MEASUREMENT OF MUNDANE TV BEHAVIORS:

REMOTE CONTROL DEVICE FLIPPING FREQUENCY

Douglas A. Ferguson

Department of Telecommunications
Bowling Green State University
Bowling Green, OH 43403
419-372-6007
FERGUSON at BGSUOPIE

Paper presented as part of a panel entitled

Refining our Measurement of Important Media Variables

for the Research Division of the

Broadcast Education Association

Las Vegas

April 1992

MEASUREMENT OF MUNDANE TV BEHAVIORS: REMOTE CONTROL DEVICE FLIPPING FREQUENCY

Abstract

A methodological issue regarding RCD use is the measurement of mundane TV behaviors. Although overt behaviors (such as media consumption and related uses and gratifications) are fairly reliable survey items, mundane behaviors such as channel changing frequency is problematic, not unlike asking respondents how many times they look at their wristwatch. An available sample of respondents (statistically similar to a cohort random telephone sample) was asked to watch television in the presence of a hidden device that recorded frequency of RCD use. This passive data was compared to their survey responses regarding channel flipping frequency. Although the actual measurement was moderately correlated with self-report, there was evidence of underestimation of channel flipping.

MEASUREMENT OF MUNDANE TV BEHAVIORS: REMOTE CONTROL DEVICE FLIPPING FREQUENCY

Behavior associated with television remote control devices (RCDs) is an important element of the study of the new media environment, no less than for cable television or videocassette recorders (VCRs). In the same time period from 1980 to 1990 when cable subscription increased from 22% of the U.S. population to 59% and VCR ownership increased from 1% to 73%, remote control penetration was increasing from 18% to 66% (Gross, 1992). RCDs have changed the way people watch television (Ainslie, 1988; Ferguson, 1992; Walker & Bellamy, 1991).

Yet, the measurement of remote control behavior is plagued by the mundane nature of the channel flipping activity. People can remember what programs they watch on a 40-channel system and they can recall how often they view videocassettes. But pressing buttons on a remote control to change channels is akin to looking at one's wristwatch. Everyone does it periodically, but few can accurately estimate how frequently. If one of the keys to audience activity is RCD activity, then measurement of RCD channel flipping is important to research on the new media environment (Webster, 1986).

Bradburn, Rips, and Shevell (1987) found that the more mundane and frequent the behavior under study is, the more unreliable the self-reports of behavior. They concluded, "Recall is not dependable. Inference, which helps fill

in details that respondents cannot recall, is at best inexact and at worst misleading" (p. 161). Reporting on "frequent, non-vivid behaviors," Blair and Burton (1987) hypothesized that respondents encounter difficulties when the number of behavioral events is large and when the question is asked as "how often" as opposed to "how many times" (p. 282).

Schwartz and Bienias (1990) chose "watching TV" as one of two mundane behaviors for which response alternatives tended to affect frequency reports. Stipp (1989) noted, "verbal reports are indeed affected by error . . . we need to look at objective measures to study channel-switching patterns." (p. 28)

This study proposes the use of a simple electronic counter to validate and better estimate the actual behavior of viewers with RCDs. Electronic measurement is often used by commercial research firms like Arbitron and A. C. Nielsen because it is usually more reliable and valid, though more expensive and artificial. With the exception of an infrequent study (e.g., Heeter, D'Alessio, Greenberg, & McVoy, 1988), nearly all social science investigations of remote control behavior have relied heavily on self-reported behavior.

The author has conducted large telephone surveys on RCD motivations and behaviors in 1990 (Ferguson, 1992) and again in 1991 (Ferguson & Perse, 1992). There has been some frustration, however, with asking people "how frequently" they use their remote control. Either the respondents misunderstand the question ("Always. I mean, I use it <u>all</u> the time. That's why I have it.") or they struggle with putting a numerical count on such a mundane behavior ("Gee, I dunno. About 20 times an hour.") Even on the telephone, one

can almost "see" the respondents rolling their eyes when asked to estimate their channel flipping frequency for a typical hour.

It has been suggested that verbal frequencies (very often, often, sometimes, rarely, never) are sufficiently accurate to use as variables in predicting behavior. If that is true, a comparison of responses to similarly constructed questions about channel flipping behavior should be correlated. Yet, some suspect this is not the case (Ferguson, 1992).

The goal of this study was to explore the correlation between actual and self-reported behavior of channel flipping, which is certainly a frequent and mundane behavior. Thus, the first research question is: How accurately do people estimate the number of times per hour that they change channels with a remote control device? The second question posed is: How accurately do people estimate the general frequency with which they change channels with a remote control device?

The construction of a device to count channel flipping was necessary to answer the first question. The device was also helpful in answering the second question, although differently worded questions also provided measurement for comparison purposes.

The Counting Device

Design Problems. There are several conceptual issues involved with designing an electronic counter in conjunction with a television remote control device. First, who is to be counted? Because this study was exploratory, it was decided to measure people viewing alone. This facilitated the collection of data

and simplified the design of a counter. Comparisons could then be made among those who reported how often they typically viewed television alone.

Second, what is it to be counted? Pressing buttons on an RCD generates streams of serial data carried on a infrared beam. A simple battery-operated infrared detector can count raw RCD activity. Radio Shack sells a GP1U52X receiver for about $4.00 (Cat. No. 276-137) that could be used to build an extremely tiny counter that records RCD activity on any television set. The problem is that 3 presses of a button on an RCD could be 3 channel changes, or 3 increases of the audio volume, or 3 fast-forward "zips" through a set of commercials. The counter would detect them equally with no regard for the particular activity. Such a "crude" device was built for this study and then discarded when it became clear that counting channel changes was more important than counting button presses. Other designs (see Application Staff, 1986) were considered and rejected.[1]

The next concern is the question of what constitutes the changing of a channel. If a person is watching channel 2 and desires to watch channel 10 but opts to "step up" rather than "leap" directly, should the counter record all 8 channel changes? Certainly not, if no substantial viewing takes place along the way. But how long does it take for the person to linger at channel 7 on the way to channel 10 before the viewing of content on the intermediate channel "counts" as a stop? Is it one second, or two seconds, or neither? A possible compromise is to design the counter to wait a moment before counting, as was done with the circuitry in this study. Another option is to use a remote control

device that requires the channel number be entered (Heeter et al., 1988), possibly by disabling the stepping buttons. This idea was not used here because it may alter the participants' normal flipping habits.

How much self-report information is advisable? Should the length of viewing be passively recorded? If so, this requires more sophisticated equipment to measure a less mundane behavior. Using the analogy of operating the brake pedal during an automobile trip, it would seem easier for a person to remember the trip's duration or the cities encountered than to remember the exact frequency of a low-level behavior like applying the brakes. Consequently, this study arbitrarily chose to rely on a laboratory setting for length of viewing data and on self-report for the exact content viewed. Clearly, this is not a cut-and-dried research decision. Higher precision may require a solution using more sophisticated equipment.

Moreover, there are aesthetic concerns associated with equipment used in the field. Although this study used a laboratory setting, the original intent of the counting device was for use in the field. It would appear to be less intrusive to place a small device atop a subject's television set, perhaps even swapping cable converter boxes, than bringing in foreboding equipment. Beyond aesthetic concern is the issue of cost.

Regardless of the method chosen, there is a trade-off. Less expensive and less intrusive devices are also less useful for gathering widely-varied amounts of data. Certainly the decision should be based on the research question or hypothesis at hand. If, as in this study, the goal is to test the ability of

respondents to report a behavior that is perhaps better remembered by an electronic counter, then the smaller, cheaper, self-contained device is the parsimonious solution.

The circuit. The hand-held remote control (U-400L) controlled a Jerrold cable channel converter (Model 400), as used by the local cable television company for its subscribers who do not have cable-ready television sets. The converter has a simple electronic tuner that modulates the selected channel onto channel 3, which is unused in Northwest Ohio. In this study, the cable converter was positioned on top of a 13-inch color television set. The audio volume for the television set was controlled manually.

The hidden electronic counter was attached to the rear of the cable converter box (CCB) in such a way that it could not be seen by the viewer. It was easily possible to have the entire unit self-contained inside the converter, but this would have prevented easy retrieval of the data. With some minor modifications to the circuitry of the counter, this problem be eliminated during future studies.

The design of such a unit is not self-evident. It is necessary to examine the CCB circuit board with an oscilloscope to find a suitable electronic pulse that coincides with a channel change. In this particular case, one of the resistors provided a signal to the counter circuit by way of an alligator clip connection. In this way it was not necessary to alter the cable converter circuitry. Indeed, the 5 volts necessary to drive the logic chip circuitry for the

counter pulse was "borrowed" from the cable converter circuit, again using the oscilloscope to find an appropriate voltage supply.

The miniature counter itself is an off-the-shelf component sold by Radio Shack (Cat. No. 277-302) for about $17. It has its own low-drain CMOS power (at 2 to 8 μA) from an ordinary AA battery. The liquid-crystal display counter and its reset are driven by closing either of two tiny normally-open switches. A subminiature doorbell-type switch was used for the reset switch. The counter switch was a generic (e.g., NPN 2222) switching transistor Q1 whose collector and emitter served as the switch terminals, with the signal input from the cable converter box connected to the base of the transistor. With each channel change at the converter, the input signal saturates the transistor base, closing the switch. The counter ground (pin 1) and the circuit ground are connected to the chassis of the CCB and the +1.5V from the counter (pin 4) is tied to the emitter of Q1.

Figure 1 about here

The other components in Figure 1 were necessary for reversing the direction of the pulse and for de-bouncing the circuit to prevent false signals. A hex inverter chip (7404) was used to convert the low-going signal from the CCB into a high-going signal to the switching transistor. The output from the inverter chip went to a pair of NAND gates (on a 7400 chip) controlled by an R-C time constant, configured as a "one-shot" monostable multivibrator (Mims,

1981, p. 102). Both chips were mounted in a small "experimenter's breadboard" available at Radio Shack and powered by the +5V from the cable converter circuit. Although jumper wires and alligator clip leads were sufficient to carry out the design for this study, a more rugged construction would be necessary to use the box in the field. The reset button is a luxury because the counter's 0 to 99,999 range is more than enough for a month's viewing. In any event, the cost should be less than $25 for each counter constructed.

Method

Procedure and Sample

A survey was conducted over a three-week period in March 1992 among an available sample of 49 college students in a broadcast research class at Bowling Green State University in Ohio. Each student viewed a single hour of television between 6 and 11 PM, alone in a small private room equipped with a 13-inch color television set, 40 television channels fed through a cable converter box (attached to a self-contained hidden counter to measure channel changing), a hand-held remote control channel changer, a comfortable couch, and a current TV Guide magazine.

The students were interviewed by the researcher about their television behaviors and attitudes immediately after leaving the room. Nearly all of the response scales were on visible 9-point scales (e.g., never/always or agree/disagree). For example, respondents indicated how "different" their hour of viewing in the special room was from a typical hour "in a more natural setting." The responses ranged from 0 (not at all different) to 8 (very different).

The mean score for this item was 2.88 (SD = 2.22) with 53.1% in the "not very different" range (0 to 2).

Of the sample, 65.3% had remote controls devices for their home television sets, compared to 77% of national homes at the time of the survey. The sample was 61.2% male and ranged in age from 19 - 34 (M = 20.63, SD = 2.25), although 83.7% of the sample were ages 19 - 21. The average respondent had completed 13.96 years of education (ranging from 13 - 18 years, SD = 0.91). College sophomores and juniors accounted for 79.6% of the sample (30.6% and 49.0% respectively).

An earlier random-digit-dialing telephone survey from March 1991 provided comparisons for responses of other students age 19 - 21. T-tests revealed very few significant differences between the convenience sample and the random sample. Broadcast majors did not differ significantly from their cohorts on affinity for television or intentionality of television viewing (Perse, 1990). With regard to ritualistic and instrumental motives for viewing (Rubin, 1984), the broadcast majors had significantly lower "pass time" viewing motives, higher "enjoyment" motives, and lower "learning from TV" motives. With regard to the number of channel changes during a typical hour yesterday, there was no significant difference between broadcast majors (M = 8.05 times, SD = 11.91) and the comparison group (M = 27.70, SD = 84.78, t = 1.77, p = .081).[2]

Media Use

Technology. Cable subscription and VCR ownership compared nearly equally with the cohort sample. Of the convenience sample, 61.2% subscribed to

cable television, almost exactly the national average at the time of the survey. Of the broadcast student sample, 65.3% had access to a VCR where they lived, somewhat less than the national average of 73% at the time of the survey. Respondents indicated how much time they spent using their VCR by answering the question, "What percentage of the time you spend watching TV is spent watching a videotape?" The responses ranged from 1 to 95% (M = 28.07, SD = 28.89). The 1991 cohort sample spent 20.02% (SD = 16.96) watching videos but there was no significant difference (t = -1.35, p = 0.19).

Exposure. Respondents indicated how many hours they viewed "yesterday morning," "yesterday afternoon," and "last night." Next, they indicated their viewing "on a typical day." Averaged numbers of hours ranged from 0 to 7.5 (M = 3.30, SD = 1.93). Among the 19 - 21 age group, viewing was higher among the broadcast students in the convenience sample (M = 3.68, SD = 1.89) than among the comparable respondents from the random group (M = 2.94, SD = 2.03, t = -2.03, p = .051).

Channel Changing

Self-report. Because of the presumed unreliability of merely asking respondents to indicate how many times per hour they changed channels, the self-report question was framed several ways.[3] First, respondents indicated on a 9-point never/always scale "how often" they used the remote control to change channels in the previous hour and during a "typical hour." Next, they provided an exact number of RCD channel changes made during the previous hour. Several questions later, the respondents were again asked about an exact

number of channel changes for a typical hour yesterday. Finally, the respondents indicated "how frequently" they changed channels while they were in the room, this time on a 9-point scale from "never" to "almost constantly." Although Blair and Burton (1987) suggest the confrontational "How did you come up with that answer?" question, it was decided that the single-classroom sample conditions might foster suspicions if the interview was too direct.

Results

The number of channel changes measured by the counter ranged from 3 to 396 times per hour ($\underline{M}$ = 107.39, $\underline{SD}$ = 82.47). Table 1 summarizes the descriptive statistics for the different measures of channel flipping.

Table 1 about here

The key self-report variable in this study centered on the answers to the question, "As closely as you can estimate, exactly how many times did you use the remote control to change channels during your hour of viewing?" The responses ranged from 1 to 300 ($\underline{M}$ = 38.45, $\underline{SD}$ = 52.97). Respondents underreported by a median factor of 3.2 times. When the presence of a hidden counter was revealed after the final respondent had reported, there was uniform surprise among the participants during debriefing. This probably indicates that the counter's existence was not generally known.

Nearly all of the respondents showed some outward sign of discomfort as they attempted to "remember" an exact number of times the channel was

changed. Many rolled their eyes, some sighed, and few seemed very convincing, on a qualitative level. The mode for self-report was 20 times (6 respondents). This answer was even given by the participant who changed channels 396 times. The largest underreporting was recorded by a respondent who reported 3 channel changes but measured 122 on the counter. The number of such outliers (or out-and-out-liars) was too large to exclude from the correlation between self-report and electronic measurement. Of the sample, 20.4% underreported by more than a factor of 8 times and 26.5% by a factor of 5 times.

Table 2 about here

Table 2 shows the correlations among the different measures of channel flipping. The electronic count was slightly more correlated with the 9-point never/always frequency report ($r = .54$, $p < .01$) than it was with the exact estimation item ($r = .52$, $p < .01$). The electronic count was even more strongly correlated with the later "how frequently" query that was anchored with "never" and "almost constantly" ($r = .63$, $p < .01$).

There was nearly no relationship at all between flipping during a typical hour yesterday and the electronic count for the hour of viewing just concluded. Overall, yesterday flipping frequency was a poor indicator, mustering at most $r = .24$ when correlated with typical flipping.

Viewing alone in more typical settings was not correlated with frequency of channel changing. There were no significant differences in flipping frequency among groups of viewers who did or did not typically view television alone.

Discussion

The results of this study support the view that channel flipping frequency is a complicated variable. The counter revealed the amount of underestimation of channel flipping, especially with regard to viewing yesterday. The correlations among the different measures of channel changing were stronger with scaled items, especially when the positive anchor was framed as "almost constantly."

These findings support the view that the use of simple electronic counters for mundane behaviors should be encouraged in media research whenever and wherever possible. Another solution is personal observation, but this is difficult in the field. At the very least, researchers must be aware that questions are not always precisely answerable, even by those who are most likely to know their own behavior.

Although there was a positive relationship between self-report and actual measurement, there was a good deal of under-reporting of channel flipping. It is important to distinguish here between prestige bias and response error. Respondents often say they view fewer hours of television because they subconsciously wish to avoid the truth. But people who report fewer instances of a mundane behavior are probably demonstrating an inability to be accurate. With truth-avoidance, there are ways to bring out the facts in a survey

situation. With accuracy-inability, there are only artificial counter-measures, such as unobtrusive devices.

It may be appropriate in future RCD research to explicitly state that every channel change "counts" -- as long as substantial viewing takes place. The determination of what is substantial is problematic. Unfortunately, there are also sex differences to consider, as men apparently make viewing judgments in much shorter time frames than women (Ferguson, 1991).

Blair and Burton (1987) noted that memory conditions change when the number of events exceeds 10. If the average number of channel changes per hour has surpassed this threshold, perhaps future research should examine shorter time frames than an hour. It might ask, "How often did (or do) you change channels in an average minute?"

Cues to memory may also be necessary to put remembered behavior in the appropriate context. Future studies might ask, "How often did (or do) you change channels during a commercial break?" One disadvantage in using this question may be prestige bias: How many of us are willing to admit watching commercials? Similar items regarding VCR fast-forwarding have produced responses heavily skewed in favor of commercial avoidance. Perhaps a more reliable means of measuring commercial avoidance is needed.

The most troubling aspect of this survey was the generally poor showing by the "yesterday" measure. In traditional surveys, there seems to be no alternative to such a question. Even though yesterday-viewing is the best

available question, it is clearly not suitable for reports on mundane behaviors such as channel flipping.

Although the available sample used in this study compared favorably with a random sample, there are limitations to generalizing from the results reported here. The findings are tentative and should be interpreted with the same caution associated with exploratory research. Future research should measure more typical television viewers in naturalistic settings. Small self-contained devices like the one used in this study should make this easier.

Future research using electronic measurement should also consider the apparent age differences in channel flipping. Heeter et al. (1988) measured 4.4 channel changes per hour among average households, a small fraction of the 100+ average channel changes found among the college students in this study.

Flipping frequency is an important variable in new media research and deserves more careful measurement. On one hand, channel changing is evidence of active program selection and reevaluation (Heeter, 1985). On the other hand, RCD channel changing reflects lack of attention to programs and less involvement with the content (Perse, 1990). Flipping frequency has not yet proven to be a reliable predictor of viewing behavior in the new media environment (Ferguson and Perse, 1992), but the nature of this shortcoming is not clear. Imprecise self-report measures may be responsible. Researchers should be aware of the different approaches to the measurement of RCD channel changing.

Notes

[1]Scott Coleman of Xanadu Consulting has designed a "computer-assisted semi-universal infrared learning remote control project" called the Xanadu Zapper. It is available from the author or by sending an electronic mail message over the Internet to coleman@f69.n233.z1.fidonet.org or by logging onto his bulletin board service telephone number 217/384-2127 (FIDOnet 1:233/69.0).

[2]The substantial disparity in means was largely due to outliers in the comparison group instead of any significant differences.

[3] In addition to the information from the electronic counter, the other two exact count measures were: "As closely as you can estimate, exactly how many times did you use the remote control to change channels during your hour of viewing?" and "During a typical hour of TV viewing yesterday, how many times did you change the channel?"

The three items measured on 9-point scales were: "During the past hour of viewing, how often did you use the remote control," "How often do you typically use the remote control when you watch TV," and "During the hour of television you just finished watching, how frequently did you change the channel?"

References

Ainslie, P. (1988, September). Confronting a nation of grazers. Channels: The business of communications, pp. 54-62.

Applications Staff, (1986, December 1). Building an infrared remote control system using off-the-shelf ICs and a few external components. Design News, pp. 103-108.

Blair, E., & Burton, S. (1987). Cognitive processes used by survey respondents to answer behavioral frequency questions. Journal of Consumer Research, 14, 280-288.

Bradburn. N. M., Rips. L. J., & Shevell, S. K. (1987). Answering autobiographical questions: the impact of memory and inference on surveys. Science, 236, 157-161.

Ferguson, D. A. (1992). Channel repertoire in the presence of remote control devices, VCRs, and cable television. Journal of Broadcasting & Electronic Media, 36, 83-91.

Ferguson, D. A. (1991, November). Gender differences in the use of remote control devices. Paper presented to the annual meeting of the Speech Communication Association, Atlanta.

Ferguson, D. A., & Perse, E. M. (1992, April). Media structure and audience influences on channel repertoire. Paper presented to the annual meeting of the Broadcast Education Association, Las Vegas.

Gross, L. S. (1992). Telecommunications: An introduction to the electronic media (4th ed.). Dubuque, IA: Wm. C. Brown.

Heeter, C. (1985). Program selection and the abundance of choice: A process model. Human Communication Research, 12, 126-152.

Heeter, C., D'Alessio, D., Greenberg, B. S., & McVoy, D. S. (1988). Cableviewing behaviors: An electronic assessment. In C. Heeter & B. S. Greenberg (Eds.), Cableviewing (pp. 51-63). Norwood, NJ: Ablex.

Mims, F. M. III. (1981). 103 projects for electronics experimenters. Blue Ridge Summit, PA: TAB Books.

Perse, E. M. (1990). Audience selectivity and involvement in the newer media environment. Communication Research, 17, 675-697.

Rubin, A. M. (1984). Ritualized and instrumental television viewing. Journal of Communication, 34(4), 67-77.

Schwartz, N., & Bienias, J. (1990). What mediates the impact of response alternatives on frequency reports of mundane behaviors? Applied Cognitive Psychology, 4, 61-72.

Stipp, H. (1989). New technologies and new viewers: A different perspective. In How Americans watch TV: A nation of grazers (pp. 24-30). New York. C. C. Publishing.

Walker, J. R., & Bellamy, R. V. (1991). Gratifications of grazing: An exploratory study of remote control use. Journalism Quarterly, 68, 422-431.

Webster, J. G. (1986). Audience behavior in the new media environment. Journal of Communication, 36(3), 77-91.

Table 1

Channel Flipping Per Hour

Descriptive Summary

	Low	High	Mean	SD
1. Exact electronic counter	3.00	396.00	107.39	82.47
2. Exact self-report tonight	1.00	300.00	38.45	52.97
3. Exact self-report yesterday	0.00	50.00	6.96	11.17
4. How frequently tonight	1.00	8.00	4.92	2.00
5. How often tonight	0.00	8.00	5.80	2.03
6. How often typically	0.00	8.00	5.63	2.13

Note. The first three items are enumerations. The last three are scale items.

Table 2

Channel Flipping Per Hour

Correlations

	1	2	3	4	5
2	.52**				
3	.02	.11			
4	.63**	.41**	.06		
5	.54**	.42**	.14	.82**	
6	.10	-.24	.24	.31*	.48**

Note. * $p < .05$ ** $p < .01$

1. Exact electronic counter
2. Exact self-report (same day)
3. Exact self-report (yesterday)
4. Scaled "how frequently" (same day)
5. Scaled "how often" (same day)
6. Scaled "how often" (typical day)

Figure 1

RCD Channel Flipping Frequency Counter