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Validity of TV, Video, Video Game Viewing/Usage Diary: Comparison with the Data Measured by a Viewing State Measurement Device

Keywords:
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Abstract

The aim of this study was to examine the validity of data entered in participating subjects' TV, video, and video game viewing/usage diaries.

The participating subjects were eight families with third and fourth graders in the Tokyo Metropolitan Area. The amount of TV viewing (total and by TV channel), viewing of video-recorded TV programs, and playing of video games by third and fourth grade children were recorded in the viewing/usage diary and at the same time measured by a viewing state measurement device. The correlation coefficient between the data obtained from the diary and that from the measurement device was equal to or higher than the coefficient obtained in a preceding study, confirming the validity of the data entered in the viewing/usage diary.

1. Introduction

In our modern information society, visual media such as televisions, videos, DVDs, Blu-ray discs, and video games are part of our daily lives. Along with the increase of the role of visual media in our daily living, there has been increased social and academic interest in such topics as the physiological and psychological effects of such media on its users and the relationship between user personality traits as motivational factors for media use and the amount of media use. Due to this interest, there have been many psychological or sociological studies examining the amount of visual media use by type or content as an independent (explanatory) variable or a dependent (objective) variable (e.g., Dill, 2012; Bryant & Oliver, 2008). In particular, a large number of studies have been conducted to examine the relationships between children's visual media use and their physiological and psychological development, because children are believed to be more easily influenced by those media (Singer & Singer, 2012).

Scientific research showing the relationship between media use and various psychological factors, including behavioral trends and personality traits, has been a topic of great social interest. Therefore, if visual media exposure is to be used as an independent or a dependent variable, the actual amount of media use by study participants must be measured as accurately as possible.

The method, which most accurately measures the amount of the participants' visual media use, requires a device that automatically records the amount of time they spend in watching or listening to media. However, it is generally difficult to applying this method to a large scale.

To this end, a self-reporting questionnaire or a viewing diary has been often used as a method for measuring the amount of media use. In a viewing diary, the subject records the type of media used, the names of viewed programs, and the start and end times of media use. Therefore, a viewing diary has an advantage over a self-reporting questionnaire in that, while a questionnaire simply asks the participants how much time they spend using a certain type of media or watching a certain type of content per day, a viewing diary allows more detailed and accurate measurements of the duration of viewing and the type of content viewed during the study period. Moreover, the viewing diary also has the advantage of the ability to measure the use of multiple types of media simultaneously (such as watching television while playing handheld games like Nintendo DS). If the participants are young children, their parents usually record the diary for them. When this occurs, however, the accuracy of measured and recorded amounts of media use may be compromised.

Anderson et al. (1985) examined the accuracy of TV viewing diaries for 5-year-old children written by their parents. They studied the correlation between TV viewing time recorded in the viewing diary in increments of 15 minutes and TV viewing time calculated based on a video recorded in a room where a participating child watched TV. The obtained correlation was. 84.

Anderson et al. (1985) used a video-recorded TV room as an objective index in the study. Note, however, there is always some risk of unsuccessful recording due to device failures or inappropriate operation. Also, because of the diversity of visual media used by children, it is necessary to examine the validity of a viewing diary not only

for the amount of TV viewing but also for the amount of DVD- or HDD-recorded TV programs, and the amount of video games played. In this study, therefore, the amount of media use was recorded in a TV, video, and video game viewing/usage diary, and at the same time measured by a device originally designed to obtain viewing rates for television stations. This device, connected to a standard TV, is capable of recording the amount of regular, BS, and CS TV programs viewed, the amount of DVD- and HDD-recorded TV programs viewed, and the amount of video games played. Then the validity of data recorded in the viewing/usage diary was examined by calculating the correlation between the data entered in the diary and the data obtained by the viewing state measurement device.

2. Method

2.1 Participants

This study was conducted in association with Video Research Ltd., a company that measures TV program viewing rates by collecting data from viewing state measurement devices installed in the residences of participating families.

The process of selecting the participating families began with a preliminary investigation of TV viewing, conducted online, among families working with Video Research Ltd. Based on the results of this preliminary investigation, families with third and fourth graders in primary school were selected. These families lived in Tokyo Metropolitan Area and did not have any family members employed in mass communications or research companies. Eight families were selected from among the families satisfying these conditions in order to eliminate bias due to the mother's work. These eight families were asked to record their viewing habits via a machine and maintain a diary of their visual media viewing/usage. The mother of each participating family recorded in the diary her child's amount of visual media use.

2.2 Study period

The study was conducted in two parts. The first study was conducted from January 20 to 22, 2012, and the second study was conducted from February 10 to 12, 2012. The study period was set from Friday to Sunday because lifestyle patterns differ by the day of the week. Moreover, the study period was three days because this was the maximum length of time the viewing state measuring device could record.

Each study was conducted with four families. The participants of the first study were a female third grader, a male third grader, a female fourth grader, and a male fourth grader. The participants of the second study were a male third grader, a male fourth grader, and two female fourth graders.

2.3 Measurement of the amount of media use

The viewing/usage diary(1) Mothers of the participating children recorded in a viewing/usage diary the time their children started and ended watching TV, video-recorded TV programs (VHS tapes, DVDs, or HDDs (including Blu-ray discs)) or playing video games. The amount of visual media use was recorded in units of 15 minutes. When a participating child watched a

(1) The viewing/usage diaries used in this research were used in the NHK research project, "Better Broadcasting for Children." Originally, they were used to record media use for a one-week period.

TV program, his/her mother recorded the channel by selecting from NHK General TV (NHK-G), NHK Educational TV (NHK-E), Nippon Television Network (NTV), TV Asahi, Tokyo Broadcasting System Television (TBS), TV Tokyo, Fuji Television Network (Fuji TV), or Other. The mother recorded the channel number, channel name, program name, and/or game title; if "Other" was selected; a TV program recorded in VHS, DVD, or HDD (including Blu-ray disc) format was watched; or a video game was played. Figure 1 shows the sample of the viewing/usage diary used in this study.

The format used is similar to that of Anderson et al. (1985); this format lists the units of time recorded next to the TV channel number and the program name. However, Anderson et al. (1985) did not record the amount of media use other than TV.

Then, the type of media used, how many times each channel was watched (every time a channel was watched within a 15-minute time frame, it was counted as one time point), and how many minutes each channel was viewed were measured from 6 am to midnight (12 am) during the three day study period, were recorded. Obtained data was used in analysis. For example, Figure 1 shows that NTV programs were watched at two time points for 30 minutes in total.

Viewing state measurement device A viewing state measurement device and a hard disc recorder were connected to the TV that was most often used in the residence of each participating family. The device was capable of identifying the viewer when the TV was turned on and controlled by its remote control. Identification of the viewer was then collected as data via the Internet. After the viewer was identified, the hard disc recorder started to record what was shown on TV. The recorded content was used to identify the channel and the name of each program viewed, if the participating child was identified as the viewer. Then, the amount of time spent watching according to the viewing state measurement device was translated into a value for each 15-minute time frame. Finally, the number of times and the duration of the use of visual media were analyzed in the same manner as the data obtained from the viewing/usage diary.

2.4 Procedure

A researcher from Video Research Ltd. visited each participating family before the study, installed a viewing state measurement device and a hard disc recorder, and showed the family how to use them. At the same time, the researcher gave each family a viewing/usage diary and showed how to enter information in the diary. The explanatory note includes the following: if the names of the programs, the titles of the games or the time intervals of the media use were unclear for the mothers, the participating children need to confirm them; it is necessary to record of all the types of media being used in cases where multiple types of media were used simultaneously; if there were any questions on the manner of recording, a researcher was consulted with; and other such similar things. The notion of recording media use in 15-min time intervals was explained using the following concrete example. "If your child was in contact with media 6:35 AM onward, please draw a vertical line starting from 6:30 AM." Additionally, the researcher asked each family to fill in the diary only if participating children watching TV connected to the viewing state measurement device. Each family was told that the objective of the study was to examine how TV was used.

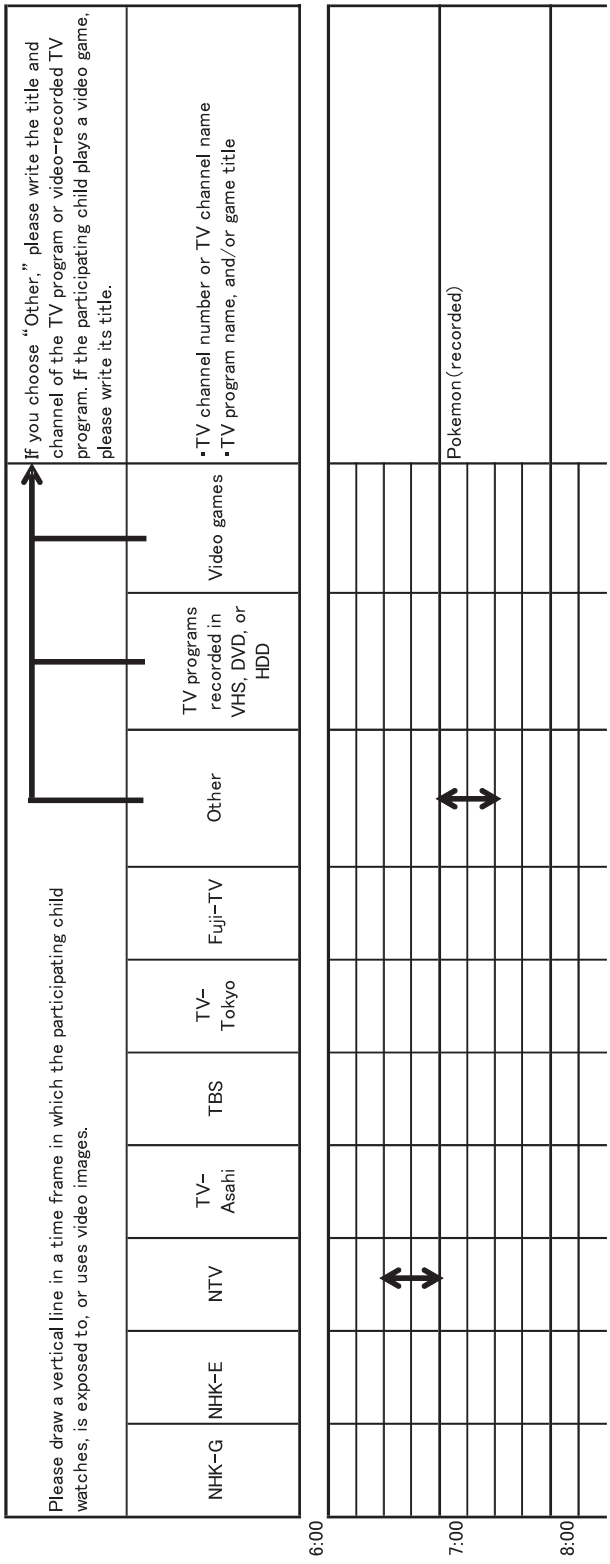

Figure 1 The sample of the TV, video, video game viewing/usage diary

After the study was complete, the researcher visited each participating family to remove the viewing state measurement device and hard disc recorder. At the same time, the researcher collected the diary after confirming it contained no missing information or mistakes. In those cases where the times when media use began or finished were unclear, the researcher checked with the family and made necessary revisions.

3. Results

3.1 Frequency of media use according to the viewing/usage diary and the viewing state measurement device

Table 1 shows how many times each participating child used media during the study period. The difference between the diary data and device measurement data was then obtained for the total number of times of media use, which included viewing of TV programs regardless of the channel, viewing of video-recorded TV programs, and playing of video games. For half of the participants the viewing/usage diary recorded a higher frequency of media use, while the viewing state measurement device recorded a higher frequency of media use for the other half of the participants (Table 1).

3.2 Total duration of media use according to the viewing/usage diary and the viewing state measurement device

Table 2 shows how long each participating child used the media during the study period. The difference between the diary data and device measurement data was then obtained for the total duration of media use, which included viewing of TV programs regardless of the channel, viewing of video-recorded TV programs, and playing of video games. For all participating children, a longer duration of media use was recorded in the viewing/usage diary than by the viewing state measurement device (Table 2). The smallest difference was 24 minutes, and the largest difference was 245 minutes. Mean of the difference was 146.88 minutes (SD = 69.92) for total duralion of media use, 30.75 minutes (SD = 117.71) for TV viewing.

3.3 Correlations between the viewing/usage diary data and the viewing state measurement device data for the amount of media use

For each 15-minute time frame, the correlation between the data recorded in the viewing/usage diary and the measurement by the viewing state measurement device was examined for the amount of media use. The correlation coefficient on each channel and media type was calculated using 1728 data items (8 samples × 3 days × 72 time points).

Table 3 shows the result of Pearson's product-moment correlation analysis. The correlations obtained for the amount of TV viewing by channel were significant, ranging from .49 to .82. The correlation for the total amount of TV viewing was .79, also significant. The correlation was .73 for viewing video-recorded TV programs and .59 for playing video games. There was also a positive and significant correlation of .75 for the total amount of TV viewing, viewing of video-recorded TV programs, and playing of video games combined.

Finally, the correlations between the data entered in the diary and measurement data obtained by the device were obtained for the total amount of use of each type of visual media to compare with Anderson et al (1985) (Table 4).

Table 1　Frequency of media use by each participating child (measured in time points)

Sample No.	How to record[1)]	NHK-G	NHK-E	NTV	TV-Asahi	TBS	TV-Tokyo	Fuji-TV	Other	All channels[2)]	Video	Video game	Total time points[3)]
1	Diary	0	1	6	10	7	3	2	0	29	16	4	49
	Device	0	0	6	9	12	4	2	0	33	0	6	39
	Difference	0	1	0	1	−5	−1	0	0	−4	16	−2	10
2	Diary	0	0	8	0	6	6	8	0	28	35	0	63
	Device	0	0	10	3	3	2	6	0	24	24	0	48
	Difference	0	0	−2	−3	3	4	2	0	4	11	0	15
3	Diary	1	0	5	6	0	2	4	0	18	11	2	31
	Device	1	0	4	5	0	0	4	0	14	6	2	22
	Difference	0	0	1	1	0	2	0	0	4	5	0	9
4	Diary	9	0	11	0	4	3	4	4	35	13	0	48
	Device	4	0	9	0	2	3	1	2	21	11	0	32
	Difference	5	0	2	0	2	0	3	2	14	2	0	16
5	Diary	1	0	5	2	3	13	45	0	69	7	0	76
	Device	1	0	5	7	3	15	41	0	72	10	0	82
	Difference	0	0	0	−5	0	−2	4	0	−3	−3	0	−6
6	Diary	4	6	10	12	0	27	6	0	65	20	28	113
	Device	8	3	24	20	3	31	15	3	107	17	23	147
	Difference	−4	3	−14	−8	−3	−4	−9	−3	−42	3	5	−34
7	Diary	0	0	22	10	6	0	20	3	61	30	12	103
	Device	0	1	34	15	8	0	21	9	88	34	0	122
	Difference	0	−1	−12	−5	−2	0	−1	−6	−27	−4	12	−19
8	Diary	0	0	0	21	2	4	15	0	42	7	2	51
	Device	0	0	2	23	1	7	24	1	58	6	0	64
	Difference	0	0	−2	−2	1	−3	−9	−1	−16	1	2	−13

1) “Diary” means the measured amount of visual media use recorded in the TV, video, video game viewing/usage diary, and “device” means the amount of visual media use measured by the viewing state measurement device. “Difference” is the value obtained by subtracting the amount of visual media use measured by the viewing state measurement device from the amount of visual media use recorded in the diary.

2) “All channels” means the total number of times that NHK-G, NHK-E, NTV, TV Asahi, TBS, TV Tokyo, Fuji TV, or Other channel was watched.

3) “Total time points” is obtained by adding “All channels,” the number of times video-recorded TV programs were watched, and the number of times video games were played.

Table 2 Total duration of media use by each participating child (measured in minutes)

Sample No.	How to record[1)]	NHK-G	NHK-E	NTV	TV-Asahi	TBS	TV-Tokyo	Fuji-TV	Other	All channels[2)]	Video	Video game	Total[3)]
1	Diary	0	15	90	150	105	45	30	0	435	240	60	735
	Device	0	6	82	144	207	56	29	0	524	0	89	613
	Difference	0	9	8	6	−102	−11	1	0	−89	240	−29	122
2	Diary	0	0	120	0	90	90	120	0	420	525	0	945
	Device	0	0	176	67	40	33	105	0	421	351	0	772
	Difference	0	0	−56	−67	50	57	15	0	−1	174	0	173
3	Diary	15	0	75	90	0	30	60	0	270	165	30	465
	Device	16	0	69	76	0	11	64	0	236	90	40	366
	Difference	−1	0	6	14	0	19	−4	0	34	75	−10	99
4	Diary	135	0	165	0	60	45	60	60	525	195	0	720
	Device	70	3	149	1	44	47	15	38	367	140	0	507
	Difference	65	−3	16	−1	16	−2	45	22	158	55	0	213
5	Diary	15	0	75	30	45	195	675	0	1035	105	0	1140
	Device	15	0	53	43	40	186	513	0	850	113	0	963
	Difference	0	0	22	−13	5	9	162	0	185	−8	0	177
6	Diary	60	90	150	180	0	405	90	0	975	300	420	1695
	Device	77	37	224	214	38	374	151	28	1143	219	309	1671
	Difference	−17	53	−74	−34	−38	31	−61	−28	−168	81	111	24
7	Diary	0	0	330	150	90	0	300	45	915	450	180	1545
	Device	0	1	358	142	50	0	224	75	850	450	0	1300
	Difference	0	−1	−28	8	40	0	76	−30	65	0	180	245
8	Diary	0	0	0	315	30	60	225	0	630	105	30	765
	Device	0	0	6	244	2	65	248	3	568	75	0	643
	Difference	0	0	−6	71	28	−5	−23	−3	62	30	30	122

1) "Diary" means the measured amount of visual media use recorded in the TV, video, video game viewing/usage diary, and "device" means the amount of visual media use measured by the viewing state measurement device. "Difference" is the value obtained by subtracting the amount of visual media use measured by the viewing state measurement device from the amount of visual media use recorded in the diary.

2) "All channels" means the total minutes spent on NHK-G, NHK-E, NTV, TV Asahi, TBS, TV Tokyo, Fuji TV, or Other channel was watched.

3) "Total" is obtained by adding "All channels," the minutes spent on video-recorded TV programs were watched, and on video games were played.

Table 3 Correlations between the data recorded in the TV, video, video game viewing/usage diary and the measurement by the viewing state measurement device (for each 15-minute time frame)

NHK–G	NHK–E	NTV	TV–Asahi	TBS	TV–Tokyo	Fuji–TV	Other	All channels[1)]	Video	Video game	Total[2)]
.72	.51	.78	.82	.52	.79	.71	.49	.79	.73	.59	.75

1) "All channels" means the total number of times that NHK-G, NHK-E, NTV, TV Asahi, TBS, TV Tokyo, Fuji TV, or Other channel was watched.
2) "Total" is obtained by adding "All channels," the number of times video-recorded TV programs were watched, and the number of times video games were played. All coefficients are significant ($p < .01$).

Table 4 Correlations between the data recorded in the TV, video, video game viewing/usage diary and the measurement by the viewing state measurement device (for total amount of each type of media use)

NHK–G	NHK–E	NTV	TV–Asahi	TBS	TV–Tokyo	Fuji–TV	Other	All channels[1)]	Video	Video game	Total[2)]
.88**	.99***	.96***	.94***	.66	.99***	.97***	.80*	.92**	.84**	.88**	.99***

1) "All channels" means the total minutes spent on NHK-G, NHK-E, NTV, TV Asahi, TBS, TV Tokyo, Fuji TV, or Other channel was watched.
2) "Total" is obtained by adding "All channels," the minutes spent on video-recorded TV programs were watched, and on video games were played. $*p < .05$, $**p < .01$, $***p < .001$.

The obtained correlations were positive and significant, being equal to or higher than .80 for all TV channels, video-recorded TV programs, and video games, except for the amount of TBS programs watched. The correlation was .92 for the overall TV viewing and .99 for the total amount of TV viewing, video-recorded TV programs, and video games combined.

4. Discussion

At the beginning, note that the measuring device's identification accuracy of the viewer. In this study, the viewer was identified by pushing the button of the device's remote control. This identification system has been used to measure the individual TV viewing rate for such a long time, that this system is supposed to have the reliability to some extent. However, the accuracy of this system was not examined in this study. Therefore, it is necessary to consider the influence of the viewer identification error on the results of this study.

The frequency of media use was recorded as higher in the viewing/usage diary for some participants while it was measured as higher by the viewing state measurement device for other participants. Meanwhile, the amount of media use was always recorded as higher in the viewing/usage diary. This means that the mothers of the participating children recorded in the diary a larger amount of media use than actually occurred. One of the possible reasons is that, while the viewing/usage diary was entered

for each 15-minute time frame, the viewing state measurement device recorded the amount of media use every minute. Even if a participating child used the media for only a part of the 15-minute time frame, the amount of media use would be recorded as "15 minutes" in the diary. This would likely to result in recording of a larger amount of media use than actually occurred. The result of this study indicated that the total amount of TV viewing was recorded as longer in the viewing/usage diary by approximately 10 minutes per day on average. This must be kept in mind when analyzing the amount of media use recorded in the viewing/usage diary. Shortening the time interval to 10 min would improve the precision of measurements in the viewing/usage diary.

The correlations between the data entered in the viewing/usage diary and the data recorded by the viewing state measurement device were .79 for the frequency of overall media use and .92 for the total amount of media use. The correlation for the total amount of media use was equal to or higher than the correlation obtained by Anderson et al. (1985). Therefore, the accuracy of the viewing/usage diary was confirmed to be equal to or higher than the accuracy found by Anderson et al. (1985). For the amount of viewing of video-recorded TV programs and the amount of video game play, there was a positive correlation of .80 or higher between the data entered in the viewing/usage diary and the data obtained by the viewing state measurement device. Again, the validity of the viewing/usage diary was confirmed with a certain degree of confidence. However, note that compared with Anderson's research, there is a higher possibility that the calculation of the correlation coefficient in this research was influenced by extreme dates because of fewer participants.

For data on the participants' video game playing, it was noticed that the diaries contained more data than the devices had recorded. This was supposed to have occurred not only because of the units recorded in the diaries that were mentioned above but also because of the limitations of the measuring device. The measuring device could only measure the videogame device it was associated with, whereas the diaries could measure handheld game playing time.

There is a growing trend of recording TV programs on an HDD and watching them at a more convenient time instead of watching TV programs in real time (Hirata & Shigyo, 2013), and young children are starting to adopt the same trends (Anraku, 2013). Also, as in the case of TV programs, there has been a strong interest in the effect of videogame play on children's development, and many studies have been conducted on this subject as well (Anderson, Dill & Gentile, 2012). In the future, the social and academic interests to empirically examine the effects of standard TV-based visual media, including TV programs, VHS-, DVD, or HDD-recorded TV programs, and video games, on children's development will continue to grow. The findings of this study propose an effective methodology for measuring the amount of media use and therefore have an important significance.

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