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Bibliometric analysis on principles of digital content creation for toddlers

Young toddlers' early experience of digital screen-watching engagement is extraordinary for their first three years of cognitive, language, physical, social, and emotional development. While previous studies have documented that toddlers' digital use negatively impacts from an ecological perspective. However, some work has shown that digital screen media opens learning outcomes for toddlers around three years old. Besides, there are significant literature gaps related to well-designed, theoretically proven, empirically researched principles of digital content creation for young toddlers. Therefore, the present study used inclusion and exclusion criteria, a PRISMA (The Preferred Reporting Items for Systematic reviews and Meta-Analyses) flow chart, and screening research hot spots to reveal the principles of creating digital content for toddlers aged 0 to 3. Bibliometric analysis on research hotspots and leading researchers' publications evokes constitute the trends in digital content creation and consumption. The findings showed a compilation of eleven principles of digital content creation for young screen consumers based on the screening process from the Dimension database. This study used the bibliometric analysis method to seek publications on principles of digital content creation for young toddlers to provide further research directions in empirical research.

Keywords: bibliometric analysis, bibliometric approaches, PRISMA, principles, digital content creation, toddlers, language acquisition, early child development.

Introduction

There is limited empirical and theoretical research on creating and designing digital content for toddlers under three years of age growing up immersed in a digital environment. Some work is concerned with the persistence of the current overall quality and low educational value of touch screen use for young kids [1]. Although, some works consider the ecological aspects of how well thought out the age-appropriate content is and forms the basis of core development [2; 3]. Consequently, their immature functions in cognitive, fine motor, and language development, some questions are significant: (1) What are the ways of high-quality digital content creation for young toddlers within successful language development? (2) What does the relevant literature search say about it? Under the above concerns, we decided to use bibliometric analysis to identify research gaps in the current topic. Bibliometric research has several important characteristics, such as summarizing metadata, identifying trends and prospects for future queries, and measuring the impact of research [4; 5].

Objectives of the study

The current bibliometric analysis aims to disentangle what principles make qualified digital content creation for young toddlers aged 0-3 in their language development and to answer the research questions below by data collection from the Dimensions database. The study results are expected to be the methodological bases for digital content creation bounded in Kazakh folklore for the children population. The study seeks to answer the following research questions: RQ 1. How are the principles of digital content creation for young toddlers conceptualized in the current research literature? RQ 2. What do the most used keywords show relevance to the research aim?

Methods and materials

Table 1 presents the inclusion and exclusion criteria as main characteristics of the current study objectives and questions: to search for literature related to the creation of digital content for the language development of young children. The articles included in the literature review had to be reviewed, written in English, and published from 2019 to 2023. Both empirical and theoretical research articles were included since both types of papers could provide reliable information on the topic. The study also considered only publica-

tions that defined the principles of creating digital content for young children or focused on language development through the use of media by toddlers.

Table 1

Inclusion and exclusion criteria used during screening process

Inclusion criteria	Exclusion criteria
Peer-reviewed articles dealing with digital content creation for young toddlers Toddlers age 0-3 English language Publish between 2019-2023 Empirical and theoretical research articles Grand Funding Researches Field of research: Language and Communication, Education, Psychology, Information and Computing	Any articles not related to principles how to create digital content for young toddlers' language development Young toddlers not under aged 3 years Proceeding papers, book review, book chapter, editorial materials Articles not available as full text

The data extraction was analyzed screening process with the paper identification from the most relevant ones. According to the research topic, we uploaded the following closely related keywords using the logical search method by Boolean operators: ("Digital content creation" or "well-designed animation" or "educational digital content") AND ("young toddlers" or "kids" or "children") AND ("language development" or "first words" or "language acquisition"). Based on these keywords, total publications 3 798 articles were identified, of which 150 were selected under the research topic, which were completed by studying and adapting, and then 15 articles showed their compliance with the research question. To improve bibliometric analysis to ensure clarity and transparency, bibliometric criteria have been prepared by the PRISMA flowchart "Preferred reporting items for systematic reviews and meta-analysis" [6], shown in Figure. Initially, we excluded any registers and automation tools in the identification stage. Papers are excluded: topic (tv exposure, toddler dysregulation, covid psychological stress, autism, etc.).

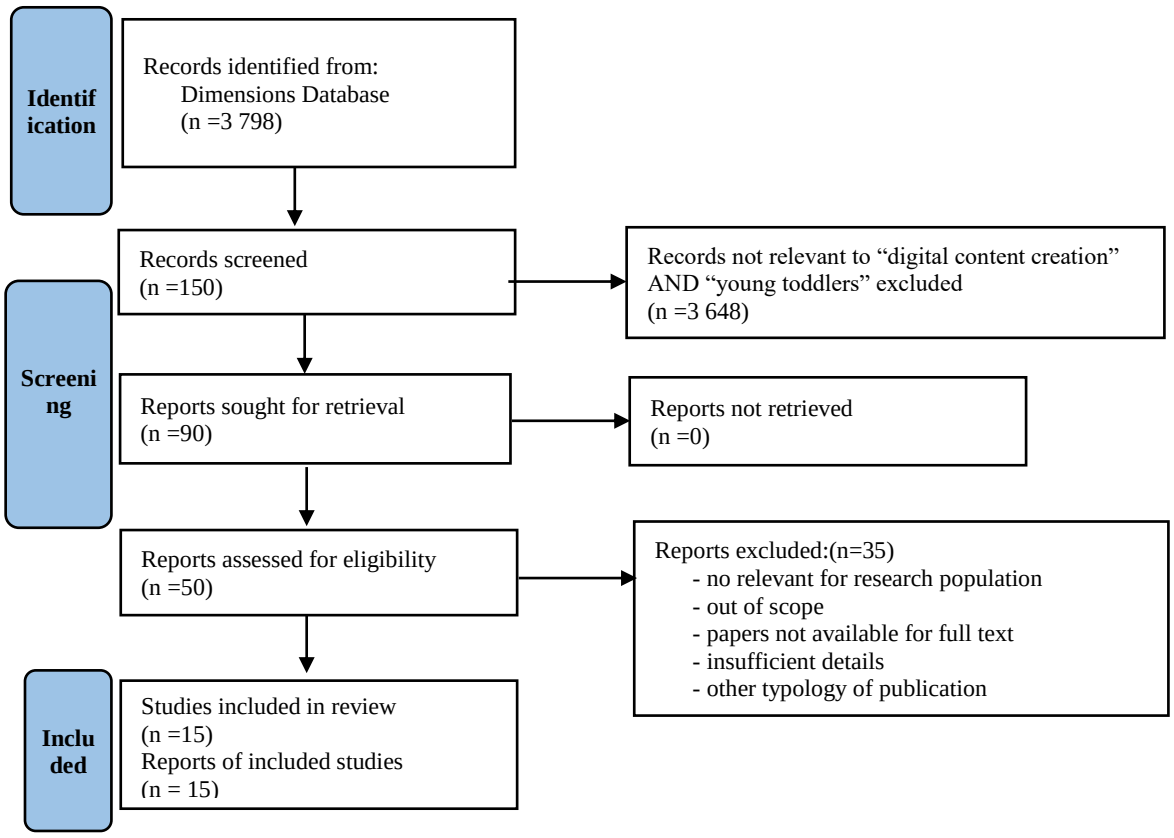

Figure. Search strategy PRISMA flow diagram

Results and Discussions

All articles cover the research questions related to digital content creation for young toddlers in their core development process and the results of the research. Many articles seek key elements of well-designed animations for early education. However, despite the fact that the publications emphasize the concerns on various features of media use and its negative and positive outcomes too, there are practically no principles of digital content creation for toddlerhood and clear theoretical or empirical studies on this subject.

After the data extraction process, we decided to involve bibliometric assessment within dynamics analysis considering the publication distribution, we need to do further steps on research hotspots of the top authors' publications.

The most prominent authors with high relevance to the research problem are shown in Table 2. The contributions of all screened publications show research hot spots in labeling several key principles of digital content creation for young toddlers.

Table 2

Research hotspots of top researchers

	Age-appropriateness	Screen time	Three-dimensional (3D) media	Soundscape	Language Acquisition	Target-Goal	Joint-media engagement	Video deficit	Educational	Interactive	Core development
Karani N.		*			*	*					
Puzio D.	*	*			*		*				*
Brodsky W.	*			*	*			*			*
Operto F. et al.					*						*
Papadamou K. et al.	*					*					*
Barr R.	*				*		*	*	*		
Heimann M. et al.	*		*				*	*			*
Osika E.		*			*	*	*				*
Strouse G.					*			*	*		*
Franco F. et al.				*	*						*
Meyer M. et al.									*	*	
Souto P. et al.											*
Cycyk L.	*				*						*
Courage M.	*					*					*
Choi K.	*							*			*

Experimental work duration within more than 10 years related to learning from infant and toddlers' media use showed that well-designed media evokes toddlers' learning but they still feel a transfer deficit (video deficit) [3]. Following longitudinal research findings addressed learning from 3D as the most effective way of promoting learning. It might reduce the transfer deficit but as authors predicted it could not wipe it out [7, 8]. Both studies promote the importance of joint-media engagement while watching any type of digital content. In other words, early joint-media engagement and co-watching with parents or caregivers are a central part of all aspects of toddlers' development. One experimental study revealed early learning process stimulates positivity and is healthy when human engagement occurs [9; 10]. Osaki E. recommends limiting time watching digital media for children under the age of two. Moreover, the author is concerned about the "persuasive design" of digital content that has more commercial interests within the capturing effect for young toddlers [11]. Strouse G. is also alarmed by regarding the quality of digital content for the young population considering their immature symbolic thinking of understanding and transferring information from video to real life. Empirical evidence reveals a video deficit effect in cognitive tasks when compared with language tasks and imitations [12]. However, the following study revealed a positive effect on fine motor skills while watching active digital content on the tables [13].

According to Brodsky W., filmmakers, and studios, production crews neglect the aural content of constituent of the digital content for young toddlers. Study reveals that the soundscape plays a significant role in

child nurturing and core development and encourage language acquisition. Moreover, research evidence demonstrates playsongs and rhythms appearing in digital content should contain declamation rhyme, returning syllables, and recurring words. From language constituents, one more research findings pointed out regular and appropriate language scope missed in most screen productions. That is vital for toddlers in their language learning environment to hear and watch accurate, intelligible verbal content in animated episodes [14]. Constituently, Franco F. et al. revealed early singing interactions promote significant advantages in language learning. This evidence is a valuable principle of digital content creation considering age-appropriateness and the development stage of infants [15].

Quantitative research on digital devices and language skills of young kids found that excessive screen-watching is a predictor of language delay. In other words, research findings showed toddlers with longitudinal digital usage are exposed to less communicative gestures where gestures and mimicking are indicators of the pre-verbal communication skills of toddlers' first 17 months of development [16]. Karani N. et al. stated that screen time duration has a negative influence on the early language development of under the age of two. Besides, researchers revealed joint engagement and interactive watching with parents or caregivers encourage a good impact on language acquisition. Consequently, stimulus characteristics like rapid video paces and reduced language can cause language delays [17].

In contrast to all these studies, Papadamou K. et al. developed four characterizations of videos for toddlers from the following labels: suitable, distributing, restricted, and irrelevant. It may seem like a principle of target aiming of inner content designing for young users. Ground truth dataset showed to avoid distributed videos as inappropriate to the age orientation; distributing inappropriate content as anti-social behavior, psychological and emotional damaging, etc. [18]. Meyer M. et al. highlighted a need for quality and educational improvement to the digital content of apps for the kinds under the three years from the Four Pillars Principles Framework (Active Learning, Engagement in the Learning Process, Meaningful Learning, and Social Interaction) [19, 20, 10].

Conclusion

The results of this bibliometric analysis show several implications. This study was given a systematic review including exclusion criteria, PRISMA flow chart for a transparent screening of relevant publications, and analyzing research hotspots of top researchers. The study revealed hot spots and contributions of relevant researchers to constitute eleven principles of digital content creation for young toddlers from various perspectives. Besides, the findings show concerns related to little research on theoretically proven and clinically studied principles of digital content creation for the target aged 0-3 years. As we know, in the digital environment, the first three-year aged population is the most vulnerable and requires nurturing in their core development stages. The interesting fact is most of the papers are retrieved from medical, psychosocial, and pediatric sources. Based on the results of this research, the following step of a more in-depth discussion would be to design a methodological basis for digital content creation bounded in Kazakh children's folklore.

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С.А. Шункеева, А.Е. Сейлханова

Бүлдіршіндерге арналған цифрлық мазмұнды құру қағидаттарын библиометриялық талдау

Бүлдіршіндердің цифрлық ортамен өзара әрекеттесуінің алғашқы тәжірибесі олардың танымдық, тілдік, физиологиялық, әлеуметтік қарым-қатынас және эмоционалдық дамуының алғашқы үш жылында ерекше болып табылады. Алдыңғы зерттеулер көрсеткендей, бүлдіршіндерге арналған цифрлық құралдарды пайдалану қауіпсіздігі мен тиімділігі тұрғыдан теріс әсер ететіні дәлелденсе, кейбір ғылыми еңбектерде цифрлық құралдарды қолдану үш жасқа дейінгі бүлдіршіндердің жан-жақты дамуының нәтижелерін жақсартатыны анықталды. Сонымен қатар, ғылыми ортада кішкентай балаларға арналған цифрлық мазмұнды құрудың жақсы әзірленген, теориялық дәлелденген және эмпирикалық зерттелген қағидаттарына байланысты айтарлықтай олқылықтар бар. Осылайша, бұл зерттеуде 0 мен 3 жас аралығындағы бүлдіршіндер үшін цифрлық мазмұнды құру қағидаттарын айқындау үшін қосу және алып тастау критерийлерін зерделеуде PRISMA (Жүйелі шолулар мен мета-талдаулар үшін қолайлы есеп беру элементтері) блок-схемасы қолданылған, фокустық зерттеулер және соның негізінде зерттеу аясына сәйкес зерттеушілердің таңдаулы еңбектері пайдаланылған. Жетекші зерттеушілердің «фокустық» зерттеулері мен жарияланымдарының библиометриялық талдауы цифрлық мазмұнды құру мен тұтынудың негізгі тенденцияларын анықтайды. Нәтижелер Dimension дерекқорынан іріктеу үдерісінің негізінде жас тұтынушылар үшін цифрлық мазмұнды құрудың он бір қағидаттарын таңдауды көрсетті. Бұл еңбекте эмпирикалық зерттеулерде одан әрі зерттеу бағыттарын қамтамасыз ету үшін бүлдір-

шіндерге арналған цифрлық мазмұнды құру қағидаттары туралы жарияланымдарды табу үшін библиометриялық талдау әдісі қолданылды.

Кілт сөздер. библиометриялық талдау, библиометриялық тәсілдер, қағидаттар, PRISMA, цифлық мазмұнды құру, бүлдіршіндер, тілді меңгеру, балалардың ерте дамуы.

С.А. Шункеева, А.Е. Сейлханова

Библиометрический анализ принципов создания цифрового контента для детей раннего возраста

Ранний опыт взаимодействия малышей с цифровой средой является экстраординарным для их первых трех лет когнитивного, языкового, физического, социального и эмоционального развития. В то время как предыдущие исследования показывают, что использование цифровых средств для малышей оказывает негативное воздействие с экологической точки зрения, однако некоторые авторы считают, что цифровые экранные средства улучшают результаты обучения для малышей в возрасте до трех лет. Кроме того, в литературе имеются значительные пробелы, связанные с хорошо разработанными, теоретически доказанными и эмпирически исследованными принципами создания цифрового контента для маленьких детей. Таким образом, в настоящем исследовании применялись критерии включения и исключения, блок-схема PRISMA (Предпочтительные элементы отчетности для систематических обзоров и мета-анализов) и фокусный отбор исследований, чтобы раскрыть принципы создания цифрового контента для малышей в возрасте от 0 до 3 лет. Библиометрический анализ «фокусных» исследований и публикаций ведущих исследователей выявляет основные тенденции в создании и потреблении цифрового контента. Результаты показали подборку одиннадцати принципов создания цифрового контента для молодых потребителей на основе процесса отбора из базы данных *Dimension*. В настоящей работе использовался метод библиометрического анализа для поиска публикаций о принципах создания цифрового контента для детей младшего возраста, чтобы обеспечить дальнейшие исследовательские направления в эмпирических исследованиях.

Ключевые слова. библиометрический анализ, библиометрические подходы, принципы, PRISMA, создание цифрового контента, малыши, овладение языком, раннее развитие детей.