Exploring the Causal Structure of Adolescent Media Addiction and Policy Intervention

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ABSTRACT

Adolescent media addiction has emerged as an important social agenda in Korea. However, there has not been enough discussion on the causal structure of media addiction and policy interventions. The objective of this study is to identify and assess the mechanism of the existing and the revised Shutdown policy based on the systems thinking approach. To achieve this purpose, we establish the relationship between media usage, flow, and addiction, and develop a causal loop diagram. Based on the causal loop diagram, we explore the causal structure of two policy scenarios: shutdown policy and deregulation. Our study suggests that policy interventions inducing direct parental control on children's media usage time are ineffective since the time control reduces children's autonomy, which helps alleviate media addiction. Therefore, this study suggests that policy intervention should focus on alleviating addiction itself rather than on controlling media usage time.

Key words: *Adolescent Media Addiction, Media Regulation, Systems Thinking, Causal Loop Diagram, Shutdown Policy.*

1. INTRODUCTION

According to the rapid spread of home and personal media devices since the 2000s, the media addiction of adolescents has been regarded as a major social issue in Korea. The main concern is that adolescents have been reported to suffer from a lack of sleep and fatigue due to gameplay late at night. To prevent the online game addiction, the Shutdown policy was passed by the Korea National Assembly in 2011 due to concerns about these side effects. The Shutdown policy is the law that restricts the access of adolescents aged under 16 to online games from midnight to 6 am. However, there have been many disputes over the effectiveness of the policy. For example, researchers consistently report that the mandatory Shutdown policy has had no significant effect on adolescents' online game use [1]. Also, there are conflicting claims that the size of the domestic online game market has rapidly decreased since the implementation of the Shutdown policy.

Although the Korean government announced a plan to change the Shutdown policy from the current mandatory regulation to a voluntary restriction by parents in 2016, there is no evidence that the revised Shutdown policy will be more effective than the current mandatory Shutdown policy as well. Policies without prior assessment are likely to result in failure. Therefore, we try to explore the causal structure of adolescents' media addiction and policy intervention, and proactively assess policy effectiveness to prevent potential policy failures.

The objective of this study is to identify and assess mechanism of the existing and the revised Shutdown policy. Specifically, this study explores the causal structure of adolescents' media addiction to provide some arguments to assist new policy makings and seeks more effective alternative policy options.

Various moderating variables between media use and addiction exist, and the media addiction may be alleviated by controlling these variables effectively. However, studies on how these variables form the causal structure are lacking. Most existing empirical studies tend to focus only on the effectiveness of specific moderating variables and ignore the overall causal structure that leads to addiction from media use. In this paper, we seek to assess the effectiveness of policy interventions from a broader perspective of a systems thinking. We reveal the causal structure mechanism underlying the

adolescents' media addiction to understand the reason for the ineffectiveness of current Shutdown policy and explore an alternative policy intervention to prevent adolescents from media addiction. We develop a causal loop diagram with reinforcing loops and balancing loops. The reinforcing loops enhance the effect and the balancing loops moderate the effect. Then, we apply the influences of policy interventions to the causal loop diagram based on two policy scenarios. Finally, we discuss the direction that future policies should pursue based on the insights obtained from the causal structure.

2. LITERATURE REVIEW

2.1 Adolescents' Media Addiction in Korea

Adolescents' media accessibility is very high due to the high level of ICT infrastructure in Korea. Adolescents are considered to have a faster rate of accepting new media than adults, and this may be a source of problematic use and various adverse effects [2]. Researchers claim that adolescents' media addiction causes social deterioration, increases aggression, and negatively affects academic achievement [3], [4].

Studies on media addiction started from TV in the early days, went through the Internet, and now studies on game addiction are actively undergoing [5]. Addiction means a state in which one is left to something without knowing it by repeating a specific habit or action [6]. Media addiction is considered as a behavioral disorder. Media addiction includes internet addiction, and previous studies treat game addiction as sub-concept of the internet addiction [7]. Kwon [8] defines the game addiction as being too obsessive to the game which would interfere with normal life.

Adolescents' game addiction has been regarded as serious social problems and has attracted the attention of policymakers. However, policy studies to prevent media addiction are not actively conducted and consequently, the effectiveness of the Shutdown policy has not been fully assessed [9].

2.2 Media Use, Flow, and Addiction

The use of media does not lead directly to addiction. Previous studies have reported that there is a control variable called flow between media use and addiction, and the flow determines the level of the addiction [10]-[12]. The term 'flow' suggested by Csikszentmihalyi [13] indicates a state of full involvement and enjoyment in an activity. Novak [11] finds that main features of flow are concentration and distorted sense of time. In this study, media flow can be defined as a mental state of full involvement and enjoyment in media use. An increase of utility caused by media use can be an example of media flow.

The term 'media addiction' is somewhat different from 'media flow'. Young [14] suggests that media addiction can be characterized by media use over a long time, withdrawal symptoms, obsession, a loss of self-control, and continued use.

In sum, media flow means the mental state caused by media use, but media addiction means symptoms or disorders that influence a user's behavior. An overuse of media causes media addiction through media flow. From this, the relationship between media use, media flow, and media addiction can be presented as Fig. 1:

Fig. 1. Media Use, Flow, Addition

In chronological order, children's media use causes media flow, and media flow causes media addiction. In reverse, media addiction also affects media flow because the symptoms or disorders derived from media addiction affect users' behavior. Users lose self-control and are unable to control themselves to use media in moderation. Hoffman and Novak [15] claim that people experience flow when using media and that the flow increases the time they spend using media.

2.3 Systems Thinking Approach

As Vedung [16] notes, many social issues related to human behavior can be regarded as a wicked problem. It is important to understand the mechanism revealed behind the issue to solve the wicked problems.

Systems thinking refers to the qualitative analysis methods that describe and explain social phenomena in the context of a cyclical causal relationship [17]. Systems thinking methodology is a useful tool for exploring cyclical causality between endogenous variables and identifying the mechanism of social phenomena. System dynamics, including systems thinking models, provide sharply focused insights to the public policy [18]. Leischow et al. [19] claim that complex problems of public issues require multidisciplinary approaches to understand and handle the complexity, and the systems thinking approaches can be an alternative route for tackling such complex problems. While most empirical studies of microscopic perspectives focus on identifying specific relationships between variables, studies based on the systems thinking approach have the advantage of identifying the overall interaction of each variable constituting the social phenomenon.

Several researchers have already attempted system dynamics approaches for the problems of adolescents' media addiction and the Shutdown policy. For example, Park and Ahn [20] explore the cyclical mechanism of adolescents' media addiction and conduct a policy simulation after developing a stock-flow model. Hwang and Park [21] conduct a simulation using a stock-flow model based on a causal loop diagram with the aim of exploring the mechanism of Shutdown policy's side-effects on the online game market. We use the systems thinking approach to analyze the feedback loop of exogenous interventions. Although systems thinking methodology is currently not utilized fully in government policy makings, policy analysis adopting systems thinking methodology can reduce difficulties and uncertainty in policy-making processes [22].

3. CAUSAL STRUCTURE ANALYSIS

3.1 Developing Causal Loop Diagram

3.1.1 Reinforcing Loops

To develop a causal loop diagram, we develop a Game Use–Flow–Addiction loop based on the conceptual framework presented in Fig. 1. The Game Use–Flow–Addiction loop consists of two reinforcing loops. First, a reinforcing loop (R1) shows that children's game use late at night increases the possibility of experiencing flow and that the game flow then causes game addiction. When children are addicted to a game, they lose self-control and spend more time playing the game late at night; the increased time they spend using the game cause game flow again. A second reinforcing loop (R2) indicates that children's game flow affects their game addiction and that their game addiction also directly affects their game flow. The Game Use–Flow–Addiction loop is presented in Fig. 2.
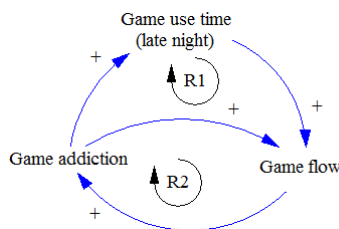

Fig. 2. Game Use-Flow-Addiction Loop

We develop an Other Media Use–Flow–Addiction loop based on the conceptual framework. First, a third reinforcing loop (R3) shows that children's other media use late at night causes flow, the flow causes addiction, and the addiction increases the time spent using other media again. Second, a fourth reinforcing loop (R4) indicates that children's other media flow increases the possibility of addiction, and the addiction reinforces the flow. The Other Media Use–Flow–Addiction loop is presented in Fig. 3.
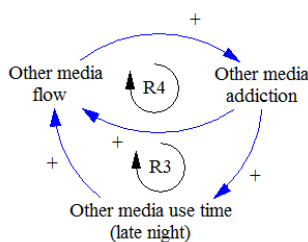

Fig. 3. Other Media Use-Flow-Addiction Loop

According to the media substitution hypothesis, an increase in the time spent using specific media reduces the time spent using other media. McCombs [23] claims that people choose media with higher utility and that media with a higher utility substitute for media with a lower utility. Furthermore, the time available to use media is limited. Therefore, the more time children spend on other media, the less time they spend on games. A Media Substitution Loop is presented in Fig. 4.
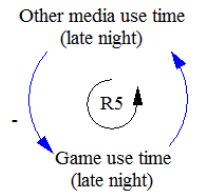

Fig. 4. Media Substitution Loop

All the reinforcing loops from R1 to R5 are described in Table 1.

Table 1. Reinforcing Loops from R1 to R5

Loops	Causal Structure
R1	Game use time (late night) → Game flow → Game addiction → Game use time (late night)
R2	Game flow → Game addiction → Game flow
R3	Other media use time (late night) → Other media flow → Other media addiction → Other media use time (late night)
R4	Other media flow → Other media addiction → Other media flow
R5	Game use time (late night) → Other media use time (late night) → Game use time (late night)

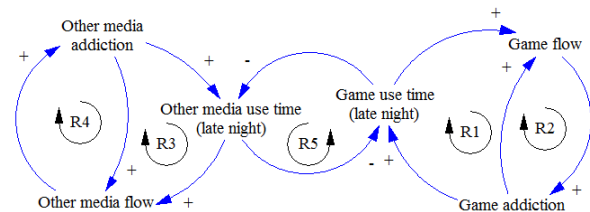We integrate these loops to develop an Integrated Media Use–Flow–Addiction loop, which is presented in Fig. 5.

Fig. 5. Integrated Media Use-Flow-Addiction Loop

3.1.2 Balancing Loops

Balancing loops are developed based on children's lack of sleep. Children's use of media late at night reduces their sleeping time, and a lack of sleep increases fatigue. Van den Bulck [24] finds that the use of games, TV, and the internet reduces adolescents' sleeping time. Accumulated fatigue prevents children from concentrating on the media and the children's flow from the media is decreased. As with the reinforcing loops, the balancing loops can be divided into games and other media.

First, we develop a Game Use Reduction loop (B1) based on the balancing effect caused by children's lack of sleep and fatigue. Children's game use late at night reduces their sleeping time late at night, and their lack of sleep increases their fatigue. When fatigue is accumulated, children find it difficult to concentrate on games, and therefore their game addiction is moderated by a decrease in game flow. The decrease in game addiction moderates the time children spend on games late at night. The Game Use Reduction loop is presented in Fig. 6.
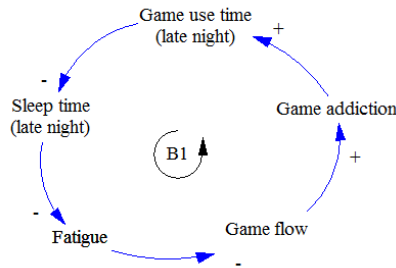
Fig. 6. Game Use Reduction Loop

Second, we develop an Other Media Use Reduction loop (B2). Children's use of other media late at night reduces their time for sleeping late at night, and the lack of sleep increases the children's fatigue. Increased fatigue decreases the other media flow, and the decrease of flow decreases addiction. The decrease of addiction to other media reduces time spent on other media late at night. The Other Media Use Reduction loop is presented in Fig. 7.
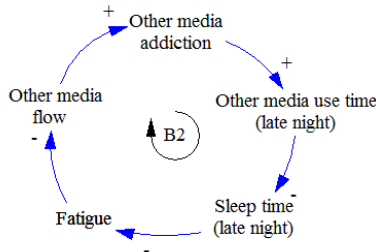

Fig. 7. Other Media Use Reduction Loop

Third, we develop a Fatigue Recovery Loop. An accumulation of fatigue increases drowsiness, and children reduce fatigue by taking a nap. When the child has recovered from his or her fatigue, the frequency of taking a nap is decreased. The Fatigue Recovery loop is presented in Fig. 8.
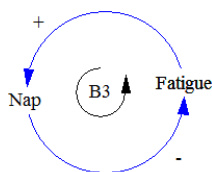

Fig. 8. Fatigue Recovery Loop

All the balancing loops from B1 to B3 are described in Table 2.

Table 2. Balancing Loops from B1 to B3

Loops	Causal Structure
B1	Game use time (late night) → Sleep time (late night) → Fatigue → Game flow → Game addiction → Game use time (late night)
B2	Other media use time (late night) → Sleep time (late night) → Fatigue → Other media flow → Other media addiction → Other media use time
	(late night)
B3	Fatigue → Nap → Fatigue

We integrate these three balancing loops to develop an Integrated Media Use Reduction loop that is presented in Fig. 9.
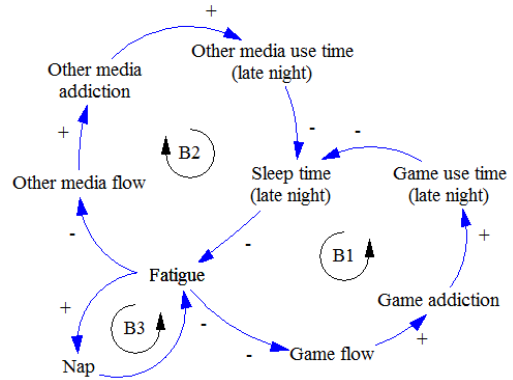

Fig. 9. Integrated Media Use Reduction Loop

3.1.3 Integrating Reinforcing and Balancing Loops

We merge the Integrated Media Use–Flow–Addiction loop presented in Fig. 5 and the Integrated Media Use Reduction loop presented in Fig. 9 to develop an Integrated Media Addiction loop, which is presented in Fig. 10
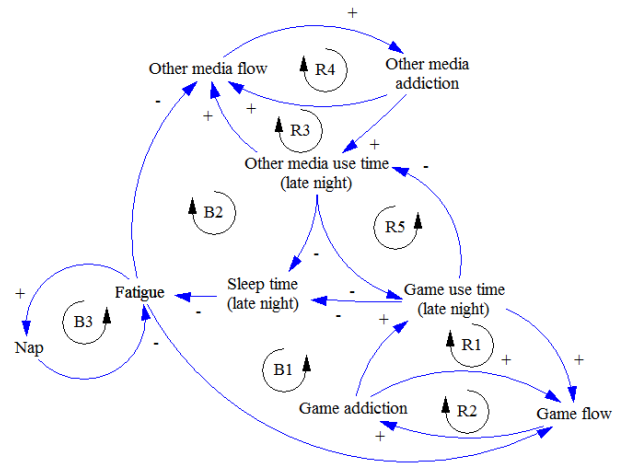

Fig. 10. Integrated Media Addiction Loop

3.2 Assessing the Policy Interventions

3.2.1 First Scenario: Current Shutdown Policy

We explore the causal structure of the current mandatory Shutdown policy based on the Media Addiction causal loop diagram presented in Fig. 10. The influences of the Shutdown policy and parents' restrictions are applied to the Media Addiction causal loop diagram.

First, the Shutdown policy directly restricts children under 16 from using online games between midnight and 6 am. Thus, the Shutdown policy directly attempts to reduce the time children spend on games late at night. However, empirical

evidence consistently shows that the Shutdown policy has not affected the time children spend on games. For example, Sung [1] finds that the Shutdown policy has had no significant effect on the time children spend on games. Song [25] notes that the proportion of adolescents accessing games illegally, such as by using their parents' residency registration number, has increased to 40%. The increase in illegal access indicates that the government's mandatory regulation has a limitation and has the side effect of pushing adolescents use their parents' residency registration number illegally. In this way, the Shutdown policy increases children's illegal access, and the increase in illegal access increases the time children spend on games late at night.

Second, parents can moderate their children's use of media late at night in various ways. Parents can assist the Shutdown policy both by directly restricting their children's game play late at night and by prohibiting their children from illegally accessing games. We can assume that in this way, the side effects of the Shutdown policy can be reduced. Also, parents can limit the use by their children of other media late at night; this use is not controlled by the government. The influences of these interventions are presented in Fig. 11.
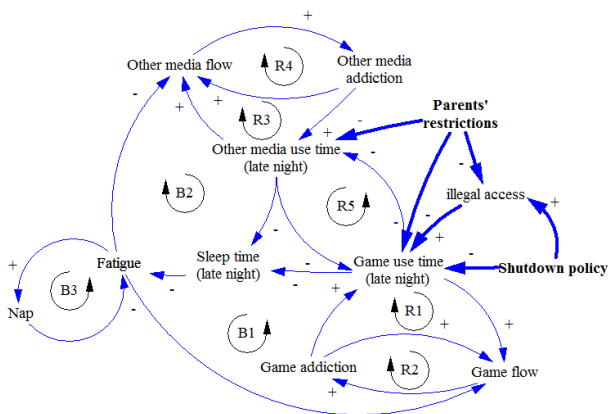

Fig. 11. First Scenario (Shutdown Policy)

The ineffectiveness of the Shutdown policy arises from the widespread illegal access. The government's mandatory regulation, based on a uniform standard, can be avoided by children's exploiting alternative ways to access to the game, which may be illegal, and this weakness reduces the effectiveness of the Shutdown policy. We also find that parents can offset the weakness of the Shutdown policy as necessary. According to Fig. 11, parents can restrict their children's illegal access, and also directly restrict the use of other media late at night. However, as mentioned above, Song [25] reports that 40% of all adolescent game users already use their parents' residency registration number illegally to access online games late at night. This empirical result indicates that the Shutdown policy is ineffective because of children's illegal access and that illegal access has not been effectively controlled by parents. Therefore, we can conclude that the ineffectiveness of the current Shutdown policy comes from the difficulties of preventing children from accessing games illegally.

3.2.2 Second Scenario: Deregulation

We present another causal loop diagram based on the Media Addiction causal loop diagram presented in Fig. 10 to explore the causal structure of deregulation, so called the voluntary restrictions by parents, or the revised Shutdown policy. This causal loop diagram is presented in Fig. 12.
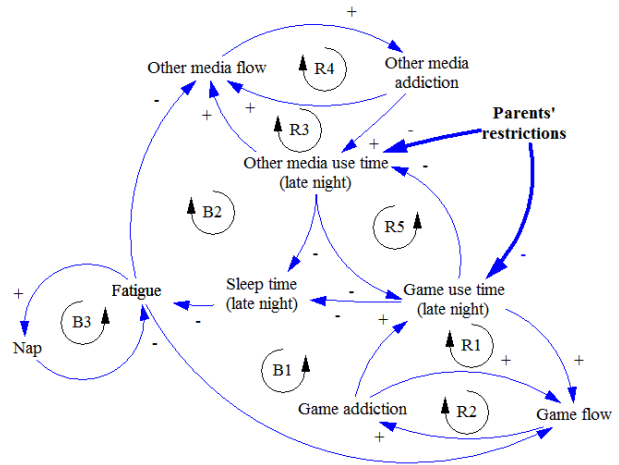

Fig. 12. Second Scenario (Deregulation)

In contrast with the first scenario, the children' media usage time in the second scenario is moderated by their parents' voluntary restrictions. Compared to Fig. 11, the government's mandatory Shutdown regulation is eliminated in the causal loop diagram and no other policy intervention is added. However, as we already noted in the first scenario, parents' voluntary restrictions are shown to be ineffective empirically in reducing children' media usage time late at night. Therefore, it is difficult to imagine that this revised Shutdown policy will be effective in preventing adolescents from becoming addicted to media use.

4. DISCUSSIONS

According to the empirical evidence reported in the literature and causal structure analysis of this study, direct interventions in children's media use time are not effective in alleviating the feedback loop between media use, flow, and addiction. The Korean government has already announced to stop the current mandatory Shutdown regulation. Therefore, an effective intervention should be sought to mitigate the feedback loop and to decrease children's media addiction.

Previous studies claim that environmental factors surrounding adolescents can prevent adolescents from media addiction [26]. Specifically, they argue that psychological factors may significantly control media addiction. Seo and Lee [27] find that people with high levels of self-competence, autonomy, and relatedness have a high level of game flow and a low level of game addiction. In the same context, we suggest that policy intervention should be focused on the addiction itself rather than on controlling the children's media usage time. Additionally, we suggest that policy intervention should try to enhance children's autonomy, self-competence, and relatedness.

Increasing children's self-competence, autonomy, and relatedness can moderate children's media addiction and therefore the children's media usage time. Parents can affect children's autonomy, self-competence, and relatedness in both positive and negative ways. A causal loop diagram with the suggested interventions is illustrated in Fig. 13.
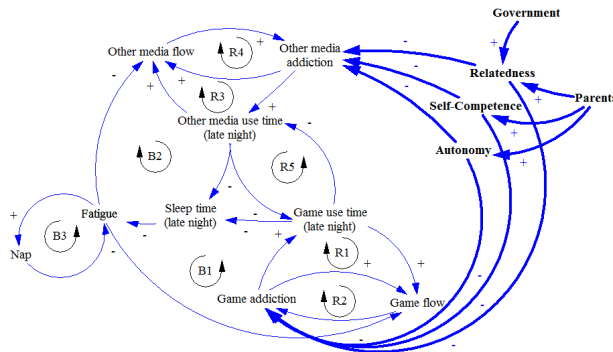

Fig. 13. Third Scenario (Suggestion)

In Fig. 13, high levels of autonomy, self-competence, and relatedness reduce media addiction, and the reduction in media addiction lowers both media flow and the children's media usage time. In contrast to Fig. 11 and 12, government and parents do not directly control the time children spend using media since time restrictions imposed by outside interventions can lower children's autonomy.

Children's relatedness can be enhanced by social capital. For example, the government may implement local community development programs to activate a local network, and the activated network may enhance children's relatedness. Wetterberg [28] claims that government should implement policies for developing social capital and also provide services that local communities cannot provide to their residents. Grootaert [29] shows that social capital can be enhanced by activating networks between members of society. For example, Kavanaugh and Patterson [30] show that increasing connectivity between residents enhances social capital of the local community. This study also claims that the government had better use policy options to enhance social capital to prevent adolescents from media addictions.

5. CONCLUSIONS

This study applies systems thinking methodology to explore the causal structure underlying adolescents' media addictions and the effects of the policy and parents' interventions within a framework of cyclical causality. Causal loop diagrams are developed to identify and assess the mechanism of the existing and the revised Shutdown policy, and to explore the possibility of new effective policy directions. Based on the conceptual framework of a relationship between media use, media flow, and media addiction, we develop five reinforcing loops presented in Table 1 that increase children's media use late at night. We also develop three balancing loops presented in Table 2 that decrease children's media use late at night. By integrating these loops, we construct the Media

Addiction causal loop diagram. Finally, we apply the influences of policy interventions such as the Shutdown policy and parents' restrictions to the Media Addiction causal loop to explore the policy leverage.

This study claims that policy intervention should be focused on the addiction itself rather than on controlling the children's media usage time, since parents' direct restrictions on children's media use can lower children's autonomy. Children's media addiction can be moderated by enhancing their autonomy, self-competence, and relatedness. Parents' attention to their children's basic psychological needs would be more important to prevent children from becoming addicted to the media and suffering from lack of sleep.

Contrary to the most previous studies which have focused on empirically examining the effects of moderating variables between media use and addiction from a microscopic perspective, this study identifies the overall causal structure of media addiction and policy intervention from a macro perspective. Based on the causal structure of media addiction, this study has suggested that psychological factors should be controlled to effectively prevent adolescents' media addiction, as the proper psychological environment surrounding adolescents may prevent adolescents from media addiction [26]. This systems thinking approach combining psychological factors of the social phenomenon is rare in the related literature, and therefore we claim that this study may contribute to widening the scope of policy studies on media addiction.

Although this study attempts to reveal the cyclical causal structure mechanism underlying the adolescents' media addiction, it is exploratory in nature and limited. Therefore, future studies may be directed towards providing some empirical evidence to support our arguments. As Kim and Kim [9] have pointed out that academic attention on policy analysis of media addiction is relatively low and this may hamper the development of effective public policies, we expect more active researches on policy analysis and evaluation so that evidence-based policies for preventing media addiction can be established.

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