By Lloyd R. Bostian

How Active, Passive and Nominal Styles Affect Readability of Science Writing

Nominal style, substituting nouns for verbs, adversely affects reader interest and reading speed.

► In the classroom, the journalism teacher advocates a concise, clear, verbal style. But when the teacher prepares a technical journal article, the style is often complex and nominal. Why the difference?

We know that style influences comprehension; readability formulas are predicated on that fact. Journalists and journalism teachers advocate a verbal, active writing style, with most verbs in active voice, and they assume this style is effective.

Contrarily, we judge passive voice writing to be less desirable because it uses more words and because the subject of the sentence is not the agent (actor). Passive voice either eliminates the actor or places the actor at the end of the sentence. In a passive sentence, the object of the action is the subject of the sentence.

Nominal prose is potentially dull because it substitutes nouns for verbs, and we know that a high noun-to-verb ratio produces dull copy. In nominal style, Latin-root nouns contain verbs and the only verbs are weak, primarily forms of "to be." For example, this sentence is nominal: "The identification of writing faults is his goal." The real action of this sentence is the verb "identify" which is hidden in the noun identification. In active form, the sentence would read "His goal is to identify writing faults," or, "He wishes to identify writing faults."

How good is our advice to use an active, verbal style and to shun passive and nominal? Do passive and nominal styles slow the reader? Are they more difficult to comprehend? Are passive and nominal styles judged as interesting and easy to read as active writing? This research examines these questions. Science writing is the chosen test vehicle because research reports often embrace passive and nominal styles. Would readers find technical journals more interesting and comprehensible if active style predominated?

We seem confident in advocating an active style, partly because the best journalists use it. Sears and Bourland found that major novelists with journalism backgrounds used significantly more active voice and action verbs than did equally famous authors who were not journalists.[1]

Conversely, we know that passive voice is a fixture in scientific writing. Svartvik counted passives in eight types of communication.[2] He found 23 passive verbs per 1000 words in science texts, but only 3 passives per 1000 words in television commercials. Similarly, Funkhouser measured the percentage of "activity words" in a range of publications, finding a much higher percentage in popular magazines than in technical journals.[3]

Many researchers have measured recall or comprehension of active and passive sentences. DeVito found that active sen-

[1] Donald A. Sears and Margaret Bourland, "Journalism Makes the Style." *Journalism Quarterly*, 47:504-509 (1970).

[2] Jan Svartvik, *On Voice in the English Verb* (The Hague: Mouton & Co. 1966).

[3] G. Ray Funkhouser, "Levels of Science Writing in Public Information Sources," 46:721-726 (1969).

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tences were better than were passives.[4] Passive sentences were longer than actives, but readability formulas DeVito applied didn't produce significant differences. Maurer tested effects of verb voice on retention of material presented via four newspaper articles.[5] He found no significant difference in information retained, although retention was slightly higher for active voice versions than for passive. He found no difference in readability. He also applied a semantic differential to the versions and found readers didn't evaluate the active passages as significantly more active than they rated the passives. However, Brown, in using a semantic differential to test connotative meaning of active and passive sentences, found active voice sentences connoted significantly more action and strength than did passive versions.

Other research shows that the relative importance of the subject and object of the sentence determines whether active is better than passive.[7] If the idea presented is such that the reader expects the object to be first, then passive may be as comprehensible as active. Also, if readers attach more significance to the object, then passive is as comprehensible. However, these things being equal, passive is not as comprehensible as active. The bulk of previous research shows readers find active easier to comprehend and recall.

Obviously, experience with processing passive voice can mute the potential negative effects. We expect, then, that scientists and government officials, who are greatly accustomed to passive voice, might comprehend passives almost as well as actives. University students, the test group in this research, also would be more accustomed to passives than would the general public.

Nominal style has not been researched as extensively as has passive voice, partly because, as Wells points out, it is not a pure dimension of style.[8] In changing verbal to nominal style, the effect isn't simply that of changing a verb to a noun, because other aspects of style and sentence structure automatically change with the verb-to-noun change. Coleman says that to change a nominal to a verbal, i.e. to change the word "inclusion" to "include," makes tense, voice, aspect and mood more specific. He judges that "much of the abstractness in scientific writing must be attributed to a reason no more profound than its tradition against I and We . . . avoiding them frequently causes writers to substitute a nominal for its active verb form."[9]

Wells suggests that scientists favor the indefiniteness of nominal—it is easy to write, is impersonal, is not conversational (sets writer apart from reader), and is equivocal (less definite in person, number and tense). But scientists aren't the only professionals who value nominal style. Hake and Williams found that English composition teachers graded essays written in nominal style higher than the clearer, more direct verbal essays.[10] Graders overwhelmingly preferred the nominal version to the verbal ones, and high school teachers valued the nominal higher than did the college teachers.

Hake and Williams concluded that the least sophisticated teachers were the most impressed with what appeared to be verbal sophistication—nominal style. Their judgments seemed to be that profound style

[4] J.A. DeVito, "Some Psycholinguistic Aspects of Active and Passive Sentences," *Quarterly Journal of Speech*, 55:401-406 (1969).

[5] Leonard Maurer, "The Effects of Verb Voice on Connotative Meaning and Retention of Material Presented in Four Newspaper Articles," unpublished research paper, Department of Agricultural Journalism, University of Wisconsin-Madison, 1963.

[6] Marion R. Brown, unpublished research, Department of Agricultural Journalism, University of Wisconsin-Madison, 1961.

[7] John B. Carroll, "Process & Content in Psycholinguistics," *Current Trends in Psychology* (Pittsburgh: University of Pittsburgh Press, 1958); Herbert H. Clark, "Some Structural Properties of Simple Active and Passive Sentences," *Journal of Verbal Learning and Verbal Behavior*, 4:365-270 (1965); Peter Herriot, "The Comprehension of Active and Passive Sentences as a Function of Pragmatic Expectations," *Journal of Verbal Learning and Verbal Behavior*, 8:166-169 (1969); Carlton T. James, Theme and Imagery in the Recall of Active and Passive Sentences, *Journal of Verbal Learning and Verbal Behavior* 11:205-211 (1972); P.N. Johnson-Laird, "The Interpretation of the Passive Voice," *Quarterly Journal of Experimental Psychology*, 20:69-73 (1968).

[8] Rulon Wells, "Nominal and Verbal Style" in T.A. Sebeok, ed., *Style in Language* (Cambridge: M.I.T. Press, 1960) 213-220.

[9] Edmund B. Coleman, "Developing a Technology of Written Instruction: Some Determinants of the Complexity of Prose," in E.Z. Tothkopf and P.E. Johnson, eds., *Verbal Learning Research and the Technology of Written Instruction* (New York: Teachers College Press, Columbia University 1971), pp. 155-204.

[10] Rosemary L. Hake and Joseph M. Williams, "Style and Its Consequences: Do as I Do, Not as I Say," *College English*, 43:433-451 (1981).

equals profound content and intellectual quality. Even through teachers found more errors in the nominal papers, they graded them higher. Hake and Williams, in a related experiment, tested whether nominal is more difficult to process than verbal. They gave papers to 70 typists of different abilities to see if typing speed and errors would differ. High school typists typed the verbal 20% faster with 22% fewer errors than the nominal. Professional typists typed verbal 8% faster with no differences in errors. Thus the nominal is more difficult to process cognitively, and is most difficult for persons with less experience in processing nominal style.

Coleman concludes that prose having a low proportion of verbs carries a heavy load of superfluous complexity, hence the processing difficulty. He found a negative correlation of -.76 between nominal style and cloze scores. Coleman also measured recall of material using active verbs versus nominalization.[11] He found active verb sentences better recalled than sentences with abstract nouns nominalized from a verb. Other researchers have found that nominalization produces a style that is less active, more monotonous, more abstract, more difficult to recall, with more prepositions, and with longer, more complicated sentences.[12]

We expect nominal to be read slower, with less comprehension, and to be perceived as less interesting and less easy to read, than either of the verbal styles, active or passive.

Comprehension, reading speed, perceived interest and perceived ease of reading were selected as measures of reader response to the styles because they have been traditional correlates with readability. Although comprehension and reading speed are most used, validity of all four measures has been studied and reported.[13]

Hypotheses

1) *Reading speed* will be reduced significantly for passive and nominal passages compared to active passages. Nominal will take longer to read than passive, but not significantly so.

2) *Comprehension* will be reduced significantly for passive and nominal styles. Nominal will be less well comprehended than passive, but not significantly so.

3) Readers of the active style will report significantly greater *interest* in the subject matter than will readers of the passive and nominal styles. Nominal will be judged less interesting than passive, but not significantly so.

4) The active passage will be judged significantly *easier to read* than will passive or nominal. Passive will be judged easier to read than nominal but not significantly so.

Method

I selected two research articles and rewrote them in the three styles. An article concerning injuries to runners (running) was based on material from a sports medicine journal. The second article, concerning alfalfa's need for sulfur (soils) originally appeared in a soil-science journal. I selected these two topics for subject-matter comparisons, expecting higher interest in the running topic than the soils topic.

I first prepared the active-voice article for each topic, making certain that all transitive verbs were active. Then I rewrote the active version, changing transitive verbs to passive, except in a few cases where more than one passive verb in the sentence would have made wording too awkward. More than 90% of the transitive verbs were passive. Finally, I reduced the active version to nominal style by substituting nouns or gerunds for most verbs.

To illustrate the three styles, here are the

[11] E.B. Coleman, "The Comprehensibility of Several Grammatical Transformations," *Journal of Applied Psychology*, 48:186-190 (1964); same author, "Learning of Prose Written in Four Grammatical Transformations," *Journal of Applied Psychology*, 49:332-341 (1965).

[12] John B. Carroll, "Vectors of Prose Style" in T.A. Sebeok, *op. cit.*, p. 286; V.M. Holmes and J. Langford, "Comprehension and Recall of Abstract and Concrete Sentences," *Journal of Verbal Learning and Verbal Behavior*, 15:559-566 (1976); Hilary Klee and Michael W. Eysenck, "Comprehension of Abstract and Concrete Sentences," *Journal of Verbal Learning and Verbal Behavior*, 12:522-529 (1973); Marc Marschark and Allan Paivio, "Integrative Processing of Concrete and Abstract Sentences," *Journal of Verbal Learning and Verbal Behavior*, 16:217-231 (1977).

[13] George R. Klare, *The Measurement of Readability* (Ames: Iowa State University Press, 1963).

TABLE 1

Stylistic Comparison of Test Materials

	Running	Soils	Average
Paragraphs in samples	12	12	12
Sentences in samples	43	40	41.5
Words in samples			
active	561	561	561
passive	663	640	651.5
nominal	696	642	669
Sentence Length in words			
active	13.0	14.0	13.5
passive	15.4	16.0	15.7
nominal	16.2	16.1	16.15
Syllables per 100 words			
active	185	153	169
passive	192	152	172
nominal	176	159	167.5
Flesch Scores			
active	7.24	5.85	6.54
passive	7.73	5.96	6.84
nominal	7.07	6.28	6.67

lead sentences taken from the running article:

> ACTIVE—Researchers have found that more and more Americans are running to achieve physical fitness.
>
> PASSIVE—It has been found by researchers that more and more Americans are running to achieve physical fitness.
>
> NOMINAL—The finding of researchers is that more and more Americans are running for the achievement of physical fitness.

We tested the three styles on 266 University of Wisconsin-Madison students. The six versions (three styles x two topics) were randomly distributed with no indication that students had different versions. Testing was divided between two classes to facilitate the comprehension test.

To determine reading speed (amount read), we instructed students to read at a normal pace, stopping them after 2 minutes 10 seconds. Most students read 60-70% of the material in this time, with only 1% reading all. After the timed reading, we instructed students to finish reading. The comprehension test (10 fact-retention questions) followed. We did not inform students they would be questioned about the material. Finally, students rated their article as to how familiar they were with the topic, how interesting the material was to read, and how easy it was to read. We included the familiarity rating to act as a control.

Stylistic Comparisons. Before testing these versions on the readers, we analyzed the three styles. (Table 1) We began with equal length active passages of 561 words, but the transformations to passive and nominal styles increased the total words to 651 and 669 respectively. Thus the passive versions are 16% longer than the actives, and the nominals are 19% longer—increases entirely due to the simple verbal transformations.

Active sentences average 13.5 words, passive 15.7 and nominal 16.2. Syllable count per 100 words does not differ, with active averaging 169, passive 172 and nominal 168.

The subject-matter versions differ in style. Although sentence length in words is similar (14.9 for running and 15.3 for soils), the syllable count per 100 words is substantially different. Running averages 184 syllables, soils 155; the running version has more technical names repeated. The

TABLE 2

Reading Speed and Comprehension, Perceived Familiarity, Reading Ease and Interest for Two Versions of Active, Passive and Nominal Styles

	Active	Passive	Nominal	
Reading Speed (sentences read)				
running	32.02 (44)	29.68 (44)	29.02 (43)	F=4.24 df=130 P .05
soils	31.05 (44)	28.84 (45)	28.62 (45)	F=3.87 df=133 P .05
total	31.53 (88)	29.26 (89)	28.82 (89)	F=6.17 df=264 P .05
Comprehension (mean correct answers in 10 qs.)				
running	6.55 (44)	6.61 (44)	5.96 (43)	n.s.
soils	5.16 (44)	5.02 (46)	5.31 (45)	n.s.
total	5.85 (88)	5.87 (90)	5.63 (88)	n.s.
Perceived Interest (mean on scale of 1-10)				
running	6.68 (44)	6.00 (44)	6.19 (43)	n.s.
soils	5.36 (44)	4.67 (46)	3.78 (45)	F=5.25 df=134 P .05
total	6.02 (88)	5.32 (90)	4.95 (88)	F=4.87 df=265 P .05
Perceived Reading Ease (mean on scale of 1-10)				
running	6.52 (44)	6.32 (44)	5.72 (43)	n.s.
soils	5.82 (44)	5.43 (46)	5.40 (45)	n.s.
total	6.17 (88)	5.87 (90)	5.56 (88)	n.s.
Perceived Familiarity (mean on scale of 1-10)				
running	5.55 (44)	6.02 (44)	5.63 (43)	n.s.
soils	5.14 (44)	3.91 (46)	3.96 (45)	F=3.46 df=134 P .05
total	5.34 (88)	4.94 (90)	4.77 (88)	n.s.

average sentence length of 15.1 words and syllable count of 169.5 for the six versions produced a Flesch Reading Ease score of 6.68—in the quality range. Although the sentence length is comparable to that of popular material, the syllable count is normal for scientific material.

Results

Active passages were read significantly faster than passive and nominal styles for both topics. (See Table 2). Although *reading speed* is not significantly different between passive and nominal, nominal is read slower than passive. Thus, H1 is accepted.

We hypothesized lower *comprehension* scores for passive and nominal passages, however differences are insignificant. We provide three conjectures as to why active did not produce superior comprehension.

First, our subjects were university students with considerable experience in processing passive and nominal styles. We would expect greater comprehension differences for subjects who have less familiarity with passive and nominal styles. In fact, in a related experiment, Sweeney found highly significant differences among high school students in their comprehension of the running topic version—with passive and nominal styles less comprehensible than active, especially nominal.[14]

A second explanation for non-

[14] Patrick J. Sweeney, "How Writing Styles—Active, Passive
(Footnote continued)

significant differences in comprehension lies in our method. Instead of testing comprehension immediately after the timed reading, we permitted slow readers to take as much time as needed to finish the passages. This could have washed out effects evident at normal reading speed.

Finally, we asked simple fact-retention questions; none of our questions required reasoning or analysis. Nominal would be more likely to show comprehension effects via questions that require conceptual manipulations.

Reader interest was significantly higher for the active style. We accept H_3. The soils version accounts for the significance with the nominal passage perceived as especially uninteresting. Actually, neither passage was rated very interesting on a 1-10 scale. We expected this, since both passages are technical material based on research. The range of interest is substantial, however, from the 6.68 active-running version, down to the 3.78 nominal-soils version.

Perceived *reading ease* scores are similar for the three styles. However, although differences are not significant, results are in the direction hypothesized—active is judged slightly easier to read, passive next and nominal last.

In determining the *effects of subject matter,* we assumed that the soils topic, being conceptually more difficult, less familiar, and inherently less interesting, would score lower on all measures than the more popular running topic. The results show this to be true. The running topic was read faster, comprehended better, and judged more interesting and easier to read than was the soils topic for all styles—active, passive and nominal. This is true even though the running versions have higher (more difficult) Flesch scores. This shows the power of subject matter interest compared to that of readability scores.

Because we distributed versions randomly to test subjects, we expected no difference in *familiarity* for running and soils versions. We selected this as a control variable. However, readers judged the passive and nominal versions of the soils topic to be significantly less familiar. We conclude that an active style enhances the perception of familiarity of an inherently dull topic.

Conclusions

The results make it clear that readers prefer an active style—they judge it to be more interesting and they can read it significantly faster. Nominal style is clearly the poorest choice of the three styles—it ranks below active and passive in every measure, although often not significantly.

We suspect the inadequacies of passive and nominal styles would have even greater impact in science writing for the general public. Our tests are conservative—we selected scientific material of inherently low interest and tested it with persons experienced in decoding passive and nominal styles.

Furthermore, the average sentence length of 15 words in test passages is 5 to 10 words below the norm for science writing. Previous research shows that nominalization adds complexity, so longer sentences in nominal style would likely be more complex and reduce comprehension further. Similarly, our comprehension test was conservative in asking only fact-retention questions and not the more difficult analytical or reasoning questions.

Active voice is especially advantageous when subject matter is dull or unfamiliar. The combination of unfamiliar, low-interest material and nominal style is disastrous. We can predict that science writing will appear dull and be poorly read if its style is nominal.

Williams argues that we implicitly (and mistakenly) equate complex style with mature style.[15] He says passive and nominal are poor style choices because "When the subject does not express the agent and the verb does not express what the agent does, then the syntactic and semantic structures of a sentence become even more complex." The clearest style uses a grammatical structure that reflects the semantic structure. Bad scientific prose is bad to the degree that it departs from an agent-action

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and Nominal Affect a Reader's Speed and Comprehension," unpublished research paper, Department of Agricultural Journalism, University of Wisconsin-Madison, 1982.

[15] Joseph M. Williams, "Defining Complexity," *College English,* 40:595-609 (1979).

per as more fair, in general, than newspapers of the larger society. The finding is particularly strong for residents of a community who read only their community's newspaper.

Secondly, the findings suggest that in future analyses of communication variables in community studies, media mix should be regarded as an important characteristic of a community. Residents of a suburban community may work, shop or spend their leisure time in a metropolitan community which reinforces the orientation to that community. The cosmopolitan orientation and media mix, in turn, affect perceptions of local newspaper fairness.

Controlling for media mix, the structural model is useful in explaining differences in perceptions of newspaper fairness. Localites in any given community tend to be supportive of local institutions, or in this case, local newspapers. Among cosmopolites, this allegiance takes a different form. Because these readers are oriented to the larger community, and have interests in common with members of the metropolitan area, they find the media of the larger society more responsive to those interests, while their own local media responsive only to the relatively homogeneous interests of the smaller community. Thus, these cosmopolites find their expectations being met less in the local paper and attribute this to the local paper's lack of fairness relative to metropolitan newspapers which tend to be more responsive to diverse groups and interests.

Finally, newspapers are said to mirror conditions in society, and this notion is strongly supported by the findings of this study. The issue here is not whether the newspapers accurately reflect *events* in the two communities, but that they reflect the structural diversity of each community, which in turn affects community residents' perceptions of newspaper fairness.

Future research should take into account the small proportion of single-community newspaper readers in suburban communities, a finding which reflects the dependency of the suburban community on the metropolitan area. To Stillwater residents, St. Paul is the "larger community," the hub of resources in terms of work, culture and political power. Analogously, St. Paul is also the "larger community" in terms of media. Newspapers in general, for many Stillwater residents, are local papers for St. Paul residents. Many Stillwater residents work in St. Paul and subscribe to a St. Paul paper, but few St. Paul residents travel to Stillwater to work and just as few subscribe to a Stillwater paper. While 94% of the respondents in Stillwater, the suburban community, show a multi-community orientation by reading two or more metropolitan newspapers, only 23% of the respondents in St. Paul, the hub community, exhibit a multi-community orientation. The subordinate relationship that exists politically and culturally between the two cities is mirrored in the media and fairness-perception differences between the two communities.

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tend to perceive their community newspa-

style, Williams believes. This research backs his contention.

Wells says researchers prefer the nominal style because it is easy to write, is impersonal, aloof and less definite. Williams says they believe it reflects verbal sophistication. Certainly nominal style is a natural product of our system of higher education. Nevertheless, no matter how much and why we value it, nominal style is a poor choice for effective communication.