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Research Article

The social perceptions of young children's use of smart devices in South Korea: Evidence from big data methodologies

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ABSTRACT

The study explored the social perceptions of young children's use of smart devices in South Korea using big data methodologies. Big data methodologies allowed to uncover underlying thoughts and feelings about young children's use of smart devices that had not been discovered in existing studies. The study extracted raw data from three different groups: the public, the journalist, and academia. Then, the study conducted keyword frequency, sentiment analysis, and CONCOR analysis with UCINET 6.0. The results of the study revealed that each group viewed young children's use of smart devices in a different way. The public was interested in effective use of smart devices while the journalist focused on educational aspects. The academia focused on parents' perception of smart devices from a developmental perspective. Regarding the results of sentiment analysis, they showed that each group had different opinion on young children's use of smart devices. The public had an ambivalent attitude toward young children's use of smart devices. While the journalist showed a positively inclined attitude, the academic had a negatively inclined attitude.

Keywords: big data methodologies, smart devices, social perceptions, young children

INTRODUCTION

Smart devices have already profoundly altered the culture of young children's lifestyle as well as the society. As smart devices transformed children from passive receivers of media to active users, people's attitudes and perceptions toward smart devices have been also transformed. The situation is not much different in South Korea, known as a fairly strong IT country. In South Korea, 70% of young children start using smart devices before reaching one-year-old (Yang, 2019), and previous studies reported social perceptions of use of smart devices among young children are mixed. Some are concerned while others regard smart devices as a learning tool; many have viewed smart devices effective only with appropriate guidance (Gil & Lee, 2016; Kim, 2013; Ryu, 2014). Social perception refers to the socially constructed perception of a particular group formed by politics, culture, socialization, history, media, literature, and religion (Kim & An, 2006). That is, social perception describes how one recognizes and understands social information and feelings about a particular topic. In order to conduct studies that are meaningful and effective, the exploration of the social perceptions on the topic should be proceeded to meet the social demands and awareness. Thus, this study investigated

the social perceptions of young children's use of smart devices in South Korea. The study could provide some insights into young children's use of smart devices that can be implemented in the field of mathematics, science, and technology education.

Young children using smart devices have been increased worldwide (Donnelly, 2019; Ducharme, 2017). A broad array of previous literature documented that using smart devices allowed young children get access to abundant educational content, fostered learning environments, helped the burden of care by supporting parents (Chen et al., 2018; Choi & Ahn, 2020; Oh & Park, 2019). However, the use of smart devices at an early age can also trigger deterioration of physical, emotional, social, cognitive development as well as poor eyesight (Chen et al., 2018; Choi & Ahn, 2020; Kim et al., 2018; Mullins, 2015). The effects of smart devices by young children would depend on how properly and effectively they are used.

Along with the exploration of developmental trajectories of children using smart devices, it is important to understand how people perceive the children's use of the tools. This perception, which could be referred as social perception, is an important social capital because it reflects norms and values that conduct interactions among people. While identifying developmental trajectories of using smart devices at a young age would matter to children's psychological and social development, understanding various social stakeholders' perceptions of the issue is important in terms of policy, welfare, and education. Despite of its importance, most existing literature has been mainly dependent on self-reported questionnaires, interviews, and literature reviews (Gil & Lee, 2016; Hwang & Hwang, 2016; Kim, 2013; Shin & Li, 2017). These do not provide a comprehensive insight of smart devices and young children. Surveys and qualitative research are difficult to find social perception in a large framework due to limited participants.

One way to resolve such difficulties and figure out social demands and perceptions of people would be big data. Big data refers to large-scale and complex massive data sets that it becomes difficult to process and analyse using traditional data processing technology (Hassanien et al., 2015). It has become an important of research methodology due to a significant increase in unstructured data (Park et al., 2020). Big data is particularly useful because new insights and values that cannot be obtained from small amounts of data such as surveys can be extracted. As a result, this study employed big data methodologies to explore people's social perceptions of young children's use of smart devices. This approach would be able to collect massive data of honest, personal perceptions on the topic and the study of social perceptions would help understand young children's use of smart devices at larger perspectives.

This study was conducted in South Korea because it is believed that many young children in South Korea are using smartphones at a young age and the first-exposed age is low compared to other countries (Hwang & Hwang, 2016). Most smart device related studies are being conducted in the US and Europe (Chang et al., 2018). Thus, the study could reveal South Korean children's use of smart devices to provide a comparative perspective on the topic and the results from the study could be able to provide insightful implications for other Asian countries and beyond. Considering the influence of smart devices on South Korea's young children, studies on young children's use of smart devices in South Korea could have significant implications.

In addition, the study divided the data into three different groups: the public, the press and academia. When big data is gathered, there is a high chance that different sources of opinions and information including commercial and brand integration are contained. To separate between commercial integration and personal postings and to understand what each group in society views young children's use of smart devices, classification would seem necessary. If the data is divided into three groups, it would be able to identify what each group thinks and feels about the topic and allow to find the similarities and differences among each group's perceptions. This will enable to compare the viewpoints of each group on the topic and provide guidelines how to communicate and exchange information among the groups. The public within the study will be defined as an entire population including individuals of all ages who had posted something on websites, blogs or SNS about the topic. The press within the study will refer to any opinions from the newspaper articles written by journalists. Academia within this study would be any published scholarly articles on young children and smart devices. In short, the public will show how ordinary people perceive the topic while the journalist group will allow to peep into how the press presents it; academia will demonstrate how the research deal with the keywords. The research questions of the study are listed, as follows:

1. What are the social perceptions of young children's use of smart devices?

a. What is the perception of young children's use of smart devices in the public?
b. What is the perception of young children's use of smart devices in the press?
c. What is the perception of young children's use of smart devices in academic?

METHODOLOGY

Data Collection

Data from the public

To understand the perception of the public regarding to young children' use of smart devices, the study collected raw data from using Textom. Textom is a big data management solution at the IMC Institution of Korea and a modified version of full text software developed by Professor Loet Leydedorff (Jun & Chung, 2016; Sung et al., 2020). Its reliability and functionality have been adequately proven since it has attained good software certificate from the Korea Information and Communication Technology Association (Lee et al., 2017b). In addition, diverse studies using Textom are being accumulated through different fields of literature.

The data collection period was from January 1st, 2016, to December 31st, 2018 (three years). The raw data for the public was gathered from Naver and Daum, the biggest search engines in South Korea. The study was limited to scrap the texts only from blogs, café (forum) and websites since these three categories are the most places where people post their personal opinions in South Korea. The targets of the study were blogs primarily posting people's personal experiences with smart devices, cafes (forum) where people with similar interests share information, and websites where information of smart devices delivered. All texts related to "young children" (*yu-a*) AND "smart devices" (*seu-ma-teu-gi-gi*) were collected. The volume of the corpus was 178 kilobytes, and the data were translated into English for analysis purpose.

Data from the press

Data for the journalist was collected using Bigkinds. Provided by Korea Press Foundation, BigKinds is a big-data analytic service based on a news archive of over 42 million articles from all media companies in South Korea (Prawitkarn, 2017). Similar to the public, the raw data was extracted for three years from January 1st, 2016, to December 31st, 2018. The word "young children" AND "smart devices" were typed as keywords to collect the raw data. Irrelevant articles and duplicate articles were deleted to get more reliable results. The total number of newspaper articles collected was 288 articles, and the size of the data was 114 kilobytes, and the data were translated into English for analysis purpose.

Data from academia

Data collection of academia was extracted from the Research Information Service System–the Korean national research information system for some 400 universities and research institutions. The data was collected for three years from January 1st, 2016, to December 31st, 2018. The word "young children" AND "smart devices" were typed as keywords. The total number of academic articles collected was 12 articles, and the size of the data was 292 kilobytes. The data were translated into English for analysis purpose. The PDF version of the publications was then extracted into the text format and then the texts were organized into excel for text analysis.

Data Analysis

In this study, text mining, sentimental analysis, and semantic network analysis (SNA) were performed to analyze big data on young children's use of smart devices. Textom was used for the process of text mining and sentimental analysis and UCINET 6–the social network analysis software–were performed for SNA analysis (Johnson, 1988). The research process is depicted in **Figure 1** and **Table 1**.

Text mining refers to the process of retrieving meaningful information from unstructured texts employing natural language processing. Thus, it allows to analyze vast number of texts to discover meaningful values and enable to interpret the texts with insight (Park et al., 2020). The frequency analysis was used using text mining and it refers to the number of times a word or a term addressed in a text.

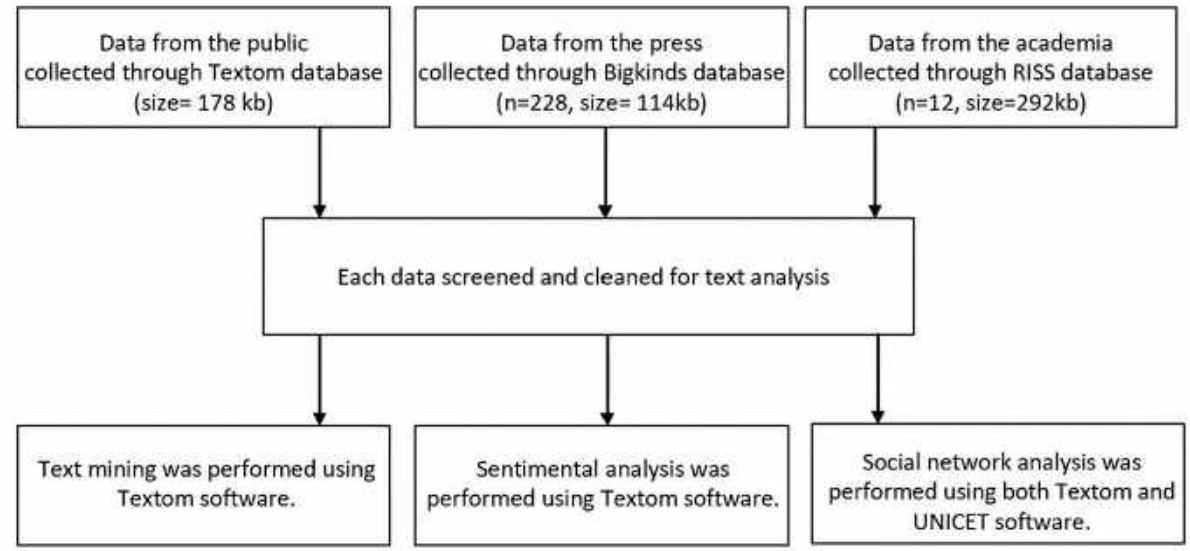

Figure 1. Data analysis process (Source: Authors)

Table 1. Analysis process

Analysis	Steps
Text mining	① Textom: Click 'data analysis'→click 'text mining'→click 'frequency analysis'
Sentimental analysis	① Learning data: Collect 'learning data' samples→code 'learning data' samples→check reliability of data ② Textom: Upload 'learning data'→click sentimental analysis→click 'apply'
Social network analysis	① Textom: Click 'data analysis'→click 'matrix'→upload the screened data→download 'matric 2-mode' ② UCINET: Click 'network'→click 'roles & positions'→click 'structural'→click 'CONCORr'→click 'standard'

Sentiment analysis is the technique of natural language processing to identify subjective information from a text. It is used to identify, monitor, and evaluate negative and positive opinions on social issues (Yoo & Kim, 2019). The study classified the learning data–the basis for classifying the entire data–by two researchers based on 100 samples of extracted raw data. The results were classified as positive/neutral/negative. Then, the learning data was used to analyze the entire corpus: data from the public, the press, and from academic. The process of the data analysis can be found in the Textom blog (Textom, 2020).

For SNA analysis, a CONCOR analysis was conducted. The CONCOR analysis, the most presentative concept in SNA, enables to discover patterns and relationship between keywords. It is a technique of grouping similar keywords by repeatedly executing the analysis until the correlation is found (Sung et al., 2020). The process of the data analysis can be found in the Textom blog (Textom, 2017).

RESULTS

Text Mining Analysis

The results of performing a frequency analysis on the top-30 terms related to young children and smart devices were shown in **Table 2**. The results showed that the keyword frequency among each group was different.

First, among the public group, the most repeated word was 'smartphones' (1,504); then, 'young children' (1,315), 'smart' (1,181), 'according to' (1,062), and 'reasons' (1,015) went after respectively. 'Negative' (849; #11) and 'positive' (840; #12) were found on the top list and this could indicate that the public is interested to know both negative and positive effects of smart devices. Keywords related to methods of using smart devices such as 'questions'(416; #16), 'prepare'(195, #25), 'how to' (193, #26), and 'support' (167, #30) ranked high. Thus, these keywords could infer that the public may seek the appropriate use of smart devices for young children.

Second, the most written keywords among journalists were 'children'(986) and 'smart' (480) and the list went after 'education' (393), 'use' (379), and 'learning' (322) in a consecutive manner. The journalists seemed to prefer to use words related to education when they refer to young children and smart devices. The press

Table 2. Results of the frequency analysis

Rank	The public		The journalist		The academic	
	Keyword	Freq	Keyword	Freq	Keyword	Freq
1	Smartphones	1,504	Children	986	Young children	2,129
2	Young children	1,315	Smart	480	Smart devices	1,468
3	Smart	1,181	Education	393	Use	1,120
4	According to	1,055	Use	379	Research	881
5	Reasons	1,015	Learning	322	Mothers	852
6	Use	1,000	Content	320	Smart	850
7	Need	965	Smartphones	319	According to	562
8	Teachers	962	Service	290	Impact	483
9	Temperament	962	Products	233	Parents	403
10	Do	864	English language	217	Results	397
11	Negative	849	Provision	194	Utilization	370
12	Positive	840	Market	192	(Child) development	297
13	Stories	591	Parents	184	Child (as a son or a daughter)	292
14	Look	588	Teachers	168	Smartphones	271
15	General	574	Application	162	Behaviors	268
16	Questions	416	Launch	161	Analysis	257
17	Smart devices	372	Smart devices	137	Addiction	254
18	Addiction	328	Corporation	119	Play	247
19	Books	282	Programs	115	Negative	229
20	Learning	271	Representatives (CEOs)	96	Relationship	221
21	Education	248	Growth	95	Problem behaviors	212
22	Provision	245	Tablet PC	91	Difference	198
23	Listen	209	Digital	91	Average	174
24	Application (Apps)	202	Child (as a son or a daughter)	87	(Found) significant	174
25	Prepare	195	Play	87	Variables	173
26	How to	193	Chinese	86	Society	172
27	Parents	190	China	84	Need	164
28	English	177	Textbooks	83	Participants	162
29	Functions	176	Study	81	Time	152
30	Support	167	Addiction	78	Parenting attitude	150

Table 3. Results of the sentiment analysis (in percentage)

	The public	The journalist	The academic
Positive	27.67	**76.82**	1.86
Neutral	33.49	16.56	14.13
Negative	**38.85**	6.62	**84.00**
Total	100.00	100.00	100.00

also used words such as 'services' (290; #8), 'products' (233; #9), 'market' (192; #12), and 'launch' (161; #16), revealing that the press' focus was closely related to the smart device industry that targets for young children.

Third, the keywords most addressed by academia were 'young children' (2,129) and 'smart devices' (1,468), followed by 'use' (1,120), 'research' (881), and 'smart' (850). Keywords such as 'behavior' (268; #15), 'addiction' (254; # 17), 'play' (247; # 18), 'problem behaviors' (212; #21), and 'parenting attitudes' (150; #30) ranked high to infer the interests of researchers in the topic.

Sentiment Analysis

The results of performing a sentiment analysis in relation to young children and smart devices were shown in **Table 3**.

The public seemed to have ambivalent attitudes toward young children's use of smart devices. The neutral opinion consisted of 33.49% of the raw data while positive and negative opinion were 27.67% and 38.85% respectively. The results of sentiment analysis for the public were displayed in **Figure 2**.

Positive words related to the group were positive, interesting, and fun and negative words of the sentimental analysis related to the group were disgust, worried, and embarrassed.

The journalist had a positive attitude towards the young children's use of smart devices. The results showed that nearly 77% of the data were positively opinionated. The positive words of the journalist data

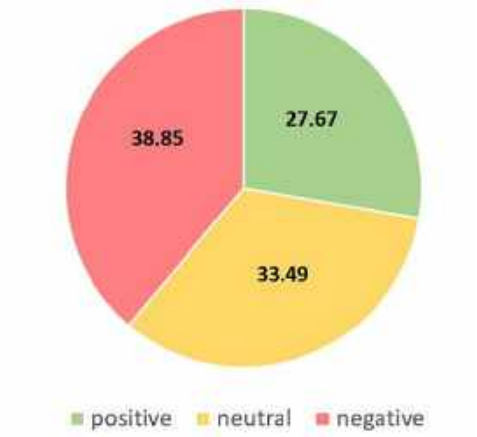

Figure 2. Visualization of the sentiment analysis for the public (Source: Authors)

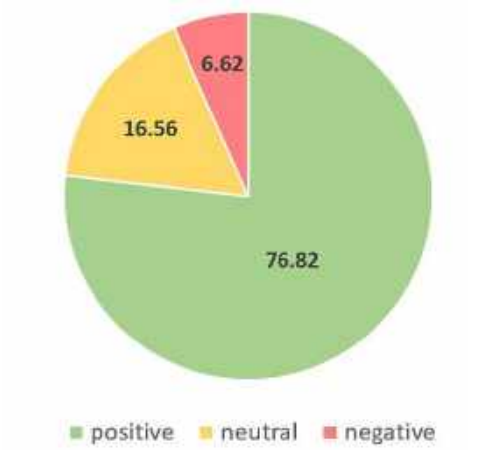

Figure 3. Visualization of the sentiment analysis for the press (Source: Authors)

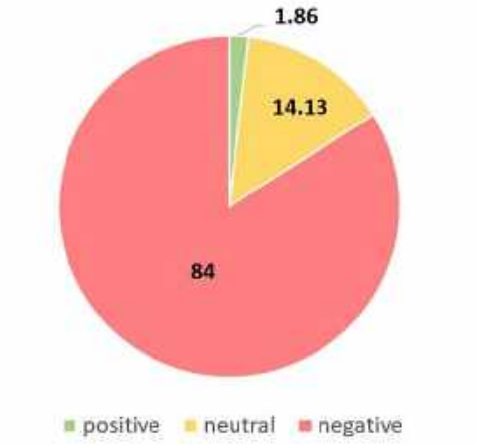

Figure 4. Visualization of the sentiment analysis for academia (Source: Authors)

were growth, balance, and satisfaction and the negative words were crying, embarrassing, burdensome and worried. The results of sentimental analysis for the journalist were shown in **Figure 3**.

Last, academia had a negative attitude. 84% of the data were negatively opinionated. Positively extracted words in the group's raw data were appropriate, and satisfied while negatively extracted words were caution, lacking, and difficult.

The results of the group were displayed in **Figure 4**.

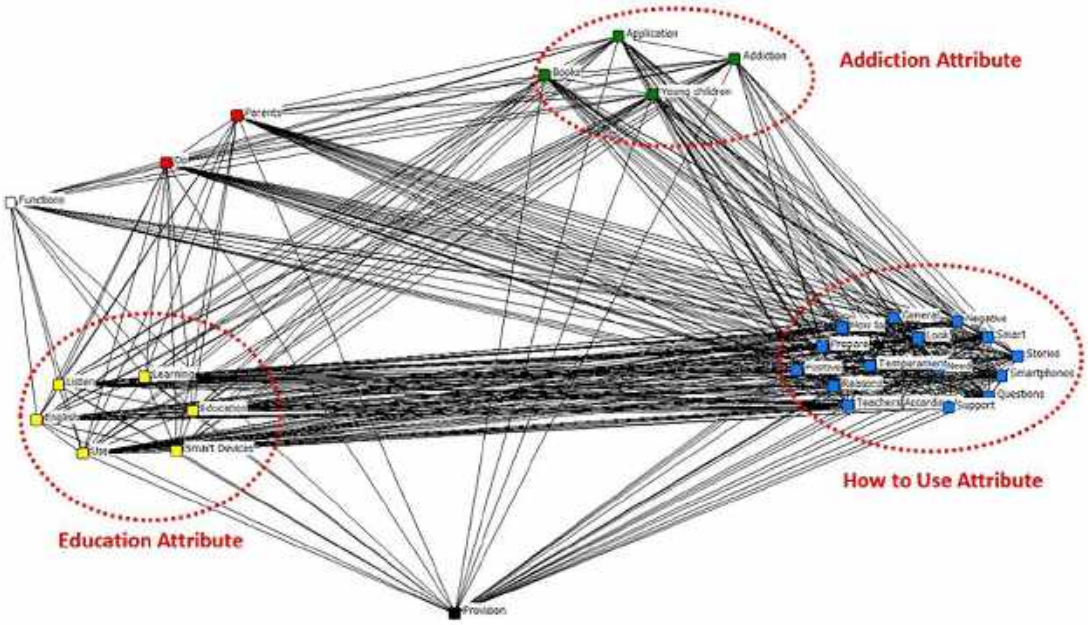

Figure 5. CONCOR analysis of the public (Source: Authors, using UCINET program)

Social Network Analysis (CONCOR Analysis)

Social network analysis can visualize patterns of the unstructured data by extracting structured information from the data. CONCOR analysis–an analysis of SNA–shows the similarity between keywords and the patterns by analyzing their relationship among the latent sub-clusters in the network cluster. In the study, homogenous groups were identified according to relationships and correlations of the extracted keywords.

Three clusters were formed in the public. The first cluster, visualized with yellow, included attributes such as 'learning', 'education', and 'English' and was named 'education attribute' cluster. The next cluster, visualized with blue, included terms like 'how to', 'preparation', 'questions', and 'support' and was named 'how to use smart devices for young children attribute' cluster. The last cluster, visualized with green, was named 'addiction attribute' cluster and could reveal that the public was interested in the addiction of smart devices for young children. The results of the CONCOR data analysis were shown in **Figure 5**.

CONCOR analysis of the press included three clusters as well. The largest cluster, visualized with blue, was composed of keywords such as 'learning', 'play', 'education', 'service', and 'products' and was named 'learning and playing with smart devices attribute' cluster. The next largest cluster, visualized with yellow, consisted of attributes such as 'digital', 'content', as well as 'textbooks' and was categorized 'digital content using smart devices attribute' cluster. The last cluster, visualized with green, composed of keywords like 'programs' and 'corporation' and it could represent programs for children using smart devices are likely to be promoted via newspapers. The results of the group were displayed in **Figure 6**.

The academic group was found to have three large clusters. The largest cluster, visualized with blue, contained attributes like 'addition', 'utilization', 'negative', and 'need' and was categorized as 'negative effects of smart devices attribute' cluster. The next cluster, visualized with orange, included terms like 'impact', 'parenting attitude', 'play' as well as 'problem behavior' and named 'impact of smart devices attribute' cluster. The last cluster, visualized with yellow, included research-related attributes such as 'analysis', 'participants', and 'results' and named 'research-related attribute' cluster. The results were shown in **Figure 7**.

CONCLUSION AND DISCUSSION

The study aimed to explore the social perceptions of young children's use of smart devices in South Korea. More specifically, by analyzing unstructured texts, the study was able to identify some insights what each group–the public, the press, and academia–was interested in. The study employed text mining, sentiment analysis, and SNA to get the results. The findings are, as follows.

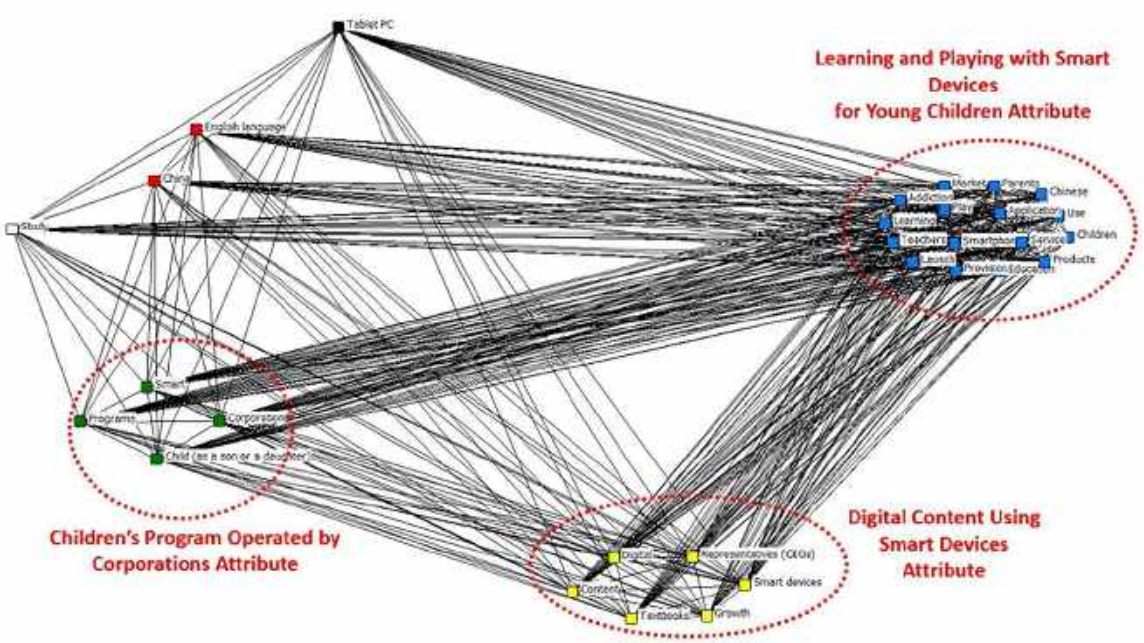

Figure 6. CONCOR analysis of the journalist (Source: Authors, using UCINET program)

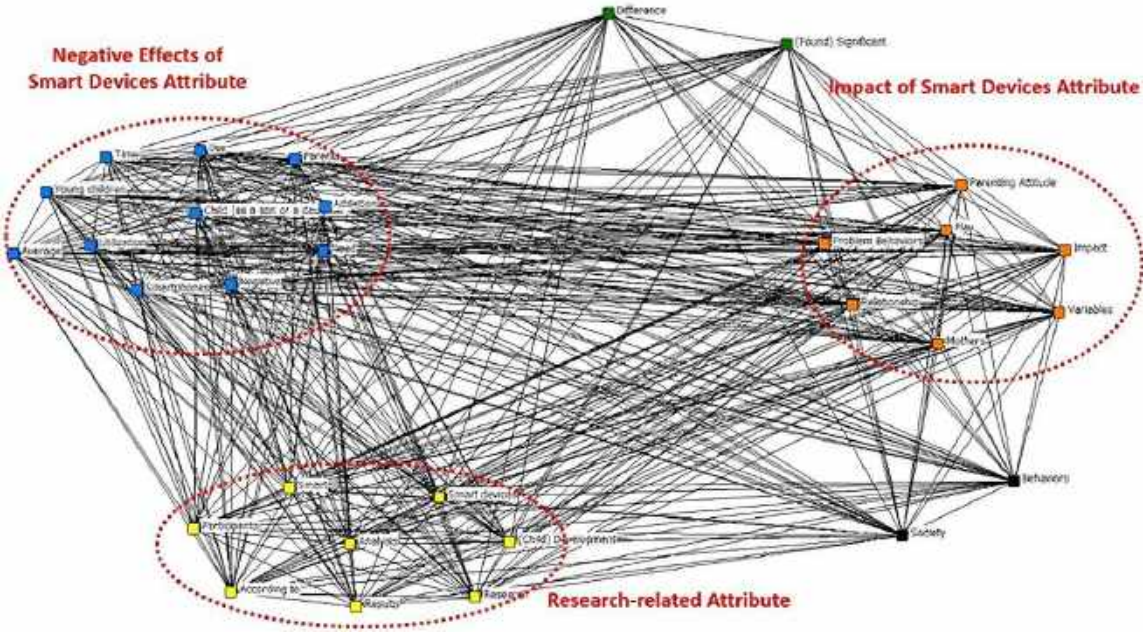

Figure 7. CONCOR analysis of the academia (Source: Authors, using UCINET program)

First, the keywords extracted from each group were different and this could refer that each group viewed young children and their use of smart devices in a different manner. The public seemed to have reservations about the use of smart devices consumed by young children, and they were also seeking how to use smart devices wisely for children. The results were congruent with the previous studies that investigated parents' perceptions of smart devices among young children (Gil & Lee, 2016; Lee, 2014; Lee et al., 2014; Oh & Park, 2019; Prasad et al., 2019). The journalists were interested in educational aspects of smart devices for young children. They concerned how to introduce new educational programs, content and technologies for young children that involved smart devices. The research group was interested in developmental and psychological aspects of smart devices and young children with emphasis on negative influence and the role of parents. Oh and Park (2019) argued that most studies on the topic have been conducted to verify the negative outcomes of smart device use, focusing mainly on social and emotional variables such as depression, anxiety, aggression, and sociality and the results of this study confirmed the argument.

Second, the results of the sentiment analysis pointed at the difficult directions. The public showed mixed opinions with a nearly equal percentage of positive, neutral, and negative views. Instead, the journalist was positively inclined, and the positive words linked to the group were growth, balance, and satisfaction. The research group was negatively inclined, and the negative words linked to the group were caution, lacking, and difficult.

Finally, the results of the CONCOR analysis elucidated the social perceptions of smart devices by young children. The public group formed three clusters: 'education attribute' , 'addiction attribute', and 'how to use attributes', indicating that the public seeking how to use smart devices wisely to avoid addiction but to maximize their educational outcomes. The press group yielded three clusters: 'learning and playing with smart devices for young children', 'children's programs operated by corporations', and 'digital content involving smart devices' clusters. The academic produced three clusters: 'negative effects of smart devices', 'impact of smart devices', and 'research-related' clusters.

Based on the analysis, three groups perceived young children's use of smart devices differently. The public considered young children's use of smart devices with caution as well as curiosity. They were both aware of the positive and negative effects of smart devices when they were given to the children. Thus, they questioned, searched, and sought for effective use of smart devices. It was similar to the perception of parents that reported negative concerns toward the use of smart devices by young children and viewed positively only on the premise when harmful content was removed (Kim, 2013). The journalist was mostly concerned with promotion of educational products involving smart devices and then this made them to focus on positive aspects of the devices. The academia seemed to be biased toward the use of smart devices at a younger age and projected negative effect of smart devices.

Based on the results of the study, some preliminary implications for the use of smart devices among young children can be drawn. These differences in the findings could suggest three implications. First, the interests of each group have some similarities and differences and the complimentary interactions among the groups should be encouraged. For example, the public is seeking both the negative and positive aspects of smart devices among young children, but researchers have been presenting findings related to negative outcomes of smart devices. In addition, the press group carried education and media fields supported by private sector educational specialists and they found to play an important to role in instigating to buy educational apps compatible with multiple smart devices. This implication has been addressed with previous studies that conducted discourse analysis on newspaper articles (Choi, 2005; Jun, 2011).

Next, there is a social tendency to believe that the use of smart devices by young children must be handled by parents. Although the order was quite different, words like "parents", and "mothers" are all appeared on the upper. The appearance of parent-related words can infer that although smart devices are used in almost every aspect of children's lives including classrooms and preschools, the use of smart devices among young children is closely linked to private or home sector. This is also consistent with the previous studies (Hwang & Hwang, 2016). The role of parents is important since parents are the ones who hand smart devices over to their children (Kim & Moon, 2015) and teach how to use the devices (Ki, 2016).

Last, the findings from the research suggest there is a need for general awareness of the use of smart devices among young children. This implication is similar to previous studies (Lee et al., 2017a; Ryu, 2014; Hwang & Hwang, 2016). The public is concerned but not well informed; their attitude towards smart devices and young children tended to be either extremely positive or negative. Ryu (2014)'s study revealed that 81% of parents are looking for educational programs for how to use smart devices properly for their children, and this curiosity has been consistently reported in other Asian countries as well (Pham & Lim, 2019; Shin & Li, 2017).

Although this exploratory study has identified key terms related to young children's use of smart devices on a massive scale with the help of big data methodologies, it has several limitations. Since the methodology is still in its infancy, some areas of methodology are not fully constructed yet. Second, the interpretation of big data is still viewed as subjective. As many previous studies lacked abilities in data reliability as well as its interpretation, this could be the limitation of the study. Lastly, the study only scrutinized the social perceptions of two keywords: young children and smart devices for specific purposes.

Since there have not been many studies on the perceptions of young children and their use of smart devise especially involving big data methodologies, the study could provide some insights in the field. The study has brought the personal but prevailing perceptions of young children's use of smart devices to light, and the case in South Korea can be further extended to Asian and beyond where children are exposed to smart devices in a faster rate. Comparative studies with other regions of the world are also highly suggested for future studies.

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REFERENCES

Chang, H. Y., Park, E. J., Yoo, H. J., Lee, J. W., & Shin, Y. (2018). Electronic media exposure and use among toddlers. *Psychiatry Investigation, 15*(6), 568-573. https://doi.org/ 10.30773/pi.2017.11.30.2

Chen, Y., Li, Z., Rosner, D., & Hiniker, A. (2018). Understanding parents' perspective on mealtime technology. *The Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies, 3*(1), 1-19. https://doi.org/10.1145/3314392

Choi, J., & Ahn, S. H. (2020). The impact of mother's parenting behavior, stress and paternal participation in child-care on young children's overdependence on smartphones. *Journal of Families and Better Life, 38*(4), 45-57. https://doi.org/10.7466/JFBL.2020.38.4.45

Choi, S. H. (2005). An analysis of newspaper articles on early childhood education. *Early Childhood Education Research & Review, 9*(1), 179-199.

Donnelly, L. (2019). Children spend twice as long on smartphones as talking to parents. *Telegraph*. https://www.telegraph.co.uk/news/2019/02/07/children-spend-twice-long-smartphones-talking-parents/

Ducharme, J. (2017). Kids are spending more time on mobile devices than ever before. *Times Magazine*. https://time.com/4989275/young-children-tablets-mobile-devices/

Gil, H., & Lee, Y. (2016). The relationship between self-regulation in children and smart device usage habits of mothers and children. *The Journal of Korea Open Association for Early Childhood Education, 21*(1), 275-295. https://doi.org/10.20437/KOAECE21-1-11

Hassanien, E., Azar A., Snasael, V., Kacprzyk, J., & Abawajy, J. (2015). *Big data in complex systems*. Springer. https://doi.org/10.1007/978-3-319-11056-1

Hwang, S., & Hwang, Z. (2016). An analysis of research trends on smart devices for young children: Focusing on domestic theses, dissertations and articles. *The Korean Society for Early Childhood Teacher Education, 20*(3), 299-317.

Johnson, J. D. (1988). UCINET software review. *Communication Education, 37*(2), 172-174. https://doi.org/10.1080/03634528809378714

Jun, C., & Chung, C. (2016). Big data analysis of local government 3.0: Focusing on Ggyeongsangbuk-do in Korea. *Technological Forecasting and Social Change, 110*, 3-12. https://doi.org/10.1016/j.techfore.2015.11.007

Jun, H. (2011). English education for young children: A media discourse analysis. *Journal of Early Childhood Education, 31*(1), 351-376. https://doi.org/10.18023/kjece.2011.31.1.017

Ki, H. (2016). *Study on characteristics of mothers influential to smartphone uses of children: Parenting stress, adult attachment, mother's smartphone addiction* [Master's thesis, Dongduk Womens University].

Kim, J. (2013). A study of the perceptions and attitudes of parents on toddlers use of smartphones. *Journal of Children's Literature and Education, 14*(4), 569-593.

Kim, M., & An, H. (2006). The transformation of social perception on target population and policy change. *Korean Public Administration Review, 40*(4), 469-490.

Kim, M., & Moon, H. (2015). A study on parental influences and analysis of young children's smart-phone usage. *The Korean Journal of the Human Development, 22*(1), 77-99. https://doi.org/10.15284/kjhd.2014.22.1.77

Kim, Y., Kim, H. , Yoon, M., & Park, J. (2018). Effects of the age at first use of smart devices and the amount of time to use smart devices on the externalizing problem behavior of infants and the moderating roles of maternal managing behavior. *Family and Environment Research, 56*(6), 541-553. https://doi.org/10.6115/fer.2018.039

Lee, H., Hong, H., & Lee, S. (2017a). A study on smart device usage and game immersion tendency. *Journal of Early Childhood Education, 34*(3), 239-262.

Lee, J., Lee, J., Kim, W., & Kim, H. (2017b). A study on perception of swimsuit using big data text-mining analysis. *Korean Journal of Sport Science, 28(*1), 104-116. https://doi.org/10.24985/kjss.2017.28.1.104

Lee, S., Seo, H., & Han, H. (2014). Use of smart devices of infants and preschool-children and their mothers' perceptions. *Korean Journal of Childcare and Education, 10*(2), 111-131. https://doi.org/10.14698/jkcce.2014.10.2.111

Lee, Y. M. (2014). *The relationship between the smartphone usage habits of children and mothers and the attention concentration and self-control of children* [Master's thesis, Kyung Hee University].

Mullins, L. M. (2015). *Systems and methods to remotely restrict the use of mobile device* [US Patent No. 9,071,958 B2, US Patent and Trademark Office].

Oh, J., & Park., Y. W. (2019). A study on pre-schoolers' smart media use and parents' perception. *Korean Journal of Child Care and Education Policy, 13*(3), 3-26. https://doi.org/10.5718/kcep.2019.13.3.3

Park, S., Ahn, H., Kim, D., & So, W. (2020). Big data analysis of sports and physical activities among Korean adolescents. *International Journal of Environmental Research and Public Health, 17*(15), 5577. https://doi.org/10.3390/ijerph17155577

Pham, B., & Lim, S. S. (2019). Vietnamese pre-schoolers' tablet use and early childhood learning: An ecological investigation. *Journal of Children and Media, 13*(3), 241-259. https://doi.org/10.1080/17482798.2019.1613247

Prasad, A., Ruiz, R., & Stablein, T. (2019). Understanding parents' concerns with smart device usage in the home. In A. Moallem (Ed.), *HCI for cybersecurity, privacy and trust*. Springer. https://doi.org/10.1007/978-3-030-22351-9_12

Prawitkarn, V. (2017). BIG DATA comes to research and journalism. *The Nations*. http://www.nationmultimedia.com/detail/Startup_and_IT/3033361

Ryu, M. H. (2014). A study of infants 'toddlers' use of smartphones and their mothers' perceptions on smartphone using. *Korea Journal of Child Care and Education, 86*, 307-329.

Shin, W., & Li, B. (2017). Parental mediation of children's digital technology use in Singapore. *Journal of Children and Media, 11*(1), 1-19. https://doi.org/10.1080/17482798.2016.1203807

Sung, Y., Kim, K., & Kwon, H. (2020). Big data analysis of Korean travelers' behavior in the post-COVID-19 era. *Sustainability, 13*, 310. https://doi.org/10.3390/su13010310

Textom. (2017). CONCOR analysis using UCINET. *Naver*. https://blog.naver.com/textom/221053277817

Textom. (2020). How to use TEXTOM sentimental analysis! *Naver*. https://m.blog.naver.com/textom/221858530009/

Yang, J. H. (2019). *Parents' perceptions about use of smart devices in early childhood* [Master's thesis, Korea National University of Transportation].

Yoo, G., & Kim, E. (2019). A study on the morpheme and emotional analysis of newspaper articles on children's right to play. *The Journal of Korea Open Association for Early Childhood Education, 24*(5), 109-132. https://doi.org/10.20437/KOAECE24-5-06