LITERATURE REVIEW

THE OBSCURITY OF YAWNING

FLAVIO CORNEL BLASATO

ALGOMA UNIVERSITY

The Obscurity Of Yawning

The implications surrounding yawning have been attempted to be solved after many years of scarce study but only in vain. Because the study of yawning has been intermittently ventured throughout history seldomly resulting into concrete facts shows in present interpretation that yawning is relatively an unrevealed topic that needs to be polished. This review of relevant literature will permit a broader understanding of the development and progression of yawning and its associated phenomena. Also, the background will form as a foundation for the present study that is currently under way.

Research in the interest of yawning dates back to Hippocrates, who was concerned with finding the causes of this ambiguous problem (Barbizet, 1958). Following the genesis of the interest in yawning, many authors have dwelled with either certain aspects or the whole problem of yawning, documented as early as in the 17th century with numerous opinions and beliefs of its onset. Though opinions are respected to a certain

degree, factual evidence of the authors findings was eminently missing.

The term "yawning" is derived from the old English verb "ganien" which in historical times referred to an "opening " in the sense of "to gape". More traditional usage has accepted yawning to be synonymous with "pandiculation" (Oxford Dictionary, 1939). Taken from the Latin meaning "to stretch oneself", one can see the harmony between the two terms.

Results within a science readily originate from observing animal studies for the purpose of applying that knowledge for human understanding. Because there have been relatively few empirical or theoretical studies of yawning in animal species, precise knowledge of yawning has been neglected (Baenninger, 1987). But Ronald Baenninger of Temple University sought to compare aspects of yawning in Betta Splendens, Homo Sapiens, Panthera Leo, and Papio Sphinx. Within the lower classes of species excluding humans, what was found interesting was to what purpose the yawns had served. Yawning occurred most often when physical contact with the same conspecifics ensued, whereas in the human situation, absence of people proved to induce

more yawning in lone individuals (Baenninger, 1987). In regarding specific ties with studies of animal behaviourism, Baenninger concluded that yawning occurred less frequently in the absence of social, cognitive, and physical stimulation, but the reverse operates within our species.

Theories attempting to explain the functions of yawning have been narrowed down by the rejection of distinct ideologies. Hypothesis concerning the mechanism and significance of yawning have appeared, but data have been insufficient to show which of these have been tenable (Heusner, 1946). Though having some grain of truth, they were discarded solely on the lack of evidence produced by the experiments.

The assumption that the purpose of the yawn is to increase blood flow to the brain was discredited. Provine demonstrated in an early study that if the primary reason for an individual to yawn was to increase cerebral blood flow and oxygen levels to the head, then a clenched-teeth yawn would be seen as normal. Though the oxygen was getting through, subjects found the manoeuvre abnormal suggesting that the yawn had an additional function (Provine, 1986). Most of the

subjects complained that yawning with clenched teeth prevented them from completing a yawn, and that this type of yawning resulted in a lack of satisfaction usually accompanied with a normally produced yawn. Provine stressed that the main purpose or function of yawning had not been achieved in this experimental condition (1986).

Expanding on the research, Provine and others went on to consider the yawn as both a stereotyped motor act and as a yawn-producing stimulus. Because the reflex response is sometimes provoked by the sight of a yawn, the need to relate the two seems warranted. In fact, it is this contagiousness or imitation that accentuates the need to understand a situation of having a yawn triggered in response to a yawn (Provine, 1989).

One of the most striking and curious features of yawning is the tendency to yawn after visually observing a yawn (Provine, 1986). Yawning is one of the first reflexes to be observed in the newborn infant (Moore, 1942). Indeed, yawning may be the best example of a stereotyped action pattern, but because studies have dwelled mostly in the area of infant imitation, the reasons why a yawn is released in adults is vague.

Provine initiated a series of studies to see how pervasive the follow-the-leader behaviour actually is. In a particular study, Provine (1989) posed variations of a 5-min series of 30 videotaped repetitions of a yawning face to notice the yawn-evoking potency of such stimuli. The obvious result was that the visually observed yawns evoked more yawns in witnesses than did featureless or smiling faces. From the data Provine suggested plainly that viewing a yawn triggers in us an urge to yawn, even though we have no conscious desire to imitate the behaviour (1989).

Contrasted to the contagious aspect of yawning, Provine further developed his studies pondering on the question whether reading about yawning could induce it. The effectiveness of reading about yawning in stimulating yawns was studied alongside reading about hiccuping to examine the number of yawns performed during each of the readings. One group of subjects were to read a passage about yawning, while another read about hiccuping. The collection of data reflected the number of yawns of subjects in which significantly more who had read the yawning passage had yawned or thought about yawning than did the other group (Provine, 1986).

The experiment was to support the suggestion that this model of behaviour was not all involuntary, or imitative, but implied that active cognitive processes were responsible for creating an urge to yawn.

The previous studies of yawning and the results derived from them have followed from the use of laboratory settings as a means of collecting data. Some experiments employed scientific and objective measures to record subject's observations. But other experiments, such as that of Greco and Baenninger (1989), sought self-report as a valid measure of yawning in the laboratory. Subjects assigned to one of two groups were to record their own yawns, where one group was completely unobserved while the other group was observed through a two-way mirror. The results showed that the two group's responses concerning yawn frequency, duration, and inter-yawn intervals did not differ from each other significantly. The authors concluded that self-report is a valid measure to study yawns and that it eliminates any inhibitions that arise because of a watchful eye (Greco & Baenninger, 1989).

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COMPARISON OF THE SOCIAL TRIGGERING MODEL AND THE COGNITIVE SUGGESTION MODEL OF YAWNING

FLAVIO CORNEL BLASATO

ALGOMA UNIVERSITY

Running head: EVALUATION OF YAWNING

Abstract

The hypothesis that individuals would yawn more if subjected to a model of yawning accompanied with a cognitive cue of yawning than to either stimulus alone was tested. Subjects from four groups individually observed a 10-min video in which the experimenter modelled either a yawn or a hiccup every thirty seconds while a second experimenter read a passage about the respiratory system describing either yawns or hiccups. Although yawning was scarce, more temptations to yawn occurred if either the visual or cognitive stimuli were presented than if neither of them were. No interactive or additive effect of the two manipulations occurred. In other words, seeing and hearing about yawns was equivalent to seeing yawns with hearing hiccups and seeing hiccups with hearing yawns. Diverse reasons of the purpose of yawning were evaluated.

Comparison of the Social Triggering Model and the Cognitive Suggestion Model of Yawning

Why do we yawn? What factor triggers us to yawn? Is there more than one possible factor that can cause an onset of a yawn? Because these questions have yet to be answered, it gives us reason to search for knowledge in this field.

Yawning is a common, frequent, and universal human act performed throughout the lifespan (Gesell, 1928). The behavioral definition of a yawn is a gaping of the mouth as an act of deep inspiration, holding that position for six seconds while many contractions of skeletal muscle groups occurs. This is followed by a forceful expiration (Darwin, 1865). Yawning is one of the many types of behaviour seen as contagious. The study of yawning provides insights into the investigation of contagion, which includes a whole class of behaviour that can be explained by examining the factors present in yawning. Blinking, smiling, and posture fall into the class of socially contagious behaviours.

The analysis of yawning provides information for behavioral evolution. The yawn is an act that has

evolved from an involuntary response mechanism to becoming somewhat self-governing. The yawning behaviour can be performed voluntarily, or can be a contagious act expressed involuntarily.

Physiological reasons stating why yawning occurs have been studied by Provine, Tate, and Geldmacher yet they have found little connection between yawning and levels of oxygen and carbon dioxide in the blood (1987). Human yawning has not been accepted as a specific response to the levels of these two factors and does not appear to serve a principle respiratory function.

According to belief, in social situations, yawning is said to occur when a model of a yawn is visually observed (Provine & Hamernick, 1986). Witnessing a yawn triggers an urge to yawn, even if not thought of (Provine, 1986).

Yawning has been demonstrated to be contagious only in humans (Provine, 1986, 1989), but behaviour resembling the gaping component of a yawn is widespread in the animal kingdom. What triggers a yawn depends on the stimuli and situational factors present at the time. In one study the occurrence of yawning between

species was examined (Ronald Baenninger, 1987) where animals were found to yawn more when in social situations but humans yawned less when others were present.

In a study conducted by Robert Provine, comparing the yawn-evoking potency of a yawning face to that of a smiling face produced distinct results (1989), in which the yawning face provoked more of the yawning response in subjects than did the smiling face. In another study, a follow-the-leader type of behaviour was caused by a releasing stimulus (the observed yawn). It was found that yawns are releasers of the stereotypic action pattern which in fact is the yawn (Provine, 1986).

In contrast to contagious yawning, there is some evidence that suggests yawning occurs as a result of thinking about wanting to yawn. The effectiveness of reading about yawning in stimulating yawns was evaluated by Robert Provine. Those who read about yawning reported significantly more that they had yawned or thought about yawning than those who had read about hiccupping (1986).

There is no precise, absolute knowledge of the eliciting stimuli or functions of yawning (Baenninger, 1987). A relationship between observing yawns and thinking of yawns has been neglected in past studies. Examining these two determinants of induced yawning may prove insightful for the interaction of contagion and suggestion in an unprecedented way. By comparing the two models in one experiment, the purpose of this study was to determine whether a combined observed and reading stimulus magnifies the yawning response. Specifically, it sought to resolve whether yawning resulting from thinking about yawning accompanied by a visual cue of a yawn will be greater than yawning from either stimulus alone.

Method

Subjects

Forty students were recruited to participate in the study. The subjects were enroled at Algoma University College and were randomly assigned to one of four groups.

Procedure

Subjects individually participated in the experiment to reduce the possibility of socially

influencing one another to yawn, but each subject's scores belonged to either one of four groups. A video monitor from the audio-visual department in the university was used to present the two forms of stimuli. The video monitor presented the two independent variables: the modelling of the behaviour and the reading of the passage to the subjects. The video had the experimenter reading an abstract of the respiratory function in human breathing, where a brief excerpt of either yawning or hiccuping was introduced early in the passage. The experimenter was only heard, not seen, so that the second experimenter modelling the behaviour would be the only visual cue for the subject. This person was the actor for performing repetitive yawns or hiccups. In this manner, both the observed effect of yawning and the induced thinking of yawning by hearing the passage read to subjects was occurring simultaneously. The modelling of yawns was presented every 30 seconds while the reading of yawns lasted about 1 minute. Both stimuli were matched for having the same time exposure on the subject. Subjects sat about 1.5 M distant from the monitor and were asked to relax and find a comfortable position in the chair.

Subjects were observed through a disclosed video camera meant to be a method of reaching them when they needed assistance from the experimenter in the adjacent room. The purpose of the camera was to avoid possible social inhibition of yawning otherwise found to occur in visual contact with another person and to objectively record the subject's behaviour rates.

Groups were categorized in the following manner (see Table 1). Two groups were exposed to a confederate

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Insert Table 1

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yawning while the other two groups were exposed to a confederate hiccuping. The person modelling the yawns and hiccups guaranteed a face-to-face exposure to all subjects. The reading lasted no longer than twenty minutes. A questionnaire was used after the video ended concerning the experiment. The last page asked subjects to pick the best statement concerning how they behaved: 1) I yawned; 2) I did not yawn, but was tempted to yawn; 3) I did not yawn and was not tempted to yawn; 4) I do not remember whether I yawned or not.

Subjects were informed that the purpose of the study was to evaluate their responses to an alternative method of teaching and that they were asked to listen attentively but would not be quizzed on the topic covered. The coordinator asked subjects to record their yawning behaviour after the visual presentation to prevent subjects from being influenced by suggestions about yawning. This was used to cross validate their behaviour during the session run. The subjects were then debriefed on the true purpose of the experiment. The group with no modelling or suggestion of yawning (Group 4) was the baseline group. The purpose of using hiccuping as the baseline effect in the design was to have a totally irrelevant behaviour that could not have suppressed or increased the rate of behaviour of yawning.

Results

Because the number of subjects who actually did yawn was unexpectedly low, results were dichotomized into those who either yawned and were tempted to yawn compared to those who neither yawned and were not tempted to yawn. In Group 1 (see Figure 1), only one

subject had yawned as by our behavioral definition, but four subjects had reported that the desire to yawn was

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Insert Figure 1

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with them. Groups 2 and 3 were the same, as six subjects in each group reported that they were tempted to yawn. In the control group, Group 4, only two subjects were tempted to yawn where the rest had no desire to yawn.

A chi-square analysis was performed on the data. The interpreted data showed that the members of the group who observed both the modelling of yawns with the reading of yawning did not differ significantly (see Figure 2) from either the group exposed only to the

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Insert Figure 2

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modelling of yawns or the group exposed to only the reading of yawns [$\chi^2(1,N=19)=0.67, p<.01$). The condition in Group 1 ironically produced less temptations to yawn than in either Group 2 or Group 3. The chi-square test demonstrated that the frequency of the temptations to

yawn by subjects in Groups 1, 2, and 3 all differed significantly from the control Group 4.

Discussion

This experiment attempted to establish the possibility that if two different models of a same stimulus were applied at the same time, the result would be that having the two working simultaneously would have produced more behaviour then by either stimulus alone. Unfortunately, this did not occur in this particular experiment but the possible reasons should be expressed here to defend what the purpose of the study was trying to achieve.

Two possible outcomes could have emerged from the experiment given that there was a significant difference in Group 1 yawning rates from those of the other groups. Taking the condition imposed on subjects in Group 1, either an interactive effect or an additive effect could have helped explain why the frequency of yawns was greater than in the other groups.

In the first explanation, the interactive effect, where we combined two independent variables together, the modelling of the yawn and the thinking of the yawn, each model could have influenced or primed the other so

that a higher yawning rate would have been reported. This could have suggested that the thought of yawning could have activated an impulsive or automatic reaction to yawn: likewise, by having yawned freely, and having sensed that we have yawned, we could have activated some cognitive processes about the yawn that we produced. Regardless from where the actual behaviour had originated after being subjected to the stimulus, complex neural mechanisms would have played an underlying factor in the yawning response (Provine, 1989). This may have suggested that an interactivity existed between cognitive systems that we were consciously aware of and those that we were not may have been occurring. This model assumes that yawning is a result of an internal blueprint combining psychological and physiological mechanisms interacting in a synchronized yet obscured manner. But because the experiment's data reported differently, grasping the interactive concept remains obscure yet worthy for further scientific study.

The second explanation would be the additive effect. When we combined the two independent variables together, the two effects (modelling + thinking) would

have influenced the subjects independently. In this case, the increase in the temptation to yawn was due to each factor amounting together to produce the behaviour observed. Because the number of temptations to yawn was similar in Groups 1, 2, and 3, the combined effect did not produce enough distinction from the other two groups to support this effect either.

There are a number of reasons why the study did not confirm the suggested hypothesis. The experiment may have failed to show expected behaviour to emerge from a combined effect of yawning from two models because of unforeseen factors that were encountered by subjects during their sessions. Many subjects had reported that they were hesitant to yawn because of the uneasiness situation the camera imposed on them. But other than preventing the possible number of yawns to increase, the camera did not confound the results since it was consistently used throughout every group.

Nevertheless, a different effect emerged from the experiment that was not expected. From the collection and interpretation of data, an isolated effect obviously arose from this experiment. This case suggests that the subjects focused either on the

modelling effect of yawning or the cognitive effect of yawning, but not both insofar as to surpass the condition imposed on subjects in groups where only one model of the stimulus was presented. In other words, because the results in Groups 2 and 3 were similar to those of Group 1, the subjects in the latter groups were influenced either solely by the observed yawn or hearing of yawns. Suggested as an explanation to this effect was the subject's inability to concentrate on the two modes of communication presented in the video monitor. Subjects reported that it was difficult to pay attention to both the modeller and the reader at the same time because of the dry topic matter. Most of the subjects keyed in on the modeller's behaviour rather than the reader's speech because viewing a simple, repetitive behaviour was an easier task to follow than a novel but complex dialogue, especially in a situation associated with boredom and low levels of arousal (Provine, 1987).

The experiment may also suggest that the contagiousness of a behaviour is simply the workings of one's subconscious, and that we define it as contagious because it has not reached our level of conscious yet.

But the study showed that induced yawning provides a unique opportunity to explore the sensation of having a stereotyped action pattern released, which is an important factor in the analysis of infectious and contagious behaviour (Provine, 1986).

This leads to the underlying premise suggesting that modelling occurs without thinking of copying the behaviour. However, if this was not true, then yawning involves a thinking, conscious desire to perform the act as it satisfies some yet undiscovered function. Whatever are the true factors that deserve recognition, the outcome will be reflected in one's behaviour, that being the yawning act.

This experiment was mostly exploratory in nature, since various perspectives of yawning have yet to be confirmed or debunked. An interactive or combined effect of yawning was never attempted beforehand. Although the experiment did not document the proposed hypothesis, it did substantiate prior studies and furthered knowledge in the context of yawning and other similar behaviours. The study does not deny that a combined effect can exist, but because the experiment had fewer controls than there should have been, it

cannot confirm this position without improvement or further investigation. The future of the comparative aspects of yawning investigated in a more discriminating manner will enhance a broader understanding of behavioral studies.

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TABLE 1

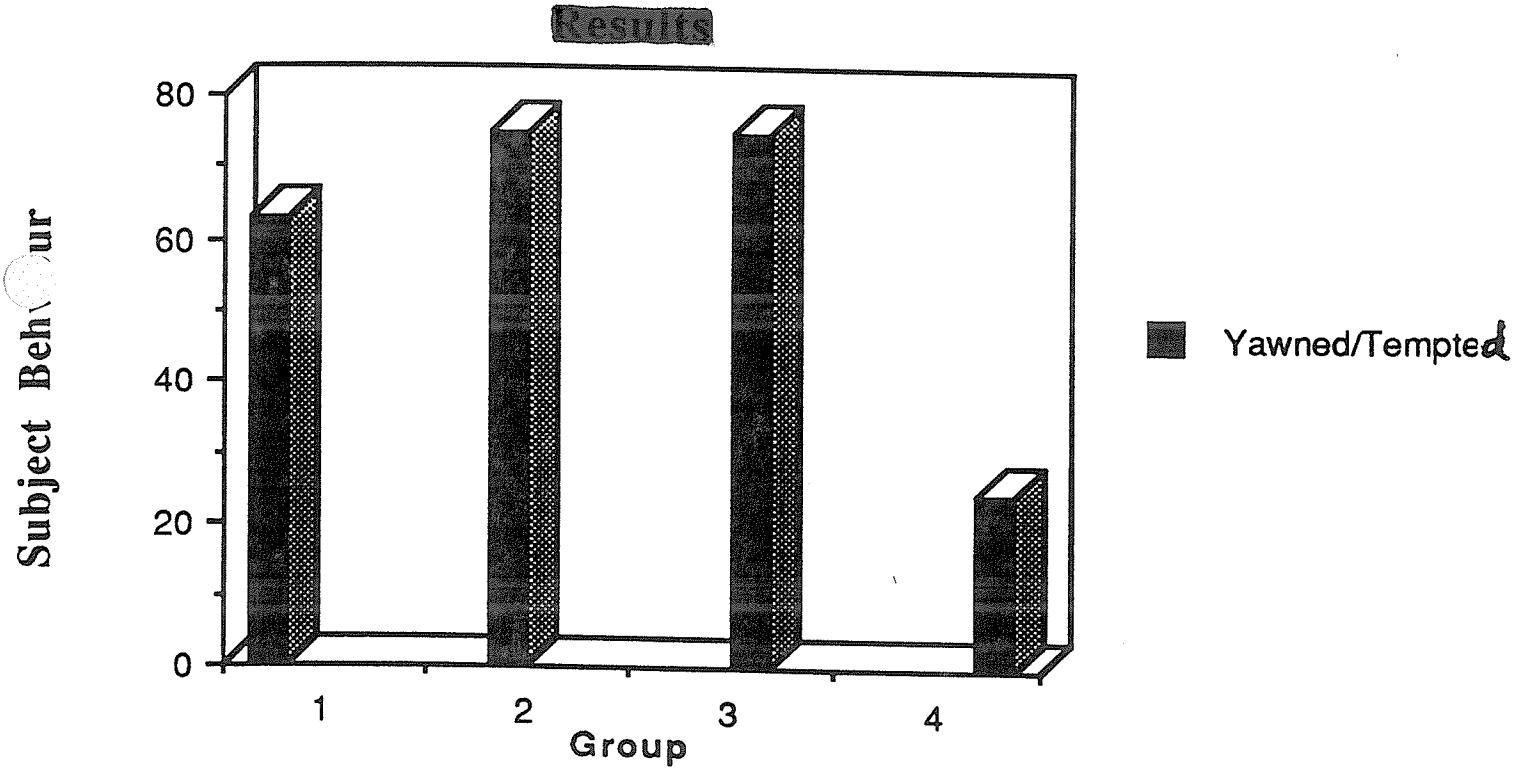
Group Design and Stimulus Conditions

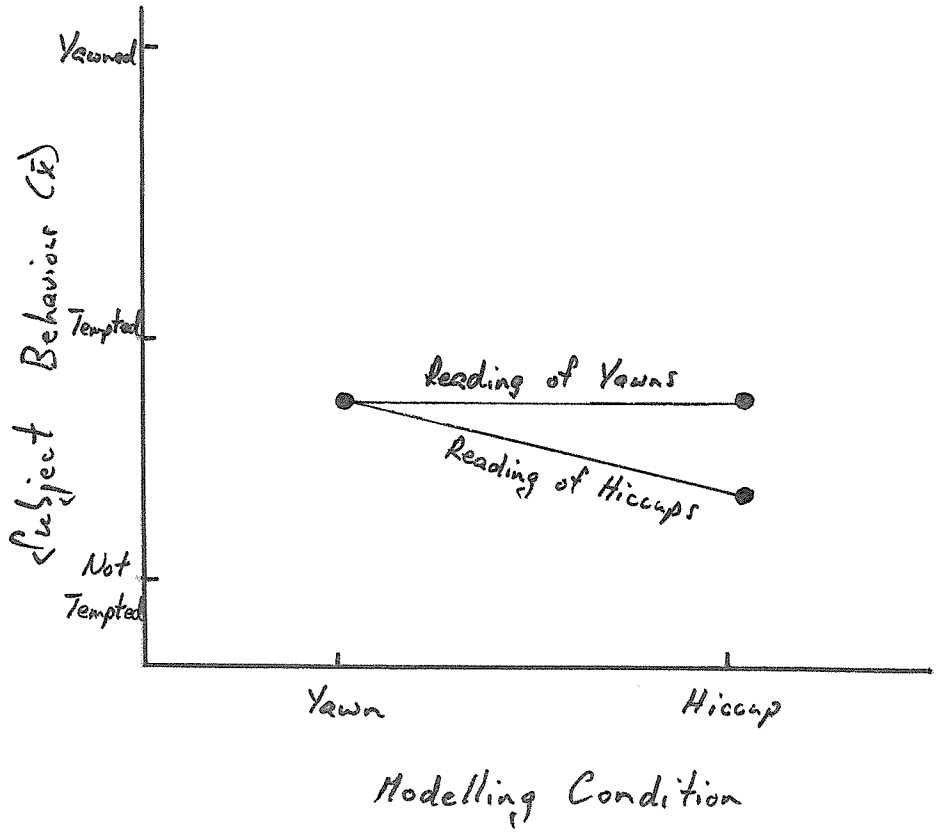
Modelling	Reading: Yawn	Reading: Hiccup
Yawn	Experimental Group 1	Experimental Group 2
Hiccup	Experimental Group 3	Control Group 4

Figure Caption

Figure 1. Percentage of yawning behaviour responses as a function of stimulus conditions in each group.

Figure 2. Relationship of subject's behaviour as a function of the independent variables.


Results
Subject Behaviour
80
60
40
20
0
1
2
3
4
Group
Yawned/Tempted


Yawned
Tempted
Not Tempted
Subject Behaviour (x̄)
Reading of Yawns
Reading of Hiccups
Yawn
Hiccup
Modelling Condition