A SCOPING REVIEW: THE IMPACT OF PORNOGRAPHY ADDICTION ON ADOLESCENTS

Sarfi Agustina Tri Astuti, Yuliani Winarti
1,2Public Health, Universitas Muhammadiyah Kalimantan Timur
Ir. H. Juanda No 15 Sidodadi Samarinda, 75124
Email: sarfiagustina400@gmail.com

ABSTRACT

The current digitalization process is overgrowing so that internet access becomes more effortless. This has led to an increase in youth exposure to pornography. Prolonged exposure to pornography can negatively impact adolescent development and lead to addiction. This study aims to map the impact of pornography addiction on adolescents using Preferred Reporting Items for Systematic Reviews and Meta-Analyse Extensions for Scoping Reviews through Pubmed, Google Scholar, Scopus, and Science Direct. The results showed that 14 of the 3,124 research articles that met the inclusion criteria stated that there were 3 effects of pornography addiction: psychological, social, and medical. The psychological impact of excessive consumption of pornography can be in the form of irritability, difficulty concentrating, stress, guilt, frustration, feelings of depression, difficulty sleeping, and psychosomatic symptoms. While the social impact that occurs in pornography addicts is difficulty establishing interpersonal relationships with other people, tend to withdraw, prefer to remain silent, and feel distant from society. As for the medical impact that occurs, based on the results of brain wave recording through electroencephalography (EEG) examination, there is a dominance of delta waves in the prefrontal cortex, which causes a decrease in cognitive function of adolescent porn addicts. This causes adolescents to lose the ability to determine what is right and wrong or refrain from doing wrong. Based on the results of this study, health promotion efforts need to be carried out, one of which is education about the impact of pornography addiction in improving the health status of adolescents.

Keywords: Adolescents, exposure to pornography, the impact of pornography

Kata kunci: Remaja, paparan pornografi, dampak pornografi
INTRODUCTION

Increasingly sophisticated digital developments make it easier for everyone to use devices for everyday activities via the Internet. Access to pornography is one of the harmful consequences of technology advancements for teens, who are the most frequent Internet and social media users. The increase in pornographic consumption patterns in each generation begins with teenagers’ convenient access and reliance on the mass media as a platform to create intimacy with other individuals and expose them to pornographic content (1). Numerous issues affect teenagers, and loneliness is one of them. Loneliness is the main factor in why adolescent engages in online sexual behavior (2). Teenagers can easily access pornography on the Internet via personal cellphones, which were initially used as learning media. Still, in the process, they might have accidentally revealed pornographic content through advertisements that present pornographic spectacles to order to lead teenagers who are curious to see and access pornographic websites. Addiction and other negative consequences will result from adolescents’ continuous exposure to pornographic content (3)(4)(5).

Based on national representative and large-scale adolescent studies conducted in the US, Canada, and Europe, 63 to 68% of teens have been pornographic users for their lifetime, and 23 to 42% this past year (6); (7); (8). Pornography sites (pornhub) describe an increase in pornography access by 11.6% in March 2020. The rate of growth starts in February 2020. It also explains that increased pornography accessibility increases by 4-24% in 27 countries. With a pornhub program aimed at premium access because of demands of lockdown and home quarantine, there is an increase in intensity to 57% in Italy, 38% in France, and 61% in Spain. On March 17, 2020, pornhub also noted a change in the pattern of pornography consumption in Europe, where the largest accessibility time occurred at 3 a.m. (31.5%) and 1 p.m. (26.4%).

In a survey conducted by the Indonesian Internet service provider association called Asosiasi Penyedia Jasa Internet Indonesia (APJII), from 2019 to the second quarter of 2020 in Indonesia, users reached 19.1 million, or 77.7% of Indonesia's total population. Where 5.5% comes from the early 10-14 - and 9.6% from the late 15-19 years olds (9). Nowadays, teens are the largest populations that pornography targets. Some surveys show that teens often view pornographic media as online media (10).

Pornography brings far greater adverse impacts both psychologically and socially on individuals. Media development makes not a few parties feel that pornography is a threat to the younger generation (11). Repeated and uncontrolled pornography users cause distress and functional disorders (6) (12).

Pornography is material that explicitly describes sexual activities to appeal to sexual arousal and is widely available and consumed regularly in contemporary societies (13). Since the consequence of pornography is the awakening of sexual impulses, everything linked to it aims to stimulate the audience's or consumers’ interest in sexual activity. When someone consistently consumes pornographic material,
they are more vulnerable to experiencing urges and sexual behavior. What must be considered in this situation is how adolescents are affected by pornography addiction (1).

According to the World Health Organization (WHO), youth is divided into three-namely, early (10-14 years), middle (15-17 years), and late (18-19 years). Adolescence is a phase of the development process involving hormonal, physical, and communication changes (14). Teenagers are naturally curious, enjoy adventure and challenges, and are willing to take chances (15). Along with physical development, there is increased interest in things related to sexual fulfillment. According to several studies, adolescents consume pornography for at least 75% of their experience (16). According to the great American student survey, 51% of men and 32% of women admitted to viewing pornography for the first time before they were 13 years old (17). Surveys of the Indonesian child protection commission, known as Komisi Perlindungan Anak Indonesia (KPAI), in 2019 found that 65.34% of 10-19 years old had access to pornographic sites on the Internet.

The impact of exposure to pornography in adolescents is four stages: addiction, escalation, desensitization, and act-out. Previous research said their study on 395 junior high school Pontianak teenagers showed that 83.3% were exposed to pornography, and 79.5% had exposure effects. An earlier study on 395 young people at SMPN Pontianak revealed that 83.3% were exposed to exposure and that 79.5% experienced its effects. Of those feeling the consequences of exposure, 19.8% were at the stage of addiction. Among the responders who reported being addicted, 69.2% were in the escalation stage, and 61.1% were in the desensitization stage. 31.8% of teenagers in the desensitization stage went through the act-out stage (18).

Peer influence was the essential element that influenced the impact of pornographic media exposure (38). Gender, frequency of exposure, availability or reachability to media sources, and knowledge are all associated factors (19).

Euphoria, anxiety, withdrawal, sadness, and irritability are the psychological effects of a pornography addiction (20). Teenagers repeatedly exposed to pornography may change their personalities and attitudes due to damage to the frontal brain area, namely the prefrontal cortex. Furthermore, adolescents who use pornography get socially harmful because they are more likely to isolate themselves, avoid hanging out with friends, and feel awkward around them. (4).

Premarital sex behavior among teenagers is more caused by the habit of watching pornographic videos (21). A study (22) revealed that 67.3% of respondents expressed increased anxiety levels. It was also stated that 58% of their respondents often felt depressed as well as had a low level of self-esteem and guilt among respondents. Recent longitudinal studies in male adolescents (ages between 14 and 18) show that higher levels of depression and anxiety in adolescents are linked to higher levels of Problematic Pornography Use (PPU) (23).

According to description, researchers are interested in discussing the effects of online pornography on adolescents using a scoping review research method. The benefit of scoping reviews is
to provide information from recent and relevant research results on the effects of problems caused by pornographic addiction in adolescents; research using scoping reviews, especially on the effects of pornographic addiction in adolescents, is still very rare. This research is expected to be useful for the future development of science.

**METHOD**

We performed a systematic search on four electronic databases – 1) Google Scholar, 2) Pubmed, 3) Scopus, and 4) Science Direct – to identify potentially relevant analyses. In database 1 for international articles using keywords "pornography impact" AND "adolescent" and "pornography addiction impact" AND "adolescent". For the search for national articles “dampak pornografi”,” dampak pornografi” DAN “remaja” OR “siswa”, “efek pornografi” DAN “remaja” OR “siswa”. Database 2 and 3 searches by keyword "Pornography impact" AND "adolescent" OR "Student", "Pornography impact addiction" AND "adolescent" OR "Student", "Pornography effect" AND "adolescent" OR "student", and database 4 is done using keywords "pornography Impact" AND "adolescent" NOT "adult", "Pornography addiction impact" AND "adolescent" NOT "adult" dan "pornography effect" AND adolescent" NOT "adult". Searches on databases 1 through 4 were conducted using the initial publication date filter "2017-2021”—furthermore, follow-up searches by filtering keywords that will only appear in article titles. A journal article search scheme used flowchart diagrams using the guidelines of Scoping review is performed using the guidelines of Preferred Reporting Items for Systematic Reviews and Metrics. A- Analyses Extension for Scoping Reviews (PRISMA-ScR) allows the journal to be reviewed.

The author ran an independent search of electronic databases for 31 days, from May 23, 2022, to June 22, 2022. Initially, the author searches each database using keywords. The author then explores research titles and reads abstracts based on the search results obtained from keyword writing—research titles and abstracts that fit the inclusion criteria, followed by reading the full article.

In addition, the author re-filters snowballing the references obtained from the complete article that meet the inclusion criteria for exploration, starting from reading the article's research title, abstract, and complete content as described in the above steps.

The full article on the effects of pornographic addiction on adolescents who meet the inclusion criteria is then collected in the form of a table, and data extraction includes the author's name and publication year, research title, research location, research purpose, research type, and research method or design, and research results. Table creation is done to determine which variables to extract and independently map the data of each eligible article, and then the results are analyzed, and conclusions are drawn.
RESULTS AND DISCUSSION

The initial search resulted in 3,124 articles. After removing duplicate articles (n=244), 2,880 studies were identified from electronic database searches and reviews of article references for text screening based on article titles and abstracts. After that, 2,611 articles were issued because they did not meet the inclusion criteria, and 169 were read in full text. After assessment based on inclusion criteria, 155 articles were issued for various reasons, resulting in 14 articles for qualitative analysis and synthesis.

One article was categorized into social effect types, one into psychological impact types, and three into medical impact types from the 14 publications subjected to analysis and synthesis. The two articles are grouped into types of psychological impact and social impact. One article is grouped in types
of psychological impact, social impact, and medical impact. Study Results were grouped into pornographic sister impact tables, as shown in table 1.

**Table 1. Scoping Review Results**

<table>
<thead>
<tr>
<th>Author's Name and Publication Year</th>
<th>Research Title</th>
<th>Research Site</th>
<th>Purpose of Research</th>
<th>Research Types</th>
<th>Research Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Razzaq et al., 2019)</td>
<td>Mental Health Of University Male Students Viewing Internet Pornography: A Qualitative Study</td>
<td>Pakistan</td>
<td>To explore the psychosocial issues in cases of internet pornography.</td>
<td>Qualitative</td>
<td>There are three main categories of psychosocial problems related to looking at internet pornography, psychological problems, social problems, and mental illness.</td>
</tr>
<tr>
<td>(Chavan et al., 2021)</td>
<td>Pornography: An Alarming Psychosocial Effects Among Post-Graduate Students</td>
<td>India</td>
<td>To study the psychosocial effect of pornography among post-graduate students in Kolhapur city and check the effectiveness of the pornography preventive model on PG students</td>
<td>Quantitative</td>
<td>More than 3/4 of respondents suffered from the following psychosocial effects of pornography: Feeling away from society, Masturbation, Feeling guilty, Mental stress, increased aggressive behavior, and Starting at women/women as ‘Sex objects.’</td>
</tr>
<tr>
<td>(Setyawati et al., 2020)</td>
<td>The Psychological Impacts Of Internet Pornography Addiction On Adolescents</td>
<td>Indonesia</td>
<td>To reveal the impacts by adolescents who experienced internet addiction to pornographic content</td>
<td>Qualitative</td>
<td>Changes in cognition and affections to sexual stimuli occur due to pornography. The effects of cognition are shown in their obsessive-compulsive thinking on sexual content. The impact of affections can be seen in that they may find it challenging to establish interpersonal relationships with others and tend to withdraw from the social environment.</td>
</tr>
<tr>
<td>(Darvish Molla et al., 2018)</td>
<td>The Role Of Difficulties In Emotion Regulation And Thought Control Strategies On Pornography Use</td>
<td>Iran</td>
<td>To examine the role of difficulties in emotion regulation and thought control strategies on pornography use</td>
<td>Quantitative</td>
<td>The use of pornography deals with difficulties in emotion setting and mind control strategies.</td>
</tr>
<tr>
<td>(Amilah et al., 2021)</td>
<td>Qeeg-Based Brain Mapping Of Internet Pornography Addicted Adolescents</td>
<td>Indonesia</td>
<td>To strengthen scientific data on internet pornography addiction. This study described Prefrontal cortex delta wave dominance can occur in pornographic teens. Wave domination is a characteristic of QEEGs to determine the</td>
<td>Qualitative</td>
<td></td>
</tr>
</tbody>
</table>

371
<table>
<thead>
<tr>
<th>Author’s Name and Publication Year</th>
<th>Research Title</th>
<th>Research Site</th>
<th>Purpose of Research</th>
<th>Research Types</th>
<th>Research Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Mattebo et al., 2018)</td>
<td>Pornography Consumption and Psychosomatic And Depressive Symptoms Among Swedish Adolescents: A Longitudinal Study</td>
<td>Sweden</td>
<td>qualitative EEG data on the brains of teens addicted to internet pornography.</td>
<td>Quantitative</td>
<td>Consuming excessive pornography in prediction can cause psychosomatic symptoms and depressive and mental health problems.</td>
</tr>
<tr>
<td>(Razzaq et al., 2018)</td>
<td>Personality Traits And Mental Health Of University Male Students Viewing Internet Pornography</td>
<td>Pakistan</td>
<td>To identify predictors for continued pornography consumption and to investigate pornography consumption concerning psychosomatic and depressive symptoms among a group of adolescents in Sweden.</td>
<td>Quantitative</td>
<td>Psychological problems, social problems, and mental illness are the three significant kinds of psychosocial issues resulting from accessing online pornography.</td>
</tr>
<tr>
<td>(Camilleri et al., 2021)</td>
<td>Compulsive Internet Pornography Use and Mental Health: A Cross-Sectional Study in a Sample of University Students in the United States</td>
<td>Malaysia</td>
<td>To explore the potential relationship between compulsive use of pornography and mental health in university students.</td>
<td>Quantitative</td>
<td>A significant relationship between mental health and pornographic use, students, reported severe or severe levels of depression, anxiety, and stress, respectively, with compulsive use of pornography significantly affecting all three mental health parameters in males and females</td>
</tr>
<tr>
<td>(Fonceca et al., 2019)</td>
<td>Impact of Pornography on Rural Youth in Tamil Nadu - India</td>
<td>India</td>
<td>To find out the impact of pornographic exposure on rural adolescent</td>
<td>Descriptive research</td>
<td>67.3% of respondents expressed increased anxiety levels. It also stated that 58% of their respondents often felt depressed, and feelings</td>
</tr>
<tr>
<td>Author's Name and Publication Year</td>
<td>Research Title</td>
<td>Research Site</td>
<td>Purpose of Research</td>
<td>Research Types</td>
<td>Research Results</td>
</tr>
<tr>
<td>-----------------------------------</td>
<td>------------------------------------------------------------------------------</td>
<td>---------------</td>
<td>-------------------------------------------------------------------------------------</td>
<td>------------------</td>
<td>------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>(Cuesta et al., 2020)</td>
<td>The Neurosciences of Health Communication: An fNIRS Analysis of Prefrontal Cortex and Porn Consumption in Young Women for the Development of Prevention Health Programs</td>
<td>Spanish</td>
<td>To analyze the role of the dorsolateral prefrontal cortex during pornography cue exposure in young women.</td>
<td>Quantitative</td>
<td>Watching pornographic clips (vs. control clips) gives rise to activation of Brodmann area 45 in the right hemisphere (B.A. 45, pars triangularis) (p&lt;0.01). Impact arose between self-reported consumption rates and activation of B.A. 45 right: reported consumption rates are getting higher, the greater activation (p&lt;0.01). In contrast, participants who do not consume pornography do not show proper B.A. 45 activity compared to a control clip (p&lt;0.01) that shows qualitative differences between non-consumers and consumers.</td>
</tr>
<tr>
<td>(Mariyati et al., 2018)</td>
<td>Studi Kasus: Dampak Tayangan Pornografi Terhadap Perubahan Psikososial Remaja</td>
<td>Indonesia</td>
<td>To find out the impact of pornography on the psychosocial changes of adolescents in Ciparigi Village, North Bogor District</td>
<td>Qualitative</td>
<td>According to the study's findings, cognitive, psychological, and social changes occur in pornography addicts, in addition to psychosocial changes. Cognitive changes such as reduced concentration, unfocusedness, laziness in studying, and lower productivity occur. Adolescents addicted to porn are also prone to mental instability, tension, embarrassment, anxiety, and depression. Adolescent social changes tend to be quiet, introverted, and destructive to relationships with their social environment.</td>
</tr>
<tr>
<td>(Tauhid et al., 2018)</td>
<td>The Impact of Pornography Addiction On Interpersonal Communication Capability (A Case Study In)</td>
<td>Indonesia</td>
<td>To find out the impact of pornographic addiction on interpersonal communication of FAI students at</td>
<td>Qualitative</td>
<td>The effects of pornography have made students’ minds full of sex. Sex thoughts will rule their subconscious. It will leave people of guilt among respondents.</td>
</tr>
</tbody>
</table>
The research aims to explore the impact of pornographic addiction on adolescents. The study used the scoping method of review. The study dealt with anything of the effects of pornographic addiction on adolescents. The results of the libraries review conducted on 4 national journals and 10 international journals show the impact of pornographic addiction on adolescents, including psychic, social impact and medical impacts, as follows:

1. The psychological impact

The effects of mental health on adolescents who consume pornography research by (30) indicate that there are problems related to Internet pornography viewing content, namely psychological problems, and mental illness. Psychological problems involve problems of concentration or focus. They suffer from frustration, guilt, and irritation after watching pornography. In line with research by (27), the use of pornography is related to difficulties in emotional regulation and mind control strategies.

The research by (25) suffers from the following psychological consequences of pornography: feeling guilty and mental stress. According to other studies, they discovered a connection between mental health and pornographic use; students reported having moderate to severe levels of stress, anxiety, and depression, with compulsive pornographic use significantly affecting all three mental
health parameters in both males and females (31). Furthermore, the research found that excessive consumption of pornography is predicted to cause psychosomatic symptoms, depression symptoms, and mental health problems (29).

The development of mental health issues in students who see online pornography is strongly influenced by personality. Recent studies have shown that students who consume pornography with a neurotic personality are more likely to have mental health problems. Individuals' psychological and mental health issues are harmed by pornography (22) (30) (31).

A person's mental health is impacted by a pornography addiction, which causes students to have sex-filled thoughts. Sexual ideas will rule their subconscious. Individuals will then be mentally upset and challenged to attempt as a consequence. Adolescents with a pornographic addiction who undergo emotional stress, anxiety, and unhappiness describe the psychological changes brought on by watching pornographic.(34) (33) (36)

2. Social Impact

Addiction is one of the most severe public health issues in the modern world. Addictions cause many fatalities and medical and psychiatric ailments, and behavioral, personality, affectivity, and social integration issues. Research conducted found that young pornographic addicts are more likely to remain silent, withdraw and deteriorate relationships with their social environment (26) (33)

Furthermore, there is a social impact, which is to the research by (24) that individuals socially have inter and intra-personal problems that do not want to interact with the environment. The social impact of watching pornography is to feel distant from society (25).

3. Medical Impact

According to research (28), there is delta wave dominance in the prefrontal cortex of pornographic addicts. Wave domination is characterized by QEEG's current state of the brain. In addition, there is evidence of a decrease in the brain function of pornographic teenagers, namely delta wave dominance. The decreasing cognitive function causes adolescents to lose the ability to determine which is right and wrong or refrain from doing wrong.

Prefrontal brain activity was captured when watching 20-second pornographic movies utilizing young female college students with varying levels of pornography usage. Compared to individuals who weren't watching porn, there was a more significant response from the prefrontal cortex when watching porn. Based on the study, results from the activation of the pornography clip (vs. clip control) caused the Brodmann 45 area activation of the right hemisphere (B.A. 45, pars triangularis) (p < 0.01). Another effect also occurs between the level of consumption reported by participants and activation of the hemisphere ba 45, which is the higher the consumption level, the greater the activation (p < 0.01). On the other hand, participants who never consumed pornographic material showed no activity in the right
ba 45 compared with the control clip (p < 0.01), which indicated qualitative differences between non-consumer and consumers (32).

Previous research has linked cognitive alterations to reduced concentration, lack of focus, laziness in studying, and worse performance. This suggests that continual exposure to pornographic information can influence the process of thinking, remembering, and recalling data stored in the brain. This cognitive process will be hampered and give output in the form of slow thinking, processing information, and difficulty concentrating. The brain of pornography addicts experiences hyperstimulation of the hormones dopamine and endorphins, so they experience shrinkage and damage to the prefrontal cortex, which functions as a decision-making center in the brain. This causes pornography addicts to find it difficult to distinguish right and wrong actions in their lives (33) (35).

Several articles had comparable results based on the results of the study of 7 articles containing the psychological impact, including 4 articles addressing the influence of adolescents being irritable, stress, and 3 articles discussing the impact of problems focusing, feeling guilty, sadness, including frustration, feeling depressed, and psychosomatic symptoms. There are articles about the effects of frustrating adolescents, feeling depressed and psychosomatic symptoms.

Articles have comparable social impact outcomes: withdrawal from the social environment, trouble relating with people, and feeling disconnected from society. Furthermore, there are some similarities in the medical impact of the four examined publications, such as impaired cognitive function. In addition, a paper addresses the difference in cognitive activation between teenage women who consume pornography and those who do not, with prefrontal brain activity observed using fNIRS.

Apart from the fact that pornography is prohibited by religion, Indonesian culture also considers pornography a bad thing. Apart from a religious and cultural perspective, psychologically, pornography is a bad thing for mental health. Continued consumption of pornography will undergo many changes in the perception of sex, resulting in a wide range of mental disorders (37). Excessive consumption of pornography can cause psychological effects on a teenager: irritability, difficulty concentrating, stress, guilt, depression, mental health, frustration, depression, and psychosomatic depression.

The social impact of article analysis is that it is challenging to establish interpersonal relationships with others, tend to withdraw, prefer to remain silent, withdraw, and feel distant from society. Teen-viewed pornography is an untimely sexual sensation, resulting in brain damage characterized by difficulty in concentration, lack of focus, lazy learning, lack of passion, loss of interest, and hobbies to shock and disorientation (33). The medical effects of pornographic addiction on cognitive function include decreased concentration, lack of focus, lazy learning, and reduced productivity. After prefrontal cortex activity, they were recorded using fNIRS resulted in a difference in cognitive activation between teenage women who consumed the productivity. It's pornography, and it doesn't consume.
An adolescent with a pornographic addiction can replace his days with beneficial activities such as sports, training, reading, and socializing. A pornographic addict can enroll in a religiously based educational institution to utilize the socialization of values and norms as the foundation for their activities. They probably won’t want to return to watching porn since they know the risks and repercussions (37).

CONCLUSIONS AND SUGGESTIONS

The 14 articles that were analyzed suggested that the findings further showed that there are three impacts of pornographic addiction: psychological effects, social effects, and medical impact. That assumption is based on a review of the articles mentioned above. The psychological impacts of pornography addictions can lead an adolescent to become agitated, have trouble focusing, be stressed, guilty, mentally ill, frustrated, depressed, and experience psychosomatic symptoms. Second, the social impact on pornographic addicts is that they are challenging interpersonal relationships with others, prone to withdrawal, and more willing to stand still, withdraw and feel distant from society. Third, the medical impact of taking pornography is that there is delta wave dominance in the prefrontal cortex of pornographic addicts. In addition, there is evidence of a decrease in the brain function of pornographic teenagers, namely delta wave dominance. The decreasing cognitive function causes adolescents to lose the ability to determine which is right and wrong or refrain from doing wrong. And after examining their prefrontal cortex activity, they were recorded using the fNIRS neuroimaging technique, resulting in cognitive activation differences between teenage women who were taking pornography and those who were not consuming it.

Early health education about pornography must be a part of the effort to prevent adolescent attempts to become pornographic media consumers. Furthermore, both parents must accompany the youth during this transition period in their growth and development.

According to the above exposure, researchers assume pornography is an addictive behavior that can cause problems facing adolescents psychological, social, and medical problems. Avoiding such behavior should prevent using effective strategies. To avoid pornography can be to preoccupy yourself with good things like learning about religion, exercising, helping parents, remembering God, and filtering or avoiding anything that creates a sublime, such as keeping eyes on and blocking media and websites specific to pornography-related content. Several strategies to prevent pornographic consumption, such as education and self-control. Prevention of pornography is indispensable to help as an effort to lower the consumption rate of pornography in adolescents.
ACKNOWLEDGMENT
The author expresses his appreciation for the research and community service institution, the Muhammadiyah University of East Kalimantan, for the Student and Lecturer Collaborative Research program, funding, and publishing of the student manuscript.

REFERENCES


