

THE OUTCOMES OF THE SUZUKI APPROACH FOR LEARNING
A MUSICAL INSTRUMENT: A SYSTEMATIC REVIEW
UČINKI PRISTOPA SUZUKI PRI UČENJU GLASBENEGA INSTRUMENTA
– SISTEMATIČNI PREGLED

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Abstract: The Suzuki approach is a progressive, child-centred teaching philosophy that incorporates many aspects of holistic music education. The present study systematically analyses peer-reviewed studies, according to PRISMA guidelines, to understand the outcomes of the Suzuki approach for learning a musical instrument. For this systematic review, we searched Web of Science, EBSCOhost Web, ProQuest Dissertations & Theses Global, ScienceDirect - SD (Elsevier), Scopus, and SAGE journals from database inception up until May 2022. From 206 records we included 12 peer reviewed studies that investigated any aspect of outcomes of the Suzuki music education approach related to learners and included qualitative or quantitative data measured systematically. According to the reviewed scientific research, learning music through the Suzuki method can enhance numerous cognitive, emotional, and social processes, as well as auditory perception.

Keywords: Suzuki approach, music instrument learning, implicit learning, outcomes, PRISMA, systematic review

Izvleček: Pristop suzuki je progresivna filozofija poučevanja glasbe, ki je osredotočena na otroka in vključuje številne vidike celostnega glasbenega izobraževanja. Ta pregledni članek sistematično analizira recenzirane študije v skladu s smernicami PRISMA z namenom boljšega razumevanja rezultatov pristopa suzuki za učenje glasbil. V sistematičnem pregledu smo iskali v bazah podatkov Web of Science, EBSCOhost Web, ProQuest Dissertations & Theses Global, ScienceDirect – SD (Elsevier), Scopus in SAGE, in sicer od začetka baze podatkov do maja 2022. Od 206 zadetkov smo vključili 12 recenziranih člankov, ki preučujejo najrazličnejše vidike rezultatov pristopa suzuki, osredinjenega na učečega se in, vključujejo sistematično merjene kvalitativne ali kvantitativne podatke. Izsledki raziskav kažejo, da lahko učenje glasbe po metodi suzuki izboljša številne kognitivne, čustvene in socialne procese ter slušno zaznavanje.

Ključne besede: pristop suzuki, glasbeno izobraževanje, učenje inštrumenta, implicitno učenje, učni izidi, PRISMA, sistematični pregled

INTRODUCTION

The Suzuki method is a music education approach introduced in Japan in the 1940s by Japanese violinist Shinichi Suzuki (1898–1998). The method's outstanding musical successes with Japanese children quickly drew international notice, leading to its extension and adoption in many other nations.

The Suzuki approach, also known as the Mother Tongue Approach, is a progressive, child-centred teaching philosophy that incorporates many aspects of holistic music education (Henke, 2021). One of the hallmarks of the Suzuki approach is an early start to instrumental learning. After observing how quickly infants learn their own language through regular exposure, imitation, repetition, and parental praise, Suzuki (1983) realized that the same technique in acquiring a language might be used to acquire music. He believed that young children learn music mainly through exposure to music and argued that the most effective and appropriate way to develop sensitivity to music in children is to listen to recordings of high-quality performances. Perruchet and Pacton (2006) refer to that kind of learning as statistical or implicit learning. The acquisition of structure in the environment involves relatively simple Hebb learning processes in neural structures and serves as a basis for language development and a mechanism for musical development (McMullen & Saffran, 2004; Romberg & Saffran, 2010). The development of musical and language skills depends mainly on the musical aspects and the diversity of the child's environment (Brandt et al., 2012). The Suzuki approach utilizes the power of critical periods, periods in children's development where individual experiences have enhanced, long-lasting effects on behaviour and development and represent an optimal time for learning (Knudsen, 2004; Penhune, 2011; Werker & Tees, 2005).

Suzuki has made a great effort to show that talent is not inborn, and that, with the proper training, any child can be educated (Suzuki & Nagata, 2014). Without subjecting them to any musical skill tests, he accepted a large number of children as his own students, educated them, and helped them grow into successful musicians. He summarized the law of ability as the following: "A living organism acquires talent responding to the environmental stimulation from the outside and adapting itself to all things surrounding it. Talent is the production of the life force; therefore, there is no talent without stimulation which comes from the outside" (Suzuki, 1983, p. 2). The Suzuki philosophy specifically forbids the selection of children based on their initial musical ability; students involved in Suzuki lessons are not chosen only based on their behavioural abilities prior to the training.

In Suzuki musical teaching the repertoire for teaching each instrument has been carefully selected and structured in appropriate technical sequences to develop fine musical sensitivity and ability to perform.

Based on acquisition of the mother tongue, where learning to read and write comes after the child learns to speak, children first learn how to play the instrument by ear. In the first years of learning the instrument, the emphasis is on the sound rather than on teaching of symbols, memorization and note reading. Children are not taught to read the music before they have established good musicianship based on an auditory approach.

In the Suzuki approach, parents are expected to participate in classes and practice sessions and actively participate in the learning process. Parents will learn to play the beginning repertoire and be responsible for daily listening to high-quality musical recordings to mimic mother tongue language immersion (Henke, 2021). Compared to other educational approaches, one of the most innovative components of the Suzuki philosophy is the combination of sequential learning and continuous review, which is used in the Suzuki method to retain previously acquired abilities at a high level and to apply them in a new learning environment – prioritizing what has to be addressed when involved in sequencing learning skills (Cox, 1985).

The Suzuki approach is designed to teach children in such a way that they will always succeed in comprehending a concept. When a difficult problem is broken down by the teacher, pupils may focus on one new concept at a time. Suzuki teaching requires the instructor to demonstrate to the pupils on a regular basis, which requires the teacher to have a particular degree of performing skill.

The present review aims at understanding how outcomes of the Suzuki music approach have been studied in the previous literature. The following are the research questions that guided this review:

- RQ 1: What were the most discussed topics in the literature on the outcomes of the Suzuki music education approach?
- RQ 2: What methodological designs have been used to investigate the outcomes of the Suzuki music education approach?

METHODS

Objective and research design

The current systematic review used the PRISMA 2020 statement developed by Page et al. (2021) to critically assess and compare peer-reviewed literature exploring the outcomes of the Suzuki music education approach. The International Prospective Register of Systematic Reviews (PROSPERO) database was searched to identify similar systematic reviews. There were no studies that discussed the outcomes of the Suzuki music education approach.

Eligibility criteria

To document the analysis methodology and inclusion criteria, a protocol was created in advance.

To be included, studies had to:

1. investigate any aspect of outcomes of the Suzuki music education approach related to the learners,
2. include qualitative or quantitative data measured systematically.

To acquire high-quality, credible data, only peer-reviewed journal papers were chosen for inclusion. Systematic reviews identified by database searches were excluded. The selection was not limited only to English-language articles and there were no restrictions on publication date or research setting. The age range of the participants in the research was not limited and not only typically developing participants were included.

Information sources

We examined for papers that fit the criteria in each of the databases listed: Web of Science, EBSCOhost Web, ProQuest Dissertations & Theses Global, ScienceDirect - SD (Elsevier), Scopus and SAGE journals. This search began in April 2022 and was updated in May 2022.

We also undertook a “snowball” search in attempt to find more studies by looking through the reference lists of publications that were eligible for full-text review and using Google Scholar to find and screen studies that cited them.

Search Strategy

To determine a minimum collection of publications that might be presented in this systematic review, a systematic search was used to locate relevant papers. Initially, the most applicable keywords were identified by doing a preliminary search in the specified electronic databases (Web of Science, EBSCOhost Web, ProQuest Dissertations & Theses Global, ScienceDirect - SD (Elsevier), Scopus, and SAGE journals). Then, using the selected keywords, a search was conducted in the same databases.

We used the following principal search phrases in the title, abstract, or keyword fields: (Suzuki* AND music*). The search was limited to peer-reviewed papers.

For *Web of Science* we used the advanced search interface, and used the search syntax “TI=((Suzuki* AND music*)) OR AB=((Suzuki* AND music*)) OR AK=((Suzuki* AND music*))” to run searches. The search yielded 46 records, which we collated and de-duplicated in EndNote. After de-duplication, all 46 records remained.

For *EBSCOhost Web* we used the advanced search interface and used the search syntax “TI ((Suzuki* AND music*)) OR AB ((Suzuki* AND music*)) OR AK ((Suzuki* AND music*))”. The search resulted in 575 hits. After de-duplicating and limiting search results to peer reviewed papers we were left with 63 records.

For *ProQuest Dissertations & Theses Global* we used the advanced search interface and used the search syntax “ab((Suzuki* AND music*)) OR ti((Suzuki* AND music*)) OR diskw((Suzuki* AND music*))”. The search yielded 100 records; after de-duplicating and limiting search results to peer reviewed papers we were left with 3 records.

For *ScienceDirect - SD (Elsevier)* we used the search syntax “Title, abstract, keywords: (Suzuki AND music)”. The search resulted in 1 record.

For *Scopus* we used the advanced search interface and used the search syntax “TITLE-ABS-KEY((Suzuki AND music))”. The search yielded 45 records, which we collected and de-duplicated in EndNote, resulting in 43 records.

For SAGE Journals the advanced search interface was used applying the search syntax “[Title suzuki*] AND [Title music*]”, “[Keywords suzuki*] AND [Keywords music*]” and “[Keywords suzuki*] AND [Keywords music*]”. The search yielded 69 records, which we collected and de-duplicated in EndNote, resulting in 46 records.

Selection process

Citations identified from the literature searches and reference list checking were imported to EndNote and duplicates were removed. The author and one additional researcher independently reviewed the first 50 records’ titles and abstracts and addressed discrepancies until they reached a consensus. The titles and abstracts of all publications retrieved were then evaluated by the author and one additional researcher. In the event of a dispute, a discussion was held to determine which articles should be screened in full text. All possibly qualifying studies’ full texts were obtained. The full-text publications were then reviewed for inclusion by the author and one additional researcher independently. In the event of a dispute, a consensus on inclusion or exclusion was established through debate. When we came across non-English language articles, we initially utilized Google Translate to see if they were eligible.

Data collection process

We developed a standardized data extraction form to extract study characteristics. The standardized form was pilot tested by the author and one additional researcher using five randomly selected studies. Reviewers worked independently to extract study details.

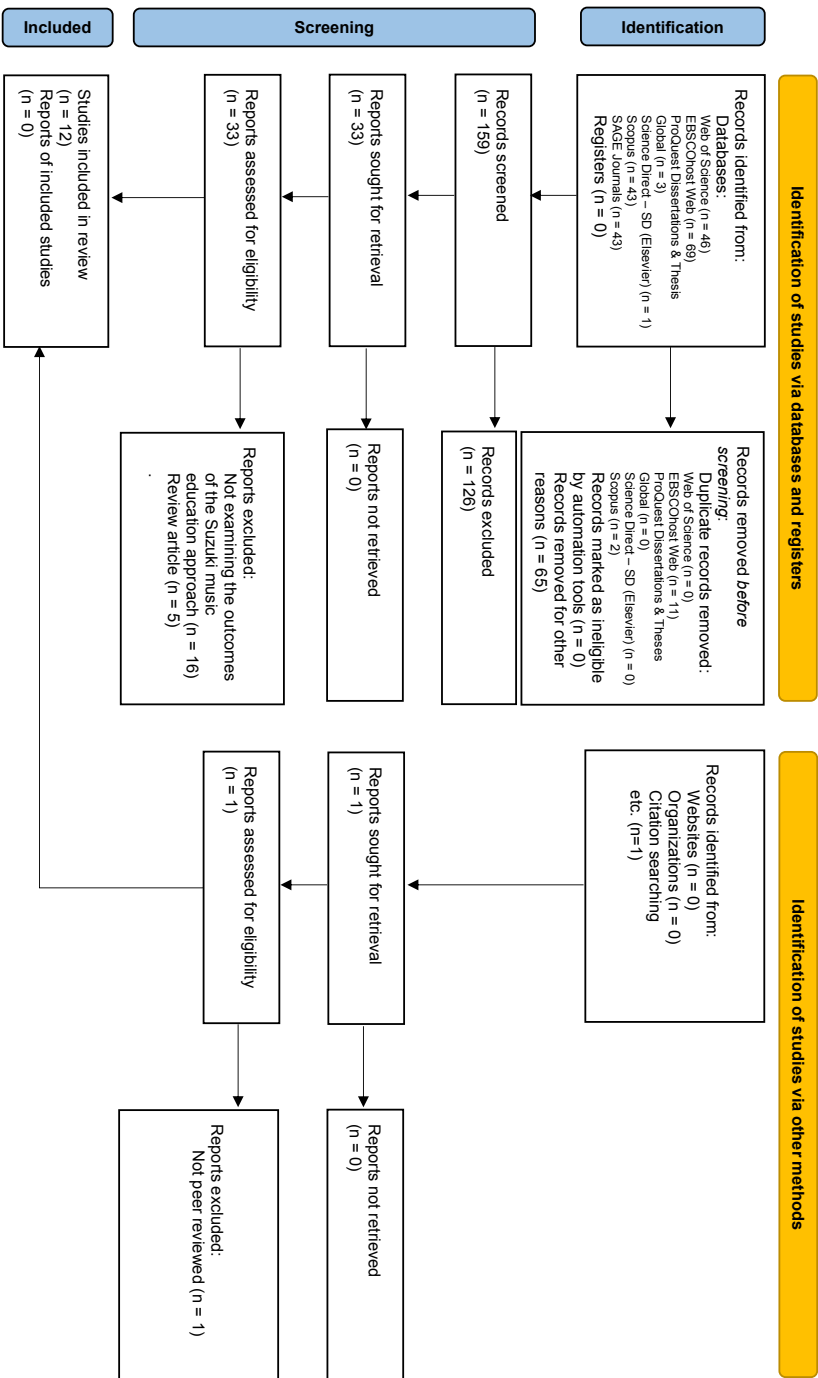


Figure 1. The PRISMA Flowchart

RESULTS

We found 206 records while scanning databases. After removing duplicates, we examined 159 records, evaluated 34 full-text publications, and eventually included 12 papers in this systematic review (Bugos & Mazuc, 2013; Fujioka et al., 2006; Gerry et al., 2012; Hallberg et al., 2017; Hendricks et al., 2021; Kajihara et al., 2013; Meyer et al., 2011; Scott, 1992; Shahin et al., 2004; Shahin et al., 2008; Trainor et al., 2012; Trainor et al., 2009). Later, we looked for materials that mentioned any of the studies that were initially included, as well as checking the studies' references. However, these searches yielded no further publications that met the inclusion requirements.

A summary of the main intervention components is described in Table 1. Some of the studies examined not only the outcomes of the Suzuki music approach but also other themes. In this report of study characteristics only the outcomes of the Suzuki music approach are presented and discussed.

What are the most discussed topics in the literature on the outcomes of the Suzuki music education approach?

Among the records included in this research, authors covered a diverse range of topics discussing the outcomes of the Suzuki music education approach. Behavioural neuroscience and auditory development were the most common topic discussing the outcomes of Suzuki music education. Multiple records examined the outcomes of the Suzuki music education approach related to the cognitive, affective, and social processes.

Behavioural neuroscience and auditory development

Neuroscientists examining the auditory development of children deliberately chose the Suzuki music education approach because the programme explicitly prohibits choosing children based only on their initial musical talent and it does not include absolute pitch training (Fujioka et al., 2006). The Suzuki music education approach also ensures that the children are exposed to music on a consistent basis. Researchers may assume that children participating in the Suzuki programme receive equivalent support from family and peers regardless of how well they are doing in the training because of the parental participation and social philosophy of this approach. All this enables them to explore the effects of training in auditory and sensorimotor modalities, offering a closer approximation to training-induced brain plasticity in behavioural neuroscience, because there is no early instruction in reading musical notation in the programme.

Shahin et al. (2004) conducted a study to determine whether children exposed to music from an early age who were attending the Suzuki lessons

show more rapid auditory cortex development. Their findings reveal a general process by which an accumulation of specific hearing experiences shapes the neocortical synaptic matrix. Authors concluded that while further research is needed to fully understand the significance of experience in the amplification of the P2 auditory evoked potential, the findings imply that Suzuki early musical instruction has a significant impact on auditory cortical representations.

Fujioka et al. (2006) investigated how auditory responses develop in children over the course of a year, what component of brain responses in each hemisphere matures differently in response to musical and non-musical sound, and how musical instruction affects normal maturation. Using magnetoencephalography (MEG), 4- to 6-year-old children's auditory evoked responses to a violin tone and a noise-burst stimulus were recorded in four repeated tests over a one-year period (MEG). Half of the subjects had Suzuki musical instruction during the year, while the other half did not. The violin was shown to have larger amplitudes, as well as a faster shift in amplitude and delay, than noise stimuli. Results indicate left-lateralized cortical development in this age group. In Suzuki-trained children, a greater and earlier peak in the left hemisphere in reaction to the violin sound was seen compared to untrained children. This difference was accompanied by a significant morphological shift in a temporal window, which was exclusively found in musically trained children in response to violin stimuli, but it was present in untrained children regardless of stimulus type. Authors believe this change might be linked to the formation of a brain network linked to sound classification and/or involuntary attention, which can be influenced by musical training.

Shahin et al. (2008) designed a study to test a hypothesis that if gamma band activity (GBA, 30-100Hz) reflects highly learned perceptual template matching, its development in musicians specific to the timbre of their instrument of practice can be observed. The data used for this study were collected by Shahin et al. (2004). Permutation tests were used to find locations in the ERSP or ITPC spectrograms that indicated significant variations across tone types, control and musician groups, and measures (before and after musical training). With one year of training, children receiving piano lessons had greater induced GBA power for piano tones, but children not receiving instruction showed no effect (collapsed over all channels and frequencies, 30-100 Hz, $p < 0.05$).

According to Trainor et al. (2009), the induced gamma-band response to musical sounds occurs in children after 1 year of Suzuki musical instruction beginning at age 4 and a half years, but not in children of this age who are not taking musical classes. The data used for this study were also collected by Shahin et al. (2004). They tested 12 children twice, first when they were 4 and a half years old and again when they were 5 and a half years old. At the time of the initial measurement, half of the children were just starting Suzuki piano

lessons, the other half did not receive any musical training. They concluded that musical training alters executive function-related oscillatory networks in the brain, and that greater executive functioning might increase learning and performance across a range of cognitive domains.

Meyer et al. (2011) investigated the impact of Suzuki musical instruction on the development of the human auditory nerve system. They measured the mismatch negativity (MMN) induced by violin and pure sine-wave tones in a sample of 7.5- to 12-year-old children who had either attended Suzuki violin tuition for several years or had no musical training. The Suzuki students' MMN reactions to violin tones clearly outperformed those of the controls; the opposite pattern was found for sine-wave tones. Suzuki students had considerably lower MMN latencies for violin tones than for pure tones; in the control group, there was no significant difference in MMN latency between pure tones and violin sounds. Thus, their findings show how and to what extent substantial musical experience influences the growth of human auditory function at several levels, including auditory discrimination processing accuracy and speed. Their findings add to our current knowledge of the mammalian nervous system's neuroplastic architecture and function. The duration and intensity of training, as well as the specific sensitivity to instrumental timbre and pitch recognition abilities, are all confirmed by behavioural recordings taken from the participants.

Kajihara et al. (2013) used a Stroop-type task to study if pedagogical background had an impact on auditory-motor coupling in young violinists. They noted that the type of musical training (traditional vs. Suzuki) had an influence on the strength of auditory-motor coupling in this group of children, with Suzuki-trained musicians having a bigger effect (significant facilitation effect of 49ms for the traditionally trained group, $t(10) = 2.5$; a significant facilitation effect of 136 ms for the Suzuki group, $t(10) = 2.3$; and no facilitation for the non-musician group, $t(8) = 0.04$). Traditionally trained violinists did not vary much from individuals with no musical training, although Suzuki-trained violinists did. The findings build on prior work in this area by indicating that mandatory audio-motor connection is linked to a musician's proficiency with their chosen instrument and is modified by instruction.

Cognitive processes

According to the methodological design outlined in the Methods, the earliest record to examine the outcomes of the Suzuki music education approach was Scott (1992) who investigated the impact of designated activities on preschool children's attention and persevering behaviours. In this quasi-experimental study, the author noted that involvement in Suzuki violin lessons might positively affect the development of control of attention and persever-

ance in preschool children. She points out that the Suzuki students' higher scores on the perseverance task may be largely due to the fact that parents had numerous opportunities to praise persistence during daily home practice sessions, whereas persistence behaviours of students in other preschool groups might not have received as much encouragement. However, because of the possible bias of the sampling strategy due to under-representation of subgroups in the sample in contrast to the population of interest, the results of this study cannot be extrapolated to the target population as the sample bias cannot be determined.

Bugos and Mazuc (2013) conducted a study to see how Suzuki violin teaching affected verbal memory, memory strategy use, and visual processing speed in children aged 8 to 12. Thirty-five children, 18 Suzuki-trained musicians with at least four years of experience and 17 non-musicians took tests in music aptitude, motor speed, music reading, intellect, verbal memory, and processing speed. The results show that musicians outperform non-musicians in verbal memory tasks such as distraction list items, short-delay free recall trials, semantic clustering scores, and overall processing speed by a substantial ($p > .05$) margin. These findings support the theory that Suzuki violin teaching leads to the development of semantic and syntactical knowledge that aids memory recall by categorizing words. The findings highlight the need to give musical training at a young age, the role of auditory skills in early music education, and the influence of musical training on cognitive development.

Hallberg et al. (2017) studied the impact of instrumental music education on kindergarten children's cognitive processes. They conducted a study with 48 students ($M = 5.15$ years, $SD = 0.301$) in kindergarten at a local Title I public elementary school in Northern Arizona who had never received previous instrumental music instruction, could play the violin, and had never lived in a primary non-English language home environment. The participants were randomly assigned to conditions: 26 children in the intervention group ($M = 5.12$ years, $SD = 0.271$) and 22 children in the control group ($M = 5.19$, $SD = 0.337$). Their findings show that instrumental music education, which is an important psychological component in academic learning, can help children improve their attention control.

Affective and social processes

In comparison to a similar period of passive exposure to music, Gerry et al. (2012) discovered that random assignment to 6 months of active participation in a Suzuki Early Childhood Education Programme beginning at 6 months of age increases the acquisition of culture-specific knowledge of Western tonality. Findings of this study are also discussed by Trainor et al. (2012). The au-

thors note that the infants who received an active musical experience developed more prelinguistic communicating gestures than those who received a passive musical experience. Results indicate that infants who received an active musical experience developed more social behaviour than those who received a passive musical experience. After participation in active music classes, infants showed much lower levels of distress than after participation in passive music classes. Their findings suggest that infants can engage in meaningful musical training when appropriate pedagogical approaches are used, that active musical participation in infancy improves culture-specific musical acquisition, and that active musical participation in infancy has an impact on social and communication development.

Hendricks et al. (2021) examined the relationships between parents' perceptions of their children's empathy, parents' beliefs and values about music, and formal Suzuki training to see how shared music learning experiences might relate to emotional and musical connections between parents and children over the course of six months. Authors note that children's initial empathy scores were significantly positively correlated with parents' ratings of the importance of music instruction generally, and of Suzuki instruction particularly, to their family. This exploratory study highlights potential relationships between family music values, children's empathy, and participation in group music-making. It supports the philosophy of musical meaningfulness, by suggesting ways in which meaningful connections may be forged simultaneously between people who care for one another, and between people and the activities they care about. Results of this study point to the importance of providing a variety of music learning activities and structures that reflect the personality, needs, and interests of children and parents.

What methodological designs have been used to investigate the outcomes of the Suzuki music education approach?

All of the 12 publications were quantitative. The 12 records were comprised of 3 (25%) experimental designs, 8 (66.6%) quasi-experimental designs and one (8.3%) exploratory study. Among the reviewed studies, EEG recordings were most commonly used (33.3%). In the majority of records (66.6%), authors used different tests, measures or subscales to measure their chosen variables.

Summaries of the studies are presented in Table 1. The investigations are listed in the table in chronological order, and details about the participants, approaches to the subjects, and major conclusions are also given.

Table 1. Summary of the studies on the outcomes of the Suzuki music education approach

Author	Study Design	Measurement time point	Intervention (n)	Control	Research instrument	Research findings
Scott (1992)	Quasi-experimental design	5 months	<p>Group I: 3 to 5-year-old children enrolled in preschool who attended 20- to 30-minute individual Suzuki violin lesson once a week (n = 16)</p> <p>Group II: 3- to 5-year-old children enrolled in preschool who attended one individual and one group lesson a week (n = 16)</p> <p>Group III: 3- to 5-year-old children enrolled in preschool who attended 45-minute group creative movement classes (n = 16)</p> <p>Group IV: 3- to 5-year-old children enrolled in preschool who did not attend any outside music or movement classes (n = 16)</p>	3- to 5-year-old children who have never been involved in any organized preschool activities or classes (n = 16)	Attention Task (Scott, 1992), Perseverance Task (Scott, 1992), Measure of frequency of teacher approval (Scott, 1992)	Suzuki violin instruction has a positive effect on attention and perseverance behaviours in preschool children
Shahin et al. (2004)	Quasi-experimental design	1 year	4- to 5-year-old children taking Suzuki music lessons (n = 7), 6 pianists and 1 violinist	Age matched 4- to 5-year-old children with no musical training (n = 7)	EEG recordings of auditory evoked potentials (AEPs) using a Neuroscan Synamps amplifier	Auditory training enhances the Pz auditory evoked potential in 4- to 5-year-old children
Fujioka et al. (2006)	Quasi-experimental design	1 year	4- to 6-year-old children attending Suzuki music school within 3 months before the first measurement (n = 6)	4- to 6-year-old children not attending any music lessons outside of school (n = 6)	MEG recordings of auditory evoked responses to a violin tone and a noise-burst stimulus	Maturation changes in auditory evoked magnetic fields can be observed within a year in 4- to 6-year-old children using individual waveforms of cortical source activity; musical training results in specific developmental changes in the responses to musical sounds but not to noise stimuli

Author	Study Design	Measurement time point	Intervention (n)	Control	Research instrument	Research findings
Shahin et al. (2008)	Quasi-experimental design	1 year	4- to 5-year-old children taking Suzuki music lessons (n = 6)	Age matched 4- to 5-year-old children with no musical training (n = 6)	EEG recordings of oscillatory gamma band activity (GBA, 30-100Hz)	Suzuki piano lessons increase power of induced GBA for piano tones in children with one year of training
Trainor et al. (2009)	Quasi-experimental design	1 year	4- to 5-year-old children taking Suzuki music lessons (n = 6)	Age matched 4- to 5-year-old children with no musical training (n = 6)	EEG recordings of auditory evoked and induced responses to a piano, violin, and pure tones	Suzuki music lessons alter executive function-related oscillatory networks in the brain, and greater executive functioning might increase learning and performance across a range of cognitive domains
Meyer et al. (2011)	Quasi-experimental design	/	7.5- to 12-year-old children from Suzuki music school (mean \pm SD age 10 ± 1.61 years, n = 18) who began violin training at approx. 5 years of age (mean 4.80 ± 1.46), practiced between 90 and 485 min weekly (mean 217.22 ± 116.26), and attended an average of 5 years (mean 5.19 ± 1.46) of Suzuki music school	19 control children matched in age and gender (mean age 9.78 ± 1.62 years; nine male and 10 female), four control children had also undergone instrumental education, the mean age of training commencement was later (mean 8.25 ± 0.64), the practice time per week shorter (mean 75.2 ± 17.08), and none of the control subjects played violin	Behavioural pitch recognition test; EEG recordings of mismatch negativity (MMN) evoked by violin and pure sine-wave tones	Extensive musical experience affects the maturation of human auditory function at multiple levels (accuracy and speed of auditory discrimination processing)

Author	Study Design	Measurement time point	Intervention (n)	Control	Research instrument	Research findings
Gerry et al. (2012)	Experimental study	6 months	34 infants (19 females and 15 males), their average age at the start of the lessons was 6.49 months (SD = 0.99), and their average age at the end of the classes was 11.56 months (SD = 0.85), 16 families (10 Active, 6 Passive) residing in very socio-economically sensitive neighbourhoods for young children	Control group of 26 infants who had no musical training and performed a subset of the final tests at 12 months (average age at test was 11.41 months, SD = 0.54)	Measure of sensitivity to Western tonality; Measure of early communicative development	Active music classes in infancy (Suzuki approach) enhance musical, communicative and social development
Trainor et al. (2012)	See Gerry et al. (2012)	See Gerry et al. (2012)	See Gerry et al. (2012)	See Gerry et al. (2012)	See Gerry et al. (2012)	See Gerry et al. (2012)
Bugos and Mazur (2013)	Quasi-experimental study	4.9 years (SD 2.0)	8- to 12-year-old musicians (M = 10.2 years, SD +1.6) with two or more years of formal Suzuki violin training (M = 4.9 years, SD 2.0) and currently practicing violin for two or more hours per week (n = 18)	8- to 12-year-old non-musicians with less than three months of prior formal musical training and not currently practicing a musical instrument or reading musical notation (n = 17)	Intermediate Measures of Music Audiation (IMMA; Gordon, 1986); Wechsler Abbreviated Scale of Intelligence (WASI; Wechsler, 1999); Finger Tapper Test (FTT; Reitan & Wolfson, 1993); California Verbal Learning Test for Children (CVLT-C; Delis, Kramer, Kaplan, & Ober, 1994)	Suzuki violin instruction enhances verbal memory performance, including distraction list items, short-delay free recall trials, semantic clustering scores, and overall processing speed
Kajihara et al. (2013)	Quasi-experimental design	16.3 years (SD = 2.8)	Children (M = 13.5, SD = 0.8) who had been trained to play violin via the traditional method (n = 11) Children (M = 13.5, SD = 1.3) who had been trained to play violin via the Suzuki method	Children (M = 13.8, SD = 0.7) with no musical training (n = 10)	Stroop-type task that required the execution of simple finger sequences according to aurally presented number sequences (e.g. "2", "4", "5", "3", "1").	Pedagogical background influences the effect of obligatory audio-motor coupling in a group of young violinists

Author	Study Design	Measurement time point	Intervention (n)	Control	Research instrument	Research findings
Hallberg et al. (2017)	Experimental design	5 weeks (15 hours)	Children (M = 5.12 years, SD = 0.271) attending kindergarten in a local Title I public elementary school in Northern Arizona (47% of the children attending the school where the research was conducted were classified at federal poverty level) who had not received previous instrumental music instruction, could play the violin (they had physical capabilities), and have not lived in a primary non-English language home environment (n = 26)	Children in the control group (M = 5.19, SD = 0.337) (n = 22) attending kindergarten in a local Title I public elementary school in Northern Arizona (47% of the children attending the school where the research was conducted at federal poverty level) who had not received previous instrumental music instruction, could play the violin (they had physical capabilities), and have not lived in a primary non-English language home environment	Stanford-Binet 5 (SB-5) working memory and visual spatial subscales; Kiddie Connor's Continuous Performance Test Version 5 (K-CPT) attention subscales	Instrumental training using the violin Suzuki Method affects working memory and attentional control of children enrolled in kindergarten
Hendricks et al. (2021)	Exploratory study	6 months	Suzuki students at a structured Suzuki school (n = 48)	/	Griffith Empathy Measure for children with additional questions regarding family demographics and values regarding music education	The study highlights the potential relationships between family music values, children's empathy, and participation in group music-making

DISCUSSION

This systematic review seeks to understand the outcomes of the Suzuki music education approach. In this section, we first provide a summary of our findings and discuss the present study's shortcomings. We then go on to discuss how

the results potentially influence methods for teaching and studying music and make recommendations for further research.

Firstly, we should point out that a diverse range of topics was covered when researching the outcomes of the Suzuki music education approach. The most common topics were behavioural neuroscience and auditory development, followed by the cognitive, affective, and social processes. We should note that the studies came from a variety of disciplines, including musical education, neuroscience, psychology of music, neurobiology, and so on. As a result, different researchers used different methods, nomenclatures, and instruments, making it difficult to interpret the results in a common language. The vast dispersion of the articles reflects the recent emergence of this field of study, which focuses on this specific domain of music education and its results.

The reviewed scientific literature indicates that learning music through the Suzuki approach can have a positive effect on the development of auditory perception and many cognitive, affective, and social processes. The research suggests that Suzuki music training may positively influence the child's cognitive development, attention, and perseverance. It can serve as an important facilitator of social and communication development and culture-specific musical acquisition.

This systematic review highlights a limited number of studies that look at the results of the Suzuki approach, indicating a lack of evidence in this field and thus highlighting future research objectives. Some positive outcomes of the Suzuki method appear to exist; however, they are not fully understood, based on the findings of the included research.

The majority of this study's limitations resulted from the significant variability of the articles examined, making it difficult to integrate them into a unified framework. With this review we also want to highlight how aspects like methodological variation have an influence on the research of Suzuki approach outcomes.

However, we believe that researches like these will enable us to identify the barriers and flaws in order to continue building the foundation of a common language to better the comparability of findings and improvements in explaining the empirical data in connection to the Suzuki approach's outcomes.

When discussing how the results of this review can potentially influence methods for teaching and studying music, it is crucial to point out the need for musical training at a young age. The findings of our research point to the idea that although early musical training is not essential to become a highly talented musician, it is important to make the most of the brain's plasticity at a young age.

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Povzetek

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Pristop suzuki je progresivna, na učenca osredinjena filozofija poučevanja glasbe, ki vključuje številne vidike celostnega glasbenega izobraževanja. Ena od najprepoznavnejših značilnosti tega pristopa je zgodnji začetek učenja instrumentov. Ta pregledni članek sistematično analizira študije v skladu s smernicami PRISMA z namenom boljšega razumevanja rezultatov pristopa suzuki za učenje glasbil. V sistematičnem pregledu smo opravili pregled v bazah podatkov Web of Science, EBSCOhost Web, ProQuest Dissertations & Theses Global, ScienceDirect – SD (Elsevier), Scopus in SAGE ter prišli do

206 zadetkov. Po odstranitvi dvojnikov smo pregledali 159 zadetkov, ovrednotili 34 publikacij s polnimi besedili in na koncu v sistematični pregled vključili 12 člankov (Bugos & Mazuc, 2013; Fujioka et al., 2006; Gerry et al., 2012; Hallberg et al., 2017; Hendricks et al., 2021; Kajihara et al., 2013; Meyer et al., 2011; Scott, 1992; Shahin et al., 2004; Shahin et al., 2008; Trainor et al., 2012; Trainor et al., 2009), ki preučujejo najrazličnejše vidike rezultatov pristopa suzuki, osredinjenega na učečega se, in vključujejo sistematično merjenje kvalitativne ali kvantitativne podatke.

Pri raziskovanju rezultatov pristopa suzuki za poučevanje glasbe je bil v ta sistematični pregled zajet raznolik spekter tem, študije so izhajale iz različnih disciplin. Velika razpršenost člankov odraža nedavni pojav tega študijskega področja, ki se osredotoča na specifično področje glasbenega izobraževanja in njegove rezultate. Izsledki raziskav kažejo, da lahko učenje glasbe po metodi suzuki izboljša številne kognitivne, čustvene in socialne procese ter pozitivno vpliva na slušno zaznavanje.

Verjamemo, da nam tovrstne raziskave omogočajo prepoznati ovire in pomanjkljivosti, da bi lahko še naprej gradili temelje skupnega jezika za boljšo primerljivost ugotovitev in izboljšav pri razlagi empiričnih podatkov v povezavi z rezultati pristopa suzuki.

Pri razpravi o tem, kako lahko rezultati pričujočega preglednega članka potencialno vplivajo na metode poučevanja in študija glasbe, je ključno poudariti potrebo po glasbenem izobraževanju v zgodnjem otroštvu. Ugotovitve naše raziskave kažejo na idejo, da čeprav glasbena vzgoja v zgodnjem otroštvu ni nujno potrebna za razvoj uspešnega glasbenika, je smiselno, da kar najbolje izkoristimo plastičnost možganov v tem razvojnem obdobju.