Finally, this study confirms the viability of a scalable, interdisciplinary, and culturally responsive method for learning cultural diplomacy in the digital age. It insists that under the right tools and learning environments, people can develop not just language but the empathy, creativity and strategic thinking necessary to serve as cultural diplomats. The stakes are high for Kazakhstan, which could both raise its international profile and foster domestic unity through greater understanding, by pursuing such innovative educational initiatives. With the world growing ever more intertwined, those models may very well come to shape diplomacy of the future.

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RHYTHM AND COMPOSITION IN MUSIC EDUCATION: THE DEVELOPMENT OF AUDITORY AND VISUAL PERCEPTION

Abstract

This article analyses the effects of rhythm and composition in musical education on the auditory and visual perception abilities of primary schools' students. By concentrating on the combination of formal rhythmic instruction and culturally sponsored composition activities, the paper seeks to consider how these various aspects

of the repertoire might affect cognitive and sensorial growth. Carried out in three schools in Kazakhstan, the study included 90 pupils (aged 7– 10 years old) who were equated in terms of number with the control and experimental group. The experimental group completed a 10-week programme including rhythmic technical exercises, movement related forms and composition in traditional Kazakh musical forms.

Task evaluations were conducted pre- and post-intervention to assess auditory discrimination, rhythmic memory, visual recognition, score-following accuracy and visual-motor coordination. The students from the experimental group significantly excelled in all the measured dimensions compared to those from the control group. Enhancements were confirmed by both statistical analysis and observational feedback in terms of increased engagement, and timing and multisensory combination.

The research clarifies the educational potential of combining rhythmical, compositional teaching with national music traditions, revealing that this encourages not only the development of perceptual capabilities, but also a coherent national identity. It proves that rhythm and composition are not only a means of aesthetic expression but also have beneficial effect on sensory training and cognitive development. The results provide support for incorporating programmed rhythm-based music education into the general Kazakhstan's curriculum and present a model for local educational systems which may be replicated.

The authors' plans for future work include extending the project to special education settings, assessing long-term retention of perceptual gains, and the development of digital tools to assist rhythm-based learning. This study in general supports the idea that music education that is based on rhythm and composition can be considered an auxiliary for the all-round development of students.

Keywords: music education, rhythm, composition, auditory perception, visual perception.

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МУЗЫКАЛЫҚ БІЛІМ БЕРУДЕГІ ЫРҒАҚ ПЕН КОМПОЗИЦИЯ: ЕСТУ АРҚЫЛЫ ЖӘНЕ ВИЗУАЛДЫ ҚАБЫЛДАУДЫ ДАМЫТУ

Аңдатпа

Бұл мақалада музыкалық білім берудегі ырғақ пен композицияның бастауыш сынып оқушыларының есту және көру қабілеттеріне әсері талданады. Ресми ритақты нұсқаулар мен мәдени демеушілік композициялардың үйлесіміне назар аудара отырып, мақала репертуардың осы әртүрлі аспектілері когнитивті және сенсорлық өсуге қалай әсер ететінін қарастыруға бағытталған. Қазақстанның үш мектебінде жүргізілген зерттеуге саны бойынша бақылау және эксперименттік топқа теңестірілген 90 оқушы (7-10 жас) қатысты. Эксперименттік топ ырғақты техникалық жаттығуларды, қозғалысқа байланысты формаларды және дәстүрлі қазақ музыкалық формаларындағы композицияны қамтитын 10 апталық бағдарламаны аяқтады.

Тапсырмаларды бағалау есту дискриминациясын, ырғақты есте сақтауды, визуалды тануды, ұпайдан кейінгі дәлдікті және визуалды-моторлы үйлестіруді бағалау үшін интервенцияға дейін және одан кейін жүргізілді. Эксперименттік топтың студенттері бақылау тобының студенттерімен салыстырғанда барлық өлшенген өлшемдер бойынша айтарлықтай жетістіктерге жетті. Жақсартулар қатысудың артуы, сондай-ақ мерзімдер мен мультисенсорлық комбинациялар тұрғысынан статистикалық талдаулармен де, бақылау шолуларымен де расталды.

Зерттеу ырғақты, композициялық оқытуды ұлттық музыкалық дәстүрлермен үйлестірудің тәрбиелік әлеуетін нақтылайды, бұл тек қабылдау қабілеттерін дамытуға ғана емес, сонымен бірге біртұтас ұлттық бірегейлікке де ықпал ететіндігін көрсетеді. Бұл ырғақ пен композиция эстетикалық бейнелеу құралы ғана емес, сонымен қатар сенсорлық жаттығулар мен когнитивті дамуға пайдалы әсер ететінін дәлелдейді. Нәтижелер ырғаққа негізделген бағдарламаланған музыкалық білім беруді Жалпы Қазақстандық оқу жоспарына енгізуге қолдау көрсетеді және қайталануы мүмкін жергілікті білім беру жүйелерінің үлгісін ұсынады.

Авторлардың болашақ жұмыс жоспарларына жобаны арнайы білім беру мекемелеріне дейін кеңейту, перцептивті жетістіктердің ұзақ мерзімді сақталуын бағалау және ритаққа негізделген оқытуға

көмектесетін цифрлық құралдарды әзірлеу кіреді. Бұл зерттеу, жалпы алғанда, ырғақ пен композицияға негізделген музыкалық білім беруді оқушылардың жан-жақты дамуына көмекші деп санауға болады деген идеяны қолдайды.

Түйін сөздер: музыкалық білім, ырғақ, композиция, есту қабілеті, визуалды қабылдау.

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РИТМ И КОМПОЗИЦИЯ В МУЗЫКАЛЬНОМ ОБРАЗОВАНИИ: РАЗВИТИЕ СЛУХОВОГО И ЗРИТЕЛЬНОГО ВОСПРИЯТИЯ

Аннотация

Данная статья направлена на изучение воздействия ритма и композиции как части музыкальной программы на развитие слухового и зрительного восприятия школьников начальных классов. Авторы фокусировались на сочетании регламентных мероприятий по ритмике и уроках сочинительства мелодий, проводимых в рамках культурной поддержки, чтобы оценить, как данные различные направления музыкального репертуара могут влиять на когнитивное и сенсорное развитие. В рамках исследования в трех школах Казахстана приняло участие 90 учащихся в возрасте от 7 до 10 лет, которые пополам были разделены на контрольную и экспериментальную группы. Экспериментальная группа прошла 10-недельную программу, включавшую ритмические технические упражнения на движения формы и композицию традиционные казахские мелодии. Оценивались задачи до и после вмешательства как для тестирования слухового восприятия, так и для ритмической памяти, зрительного распознавания, и моторики, правильного подсчета очков, и визуально-моторной координации. Учащиеся экспериментальной группы превзошли контрольную группу по всем параметрам. Улучшения подтверждались статистическими анализами и наблюдением на повышение вовлечения, синхронизации и мультисенсорного сочетания. Текущее исследование является мерилом образовательной уместности разработки сочетаемые занятий по ритмике и композиции с национальными музыкальными традициями, демонстрируя, что такой подход считается высокоэффективным не только для развития чувственных способности, но и для создания целостной национальной идентичности. Результаты подкрепляют предложение интеграции музыкального образования, связанного с программированным ритмом, в казахстанские школьные учебные планы и выполняют функцию модели для локальных образовательных систем. Дальнейшее планирование включает в себя расширение проекта на специальные учреждения, определение долгосрочного хранения навыков оценки и разработку цифровых программ для подбора ритмического обучения. Итого это исследование помогает подтвердить идею о ритм и композиции как вспомогательных средствах для всестороннего развитие детей.

Ключевые слова: музыкальное образование, ритм, композиция, слуховое восприятие, зрительное восприятие.

Introduction. The correlation between rhythm and composition in music education has a significant contribution on both auditory and visual intelligence specially in early years. These are not just imagistic props that we can discard at will but are central to our evolving system of cognitive-perceptual skills. In Kazakhstan, the necessity of teaching rhythm and composition for harmonic development of a sense as a part of an educational process is gradually being felt.

Traditionally, the music life of Kazakhstan was based on traditions, particularly the great importance that kuis have in shaping the cultural heritage of the nation. kuis singing demands a sophisticated sense of rhythm and composition, making this a healthy approach to developing aural and visual abilities, and a powerful educational tool. Studies suggest that grappling with such intricate musical forms help students' auditory system and the ability to think with the visual part of the brain. [1]

Recent research has confirmed that association between music training and sensory development. For example, a study performed by Barakat et al. shows that auditory training leads to enhancement of visual

rhythm perception, revealing an interesting inter-sensory influence in music education. This cross-modal facilitation indicates that organised music-making activities can facilitate both auditory and visual abilities. [2]

In addition, the widespread use of digital devices in music education has brought new possibilities of sensory development. Interactive materials and software enable experiencing the interactive environment where students can see what they hear in a musical score that enhances the bond between the concrete and the abstract nature of music. Such fusion of technology corresponds to the education standards of the Republic of Kazakhstan, contributing to the development of creativity in the teaching process. [3]

There are psychological factors in the process of music education that deserve to be mentioned. Rhythmic and melodic engagement has been associated with benefits in attention, memory and affect regulation. These cognitive benefits are especially relevant in the early education setting where foundational skills are being formed. Including rhythmic activities and composition analysis in the curriculum can therefore promote the development of the whole child.

Moreover, the social value of music in Kazakhstan affords a special exception to the adaption of traditional and classical to the modern system of education. With this blend of tradition and forward thinking, teachers can provide an enriching learning environment that respects cultural heritage and supports sensory growth. This method also improves hearing and sight sense while it reinforces the appreciation on the nation's musical heritage as well.

To sum up, the deliberate integration of rhythm and composition in music teaching can play a role as a driving force for the enhancement of listening and visual perception. In traditional ways, with the help of modern technologies and discoveries of psychology, the musical-educational process in Kazakhstan can use the properties of music for upbringing a harmonious, sensitive personality. Further research and development in this area will help to reinforce the importance of music education for sensory and cognitive development.

Methods. Rhythm and composition in the development of auditory and visual perception in music education: a mixed methods research design was used to explore how rhythm and composition impact auditory and visual perception in learning to read music. This approach combined experiments, interventions and statistics to achieve systematic data collection and processing. Three general education schools with specialized music programs in Almaty and Nur-Sultan were covered in the study with the participation of 90 students aged 7 to 10 years.

The investigation was divided into two phases: diagnostic-assessment phase and intervention phase. At first, mean measures of standardised auditory and visual perception were taken in these two groups. The audiological assessments consisted of pitch discrimination, rhythmic memory, and sound localization. Visual perception was evaluated on pattern Reco-knowing tasks, visual serial processing, and the synthetic control of visual-motor reactions by rhythm-notation reading tasks. The questionnaires were selected from existing validated instruments and were slightly modified according to the cultural language of the country and to the curriculum of Kazakhstan general education standards [4].

The students were split into 45 students' pilot and 45 students' control groups. Control group received a traditional music curriculum and experimental group received in intervention that was designed to focus on rhythm and composition. This training involved daily rhythm pattern exercises on percussion instruments, composition exercises on melodic and rhythmic themes and training procedures aimed at integrating motor tempo with auditory and visual stream (e.g., rhythmic games of clapping along musical scores).

The experimental program was delivered for 10 weeks (four 40-min sessions per week). Planning and carrying out of lessons corresponded with State Common Educational Standards of the Republic of Kazakhstan and met the pedagogical standards [5]. The program was delivered the content using kui-based traditional Kazakh rhythmic patterns as foundational, integrating them with clapping and step-based coordination activities to make their delivery culturally relevant and embodied [6].

Student progress was monitored during instruction with formative assessment logs and weekly performance rubrics. Behavioural engagement, auditory task response time accuracy, and eye movements during score-reading were monitored by teachers with training in music education and cognitive psychology. These signs were examined for vision gains.

After the program, all subjects received post-testing with the same diagnostic instruments used at baseline. Statistical analysis was performed using SPSS (Version 25). Paired t-tests and independent t-tests were applied to assess significance between within-groups differences (pre and post-tests) and between-group differences (control-experimental). $P < 0.05$ was considered to be statistically significant.

The studies group demonstrated highly significant changes in auditory discrimination as well as in visual tracking ($p < 0.01$), and those that required synchronization of visual and auditory cues. These results were in agreement with a study from Russia and Finland, in which sensorimotor synchronisation and visual pattern recognition can be improved by rhythmic training [7].

Furthermore, qualitative feedback from teachers and students demonstrated greater engagement, attention, and memory of content in the experimental group. Teachers felt that students had developed an intuitive sense of rhythmic content and their facility in reading and playing compositions became significantly increased [8].

Using a focused, culturally attuned rhythmic-composer intervention and rigorous study design, it was possible to validly determine the extent to which music-structural experiences improve sensory perception. "I don't think it would be difficult to extend this program to other educational settings based on its reproducibility and statistically validated results.

Results. The results of the study suggest a clear and quantifiable improvement in auditory and visual perception in students of structured rhythm and composition training. These enhancements were supported by both quantitative data and qualitative responses from users and teachers. Comparing Post-test results between control and experimental groups revealed a significant difference in favour of the experimental group for all main variables.

At the end of the 10-weeks treatment, participants in the experimental group improved in auditory discrimination, rhythmic memory and visual-motor coordination. The auditory discriminatory scores, for example, were raised to a mean of 89 in the experimental group as opposed to 72 in the controls. There were also comparable improvements in rhythmic memory, with the experimental group scoring 86 and the control group 68. These findings are in line with previous neuroscientific literature that highlights the developmental significance of rhythmic structures for perception [9].

The results on all test domains are summarized in Table 1. This table shows not only the post-test means, but AKL the degree of %M (measures) of improvement obtained by the experimental group over the control.

Table 1 – Post-Test Performance Comparison between Control and Experimental Groups

Test Type	Control Group Mean Score (Post-test)	Experimental Group Mean Score (Post-test)	Improvement (%)
Auditory Discrimination	72	89	23.61%
Rhythmic Memory	68	86	26.47%
Visual Pattern Recognition	70	88	25.71%
Score-following Accuracy	65	83	27.69%
Visual-Motor Coordination	67	85	26.87%

The experimental group performed better compared to the control group in all categories as presented in Table 1. Visual pattern recognition, for example, was enhanced by 25% in the experimental group. Studies have found that rhythmic visual sequencing tasks lead to significant improvements in children's abilities to perceive and reproduce tablet-based visual motor tasks. This finding reaffirms the visual-cognitive synergy in music learning [10].

One of the greatest improvements was observed for score-following accuracy, that is, being able to align auditory input with notated music in real time. Averages were 83 for the experimental group and 65 for the control group, underscoring the need to include rhythmic notation and listening tasks. These data are consistent with emerging neuro-imaging evidence of rhythmic influences on auditory-visual synchronisation of perception [11].

These results were also substantiated by behavioural observations during the study. Teachers reported increased attention and faster response to auditory cues and greater confidence in score reading for their experimental students. It was also reported that there was an increased engagement in, and participation with, class activities, with improved spatial awareness of students playing compositions [12].

Interviews with students also suggested that, when listening, many were already starting to imagine rhythms in their mind's eye, hinting at a much stronger cognitive association between listening and seeing musical organisation. This corresponds to cognitive neuroscience research finding that repeated rhythmic exposure enhances neural connections between auditory and visual centres [7].

The significance of the data was tested by statistics. The paired-sample t-test showed significant improvements ($p < 0.01$) in the experimental groups in all measures, and the independent-sample t-test also showed equally significant differences between the two groups. These results confirm rhythm and composition as tools for the development of the senses and provide sound pedagogical justification for their inclusion as mainstream activities and skills.

Content having cultural relevance would also contribute to educational success. The rhythmic designs borrowed from Kazakh kui pieces serve as a means of enhancing the aural and cultural experiences and enable the students to connect with national traditions and customs. There was a feeling of national pride and emotional response for student, when national music was utilised in rhythm work [6].

In summary, the results outlined in Table 1 and the statistical and observational analysis prove that rhythm and composition learning can produce a substantial increase of auditory and visual perception for children. This evidence highlights the necessity of incorporating such training within educational institutions in Kazakhstan across curriculums, not only to promote cognitive development, but for cultural appreciation [8].

Discussion. The results from this investigation provide strong support to the account that a focused education in rhythm and composition boosts school-age children's auditory and visual perception development. These findings add to an increasing body of literature showing that music education, pursued in a systematic, culturally relevant manner, confers a wide range of cognitive and perceptual benefits.

These findings are even more significant given the nature of the Kazakhstani educational environment in general. The General Education Standards for the State of the country place an emphasis not only on cognitive development but also on the development of aesthetic and creative capabilities in students [5]. Within this discourse, the inclusion of music education conforms and contributes to national goals of supporting the whole child. Our findings lend empirical support to such alignment and suggest that rhythm and composition training significantly complements crucial developmental goals, particularly sensory and cognitive integration.

In comparison, the previous Music experiences in Kazakhstan papers acknowledge traditional music's effect, in the formation of the cultural identity but no one explored its impact on auditory perception development in such a specific way supported by the statistics. For instance, Utepov's study on the kui rhythmic system focuses on the ethnocultural aspect of the kui but does not venture into the cognitive area [6]. Our work is an extension of this work, attempting to quantify the developmental benefits of these rhythmic structures if used within an education context.

Such increases in auditory discrimination, rhythmic memory, and score-following accuracy support the idea that rhythm and composition exercises are not merely artistic activities but also act as sensory training tools. These results are also consistent with foreign studies. For example, in a study investigating gains in visual-motor coordination and rhythmic prediction by Finnish students in structured music activities, students about whom information on leisure time activities was known did not differ in these aspects relative to each other [13]. This cross-national similarity underscores the widespread neurocognitive advantages afforded by rhythmic activities, irrespective of cultural setting.

However, the cultural construct of rhythm and composition continues to be a focal point here. The incorporation of well-known Kazakh motifs in the experimental programme did not merely engage, it enhanced teaching by offering students culturally familiar frames of reference. As Aitkalieva writes, culturally inflected instruction is conducive to not only information acquisition, but also the shaping of identity and emotional engagement [8].

Moreover, the results emphasize the association between music training and the formation of reciprocal cross-modal pathways. Ivanov proposes that rhythm plays the role of a "neural bridge" (ibid) linking regions of the brain responsible for processing auditory and visual information. The striking enhancement of students' skills to read and apply scores after training rhythm is in line with this suggestion. It also confirms the multimodal nature of the intervention and consequently, our intervention program, which involved clapping, movement, score reading and melodic repetition.

The enhanced development of students' visual pattern recognition and visual-motor coordination of our intervention is also reminiscent of prior experimental studies done in Russia that found that rhythmic intervention had a positive effect on children's working memory and pattern- tracking sense [10]. In our case, the visual tasks employed (matching rhythmic sequences to notation, synchronized movement) provided scaffolds for developing these skills, which may have in turn provided a clearer path to internalization of abstract visual forms.

Another node of discussion focusses on motivation and affective involvement. Observations from the teachers suggested that students in the experimental group had not only developed more technical but also displayed enthusiasm and confidence. This is consistent with the theory of emotional involvement in learning in which motivation facilitates retention and application of knowledge. As noted by Tleubergenova, ``when students are emotionally connected, cognitive processing is better and flexible'' [9].

Students mentioned that they not only felt more personally connected to the music they were studying, but also that the experience of building their own rhythmic patterns in turn assisted them in grasping the concept of musical form in an intuitively personal way. This compositional situation seemed to foster both creativity and analytical thought. Therefore, the kind of two-way engagement mentioned above – learning and messing

around – is a characteristic of high impact pedagogy, as pointed out by Ospanova in her research on multi-sensory instruction [11].

In addition, the structure of the rhythmic-compositional program parallels suggestions by international music education researchers who call for an integrated format. Integration of rhythm and movement results in increased memory of melodic and harmonic ideas because these concepts are experienced physically [2]. In this respect, the current study contributes empirical evidence to theoretical paradigms that in international contexts have been supported for some time.

The broader implications on inclusive education are also worth such discussion. It is well documented how rhythmic and compositional training supports children with learning differences as they move toward cognitive potential using routine and spatial organization. Our study did not involve students in the category of special education, but the robust general student findings in our study indicate the potential for generalization. Aliyev found that in the context of chromatism, rhythm exercises promoted children's ability to follow instructions and to predict the changes of a situation in the classroom [12].

These pedagogical implications are further strengthened by the statistical significance of our findings. Its universal p-value<0.01 indicates that these improvements were not random, occurring only due to the intervention. Also relevant for future curricular development [5], the study adhered to recommended methodological norms included in Kazakhstan's educational research guidelines.

Inclusion of the national legacy of music not only justified cultural standards but cemented the identity-based training. As Tulepbergenov mentioned, students tend to remember better when it comes to educational material that are related to their culture with a better rate [4]. Our results complement this account by showing that such acculturational blending does not detract from but in fact enriches cognitive precision.

Overall, the present study confirms rhythm and composition as tools used to increase auditory and visual perception, and motivational and cognitive engagement in music education. Traversing statistical analysis, cultural sensitivity, and pedagogical grounding, the project provides a model for curriculum innovation in both Kazakhstan and elsewhere. Further research could investigate long-term consequences, as well as extend these findings to older student samples and students with different learning difficulties. Nevertheless, as this study demonstrates, rhythm and composition based on national tradition and conducted within the framework of structured educational planning might have the potential to change children's sensory experiences and learning outcomes.

Conclusion. The studies detailed provide comprehensive evidence of the developmental potential inherent in music education through rhythm and composition. Through integration of structured rhythm training and compositional activities based on culturally familiar material, this investigation shows that students can experience highly significant gains in auditory and visual perception. Such results are especially relevant for Kazakhstan considering recent initiatives in its educational policy that increasingly focus on innovation, cultural inclusivity and formation of sensory and cognitive skills already at the stage of early schooling.

What sets this study apart is its two-fold interest: not only does it examine the cognitive and perceptual impact of rhythm and composition, but it also locates its intervention in Kazakh national music. Although there are several cross-cultural studies that have examined it (role of rhythm) in perception and cognition, few have integrated the study of traditional musical practices as central to the pedagogical process. By organizing rhythmic and compositional learning around kui rhythms and melodies known to Kazakh students, the program facilitated listening and raised cultural consciousness. The implementation of both the dimensions above make the results more relevant and more transferable for local schools.

And the research is empirically sound as well. The experimental plan, number of samples, and application of statistical tests were conducted to make certain the results are reliable and repeatable. Benefits in all perceptual skills (auditory discrimination, rhythmic memory, visual pattern recognition, score-follow accuracy, and visual-motor coordination) consistently favoured the experimental with respect to the control group. These gains were not only substantiated through quantitative data but also through qualitative feedback from teachers and students, who were witness and subject of the changes in actual classroom practices.

This is of particular significance as the current field of Kazakhstani literature on music education contains a gap in the literature. Other works are strongly oriented toward theory or culture but lack a similar extent of coverage of perception and development. The present research attempts to fill a gap and provides a culturally valid educational model that is both theoretically sound and practice oriented. As Tulepbergenov [4] mentioned good music teaching should be the harmony of nation and innovation for Kazakhstan — and this might be one chance to try it.

As for the future works there are some exciting avenues to explore. Longitudinal research would be needed to ascertain whether these gains are long-lasting and affect other academic training, such as language and mathematics recently related to auditory or the visual processes. Moreover, broadening the scope of inquiry

to students with learning disabilities can determine whether the structured rhythmic-compositional process is supportive for inclusive instruction—a focus now prominently highlighted in state policy.

A next research area is the potential of digital devices to practice rhythm and composition. Interactive software and rhythm-based learning games are possible tools that can make these practices more accessible and engaging, especially for rural and music educator–limited schools. The creation of such tools based on the Kazakh music legacy could contribute to the twin objectives of perception advancement and national heritage preservation.

The results of this study confirm the transformative power of music education in the domain of core cognitive and perceptual capabilities, not simply musical ability, when it is deliberately designed and culturally informed. The rhythm of composition is not only an element of composition; both are developmental devices for organizing however it is that children end up hearing, seeing, thinking, and understanding things in this world. It is evident that in the context of the changing educational systems in Kazakhstan, there is potential for rhythmically structured, culturally based music education to become one of the most effective ways for raising balanced, sensitive, and culturally competent learners.

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