelligence test scores are generally less likely to be diagnosed with depressive or anxiety disorders or to report indications (signs) of psychological suffering later in life (7-9). These issues represent just one extreme of the wide spectrum of mental well-being. Due to the significant potential scientific and societal implications, the possibility of improving cognitive skills through training and some interventions has been one of the most influential subjects of cognitive psychology. Research has shown that digital education technology can stimulate students' internal drive, inspire them to learn, and improve their cognitive skills (3). Moreover, studies have explored the intricate relationship between working memory (WM) and overall cognition, suggesting that targeted WM training could lead to significant cognitive improvements across various domains (10). Other interventions like dance (11), music (12), and chess (13) in addition to using media like pop-up book learning media (14) have been hypothesized to impact cognitive ability.

Given the undeniable shortcomings of prevalent methods, most countries seek to develop approaches that cultivate thinking, creativity, and problem-solving. Therefore, diverse educational methods have emerged, including creative thinking, critical thinking, problem-solving skills, innovative curriculums, and philosophy programs for children (15).

The practice of “Philosophy for Children”, commonly abbreviated as P4C, is considered one of the initial tools for developing thinking abilities (16). The use of P4C is becoming more widespread in school settings, particularly to promote the well-being of youth. Lipman is known for being the founder of Philosophy for Children in the 1970s and holds the belief that philosophical thinking can be taught at any age (17). This educational program is designed to promote critical thinking, caring, creative reasoning and inquiry within the educational environment (18, 19). Lipman explains that P4C aims to broaden the scope of philosophy by using it as a form of teaching. In this teaching method, philosophy is employed to stimulate children's innate desire and interest in seeking meaning and understanding (20). The educational material in programs that utilize this philosophical approach consists of philosophical stories and the processes are focused on communities of inquiry. The term "inquiry" is chosen over "lesson" because the focus is on the group investigating questions together with the teacher acting as a facilitator rather than an authoritative source of information (21). Throughout P4C exercises, students are provided with an existential or philosophical subject when they read a story, watch a short video, or select particular themes themselves (22). P4C incorporates discussion as one of the primary elements. In addition, in a community of inquiry, learners have the opportunity to deeply reflect on and assess several concepts. Class exploration circles provide an environment for learners to achieve emotional and social development in addition to their cognitive and political growth (23). In these circumstances, they can have actual discussions, respect one another, ever-increasing sense of mutual confidence,

and increase the ability to communicate at different levels. Through P4C, children can learn to be more thoughtful, adaptable, considerate, and logical (17).

Childhood mental health issues have significant negative effects on the person, family, and society (24). Consequently, it is imperative to promptly regard many issues that children may encounter, including anxiety, conduct problems, and symptoms such as hyperactivity and inattention. Various interventions have been used to mitigate the above-stated issues (25-27). The current study set out to assess the effect of the P4C intervention on children's social problems including items like (being unaccepted, being isolated, having no fair play, lacking leadership, having trouble with the same sex, being uncooperative and easily led), conduct problems include items like (being impudent, lying, being destructive, being quarrelsome, stealing, disturbing, teasing, acting smart). Also, other factors are being hyperactive, being anxious, and having inattention symptoms (28).

2. Materials and Methods

2.1. Participants

The current study enrolled 74 Iranian children, 41 of whom were boys and 33 of whom were girls, with a mean ±SD age of 8.77 ± 2.18 years (range: 6–13). According to the reports of teachers and parents, no clinical diagnosis of psychiatric disorders has been reported. After that, they were randomly categorized into two groups: control and P4C, as detailed in Table 1. Shahid Beheshti University of Medical Sciences ethics committee in Tehran, Iran, gave its approval for this study (IR.SBMU.PHNS.REC.1400.077). Both the participants' legal guardian or next of kin and the participating teachers gave their informed consent to take part in the study. All methods were performed in accordance with the relevant guidelines and regulations of Helsinki.

Table 1- Characteristics of the study population in P4C and control group.

	Total number	Boys (n)	Girls (n)	Age, Mean ± SD (years)
P4C	37	15	22	8.86 ± 2.26
Control	37	26	11	8.86 ± 2.096
Total sample	74	41	33	8.86 ± 2.16

2.2. Instruments

2.2.1. Swanson, Nolan, and Pelham (SNAP)

The SNAP-IV 18-item scale is an abbreviated version of the Swanson, Nolan, and Pelham (SNAP) questionnaire (29, 30). It is a commonly used scale that evaluates the main symptoms of attention deficit hyperactivity disorder (ADHD) (31) in both ADHD (32) and healthy communities (33). This questionnaire applies the 4-point Likert scale from not at all (0) to very much (3) to assess the following factors: hyperactivity/impulsivity (9 items), inattention (9 items), and combined (both inattentive and hyperactive/impulsive) (18 items). SNAP is reported to have high reliability and validity (34). The questionnaire has been modified for the Iranian society (35). Sadr-Alsadat reported a test-retest reliability of 82% for the teacher form, with Cronbach's alpha coefficients at 90% (36).

2.2.2. Connors Teacher Rating Scale form

The Connors Teacher Rating Scale form (CTRS), which was initially designed in 1968 with 39 items (37), is still a useful and accurate tool for evaluating behavioral issues in children and teenagers. This multiple-choice questionnaire supports the Likert scale, with possible answers ranging from 0 (never or very rarely) to 3 (always, most of the time). This questionnaire has been adjusted for the Iranian society (28). Connors (1969) reported that the test-retest reliability of the

teacher form ranged from 72% to 92% over a month to a year, as well as 70% of the teachers' scoring reliability. Cronbach's alpha coefficients are reported to be between 61% and 95% (38).

2.3. Procedure

Participants were randomly categorized into two groups. The intervention group comprised 37 children who participated in weekly 1-hour P4C sessions for 9 months, completing 36 sessions. The P4C sessions in this intervention focused on issues such as happiness, normal vs. not normal, making mistakes, sadness and anger, division and death, and family. The other group consisted of 37 children selected from the wait-list control condition. Snap-IV and Conners rating scales were administered as pre-and post-tests to both groups. Teachers conducted pre-intervention (a week before the intervention began) and post-intervention (a week after the intervention concluded) assessments, which included two questionnaires. The pre-test and post-test scores were compared.

2.4. Statistical analyses

Our hypotheses were investigated using ANCOVA, which is a recommended method for increasing statistical power in randomized control trials. By using ANCOVAs, we could compare post-intervention scores between groups while adjusting for pre-intervention scores and gender. Paired t-test was used to compare pre to post-differences in each group. The level of significance was considered at $P<0.05$. Quantitative variables were described as mean ± SD. The data was analyzed by applying the software $SPSS_{V26.}$

3. Results

3.1. Effects of P4C on the SNAP scores

The effectiveness of P4C intervention in addressing symptoms of inattention, hyperactivity, and combined symptoms was assessed through pre-to-post-test score differences using the SNAP-IV questionnaire.

Results indicated significant differences between the control and P4C groups for all three symptom domains: inattention ((F = 19.972), $p < 0.001$, $\eta^2 = 0.222$), hyperactivity ((F = 32.505), $p < 0.001$, $\eta^2 = 0.317$), and combined symptoms ((F = 25.419), $p < 0.001$, $\eta^2 = 0.266$). Large effect sizes were observed, suggesting a substantial impact of P4C interventions on reducing symptoms across these domains (Table 2).

***Table 2**- ANCOVA results of SNAP-IV domains*

SNAP-IV domains	df	F	p-value[1]	Partial Eta Squared(η^2)
Inattention	1	19.972	<0.001	0.222
Hyperactivity	1	32.505	<0.001	0.317
Combines	1	25.419	<0.001	0.266

We conducted paired t-tests to assess group changes in pre-to-post-intervention scores. Table 3 presents the comparison of pre-to-post-test score changes between the control and P4C groups. In the control group, there was a slight decrease in mean scores for inattention from 0.98 (SD = 0.78) at the pre-test stage to 0.85 (SD = 0.59) at the post-test stage, although this change was not statistically significant ($p = 0.243$). Conversely, the P4C group demonstrated a significant reduction in inattention symptoms, with mean scores decreasing from 0.75 (SD = 0.51) at the pre-test to 0.44 (SD = 0.45) at the post-test ($p = 0.008$).

For hyperactivity, both the control and P4C groups exhibited minimal changes in mean scores from pre-to-post-test, with p-values of 0.957 and <0.0001, respectively. However, the P4C group showed a significant reduction in hyperactivity symptoms in comparison to the control group. Similarly, in terms of combined symptoms, the P4C intervention resulted in a significant reduction

in mean scores from pre-to-post-test ($p < 0.0001$), whereas the control group showed less pronounced changes ($p = 0.497$).

***Table 3**- Comparison of SNAP-IV pre-to-post-test score differences in the control and P4C group.*

SNAP-IV domains	Control			P4C		
	Pre-test	Post-test	P-value	Pre-test	Post-test	P-value
Inattention	0.98 ± 0.78	0.85 ± 0.59	0.243	0.75 ± 0.51	0.44 ± 0.45	0.008**
Hyperactivity	0.98 ± 0.82	0.97 ± 0.55	0.957	0.89 ± 0.59	0.44 ± 0.45	<0.0001****
Combines	0.98 ± 0.74	0.91 ± 0.52	0.497	0.82 ± 0.48	0.38 ± 0.36	<0.0001****

Data is presented as Mean ± SD, A Paired t-test was used to compare pre-to-post differences in each group.

<0.01, <0.0001**

3.2. Effects of P4C on the Conner's Scale Scores

Table 4 presents the results of the ANCOVA conducted to assess the effects of the intervention on various domains of Conner's Scale. The ANCOVA results revealed substantial differences between the control and target groups across all domains of Conner's Scale. Specifically, for hyperactivity, conduct problems, social problems, anxiety, and inattention, the F-values were 42.311, 40.220, 34.775, 32.920, and 40.525, respectively, all with p-values less than 0.001. Furthermore, the effect sizes, measured by partial eta squared, were substantial for each domain, indicating that a considerable proportion of the variance in the dependent variable was explained by the intervention while controlling for covariates. Partial eta squared values ranged from 0.320 to 0.388, suggesting strong effects of the intervention on the various domains of Conner's Scale.

***Table 4**- ANCOVA results of Conner's Scale domains*

Conner's Scale domains	df	F	p-value[1]	Partial Eta Squared(η^2)
Hyperactivity	1	42.311	<0.001	0.377
Conduct problems	1	40.220	<0.001	0.365
Social problems	1	34.775	<0.001	0.332
Anxiety	1	32.920	<0.001	0.320
Inattention	1	40.525	<0.001	0.367
Total	1	44.368	<0.001	0.388

To assess within-group changes in pre-to-post-intervention scores, paired t-tests were applied. Table 5 presents the comparison of pre-to-post-test score changes between the control and P4C groups. In the control group, there was a slight decrease in mean scores for hyperactivity from 10.40 (SD = 7.38) at the pre-test stage to 9.64 (SD = 4.87) at the post-test stage. However, this change was not statistically significant ($p = 0.345$). Conversely, the P4C group demonstrated a significant reduction in hyperactivity symptoms, with mean scores decreasing from 9.48 (SD = 5.72) at the pre-test to 5.05 (SD = 4.27) at the post-test ($p<0.0001$).

For conduct problems, both the control and P4C groups exhibited changes in mean scores from pre-to-post-test, with p-values of 0.973 and <0.0001, respectively. However, the P4C group showed a substantial reduction in conduct problems compared to the control group. Similarly, in terms of social problems, anxiety, inattention, and total symptoms, the P4C intervention resulted in a significant reduction in mean scores from pre-to-post-test ($p < 0.0001$), whereas the control group showed less pronounced changes ($p = 0.649, 0.468, 0.151, 0.556$, respectively).

Table 5- *Comparison of Conner's Scale pre-to-post test score differences in control and P4C group.*

Conner's Scale domains	**Control**			**P4C**		
	Pre-test	**Post-test**	**P-value**	**Pre-test**	**Post-test**	**P-value**
D1 (Hyperactivity)	10.40 ± 7.38	9.64 ± 4.87	0.345	9.48 ± 5.72	5.05 ± 4.27	<0.0001****
D2 (Conduct problems)	7.00 ± 6.04	6.97 ± 4.95	0.973	4.62 ± 4.39	1.89 ± 2.96	<0.0001****
D3 (social problems)	6.97 ± 4.61	6.97 ± 4.55	0.649	6.16 ± 3.91	3.45 ± 3.21	<0.0001****
D4 (Anxiety)	9.02 ± 4.00	8.59 ± 3.71	0.468	10.00 ± 4.21	5.94 ± 4.24	<0.0001****
D5 (Inattention)	8.24 ± 3.81	7.51 ± 3.40	0.151	8.27 ± 2.20	6.10 ± 2.06	<0.0001****
Total	41.35 ± 22.25	39.70 ± 18.19	0.556	38.54 ± 17.10	22.45 ± 14.02	<0.0001****

Data is presented as Mean ± SD, A Paired t-test was used to compare pre-to-post differences in each group.

<0.0001****

4. Discussion

The purpose of this study was to determine the impact of a P4C-based program on the mental health of Iranian children. Compared to the control group, members in the target group tend to have better performance in addressing mental health symptoms, including conduct problems, social problems, anxiety, inattention, and hyperactivity. In the context of our Philosophy for Children program, we employed two standardized assessment tools SNAP-IV questionnaire and the Conners' Scale. These instruments were selected for their ability to comprehensively evaluate behavioral and emotional aspects, including symptoms associated with ADHD in children. The SNAP-IV questionnaire is widely used to assess ADHD symptoms, such as inattention and hyperactivity, in both clinical and research settings. Similarly, the Conners' Scale provides

valuable insights into various domains of behavior, including hyperactivity, conduct problems, and inattention. In our study, we observed significant reductions in inattention symptoms within the P4C group, whereas the control group did not exhibit significant changes. Although both groups showed minimal changes in hyperactivity symptoms, the P4C group demonstrated a notable decrease compared to controls. Moreover, the P4C intervention resulted in statistically significant reductions in combined symptoms, in contrast to the control group. Additionally, post-test scores significantly decreased across all domains of the Conners' Scale (hyperactivity, conduct problems, social problems, anxiety, and inattention) in the P4C group, while no significant differences were observed in the control group. These findings highlight the effectiveness of the P4C intervention in addressing ADHD symptoms and improving overall mental health outcomes in children.

Özgür Öner et al. (33) evaluated ADHD symptoms like inattention and hyperactivity in normal students who are younger for their grade in a low-middle income country by using SNAP-IV scales. When age, gender, and Fluid IQ scores were taken into account, the results indicated that teachers assessed ADHD symptoms to be 2.5–3.6 times more prevalent among students who were younger for their grade. Epstein et al. (39) explored the presence of racial differences in the results obtained from the CTRS on healthy children. The research examined potential disparities in the rating scale's results across different racial groups and sought to understand their underlying reasons. The results showed that black females rated the Conduct Problems factor significantly higher than white females and black males scored significantly higher than white male children on the Conduct Problems and Hyperactivity factors. Notably, they suspected that this significant difference may be due to teacher bias and suggest further investigation is necessary. The current educational crisis highlights a significant gap in students' interpersonal connections, with

education systems worldwide focusing heavily on gaining knowledge and skills for citizenship and economic contributions, while often neglecting essential human aspects like health, happiness, and values (40). A significant challenge faced by teachers today is their inability to address the complete spectrum of students' psychological and social requirements during classroom instruction. This is one reason why students do not feel engaged in their education and may fail to provide a means that directs and inspires their further progress. Deci and Ryan (41, 42) highlighted that intrinsic motivation includes conditions like autonomy, competence, and a sense of belonging or connectedness. Traditional educational settings often dismiss students' individuality, beliefs, thoughts, interests, personal experiences, questions, and curiosity (43). However, the P4C approach encourages an environment of curiosity and exploration, where students' personal experiences and questions are valued. This paradigm shift allows students to genuinely connect with their learning, as they learn to align their thoughts with evidence and reason. In these classrooms, educators are passionate about their students' academic needs and are deeply concerned about their social, emotional, behavioral, and psychological states. Teachers aim to create a space for intrinsic motivation and self-exploration, fostering stronger connections within students and between students and teachers, ultimately leading to a more meaningful educational experience. In 2021, Malboeuf-Hurtubise et al. investigated the impact of philosophy for children (P4C) and online mindfulness-based intervention (MBI) on mental health during the COVID-19 pandemic on 37 students (both girls and boys; average age:8.18 years) (44). In comparison to mindfulness, P4C appeared to be more effective in reducing mental health issues including anxiety and inattention, according to the study. In this study, we assessed the effects of P4C on mental health and found that P4C has a positive influence on improving these aspects.

Over seven months, Trickey et al. examined the impact of collaborative philosophical enquiry on girls and boys students aged 11–12 (45). The findings indicated that there were significant differences in self-esteem, anxiety, and dependency between the target and control groups and girls gained more than boys; also, there were no substantial differences in social skills between the target and control groups. The research has not adequately addressed the impact of P4C on conduct/social problems. However, our findings revealed that P4C had a favorable impact on enhancing these characteristics.

According to the majority of studies, the duration of applied P4C programs varied widely from 5 weeks (46), 10 weeks (47), to 8 months (48). Here, we applied a 9-month study period since the course study in Iran lasts 9 months and the more important reason is to investigate the long-term effects of the P4C method on mental health compared to control groups. However, a study revealed the duration of the program which exposed students for just under a year may not have been long enough for the full impact of P4C to be felt. One study examined the cognitive effects of collaborative philosophical inquiry (CPI) sessions with 10–12-year-old school children in the UK for 16 months. The sessions, which lasted 60 minutes, aimed to get the children thinking philosophically by discussing open-ended questions. The study found that these philosophy sessions had positive effects on the children's verbal, non-verbal, and quantitative reasoning abilities. Participating in regular philosophical discussions helped strengthen the children's cognitive flexibility and ability to consider multiple viewpoints in both girls and boys. It also benefited their reasoning and critical thinking capacities over time. Additionally, it also noted that boys had slightly higher pre-test scores than girls on all subscales. Boys achieved greater gains than girls in overall scores and verbal and non-verbal subscale scores. In terms of the quantitative subscale scores, girls outperformed boys (49). Also, the follow-up study re-assessed students 2

years after completing the program to see if any cognitive gains were maintained over time. It found that students who had participated in CPI continued to outperform controls on measures of verbal, non-verbal, and overall cognitive ability even 2 years later. The results suggested that CPI had lasting benefits for students' cognitive development well beyond the duration of the actual intervention program and improved critical thinking skills that transfer more broadly over time (50).

Typically, ADHD symptoms begin before the age of 12, and in some children, they become noticeable as young as 4 years old (51). Anxiety, hyperactivity, and inattention are considered to be symptoms of ADHD, and its increase in childhood and its lack of control can be a warning of a serious injury and disorder. P4C is a method that has improved obsessive-compulsive disorder (52) and mental health problems (44) (anxiety and inattention). A case study exploring the participation of a student with autism spectrum disorder (ASD) in guided philosophical dialogues. By analyzing the student's involvement in structured philosophical discussions, the article sheds light on the potential benefits of such intellectual engagement for individuals with ASD, suggesting that it may be a valuable approach for enhancing their cognitive development and communication (53). Hence, it is necessary to investigate the effects of this educational method on the domains mentioned in this article.

One of the shortcomings of our study, which was related to the influence of gender, was the unequal distribution of male and female participants across the control and target groups. To address this issue, we considered gender as one of the covariates in the analysis. Our recommendation for future studies is to implement a philosophy education program for children in gender-specific groups. Also, the balance of the number of boys and girls should be given special attention.

There has also been a paucity of research examining the effects of philosophical educational programs on children of different ages. In a 9-month P4C program, Giménez-Dasí et al. (54) conducted an evaluation of sixty 4-to-5-year-old children to assess their social skills and emotional understanding. Furthermore, Fair et al. (55) examined the influences of P4C training and discovered a significant distinction in the positive effects of cognitive skills acquired between 7th and 8th-grade primary students. It is suggested to investigate the effects of P4C on different grades more precisely in future investigations.

The potential impact of socioeconomic factors on children's mental well-being (if any) remains unclear and more investigation into the association between the P4C outcomes and social factors would be beneficial. It seems P4C outcomes are affected by the combination of gender, age, and socioeconomic status (56).

To enhance the validity of our findings derived from teacher-filled questionnaires, augmenting our methodology with additional neuroimaging techniques such as functional Magnetic Resonance Imaging (fMRI) and electroencephalography (EEG) can be helpful. These advanced imaging methods can offer objective measures of brain activity and connectivity associated with symptoms, providing valuable complementary insights to questionnaire-based assessments. Integrating neuroimaging data with questionnaire responses, behavioral assessments, and self-reported measures can facilitate a more holistic evaluation of children's mental health and cognitive functioning. Further investigations with more participants, incorporating advanced imaging techniques, and covering socioeconomic status may enhance the reliability and depth of the findings.

Ethics approval and consent to participate: The study was conducted according to the guidelines of the Declaration of Helsinki and the Shahid Beheshti University of Medical Sciences ethics committee in

Tehran, Iran, gave its approval for this study (IR.SBMU.PHNS.REC.1400.077). The participants' legal guardian or next of kin and the participating teachers gave their informed consent to participate in the study.

Availability of data and materials: The data that support the findings of this study are available from the corresponding author if requested.

Competing interests: The authors declare that they have no competing interests.

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Authors' contributions: *F.V. and Fereshteh K.* carried out the experiment. *F.V., Fariba K.*, and *Fereshteh K.* contributed to the conceptualization and study design. *F.V., A.Z.*, and *S.A.* participated in the data analysis. *F.V., S.A., Fariba K., and A.Z.* contributed to the data interpretation and writing the manuscript. *MA.M., T.R., Fariba K., and S.A.* contributed to editing the manuscript. *R.K. and Y.G.*: curated the data. *Fariba K. and S.A.* supervised the project.

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References

1. Gabard-Durnam L, McLaughlin KA. Sensitive periods in human development: charting a course for the future. Current Opinion in Behavioral Sciences. 2020;36:120-8.
2. Kolb B, Gibb R. Searching for the principles of brain plasticity and behavior. Cortex. 2014;58:251-60.
3. Yan D, Li G. A Heterogeneity Study on the Effect of Digital Education Technology on the Sustainability of Cognitive Ability for Middle School Students. Sustainability. 2023;15:2784.
4. Hunter JE. Cognitive ability, cognitive aptitudes, job knowledge, and job performance. Journal of Vocational Behavior. 1986;29(3):340-62.
5. Gale CR, Cooper R, Craig L, Elliott J, Kuh D, Richards M, et al. Cognitive Function in Childhood and Lifetime Cognitive Change in Relation to Mental Wellbeing in Four Cohorts of Older People. PLOS ONE. 2012;7(9):e44860.
6. Henderson C (edit).Clements SC, S Humin, Y & , Karmas R. Mental Health Coordinating Council Inc. (MHCC) 2015, Cognitive functioning: supporting people

with mental health conditions.
7. Hatch SL, Jones PB, Kuh D, Hardy R, Wadsworth MEJ, Richards M. Childhood cognitive ability and adult mental health in the British 1946 birth cohort. Social Science & Medicine. 2007;64(11):2285-96.
8. Martin LT, Kubzansky LD, LeWinn KZ, Lipsitt LP, Satz P, Buka SL. Childhood cognitive performance and risk of generalized anxiety disorder. International Journal of Epidemiology. 2007;36(4):769-75.
9. Koenen KC, Moffitt TE, Roberts AL, Martin LT, Kubzansky L, Harrington H, et al. Childhood IQ and Adult Mental Disorders: A Test of the Cognitive Reserve Hypothesis. American Journal of Psychiatry. 2009;166(1):50-7.
10. Morrison AB, Chein JM. Does working memory training work? The promise and challenges of enhancing cognition by training working memory. Psychon Bull Rev. 2011;18(1):46-60.
11. Kein, xe, nen M, Hetland L, Winner E. Teaching Cognitive Skill through Dance: Evidence for near but Not Far Transfer. Journal of Aesthetic Education. 2000;34(3/4):295-306.
12. Schellenberg EG, Nakata T, Hunter PG, Tamoto S. Exposure to music and cognitive performance: tests of children and adults. Psychology of Music. 2007;35(1):5-19.
13. Sala G, Gobet F. Do the benefits of chess instruction transfer to academic and cognitive skills? A meta-analysis. Educational Research Review. 2016;18:46-57.
14. Dian Idha R, Rukiyati R, editors. Developing Pop-Up Book Learning Media to Improve Cognitive Ability of Children Aged 4-5 Years. Proceedings of the 4th International Conference on Early Childhood Education Semarang Early Childhood Research and Education Talks (SECRET 2018); 2018 2018/11: Atlantis Press.
15. Hogan M. Cultivating thought-full and creative thinkers: A comment on quality merging Costa with Claxton et al. Thinking Skills and Creativity. 2006;1:152-4.
16. Zulkifli H, Hashim R. Philosophy for Children (P4C) in Improving Critical Thinking in a Secondary Moral Education Class. International Journal of Learning, Teaching and Educational Research. 2020;19:29-45.
17. Khanmohammadi M, Seifi M, Nateghi F. Effectiveness of Applying Philosophy for Children (P4C) Teaching Approach in a Media Literacy Course. Interdisciplinary Journal of Virtual Learning in Medical Sciences. 2020;11(2):112-20.
18. Vansieleghem N, Kennedy D. What is Philosophy for Children, What is Philosophy with Children—After Matthew Lipman? Journal of Philosophy of Education. 2011;45(2):171-82.

19. Lipman, M. Philosophy for Children. Developing Minds: A Resource Book for Teaching Thinking, Costa, A.L., Ed.; Association for Supervision and Curriculum Development: Alexandria, VA, USA, 1985; pp. 214–216. 1985.
20. lipman M. Thinking in education (2nd ed.). Cambridge University Press. 2003.
21. Bleazby J. Social Reconstruction Learning: Dualism, Dewey and Philosophy in Schools2013. 1-224 p.
22. Lipman M SA, Oscanyan FS. Philosophy in the Classroom. Philadelphia, PA: Temple University Press muse.jhu.edu/book/9490.2010.
23. Haynes J. Children as Philosophers: Learning Through Enquiry and Dialogue in the Primary Classroom (2nd ed.). Routledge. . 2008.
24. Ogundele MO. Behavioural and emotional disorders in childhood: A brief overview for paediatricians. World J Clin Pediatr. 2018;7(1):9-26.
25. Fisak B, Penna A, Mian ND, Lamoli L, Margaris A, Cruz SAMFD. The Effectiveness of Anxiety Interventions for Young Children: A Meta-Analytic Review. Journal of Child and Family Studies. 2023;32(8):2546-57.
26. Salartash V, Yekta M, Zabihi R. The Effectiveness of Cognitive Behavior Therapy on Anxiety, Physical Symptoms, Worry, and Attention Deficit in Women with Generalized Anxiety Disorder. The Open Public Health Journal. 2022;15.
27. Gardner F, Burton J, Klimes I. Randomised controlled trial of a parenting intervention in the voluntary sector for reducing child conduct problems: outcomes and mechanisms of change. J Child Psychol Psychiatry. 2006;47(11):1123-32.
28. Rezai M, Mirlu M, Nazari M. Tahlil avamel ekteshafi va hanjaryabi meghyas daraje bandi CONNERS- form moalem dar danesh amoozan maghta ebtedai shahr Zanjan (Analysis of exploratory factors and validity of Conners grading scale - teacher form in primary school students of Zanjan). 2015.
29. Swanson JM. School-based assessments and interventions for ADD students. Irvine, Calif.: K.C. Pub. Irvine, Calif.; 1992.
30. Swanson JM, Sandman CA, Deutsch C, Baren M. Methylphenidate hydrochloride given with or before breakfast: I. Behavioral, cognitive, and electrophysiologic effects. Pediatrics. 1983;72(1):49-55.
31. Hall CL, Guo B, Valentine AZ, Groom MJ, Daley D, Sayal K, et al. The Validity of the SNAP-IV in Children Displaying ADHD Symptoms. Assessment. 2019;27(6):1258-71.
32. Luo J, Huang H, Wang S, Yin S, Chen S, Guan L, et al. A Wearable Diagnostic Assessment System vs. SNAP-IV for the auxiliary diagnosis of ADHD: a diagnostic test. BMC Psychiatry. 2022;22(1):415.
33. Öner Ö, Vatanartıran S, Karadeniz Ş. Grade effects on teacher ratings of ADHD symptoms among primary school students. Scand J Psychol. 2019;60(4):304-8.
34. Bussing R, Fernandez M, Harwood M, Wei H, Garvan CW, Eyberg SM, et al. Parent and Teacher SNAP-IV Ratings of Attention Deficit Hyperactivity Disorder Symptoms: Psychometric Properties and Normative Ratings From a School District Sample. Assessment. 2008;15(3):317-28.
35. SADR ALSADAT S.J., HOUSHYARI Z., SADR ALSADAT L., ROUZBAHANI AKBAR, GHIAS MAJID, NIKFARJAM M.. A RATING SCALE TO DIFFERENTIATE BETWEEN CONDUCT DISORDER AND ATTENTION DEFICIT HYPERACTIVITY DISORDER. JOURNAL OF ISFAHAN MEDICAL SCHOOL (I.U.M.S)[Internet]. 2009;27(100):589-599. Available from: https://sid.ir/paper/50885/en.
36. Sadr alsadat S.J, Houshyari Z, Zamani R, Sadr alsadat L. Taein moshakhasat ravan sanji meghyas daraje bandi SNAP-IV ejraye valedain (Determining the Psychometric Characteristics of the Parental Implementation Snap-IV Grading Scale). Tavanbakhshi. 2008.
37. Conners CK. A teacher rating scale for use in drug studies with children. Am J Psychiatry. 1969;126(6):884-8.

38. Shahim S, yousofi F, Shahaian A. Hanjaryabi va vigegi ravan sanji meghyas daraje bandi CONNERS - form moalem (Validity and psychometric properties of Conners rating scale - teacher form). Olum tarbiati. 2008;79-80(14):1-26.
39. Epstein JN, March JS, Conners CK, Jackson DL. Racial differences on the Conners teacher rating scale. Journal of abnormal child psychology. 1998;26:109-18.
40. Ozmon H, Craver SM. Philosophical foundations of education. 1981.
41. Deci EL, Ryan RM. A motivational approach to self: integration in personality. Nebr Symp Motiv. 1990;38:237-88.
42. Deci EL, Ryan RM. Self-determination theory: A macrotheory of human motivation, development, and health. Canadian psychology/Psychologie canadienne. 2008;49(3):182.
43. Leng L. The Role of Philosophical Inquiry in Helping Students Engage in Learning. Front Psychol. 2020;11:449.
44. Malboeuf-Hurtubise C, Léger-Goodes T, Mageau GA, Joussemet M, Herba C, Chadi N, et al. Philosophy for children and mindfulness during COVID-19: Results from a randomized cluster trial and impact on mental health in elementary school students. Progress in Neuro-Psychopharmacology and Biological Psychiatry. 2021;107:110260.
45. Trickey S, Topping KJ. Collaborative Philosophical Enquiry for School Children:Socio-Emotional Effects at 11 to 12 Years. School Psychology International. 2006;27(5):599-614.
46. Malboeuf-Hurtubise C, Di Tomaso C, Lefrançois D, Mageau GA, Taylor G, Éthier MA, et al. Existential Therapy for Children: Impact of a Philosophy for Children Intervention on Positive and Negative Indicators of Mental Health in Elementary School Children. Int J Environ Res Public Health. 2021;18(23).
47. Cassidy C, Marwick H, Deeney L, McLean G. Philosophy with children, self-regulation and engaged participation for children with emotional-behavioural and social communication needs. Emotional and Behavioural Difficulties. 2018;23(1):81-96.
48. Säre E, Luik P, Tulviste T. Improving Pre-Schoolers' Reasoning Skills Using the Philosophy for Children Programme. Trames-journal of The Humanities and Social Sciences. 2016;20:273.
49. Topping KJ, Trickey S. Collaborative philosophical enquiry for school children: Cognitive effects at 10–12 years. British Journal of Educational Psychology. 2007;77(2):271-88.
50. Topping KJ, Trickey S. Collaborative philosophical inquiry for schoolchildren: cognitive gains at 2-year follow-up. Br J Educ Psychol. 2007;77(Pt 4):787-96.
51. Doğru H. Is Occupational Therapy Beneficial for Attention-deficit/Hyperactivity Disorder Accompanying Agenesis of the Corpus Callosum? Turk J Child Adolesc Ment Health. 2022;29(2):127-9.
52. darezereshki poor o, fallh mh, Saeidmanesh M. Designing stories to create cognitive faults in the philosophy program for children and its effectiveness on reducing the symptoms of obsessive-compulsive disorder in children with OCD symptoms in the elementary school of Yazd city. Thinking and Children. 2020;10(2):69-90.
53. Gardelli V, Backman Y, Franklin A, Gardelli Å. 'you talk and try to think, together' – a case study of a student diagnosed with autism spectrum disorder participating in philosophical dialogues. Childhood and Philosophy. 2023;19(n/a):1-28.
54. Giménez-Dasí M, Quintanilla L, Daniel M-F. Improving emotion comprehension and social skills in early childhood through philosophy for children. childhood & philosophy. 2013;9(17):63-89.
55. Fair F, Haas L, Gardosik C, Johnson D, Price D, Leipnik O. Socrates in the schools from Scotland to Texas: Replicating a study on the effects of a Philosophy for Children program. Journal of Philosophy in Schools. 2015;2:pp. 18-37.
56. Fariba Khodagholi MAM, Yahya Ghaedi, Shakiba Salarvandian, Fatemeh Vosoughian, Mobina Javadi, Fereshteh Khodagholi , Solmaz Khalifeh , Roohollah Karimi , Masoud Seddighfar , Shima Barzin , Leila Dargahi. Looking at Philosophy for Children and Its Outcomes Through a Neuroscience Lens. 2023.