The Method of Negative Instruction: Herbert S. Langfeld's and Ludwig R. Geissler's 1910–1913 Insightful Studies

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Herbert S. Langfeld and Ludwig R. Geissler published insightful articles during the period of 1910–1913 using what they called the Method of Negative Instruction, which anticipated much current research on action control and the role of instructions. We review their studies and relate the findings to contemporary research and views concerning task-irrelevant congruency effects and deception, concluding that their work has not received the credit it warrants. We also call for contemporary researchers to revisit prior studies, especially ones conducted before the cognitive revolution in psychology, to enrich their knowledge of the field and improve the quality of their research.

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The influence of instructions on human action control and learning is a topic that has been attracting increasing research interest. This interest is illustrated in the topic of the 27th *Attention & Performance* meeting, "The Power of Instructions," held in June 2016. The talks featured recent research on the role of instructions in basic cognition and action control, emotional learning, hypnosis, placebo effects, and persuasion, as well as on the neural bases of instructions. Much of the current research in action control has focused on automatic task execution based on instructions. For example, when sufficient motivation and processing resources are available, stimulus–response (S-R) associations become immediately operative when participants are instructed about how to perform a choice task (e.g., Cohen-Kdoshay & Meiran, 2007, 2009; Everaert, Theeuwes, Liefooghe, & De Houwer, 2014; Meiran, Pereg, Kessler, Cole, & Braver, 2015).

Research on the automatic impact of instructions on action control can be traced back to the late 1800s and early 1900s. At that time, psychologists started to notice that the events in a psychological experiment, such as reactions, associations, judgments, and thoughts, were determined by something other than the reportable events themselves. For example, as summarized by Wilcocks (1925), Oswald Külpe (1904), a consulting editor for the *American Jour-*

nal of Psychology (*AJP*) from 1895 to 1915, instructed participants to attend to one of several attributes of a briefly displayed visual array of nonsense syllables (e.g., the different letters or colors of syllables in the display and their approximate locations). His results showed that the participants were able to report the designated attribute more accurately than they could when an advance instruction was not given (see also Humphrey, 1951, pp. 30–131). Henry J. Watt (1904/1906), a student of Külpe's at the University of Würzburg, reported a similar effect in 1904. He explained it as an *Einstellung* ("task set") that people create in constituting an *Aufgabe* ("task") before the stimulus presentation due to the instructions. In particular, the Würzburg psychologists interpreted *Einstellung* as meaning "setting," or "installation," as well as a person's "attitude," to explain the effect of instructions. Narziß Ach's (1905/1964) experimental example is one of the best demonstrations: The numbers 6 and 2 presented as stimuli to the participants yielded a result of 8, 4, or 12 depending on whether the *Aufgabe* ("task" in German) instructed was to add, subtract, or multiply the numbers. According to Ach, "The same stimulus may lead to reproduction of different presentations; in each case it is the presentation corresponding to the meaning of the intention which becomes over-valent" (1905/1964, p. 206).

Although some experiments in the early 1900s would not match up to contemporary standards and relied mainly on the method of introspection, the introspective analyses were performed in a much more compelling and informative manner than is usually implied, often accompanied by objective measures of behavior including proportion correct responses and reaction times. The Würzburg psychologists' finding that the task or the specific task instruction creates the situation that potentially invokes the determination effect of task performance is the same topic being discussed more than 100 years later. Consequently, in this article we review research on instructions coming out of this paradigm that seem particularly relevant nowadays, specifically several articles by Herbert S. Langfeld and Ludwig R. Geissler published in 1910–1913. Langfeld's articles in *Psychological Bulletin* and *Psychological Review* and Geissler's articles in *AJP* used what they called the method of negative instruction, which is a precursor of the Stroop color-

naming task (Stroop, 1935). Those articles provide a historical context into which contemporary work on the effects of instructions on human performance and learning can be placed. We also examine relationships between the research on negative instructions and explanations of various S-R correspondence effects involving irrelevant stimulus information and phenomena of deception.

Suppression With Negative Instruction

James McKeen Cattell (1882), one of the most prominent early American psychologists, briefly described the results of experiments he conducted in Germany in which participants were instructed to name colors and pictures of objects. In his words,

> The time was found to be about the same (over ½ sec.) for colours as for pictures, and about twice as long as for words and letters. Other experiments I have made show that we can recognise a single colour or picture in a slightly shorter time than a word or letter, but take longer to name it. This is because in the case of words and letters the association between the idea and name has taken place so often that the process has become automatic, whereas in the case of colours and pictures we must by a voluntary effort choose the name. (p. 65)

Of note for present purposes is that Cattell described naming of colors and pictures as requiring effort. Nevertheless, the studies discussed in the remainder of this section provide evidence that pictures of objects are named relatively automatically.

LANGFELD'S SUPPRESSION WITH NEGATIVE INSTRUCTION. Herbert Langfeld received his PhD in 1909 with Carl Stumpf at the University of Berlin. In 1910, Langfeld, as a new assistant professor at Harvard University, reported an experiment he conducted in an article titled "Suppression With Negative Instruction." In contrast to Cattell's "positive" instructions to name the color or object, negative instructions in this context refer to not saying the name but another word instead. In Langfeld's experiment, participants were shown a series of 10 pictures of simple objects, one at a time. A picture was exposed by the dropping of a shutter, at which time the participant was to say the first word that came to mind from the picture *except* the name of

the object. After each response, the participant was to introspect. The explicit instructions were as follows:

> Shortly after you hear the word "now" a picture will be exposed in the square opening. You are to speak the first word suggested to you by the object in the picture, unless it is the name of this object. You are not to name the object, but you may describe it or name any of its parts. For example, if it is a cow you may say small, old, head, etc. After the word is spoken you are to give the results of a careful introspection. Pay particular attention to the processes of suppression and association and to the imagery. (p. 200)

After this initial association (A) test, a reproduction (R) test was performed in which the same 10 pictures were presented again, and the participant was to try to respond with the same word as before, "but if another word should come up, you are not to inhibit it" (p. 201), unless, of course, it was the name of the object. This procedure was performed six times, for a total of 60 different objects.

The eight participants who were tested were able to perform the negative instruction task, with seven of the participants incorrectly saying the object's name on less than 10% of the A-test trials and the remaining participant having an error rate of 16%. On many trials, participants' introspections included reports of "kinaesthetic imagery" of the name of the object, which was subsequently suppressed. As one example, for the object *comb,* to which the participant responded "hair," the introspection was, "I recognized comb. Kinaesthetic image of comb. Locked the muscles of the throat, after thinking that I must not say the word. Then hair came" (pp. 204–205). Reaction times decreased with practice across sets 1 to 6, as did the number of reports of kinaesthetic imagery. On this basis, Langfeld (1910, p. 204) concluded, "This is proof of an increased power of suppression with practice." Such imagery was reported less for R-tests than for A-tests, which the author also attributed to practice suppressing the object name. He noted as well, "The fact that the interval between the two acts of suppression (in the A- and R-tests) is short and that a definite reaction word has been partially established in the A-tests also helps the inhibition

[in the R-tests]" (p. 204). With regard to the overall introspections, Langfeld emphasized,

> We find all forms of suppression from a fully voluntary act to a purely automatic reaction. In all cases the participant begins in the attitude of the negative and positive instructions. As the series progresses, this attitude or "Einstellung" is less vivid in consciousness. (p. 206)

Langfeld summarized his main results as showing,

> There are a positive and negative "Aufgabe," both of which are carried out. The negative "Aufgabe" has acted as a block, cutting out a definite association. . . . We have also seen evidence of the force of the suppression, which not only inhibits the name of the picture, whenever there is a tendency for it to be pronounced, but frequently inhibits words closely related to the picture. . . . Finally, the general development of the suppression process, especially as shown in the decrease of the kinaesthetic image, tends to prove that the suppression can be strengthened by practice. (p. 208)

Langfeld (1911) extended the method of negative instruction to examine individual differences in an article that had the same main title as his 1910 article but the subtitle "Tests With Alcohol and Caffeine and on Cases of Dementia Praecox and Manic Depression." For the tests with alcohol and caffeine, participants performed the negative instruction task alternating between sessions in which alcohol or caffeine was consumed before task performance and sessions in which it was not. Reaction times were reduced by alcohol and caffeine but without a concomitant increase in error (naming the object) for the former. Analysis of the specific words that were produced showed "surprising similarity in the distribution of words on drug days and normal days" (p. 417), implying that the same process was used to generate and select a response word. Langfeld noted in addition, "Introspection on the fore-period showed no evidence of the necessity of translating negative into positive instruction. This makes it probable that there is a distinct negative as well as positive attitude, which in most instances can be described solely in terms of cortical set" (p. 424).

For the second extension, Langfeld (1911) tested patients with dementia praecox (schizophrenia) or manic depression. Reaction times for associations were generally longer than for the nonpatient participants for both patient groups, whereas the reaction times for reproduction did not appear to be lengthened. The patients with dementia praecox showed many failures of suppression of the object name in the A-test phase, which Langfeld attributed mainly to "an impairment of the will in which a decrease in attention plays an important part" (p. 423). In the R-test phase, accuracy of reproduction for both dementia praecox and manic depression was close to normal except for one patient with dementia praecox.

To summarize, Langfeld (1910, 1911) established with the method of negative instruction that participants usually activate the name of the object, which they then must inhibit to select a correct response. He then demonstrated how the method could be used to investigate factors that could influence suppression and response selection. This activation–suppression process is also evident in more recent studies that focused on reaction time as the primary measure. For instance, Seymour (1977) examined Stroop-like congruency effects for a task in which participants were to name the season associated with or opposite that of a relevant stimulus color (e.g., say "winter" for white or "yellow" for white). Reaction times were longer when an irrelevant season word carrying the color was incongruent with the season associated with the color, even when the task was to respond with the opposite season name. As an example, participants were quicker to respond "summer" to the color white when the stimulus spelled *WINTER* than when it spelled *SUMMER*. Much like Langfeld, Seymour attributed this result to the word *SUMMER* creating an incongruent code during a conceptual identification processing stage "which must be deleted" (p. 263) before a subsequent name production stage.

GEISSLER'S ANALYSIS OF CONSCIOUSNESS
UNDER NEGATIVE INSTRUCTION.
Ludwig Geissler also received his PhD in 1909, from Edward B. Titchener at Cornell University (Thomas, 2009), and Geissler was working in Titchener's laboratory when he published his 1912 article on negative instruction. Geissler noted of Langfeld's (1910, 1911) studies, "The problem of the negative instruction and its relation to recent investigations of the conscious attitudes, the thought-processes, and other similar topics, seemed to us of such importance as to deserve a special and more detailed study for its own sake" (Geissler, 1912, p. 183). He continued on to say, "Our aim was, therefore, first to repeat Langfeld's experiments with greater emphasis on detailed introspections and then to introduce such variations of conditions as might be expected to throw further light on the analysis of consciousness under negative instruction and in particular on the nature of suppression" (p. 183). In the current era of the so-called replication crisis (e.g., Maxwell, Lau, & Howard, 2015), psychologists have been accused of not including close replication as part of their typical research process but only "conceptual replications" (Yong, 2012). Consequently, it is worth emphasizing that Geissler appreciated the necessity of replicating Langfeld's experiments with methods "as nearly identical with the original as possible" (p. 183) and then extending them to provide new understanding of the resulting phenomena. The extension included obtaining detailed introspections in some trial blocks of the foreperiod and afterperiod. Making progress through replication and extension was an approach valued more generally by experimental psychologists early in the 20th century (e.g., Dunlap, 1926), which we think also applies to most experimental psychologists nowadays.

Geissler's (1912) results for introspections regarding the main task period "agree[d] closely with those of Langfeld" (pp. 185–186), although reaction time did not decrease with practice. From very detailed introspective reports, Geissler identified three subperiods during the time between picture onset and response: "the stage of recognition, the stage of suppression, and the stage of search, suspense, or hesitation" (p. 190). With regard to the recognition stage, Geissler emphasized, similar to Langfeld,

> The first point of significance in our introspections is that the negative instruction does not inhibit the rise of the forbidden name into consciousness. There are only 43 cases out of 282 experiments [trials], that is, about *fifteen per cent*, in which no name of the object occurred. (p. 191)

Because the activated object name was not to be given as a response, the second stage, that of

suppression, was necessary. Geissler (1912) noted, that suppression "is brought about in two different ways, which may be called the *attitudinal* form of suppression and the *ideational* form of suppression. The former consists mainly of kinaesthetic strain and pressure sensations in the back of the mouth . . ., of general bodily tension and rigidity about the lips, and of inhibited breathing" (p. 192). In contrast, "The ideational form of suppression consists chiefly in some verbal repetition of a part of the instruction, as 'you are not to name the object'" (p. 193). In sum, Geissler concluded, the introspections "have established the fact that the suppression, whether as an attitude or as idea of instruction, is successful in inhibiting the articulation of the forbidden name, but cannot prevent its appearance in consciousness in one form or another" (p. 195).

Geissler (1912) also had participants introspect about the foreperiod, stating,

> In connection with these introspections it is important to recall the exact words of the instruction [which were identical to those of Langfeld, 1910, quoted earlier]. . . . It will be seen that this instruction involves four factors which refer to the future: (a) it calls for the first word suggested by the picture; (b) it requires the avoidance of the name of the object; (c) it suggests the use of descriptive terms or the naming of parts; and finally (d) it calls for introspections. In the light of Ach's work and the results of the Würzburg school we must assume that these four factors set up four different determining tendencies. (p. 198)

With regard to the first two of these factors, Geissler (1912) noted that the introspections he collected confirmed Langfeld's (1911) conclusion that the negative instruction was not translated into a positive one. That is, rather than converting the positive set to say the first word and the negative set to avoid the name of the object into a positive set of "say a word other than the object name," participants maintained the positive naming and negative avoidance sets. Finally, Geissler pointed out that introspections about the afterperiod of responding showed two important results. The first is that after successfully inhibiting the object name, the positive task set "seems to resume its work by bringing into consciousness other

associations set in readiness during the fore-period" (p. 203), leading to the word that is spoken. However, when attitudinal suppression is very strong, its effects extend to associated words and no related words or ideas come to mind. The second result is that when the response was correct there was "the frequent occurrence of a pleasant feeling of satisfaction 'that the instruction was carried out successfully'" (p. 204).

In a final session, Geissler (1912) had participants perform the same negative instruction task but with objects that had to be identified by touch. He noted, "The experiments with objects and negative instruction confirm in every way the results obtained with the visual stimuli" (p. 211). After they performed the object task with the negative instruction, Geissler tested the participants with the positive instruction "do not react with anything except the name of the object" (p. 213). His purpose in using "do not" to frame the positive "say the name" instruction was to make the situation favorable to any tendency to suppress alternative words. He noted, "Nevertheless, our introspections do not furnish the slightest evidence of a conscious or unconscious blocking of undesired associations" (p. 213). The only difference is the absence of the stage of suppression.

To summarize, Geissler (1912) verified Langfeld's findings and conclusions through more detailed introspective analyses. He formulated more explicitly the processing stages for performance of the negative instruction task and emphasized the role of the specific instructions in creating the determining tendencies of the mental set to perform the task. Geissler's conclusion that the object name continues to exert an effect on selection of the ultimate response after being suppressed is consistent with recent research on deception (Debey, De Houwer, & Verschuere, 2014), a point we consider in more detail later. His emphasis on the sense of accomplishment at successful task performance is in agreement with Wulf and Lewthwaite's (2016) view that performance success leads to positive affect, which may then be anticipated as an outcome of future performance.

1913 Articles of Langfeld and Geissler (With Emily Burr)

Extending the Method

Langfeld and Geissler published additional articles in 1913 that expanded the research on negative instruction to a wider range of tasks. A general point of their

articles is that conditions of negative instruction may be more prevalent than one might think.

LANGFELD'S (1913) "VOLUNTARY MOVEMENT UNDER POSITIVE AND NEGATIVE INSTRUCTION."

Langfeld (1913) described a study that "was undertaken in order to obtain an analysis of the process of executing a skillful movement, that is, a movement requiring perfect motor control, under the conditions of positive and negative instruction" (p. 459). The task required participants to move a stylus in a linear groove 25 cm long, for which the sides tapered from 0.5 cm apart at the start end to 0.1 cm at the far end. Initially, a positive instruction of "Go down the middle of the groove" was used, and participants practiced until they could negotiate the distance in less than 9 s. Participants then completed 10 trials with the right hand, after which they reported their introspections, and then 10 with the left hand. This procedure was followed for several series, separated by 1-week intervals, after which the participants were given the negative instruction not to touch the sides: "Do as before but this time direct your attention to inhibiting the stylus from going toward the sides in going down the groove" (p. 461).

Langfeld (1913) noted, in agreement with Geissler's (1912) analysis, "The two forms of instruction, positive and negative, do not necessarily imply the same action" (p. 461). He stated, "As might be expected there was a change of imagery with a change in the instruction. A visual image of a straight line was very common under the positive instruction. . . . We also find instances under the negative instruction of the sides of the groove becoming more prominent in the visual imagery or in the perception and of the attention wandering from one side to the other" (p. 466). From these and other results, Langfeld concluded, "Here we have what for want of a better name may be termed a positive and a negative attitude toward the task and these attitudes influence the results" (p. 474).

Of even more interest, he noted, "Except in the case of one subject, *D,* and once with *A,* neither in the fore-main or main period, under the positive or negative instruction, was there any imagery of the intended movement. . . . The usual conscious content aside from verbal instruction was a representation of the end or result to be obtained" (Langfeld, 1913, p. 475). In other words, Langfeld endorsed a

focus on action effects, saying, "The visual imagery of the result best sets off the several neural arcs" (pp. 475–476). Although Langfeld's conclusion would be accepted by advocates of contemporary ideomotor theory (see Shin, Proctor, & Capaldi, 2010, for a review), he rejected ideomotor theory because of its characterization at that time as focusing on the movement itself rather than the action goal. Langfeld stated that he was in agreement with Thorndike's poll of American psychologists, which showed, "You vote overwhelmingly that a mere picture of the spear striking the enemy is more likely to produce the proper cast of the spear than a full and exact representation of the movement itself" (Thorndike, 1913, p. 100).

BURR AND GEISSLER'S (1913) "AN INTROSPECTIVE ANALYSIS OF THE ASSOCIATION–REACTION CONSCIOUSNESS."

Emily Burr and Geissler (1913) reported experiments that were initiated in 1910, for which Geissler (1910) published a preliminary report of his own introspections, which examined what they called "concealing of a complex." A complex is a variant of "constellation," which "means an associative arrangement of specific mental data" (Kohs, 1914, p. 551), being "merely a constellation possessing a more intense affective-toning" (p. 552). On each trial in Burr and Geissler's experiment, participants were shown a pair of two materials (boxes, each containing a "joke or surprising incident" (p. 564); two different stories; or two different pictures), from which they were to choose one. The experimenter, who was shielded from the participant and did not know the choice, then gave the instruction,

> I am going to show you (or pronounce to you) one by one, a series of words, and you are to give as soon as possible, in response to each, a word that is associated in your mind with my word; but do not, if you can help it, give one that is connected with your choice. (p. 564)

Instructions to introspect immediately afterward about the mental events during the time from word onset were then given.

The main behavioral finding was as follows:

> The longest reaction-times occur invariably with critical words; and their mean variation is considerably larger than that for irrelevant words. Critical stimuli were sometimes an-

swered by quick and insignificant associations; but if followed up by one or two more critical stimuli, the complex could no longer conceal itself, and was manifested either in delayed or in significant associations or in both together. (p. 565)

Burr and Geissler (1913) placed more emphasis on the introspective reports, concluding,

Of much greater importance are our qualitative results as revealed in the introspections. They have led us to the conclusion that what is usually spoken of as the concealing of a complex is but a special case of a consciousness under negative instruction, the only essential difference being a greater degree of emotional vividness and strength in the complex. (p. 565)

Burr and Geissler noted, "The first similarity lies in the nature of the *Aufgabe* itself; for 'not to betray oneself' is only one particular negative instruction. It does not even matter whether linguistically the instruction is formulated in a positive way; its intent is accepted negatively" (pp. 565–566). In other words, the task set that is conveyed is the critical factor.

Burr and Geissler (1913) showed that the introspections conformed well to the three-stage distinction during processing of the word proposed by Geissler (1912) for the processing of objects in his negative instruction study. In the recognition stage "the stimulus-word is received and as a rule carefully examined as to its connection with the chosen material" (Burr & Geissler, 1913, p. 567). If the word is recognized as not relevant to the selected material, then a rapid response is made. However, if the word is recognized as relevant to the selected material, "a stage of suppression sets in" (p. 567). Burr and Geissler (p. 567) noted,

In other words, we have here the same two phenomena as in the N. I. [negative instruction] experiments, on the one hand the failure of a negative instruction to keep forbidden ideas entirely out of consciousness, and on the other hand the successful avoidance of their motor discharge, that is, the inhibition of the reaction of articulation.

At the final stage, there may be hesitation as search for an acceptable response is made. Finally,

Burr and Geissler noted, "Although suppression occurs in both tasks, concealing the complex involves the stronger unpleasantness accompanying the effort to suppress an incriminating idea" (1913, p. 568).

Recent studies of the cognitive aspects of deception have obtained subjective and objective evidence consistent with that reported by Burr and Geissler (1913). Debey et al. (2014) characterized the current state of knowledge thus: "Most research favors the explanation that cognitive control would be needed to resolve the response conflict evoked by the automatic activation of the dominant truth response" (pp. 324–325).

DISCUSSION

RELATING THE PAST TO THE PRESENT.
How people prepare to react in specific, and sometimes novel, ways when instructed to perform a task is essential to understand. Such understanding was a goal of Watt (1904/1906), Ach (1905/1964), and the other psychologists working with Külpe at the University of Würzburg, who introduced the concepts of task set and determining tendency, among others. The method of negative instruction, introduced by Langfeld (1910) and examined in detail by Geissler (1912), followed in this tradition and provided compelling illustrations of many of the roles instructions play in action control. The task set conveyed by instructions provides a framework for processing subsequent stimuli through narrowing down or activating associated S-R relations. Positive instructions to name an object activate associations to object names, whereas negative instructions (which exclude the name as a spoken response) may activate an inhibitory process as well.

Thus, study of negative instructions is a predecessor not only of the Stroop color-naming task but also of related tasks such as the Simon task (Simon, 1990) and the flanker task (Eriksen & Eriksen, 1974) that require participants not to make dominant responses. The analyses reported by Langfeld (1910) and Geissler (1912) provide systematic evaluations of behaviors and introspective reports that led to views consistent with many contemporary models (e.g., Ulrich, Schröter, Leuthold, & Birngruber, 2015): Automatic activation of the dominant response—the name of the object for the negative instruction task, the name of the color word in the Stroop task, and

the spatially corresponding response in the Simon task—occurs in the task context. This activation is a consequence of the task set, as captured, for example, by Ansorge and Wühr's (2004) response discrimination hypothesis for the Simon effect, according to which the activation occurs only when stimulus dimension overlaps with a dimension along with the responses must be discriminated to perform the task.

The dominant response tendency must be suppressed, or inhibited, if the task is to be performed correctly, as Ridderinkhof (2002) and Töbel, Hübner, and Stürmer (2014) have stressed with regard to the Simon effect. The two forms of suppression proposed by Geissler correspond to response inhibition and interference suppression, fundamental components of cognitive control that have been a focus of investigation more recently (Miyake et al., 2000). The suppression engendered by negative instructions mainly entails control over selective attention that should be paid only to relevant information. The continued influence that the inhibition exerted through activating associations also reveals response inhibition.

Another critical point, particularly evident in Geissler's (1912) study, is that instructions should be analyzed for the specific mental sets they create. Lambert and Ewert (1932) evaluated the effect of verbal instructions (or "set") on stylus maze learning, for which the instructions were generally to learn, learn plus a description of the maze structure principle, or those instructions plus action strategies. More precise instructions were found to decrease the number of trials and the learning time, revealing that an explicit S-R mental representation is the core of task set. Eighty-five years later, Eder and Dignath (2016) obtained similar results for the influence on response selection of verbal instructions about action effects. Instructions for different groups of participants specified whether they should ignore, attend to, learn, or intentionally produce an acoustic effect produced by button presses. Results showed that explicit instructions of action–effect relations activated effect-congruent action tendencies in the first trials after the instruction; in contrast, no evidence for effect-based action control was observed on these trials when instructions were to ignore or attend to the action effects. The findings of Lambert and Ewert and of Eder and Dignath illustrate that performance

and learning are influenced greatly by verbal instructions, as a consequence of whether they specify the critical relations in the task environment.

Several recent studies have provided evidence that the influence of the task set does not necessarily require that the specific instructed task has been performed previously (Meiran et al., 2015; Theeuwes, Liefooghe, & De Houwer, 2014). Correspondence effects, like the Simon effect, typically attributed to automatic activation of the prepotent response, can be obtained in the first few trials of a task or when instructions for a later task have been given. Likewise, as noted, Langfeld (1910) found that reports of activation of the object name tended to decrease across six blocks of 10 trials, providing some evidence of automatic activation of the previously learned object name through the instructed task set from the earliest trials.

In his later article, Langfeld (1913) pointed out that execution of a motor task could be impeded by negative instructions because they mention what is not to be done. This argument has been used to explain "choking" under pressure. Oudejans, Binsch, and Bakker (2013) had participants perform a dart throwing task, with either positive instructions (try to hit the bull's-eye) or negative instructions (be careful not to hit in a ring below a certain value). Poorer performance was evident with the negative instruction, but only under a condition in which anxiety was high. Langfeld's conclusion that performers represent the intended action in terms of the distal goal is in agreement with the theory of event coding (Hommel, Müsseler, Aschersleben, & Prinz, 2001), which has been highly influential over the past 15 years, and substantial evidence indicating that an external focus of attention on the goal effect of the movement improves learning and performance of motor skills (Wulf & Lewthwaite, 2016).

Finally, a study by Walczyk, Roper, Seemann, and Humphrey (2003) in which participants respond truthfully or deceptively to personal questions provoked a series of studies on deception and lying. Walczyk et al. found that deceptive responses took longer than truthful ones and that self-reports given afterwards "reveal that the truth became active" (p. 766). These findings and others led Walczyk, Harris, Duck, and Mulay (2014) to propose the activation–decision–construction–action theory, in which this

activation of the truth must be inhibited before a deceptive response can be made. The activation produced by the truth spreads through a network of associations in long-term memory, which can serve as a basis for selecting the deceptive response. In support of this functional aspect of truth activation, Debey et al. (2014) found that truth distractor stimuli facilitated deceptive responses relative to deceptive distractors.

LIMITED IMPACT OF LANGFELD'S AND GEISSLER'S STUDIES.
Langfeld and Geissler went on to have distinguished careers in psychology, as did Burr. Langfeld moved up the ranks at Harvard University to associate professor, before moving to Princeton University as professor in 1924 (Bartlett, 1958). At Princeton, Langfeld served as chair of the Psychology Department from 1937 to 1947, and among other honors, he was president of the American Psychological Association in 1930. Geissler held appointments at several academic institutions, including the University of Georgia, Clark University and College, and Randolph-Macon Women's College. He is best known as one of three founding editors of the *Journal of Applied Psychology* in 1920, the main driving force behind establishment of the journal and primary editor through 1924 (Thomas, 2009). Although Burr is less well known in the field, she subsequently was an early practitioner of mental and vocational testing (Lawson, Graham, & Baker, 2016, p. 343).

Given the detail and scope of Langfeld's (1910, 1911, 1913) and Geissler's (1910, 1912; Burr & Geissler, 1913) studies, and the authors' later prominence in psychology, one might think that those studies would have had substantial impact on attention and performance research. Yet this does not seem to have been the case. Langfeld's articles were not mentioned in obituaries by Bartlett (1958) and Pratt (1958), even though the latter stated, "Throughout his writings there appear numerous variations on the theme of a motor theory of consciousness, or, as he preferred to call it, a response psychology" (p. 322). Likewise, in an obituary for Geissler, Dallenbach (1933) stated, "His studies upon attention were systematically important" (pp. 365–366), but he did not mention the studies of negative instruction and association–reaction consciousness; more recently, Thomas (2009) included six articles of Geissler's in his general references section but not his 1912 article or either of the

others. Finally, PsycINFO and Google Scholar list few citations of their major articles: The respective citation counts on July 13, 2016, for Langfeld (1910) were 7 and 22 and for Geissler (1912) were 1 and 11. Although these counts are surely underestimates, they are indicators of a relative lack of impact.

Most of those citations are superficial. Fletcher (1914) cited Geissler's (1912) distinction between ideational and attitudinal suppression with regard to stuttering, and Sullivan (1927) cited both Langfeld (1910) and Geissler (1912), though not to much effect, in an article on the relationship between attitudes and learning. Wegner, Schneider, Carter, and White (1987) did not cite Langfeld or Geissler's research in their initial study on the "white bear effect" effect (try not to think of a white bear) and thought suppression, but starting with Wenzlaff and Wegner (2000), Langfeld (1910) has received cursory acknowledgment (Derakshan, Myers, Hansen, & O'Leary, 2004; Williams & Lynn, 2010). Perhaps most surprising, Stroop (1935) cited Cattell's (1882) study and related research in his classic article introducing the Stroop task, but he did not cite any of the work using the negative instruction method.

Ironically, the most accurate brief description of Langfeld's (1910) study is in a recent article on type of teacher's instruction to students, by Havigerová, Loudová, Novotný, and Krupičková (2015, p. 707): "Langfeld already in 1910 states that the negative Aufgabe acted as a block against definite association; it was found that the force of suppression not only inhibited the name of the pictures, but frequently inhibited words closely related to the picture and that such a suppression process may be strengthened by practice (Langfeld, 1910, 208)." Although Havigerová et al. cited MacDonald and Just (1989) as verifying and extending Langfeld's statements in an experimental article on changes in activation levels with negation, the latter authors did not cite either Langfeld (1910) or Geissler (1912). We hope readers of our article will agree that Langfeld and Geissler deserve much more credit for their insightful work than they have been given to date.

In his editorial note in the first issue of *AJP* 130 years ago, G. Stanley Hall (1887) said, "The main object of the journal will be to record the progress of scientific psychology" (p. 4). Consequently, *AJP* provides an archive for psychological science from

the earliest days of the field to the present, as do other journals including *Psychological Review* and *Psychological Bulletin* initiated in the late 19th and early 20th centuries. These archives are a readily available resource that contemporary researchers should use to enrich their knowledge of the field and enhance their research. Particularly when conscious experience is of concern, the research based primarily on the method of introspection that was popular in the early days of scientific psychology should be consulted.

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