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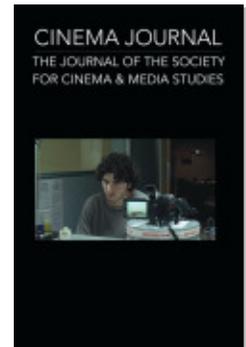
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Statistical Analysis of Television Style: What Can Numbers Tell Us about TV Editing?

by JEREMY BUTLER

Abstract: This article assays the value of splicing together humanities-based analysis of television style with digitally generated statistical data. The editing style of the situation comedy *Happy Days* (1974–1984) provides an intriguing test case for the utility of such analyses, as the show made a radical shift in its mode of production after its second season—switching from single camera to multiple camera (with a studio audience). Using data collected on Shot Logger (<http://www.shotlogger.org>), this article measures the cutting rates correlated with each mode of production and finds a statistically significant difference between the two. Additionally, the article examines the general acceleration of cutting rates on American television since 1951 and comes to a perhaps surprising conclusion about the impact of individual editors on television style.

In extending our critical methodologies, we must have at least a passing familiarity with code languages, operating systems, algorithmic thinking, and systems design. We need database literacies, algorithmic literacies, computational literacies, interface literacies. We need new hybrid practitioners: artist-theorists, programming humanists, activist-scholars; theoretical archivists, critical race coders.

—Tara McPherson¹

Happy Days was my artistic period. I wanted to make a little film each week, all one-camera shoots like a little film. Pretty! Nice! And they said, “Too soft, and too expensive.”

—Garry Marshall²

1 Tara McPherson, “US Operating Systems at Mid-Century,” in *Race after the Internet*, ed. Lisa Nakamura and Peter Chow-White (New York: Routledge, 2011), 35.

2 “*Happy Days* Are Here Again on DVD,” *Today*, August 16, 2004, http://www.today.com/id/5725890/ns/today-today_entertainment/t/happy-days-are-here-again-dvd/#.UOCDU8dGHWQ.

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Tara McPherson's clarion call for mixed-methods practitioners asks those of us in media studies to radically extend and rethink our methodological boundaries. She is not alone. Scholars within the burgeoning, amorphously defined, hybridized field of digital humanities are beginning to make significant inroads into the sometimes recalcitrant discipline of media studies. McPherson herself presented her notion of programming humanists at the 2011 SCMS conference, during a workshop tellingly titled "New Media Futures: The Digital (the Academy)."³ Miriam Posner and Jason Mittell subsequently carried the digital humanities torch further with a 2013 SCMS workshop that "staged an encounter" between the digital humanities and film and media studies.⁴ Academia of the 2010s may well be defined by digital humanities encounters, as discussion (argument?) about it has already generated a 516-page anthology on "debates in the digital humanities," in which McPherson's essay is reprinted.⁵ Moreover, the *New York Times* has announced the arrival of "Humanities 2.0" in a series of articles.⁶ Even the august National Endowment for the Humanities has opened the Office of Digital Humanities to fund start-up grants "for projects designed to explore and develop innovative uses of technology in humanities education, scholarship, and public programming."⁷ Inevitably, such projects require a blending of expertise from previously antipathetic disciplines. Many in media studies have been heretofore resistant to developing the literacies that McPherson articulates and that digital humanities demands. In our desire to distinguish humanities-based media studies from social science-based mass-communication studies, this antagonism toward digits, toward *numbers*, has commonly expressed itself in a specific resistance to statistical literacy. For decades, the border between statistical method and critical theory has been heavily barricaded. Researchers on opposite sides of this particular border collaborate very infrequently. Journals and conferences seldom accept papers outside their own research bailiwicks. There are tiresome historical reasons for these divisions and practical challenges for researchers attempting to hyphenate themselves—artist-theorists, activist-scholars, theorist-statisticians—but there are few genuine epistemological barriers to academic border crossing.

In media studies, this border crossing is not utterly unknown, as is illustrated by the infiltration of the social-scientific, ethnographic work within the British cultural studies model—research involving actual, human television viewers—into humanities strongholds such as *Screen*, the British Film Institute, and the Society for Cinema and

3 Nicholas Mirzoeff, Kathleen Fitzpatrick, Alexandra Juhasz, Wendy Chun, and Tara McPherson, "New Media Futures: The Digital (the Academy)" (workshop, Annual Meeting of the Society for Cinema and Media Studies, New Orleans, March 11, 2011).

4 Miriam Posner, Jason Mittell, Hannah Goodwin, Jasmijn Van Gorp, Jason Rhody (in absentia), and Eric Faden, "Digital Humanities and Film and Media Studies: Staging an Encounter" (workshop, Annual Meeting of the Society for Cinema and Media Studies, Chicago, March 8, 2013).

5 Tara McPherson, "Why Are the Digital Humanities So White?, or, Thinking the Histories of Race and Computation," in *Debates in the Digital Humanities*, ed. Matthew K. Gold (Minneapolis: University of Minnesota Press, 2012), 154.

6 Patricia Cohen, "Digital Keys for Unlocking the Humanities' Riches," *New York Times*, November 16, 2010, http://www.nytimes.com/2010/11/17/arts/17digital.html?_r=0.

7 "NEH Timeline," National Endowment for the Humanities, <http://www.neh.gov/about/history/timeline>. The first endowment awards were made in 2007.

Media Studies during the 1970s and 1980s.⁸ Media ethnographers and their reliance on Geertzian cultural anthropology have thus paved the way for media studies to incorporate social-scientific methods.⁹ Moreover, the field of anthropology itself provides an intriguing precedent for such border crossing: the research tradition known as mixed-methods research, which blends qualitative and quantitative methods.¹⁰ Taking a page from such mixed-methods research and aspiring to become one of McPherson's digital humanities hyphenates, the present study assesses the feasibility and usefulness of importing computer-based, quantitative, statistical methods into television critical studies.

To test statistics' applicability to television studies I have chosen to examine editing rhythms in American narrative programs. Editing analysis readily lends itself to statistical computation because it is relatively simple to measure the lengths of shots and thus convert a qualitative, stylistic component into quantitative data. Once in numeric form, data can be easily stored in a database, and any number of computations and manipulations can be carried out with them. In specific terms, I've collected shot-length data for all eighty-seven episodes from the first four seasons of the television program *Happy Days* (ABC, 1974–1984) and have made this data set available online for other researchers to examine.¹¹ *Happy Days* provides a unique test case for the impact of production mode on editing pace and rhythm. Its first two seasons were shot using the single-camera mode of production, but according to producer Garry Marshall, that mode's comic impact was considered too subtle, too "soft," to garner a large audience.¹² Consequently, the third and subsequent seasons changed to a broader comedic style and a different, less expensive mode of production: multiple-camera shooting in front of a studio audience. The division between single-camera and multiple-camera episodes does not precisely align with the program's seasons, however, as the second season has one experimental multiple-camera episode, and some of the third and fourth seasons have significant single-camera scenes within the multiple-camera episodes. Nonetheless, the shooting styles of the two modes are distinct enough that a researcher can easily detect which episodes—and which scenes within individual episodes—used each mode of production.¹³

My main hypothesis, thus, is that the mode of production used in *Happy Days* correlates with the speed of cutting rates. Statistics provides a way to test for the difference

8 One notable early practitioner of the cultural studies model was David Morley. In 1992, he chronicled the evolution of this approach with regard to TV studies in *Television, Audiences, and Cultural Studies* (London: Routledge, 1992).

9 Clifford Geertz, "Thick Description: Toward an Interpretive Theory of Culture," in *The Interpretation of Cultures: Selected Essays* (New York: Basic Books, 1973), 3–30.

10 David L. Driscoll, Afua Appiah-Yeboah, Philip Salib, and Douglas J. Rupert, "Merging Qualitative and Quantitative Data in Mixed Methods Research: How to and Why Not," *Ecological and Environmental Anthropology* 3, no. 1 (2007): 19–28.

11 For data and full-color illustrations, see Jeremy Butler, "Statistical Analysis of Television Style: What Can Numbers Tell Us about TV Editing?," Fall 2014, <http://shotlogger.org/research/happydays/>.

12 "Happy Days Are Here Again on DVD," *NBCNews.com*, August 16, 2004, <http://today.msnbc.msn.com/id/5725890/ns/today-entertainment/t/happy-days-are-here-again-dvd#.UEDVfZiStm>; quoted in Todd VanDerWerff, "Happy Days Became One of the Biggest Hits on TV by Selling Its Soul," *A.V. Club*, August 27, 2012, <http://www.avclub.com/articles/happy-days-became-one-of-the-biggest-hits-on-tv--84232>.

13 Also, the multiple-camera episodes with audiences are identified at the start by Tom Bosley announcing, "Tonight's *Happy Days* was filmed before a live audience" or "*Happy Days* is filmed before a live audience."

between the two rates and to quantify both the degree and the significance of the difference. Further, digital technology—when employed by McPherson’s programming humanists—provides new tools for calculating stylistic statistics and understanding the vagaries of moving-image style.¹⁴ And yet for scholars such as myself, trained in 1970s humanities-based film studies programs, this is a rather unnerving prospect. Does all this digital manipulation offer us anything that we could not discover while watching a movie in the dark and scratching cuneiform notes with a stylus into a clay tablet?

Statistical Analysis in Media Studies. Well before the rise of the digital humanities, there have been occasional attempts at numbers-based analyses of film. Yuri Tsvian traces these efforts all the way back to Hugo Münsterberg’s 1916 consideration of the psychological impact of editing in the silent cinema.¹⁵ Similarly, Kristin Thompson uncovered a 1926 analysis of silent-cinema editing metrics in a German technical film magazine.¹⁶ And silent filmmakers themselves were well aware of the power of shot lengths. Sergei Eisenstein’s 1929 essay “Methods of Montage” explains that the “fundamental criterion” for what he called metric montage “is the *absolute lengths* of the pieces. The pieces are joined together according to their lengths, in a formula-scheme corresponding to a measure of music. . . . Tension is obtained by the effect of mechanical acceleration by shortening the pieces while preserving the original proportions of the formula.”¹⁷ Decades after the silent-film era, Barry Salt issued a functional manifesto for the application of statistics to film style in a 1974 *Film Quarterly* essay.¹⁸ Although cinema style has remained his main preoccupation, he also offered some exploratory comments on the statistical analysis of television style in 2001.¹⁹

Despite these early efforts and Salt’s continuing advocacy, most of twentieth-century, humanities-based media studies evidenced little interest in the statistical analysis of film or television style—with no scholarly monographs (aside from Salt’s efforts) and very few journal articles devoted to the topic.²⁰ At the same time that film and the later-developing television studies were shunning statistical analysis, a significant strain

14 Nick Redfern has advocated vociferously for statistical literacy in media studies: Nick Redfern, “Statistical Literacy in Film Studies I,” *Research into Film*, March 22, 2012, <http://nickredfern.wordpress.com/2012/03/22/statistical-literacy-in-film-studies-i/>.

15 Hugo Münsterberg, *The Photoplay: A Psychological Study* (New York, London: D. Appleton, 1916), 45–46, cited in Yuri Tsvian, “Question One: Median or Mean?,” *Cinematics*, July 24, 2012, http://www.cinematics.lv/devon_statistics.php.

16 Georg Otto Stindt discusses average shot lengths in American and German silent films: “Bildschnitt,” *Die Filmtechnik* 2, no. 7 (April 3, 1926): 129, cited in Kristin Thompson, *Herr Lubitsch Goes to Hollywood: German and American Film after World War I* (Amsterdam: Amsterdam University Press, 2005), 117.

17 This can be observed in Eisenstein’s own work, such as *October* (1927). Sergei Eisenstein, “Methods of Montage,” in *Film Form: Essays in Film Theory*, ed. and trans. Jay Leyda (New York: Harcourt, Brace & World, 1949), 72.

18 Barry Salt, “Statistical Style Analysis of Motion Pictures,” *Film Quarterly* 28, no. 1 (Fall 1974): 13–22.

19 Barry Salt, “Practical Film Theory and Its Application to TV Series Dramas,” *Journal of Media Practice* 2, no. 2 (2001): 98–113, reprinted in Barry Salt, *Moving into Pictures: More on Film History, Style, and Analysis* (London: Starword, 2006).

20 Still, there have been persistent efforts in this area. David Bordwell and Kristin Thompson, the two most influential stylisticians in film studies, often refer to average shot lengths in their analyses of editing. One anthology has appeared which collates work in this area: Michael Ross, Manfred Grauer, and Bernd Freisleben, eds., *Digital Tools in Media Studies: Analysis and Research, An Overview* (Bielefeld, Germany: Transcript Verlag, 2009).

of media analysis was embracing it. Within the US “mass communication” research tradition, statistics became the dominant method for measuring media effects in post–World War II academe.²¹ To this day, mass-communication researchers rely on surveys and physiological measuring devices (tracking heart rate, eye movement, and so on) to gather data on media’s impact on their users. Yet another mass-communication application of statistics is “content analysis,” an approach that counts the number of incidences of certain elements within a media text. Those counts may be put to descriptive use or may have statistical calculations run on them to test hypotheses about differences among texts—across genres or over time, for example.²² Furthermore, academic researchers are not the only ones employing the statistical analysis of media. Outside academe, media industries generate vast mountains of statistical data based on film box-office results and Nielsen television ratings. And before films, commercials, and TV programs are aired, they go through rigorous, statistically based market research. Thus, digitally grounded statistical methods are embraced in both academic mass-communication research and media industries but not in humanities-based film or television studies.

As the twenty-first century began, however, fresh interest in the statistical analysis of film and television began to evolve within critical studies. These new scholarly enterprises were not rooted in box-office numbers, TV ratings, effects measurement, or content analysis. Rather, they directly addressed the significance of film and television style, emphasizing form rather than content or effect, and they blossomed from a fertile digital humanities mixture of easily accessible digital video, applications for manipulating that video, and do-it-yourself software coding. In recent years, several of McPherson’s programming humanists have been drawn to the statistical analysis of visual and sound style. The Institute for Research and Innovation of the Centre Pompidou created *Lignes de Temps* (Time Lines), software that facilitates shot-by-shot analysis of films (Figure 1).²³ Luminaries of French film scholarship such as Raymond Bellour and Jean-Louis Comolli have participated in the project. Similarly, the Cinemetrics project, developed by Yuri Tsivian and Gunārs Cīvāns, has attracted an international cadre of film and TV scholars and statisticians—including Salt (Figure 2).²⁴ And EDIT2000 software calculates statistics and draws graphs based on the edit decision lists generated by digital video-editing software (Figure 3).²⁵ Looking beyond these programming humanists, we might well find researchers in information science who also work on video

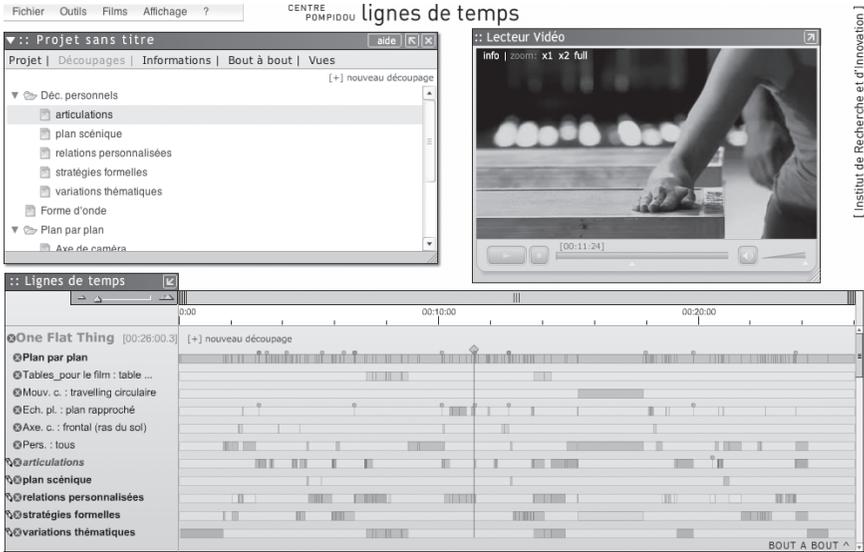
21 See, for example, Jennings Bryant and Mary Beth Oliver, eds., *Media Effects: Advances in Theory and Research*, 3rd ed. (New York: Routledge, 2009). For additional information, see Jeremy G. Butler, “Appendix II: Mass Communication Research,” in *Television: Critical Methods and Applications* (New York: Routledge, 2012), 435–444.

22 Examples of content analyses include Nancy Signorielli, “Prime-Time Violence 1993–2001: Has the Picture Really Changed?,” *Journal of Broadcasting and Electronic Media* 47, no. 1 (March 2003): 36–57; Mary Cassata, Thomas Skill, and Samuel O. Boadu, “Life and Death in the Daytime Television Serial: A Content Analysis,” in *Life on Daytime Television: Tuning-In American Serial Drama*, ed. Mary Cassata and Thomas Skill (Norwood, NJ: Ablex, 1983), 23–36. The latter is critiqued in Robert C. Allen, *Speaking of Soap Operas* (Chapel Hill: University of North Carolina Press, 1985), 36–38.

23 “Lignes de Temps,” Institute for Research and Innovation, May 6, 2010, <http://www.iri.centrepompidou.fr/outils/lignes-de-temps-2/>.

24 “Movie Measurement and Study Tool Database,” *Cinemetrics*, November 2005, <http://www.cinemetrics.lv>.

25 Data 2000, “EDIT2000 0.2.2,” 2010, <http://www.data2000.no/EDIT2000/>.



[Institut de Recherche et d'Innovation]

Figure 1. Lignes de Temps facilitates detailed, shot-by-shot analysis of films—allowing annotations organized around a timeline (Institute of Research and Innovation of the Centre Pompidou, 2006).

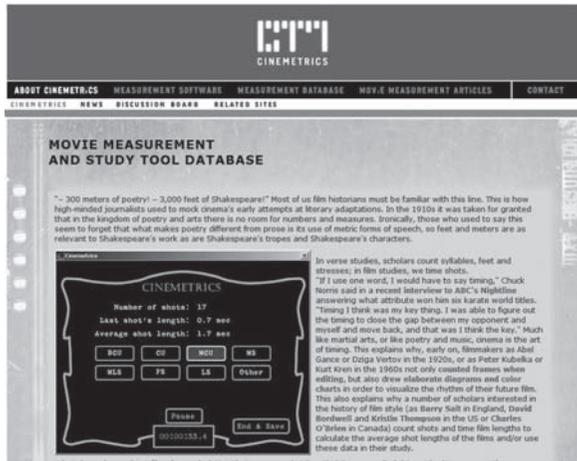


Figure 2. Cinemetrics crowdsources the collection of editing data by distributing its own shot-measurement software and soliciting individuals to contribute data on films and TV programs (Cinemetrics, 2005).

style. The latter are often obsessed with identifying stylistic video elements to support the archiving and indexing of moving images. To index video and attach metadata to it for search applications, for example, researchers first need to be able to mark where shots begin and end, or, in information science terms, they must detect “shot boundaries” to situate the location of those metadata. One such academic project

has been part of the research center Media Upheavals, which was funded by the German Research Foundation. In this context, Ralph Ewerth and his colleagues have developed the software tool kit Videana (Figure 4) for automatic video content analysis.²⁶ Fully automatic shot-boundary detection (SBD) has become the holy grail of

26 For more on Videana, see Ralph Ewerth, Markus Mühling, Thilo Stadelmann, Julinda Gllavata, Manfred Grauer, and Bernd Freisleben, “Videana: A Software Toolkit for Scientific Film Studies,” in *Digital Tools in Media Studies: Analysis and Research, an Overview*, ed. Michael Ross, Manfred Grauer, and Bernd Freisleben (Bielefeld, Germany: Transcript-Verlag, 2009), 101–116.

video indexing—resulting in numerous competitions and well-funded, proprietary systems.²⁷ So far, no one has created SBD software with a 100 percent accuracy rate, which is why all the projects mentioned here still rely on human input to identify shot changes.

These projects within film studies and information sciences inspired my own entry into software-aided statistical-style analysis—leading me to create Shot Logger, an online digital humanities application for measuring shot lengths (located at ShotLogger.org; see Figure 5).²⁸ As of this writing, Shot Logger contains shot-length data for 910 instances drawn from 232 films and television programs. Its software, which I coded in PHP and MySQL, relies on video-frame captures created as JPEG files by the VLC Media Player.²⁹

Each of the approximately 250,000 frames entered into Shot Logger has time-code data embedded in its file name, indicating the starting times of every shot in the analyzed films and TV episodes. Using these starting-time data, we can easily calculate both the length of each shot and identify where it occurs in the video text, thereby detecting shot boundaries. The frames must be captured manually, while watching the video, but Shot Logger can then use them to automatically generate descriptive statistics for a video

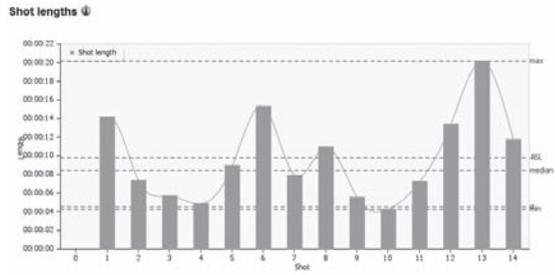


Figure 3. EDIT2000 converts the edit decision lists generated by digital video editors into statistical charts and other formats, such as this chart showing the lengths of fourteen shots in a short sequence and calculating their average shot length and median shot length (EDIT2000, 2008).

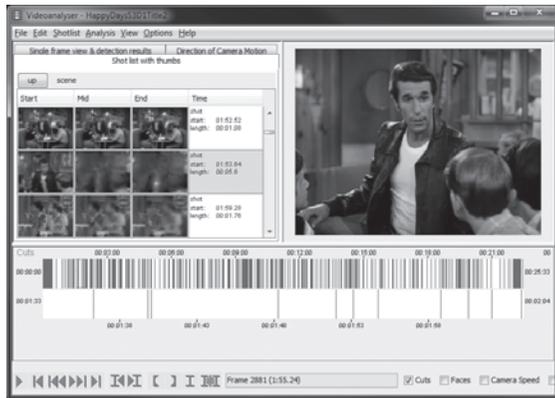


Figure 4. Videana attempts to automate the analysis of shot lengths and the visual aspects of individual shots. Among other data, it generates a shot list, with thumbnail images, that identifies when each shot begins and how long it lasts (Media Upheavals, University of Siegen, Germany, 2007).

27 A recent overview of the TRECvid shot-boundary exercise may be found in Alan F. Smeaton, Paul Over, and Aiden R. Doherty, "Video Shot Boundary Detection: Seven Years of TRECvid Activity," *Computer Vision and Image Understanding* 114 (2010): 411–418.

28 Jeremy Butler, "Analyzing Visual Style," *Shot Logger*, 2014, <http://shotlogger.org>.

29 PHP is a scripting language designed for Web development—see PHP Group, "PHP: Hypertext Preprocessor," 2014, <http://www.php.net>. MySQL is a database language and server software—see Oracle Corporation, "MySQL," 2014, <http://www.mysql.com>. VLC media player is a multimedia player—see VideoLAN, "VLC Media Player," 2014, <http://www.videolan.org/vlc/index.html>.

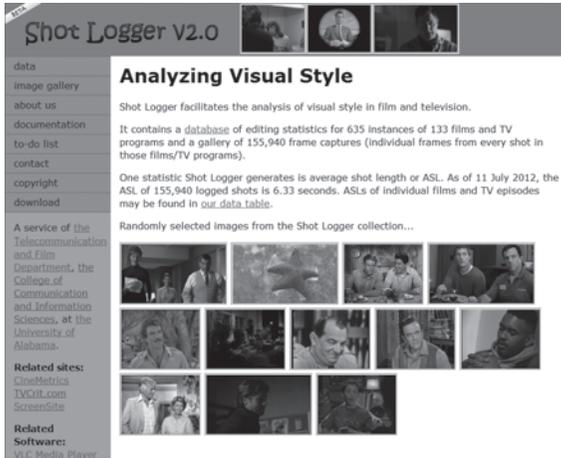


Figure 5. Shot Logger processes frame captures to automate shot-length measurement in films and TV programs (Jeremy Butler, 2007).

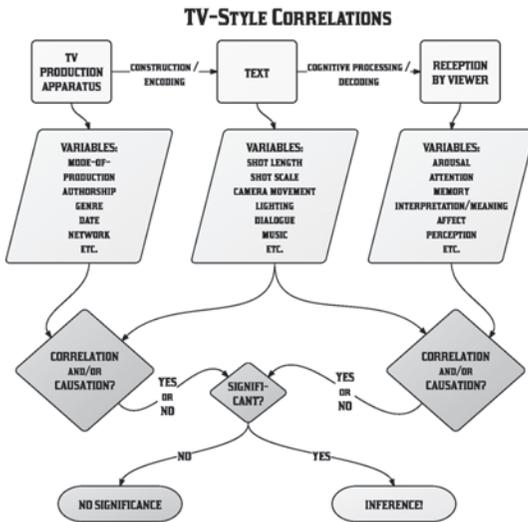


Figure 6. A highly simplified flowchart of television’s production and reception illuminates how statistical correlations can be used to understand correlations among these processes.

the technology used to distribute, transmit, and display the television text. And “reception by viewer” refers to the activity of human viewers, the audience, as they respond to the text and cognitively process or “decode” it. For purposes of illustration, I have greatly simplified Stuart Hall’s frequently invoked encoding and decoding process, but doing so allows me to cluster statistical variables in three locations:

text. For example, Table 1 contains descriptive statistics for the *Happy Days* pilot, “All the Way.”³⁰

Whether researchers code their own software or take a number clicker to a film screening and count shots, the first step of any statistical analysis is a descriptive one, as we can see in Table 1. However, descriptive statistics are just an unhelpful jumble of numbers until they *correlate* one variable with another.

Figure 6 illustrates how statistical correlation functions in television analysis, although the same principles apply in the cinema. This rudimentary diagram presents the basic processes of television production and reception horizontally across the top. The “TV production apparatus” refers to *everything and everyone* that contributes to the construction or “encoding” of that text: financial institutions, the Federal Communications Commission, networks, production companies, scriptwriters, directors, cinematographers, actors—even

30 For the frame captures from the *Happy Days* episode “All the Way,” see Shot Logger, March 3, 2011, <http://shotlogger.org/TitleListDetail.php?recordID=449>.