The Language of Criminal Confessions:
A Corpus Analysis of Confessions Presumed True vs. Proven False

Lucrezia Rizzelli
DPhil Candidate, University of Oxford, Centre for Criminology
Oxford, U.K.

Saul M. Kassin
Distinguished Professor, Department of Psychology
John Jay College of Criminal Justice
New York, U.S.A.

Tammy Gales
Associate Professor of Forensic Linguistics
Hofstra University
Hempstead, New York, U.S.A.

Confession evidence is powerfully persuasive, and yet many wrongful convictions involving false confessions have surfaced in recent years (Innocence Project, 2021; National Registry of Exonerations, 2021). Although police are trained to corroborate admissions of guilt, research shows that most false confessions contain accurate details and other content cues suggesting credibility as well as extrinsic evidence of guilt. Hence, a method is needed to help distinguish true and false confessions. In this study, we utilized a corpus-based approach to outline the linguistic features of two sets of confessions: those that are presumed true (n = 98) and those that have been proven false (n = 37). After analyzing the two corpora in LIWC (Linguistic Inquiry and Word Count) to identify significant categories, we created a logistic regression model that distinguished the two corpora based on three identified predictors: personal pronouns, impersonal pronouns, and conjunctions. In a first sample comprised of 25 statements per set, the model correctly categorized 37 out of 50 confessions (74%); in a second out-of-model sample, the predictors accurately classified 20 of 24 confessions (83.3%). A high frequency of impersonal pronouns was associated with confessions proven false, while a high frequency of conjunctions and personal pronouns were associated with confessions presumed to be true. Several patterns were observed in the corpora. In the latter set of confessions, for example, "I" was often followed by a lexical verb, a pattern less frequent in false confessions. Although these data are preliminary and not to be used for practical diagnostic purposes, the findings suggest that additional research is warranted.

I Introduction

For decades, false confessions have been concealed by the mistaken "common sense" assumption that innocent people do not confess to crimes they did not commit (Kassin, 2017). Yet, the National Registry of Exonerations has reported that out of the approximate 2,400 exonerees in their database, 291 had falsely confessed, amounting to 15% of all cases (National Registry of Exoneration, 2019). Even more glaring are the figures reported by the Innocence Project, which has helped exonerate 375 individuals incarcerated exclusively for murders and rapes through postconviction DNA testing. In their sample, 28% of cases contained a false confession as a contributing factor (Innocence Project, 2021).

Consisting of an admission of guilt and a narrative chronological statement of who, what, when, how, and why, confessions are powerfully persuasive in court (*Bruton v United States*, 1968; Wigmore, 1985). Records show when false confessors reject a guilty plea and opt for trial, the odds of conviction range from 73% to 81% (Leo & Ofshe, 1998; Drizin & Leo, 2004). Over the years, mock jury research has shown that confession evidence increases the conviction rate more than eyewitness identifications and other forms of evidence (Kassin & Neumann, 1997). In fact, this research has shown that confession evidence is potent even when the interrogation was coercive (e.g., Kassin & Sukel, 1997), even when the participants were trial judges (Wallace & Kassin, 2012), even when the confessor was a juvenile (e.g., Redlich et al., 2008), even when the confession was contradicted by DNA or other evidence (e.g., Appleby & Kassin, 2016), and even when the confession was reported secondhand by a motivated informant (e.g., Neuschatz et al., 2008).

As suggested by numerous wrongful convictions that have hinged on false confessions, research also shows that people are unable to distinguish between true and false confessions. In a two-part study, Kassin, Meissner, and Norwick (2005) recruited male prison inmates for a pair of videotaped interviews. In one, each inmate was instructed to give a full confession to the crime for which he was incarcerated; in the other, they were asked to come up with a false confession to a specific crime they did not commit. In Part 2, observers watched ten of these confessions. Results showed that neither college students nor police investigators exhibited significant levels of accuracy, though police were more confident in their judgments. This anemic level of discrimination accuracy was later replicated in studies involving true and false confessions made by juvenile detainees (Honts et al., 2014; Honts et al., 2019).

Although it is not possible to assert a prevalence rate to the problem of false confessions, it is clear that modern police interrogation techniques are psychologically potent, that false confessions are elicited with some regularity, and that the risk is increased by certain factors inherent in the suspect as well as the processes of interrogation. It is also clear that there are

different types of false confessions (Kassin, 1997; Kassin & Wrightsman, 1985; Wrightsman & Kassin, 1993): *Voluntary* (when innocent people offer confessions without pressure from police), *compliant* (when innocent suspects acquiesce to the demand for a confession to escape a stressful situation, avoid a perceived threat, or gain a perceived reward), and *internalized* (when innocent suspects, exposed to highly suggestive interrogation tactics, come not only to capitulate but also to believe they committed the crime in question).

Inspired by the 1992 founding of the Innocence Project, and later the National Registry of Exonerations, both of which uncovered surprising numbers of false confessions within the database of wrongful convictions, researchers have identified both dispositional and situational risk factors that can lead innocent people to confess. This research has produced a useful body of knowledge. In 2010, Division 41 of the American Psychological Association (APA), also known as the American Psychology–Law Society (AP-LS), published a scientific review or "white paper" titled "Police-Induced Confessions: Risk Factors and Recommendations" (Kassin et al., 2010). The APA has also cited the science reviewed in the white paper in several amicus curiae briefs it has submitted on the topic.[1] The essential points in these briefs were reiterated in APA's (2014) Resolution on Interrogations of Criminal Suspects. In addition, a recent survey of confession researchers worldwide revealed a strong consensus within the scientific community that several findings in this literature are sufficiently reliable to present in court (Kassin et al., 2018).

In addition to examining the circumstances surrounding a confession, studies have also examined the contents of false confessions, mainly through qualitative analyses focusing on specific elements of the narrative. Garrett (2010) examined 38 confessions taken from DNA exonerees in the Innocence Project database and found that 36 contained facts about the crime that were accurate and yet not in the public domain, the kinds of facts that "only the perpetrator could have known." In a follow-up analysis, Garrett (2015) found that 62 out of 66 false confessions (94%) were similarly contaminated with inside information communicated, purposefully or inadvertently, through suggestive questions, photographs, and other aspects of interrogation.[2]

False confession narratives contain other cues that signal credibility as well. Appleby, Hasel, and Kassin (2013) content-analyzed 20 known false confessions and found that they all contained visual and auditory details about the crime, the crime scene, time, and location. Many of these confessions recounted what the victim allegedly said; described the victim's alleged mental or emotional state ("She was scared, she could hear me coming"); asserted the voluntariness of their statement; described their motivation; and expressed sorrow, remorse, and apologies for the crime they did not commit. "This was my first rape," said Korey Wise of the Central Park Five, who was innocent, "and it's going to be my last."

Given the weighty nature of confessions, one wonders if there are patterns of features that can be used to differentiate between true and false confessions. In a comparative follow up of the aforementioned content analysis, for example, Appleby and Perillo (2015) examined 20 confessions from police files that were not in dispute and observed a marked similarity between

[1] For a list of APA amicus curiae briefs see American Psychological Association, 2009.

[2] For a discussion, see Nirider, Tepfer, & Drizin, 2012; for a first-hand law enforcement account of how this can occur, see Trainum, 2008; for an experimental demonstration, see Alceste, Jones, & Kassin, 2020.

the two samples in regard to the amount of detail and the presence of such credibility cues as assertions of voluntariness, statements of motivation, apologies, and expressions of remorse.

Verbal content notwithstanding, perhaps confessors betray first-hand guilty knowledge in their physiological responses to a description of the crime. In a first test of this hypothesis, Geven et al. (2020) recruited 83 pairs of participants for a laboratory experiment on problem-solving. Within each pair, one team-member was a confederate who tempted some participants but not the others to break the experimenter's rule that they work alone. Afterward, participants were separated, accused of cheating, and interrogated. All guilty participants confessed in this situation compared to 61% of those who were innocent. Afterward, they were physiologically monitored (heart rate, respiration, skin conductance) as they were read multiple-choice questions in which only one alternative answer matched the instance in which cheating was alleged. Results showed that true confessors, but not false confessors exhibited "recognition" as measured by larger physiological responses to the correct answer relative to plausible but incorrect answers. This result offers a promising possibility. In light of the fact that most false confessors obtain guilty knowledge of crime facts through police contamination, more research is needed to determine if these "informed" innocent confessors can be distinguished from those whose guilty knowledge is acquired by their firsthand involvement.

Most closely related to the current study is a call for research on the linguistic style of confession statements (Shuy, 1998). One of the rare studies in this area is one in which false and true confession statements of past social transgressions were elicited from 85 participants; the study showed that false confessions possessed fewer adjectives than confessions defined as true, but no differences were found for verbs as indicators of deception (Villar et al., 2013).

Therefore, as content cues lack diagnostic value, as physiological data are typically not available, and as studies focusing on the linguistic aspects of confessions are very limited, the present study was designed to explore the language of confessions more explicitly. First, we created a baseline of linguistic features that appear in confessions presumed to be true by analyzing 98 law enforcement case files from a national sample. This was followed by creating a baseline of features in 37 confessions proven to be false that were drawn from the Innocence Project and other sources. Finally, we compared two sub-corpora composed of 25 randomly selected confessions for each condition in order to reveal any patterns that may differentiate between the two data sets; additionally, we tested the resulting model on a separate out-of-model sample consisting of 12 false confessions and 12 presumed true confessions.

II Method

The present study analyzed the language of confessions from a corpus-based perspective, which allows for the discovery of systematic patterns of features across a large number of texts (Biber, 2010). Corpus analysis also allows for both quantitative and qualitative analyses, the first of which reduces potential bias associated with more subjective forms of coding; the second of which highlights the need to interpret meaning in context (Baker 2006).

As described in the following sections, two corpora were created: Confessions Presumed True (CPT) and Confessions Proven False (CPF). The first task was to analyze each corpus for features shared by the confessions within that corpus. The second task was to compare those features to determine if any differentiated the two corpora. The third task was to examine significant features in a qualitative manner to reveal additional patterns of use in each corpus.

A. Data

The texts for the Confessions Proven False (CPF) corpus were compiled from several resources, the first of which was the Innocence Project. The confessors from the Innocence Project had all confessed to rape and/or murder and had spent an average of 14 years in prison before being DNA exonerated. Additional texts for the CPF were gathered from Dr. Brandon Garrett's online database (DNA Exoneration Database, 2019), from the second author's research and consulting files, and from the third author's previous studies in the field. In all cases, the confessor was exonerated. All texts that were not electronic were retyped into individual TXT files. All typos and non-standard grammatical usages were kept intact, but glosses with corrections and standard usages were included so that the analytic software would more easily recognize the errors and non-standard forms. Finally, because many confessions were embedded within police interviews or interrogations, the language of the police was separated from the language of the suspect in order to capture only the suspect's language.[3] In total, the CPF corpus consisted of 27 Question and Answer (Q&A) and 10 first-person confessions for a total of 37 false inculpatory statements.[4]

The texts for the Confessions Presumed True (CPT) corpus were compiled from FBI files housed at John Jay College of Criminal Justice. The data for this research were taken from closed, fully adjudicated state and local cases that were contributed by law enforcement agencies from around the country for the purpose of research. Since the files for the CPT corpus were all typed or handwritten paper copies, we manually retyped the shorter texts and scanned the longer ones using Adobe Reader's optical character recognition (OCR) program to transform them into machine readable texts. We hand-checked all OCR texts for accuracy and used the same protocol noted above regarding typos and non-standard language use. Finally, all identifiers, including the names of victims, suspects, offenders, officers, departments, and correctional agencies were removed.

[3] The data being mostly in Q&A format provides an interesting avenue of further research using Conversation Analysis to examine the exchanges between the police and the suspects in cases that led to CPT vs. CPF.

[4] The majority of our data consisted of written transcriptions of spoken confessions. However, given the archival nature of some of these data, some caveats are in order. Of the ten first-person statements in the CPF corpus, there was one handwritten confession and nine statements that had been read into the record in court and/or typed up by law enforcement officers. In the CPT corpus, the first-person statements were composed of 37 confessions typed or handwritten by officers; six confessions handwritten or typed by suspects; two handwritten confessions the authorship of which was not clear; and one confession that was prepared from memory and typed by an officer after the interview. While both corpora are based on the written transcripts in each case, most confessions were originally spoken in nature. At this point, more work is needed to determine if there are differences between spoken and written confessions, especially when the register of origin is unclear.

In order to avoid the influence of features based on content (e.g., related to crime type), a strong homogeneity between the corpora was a prerequisite (Granger & Leech, 2014). Thus, since the Innocence Project data consisted of rape and murder cases, we gathered only confessions of such crimes for the CPT corpus. Confessions from this national sample included the following criminal categories: single victim homicide, serial homicide, multiple homicide, single rape, serial rape, domestic homicide, and serial sexual homicide. This total sample consisted of 98 confessions divided into the two subgroups: Q&A (n = 31) and first-person statements (n = 65).[5] A summary of the two corpora is presented in Table 1.

Table 1. Summary of the Corpora

	Q&A	1st Person	Total Texts	Total Words
CPT	31	65	96	113,187
CPF	27	10	37	162,284

B. Procedure

The first software we used is a psychological language analysis program called Linguistic Inquiry and Word Count (LIWC) (Pennebaker, Booth, et al., 2015). LIWC was created to identify spoken and written features present within a variety of psychological, social, and linguistic categories (Pennebaker, Boyd, et al., 2015). LIWC operates by comparing the words in a corpus (called target words) to a list of words that are part of its internal dictionary of approximately 6,400 words.[6] Every target word present in the dictionary is sorted into one or more of the 95 specific dimensions representing different psychological constructs (e.g., positive and negative emotions, cognitive processes such as causation words), social concepts (e.g., family, health, occupation), and linguistic categories (e.g., adverbs, pronouns, articles) (Pennebaker et al., 2003). The final output summarizes the percentage of the overall corpus that falls under a specific category. After running both corpora through LIWC, we converted the percentages into raw counts and conducted bivariate correlational analysis to examine which of the 95 categories had a higher likelihood of being predictive of either the CPT or CPF corpus. Categories were considered as significantly correlated only if they met threshold values of $p < 0.05$ and $r > 0.2$.

To compare the types of confessions, we then created a random sample of 25 CPT and 25 CPF, controlling for format by including the same proportion of Q&A and first-person statements in both sub-samples. As with the full data sets, we analyzed each sample through LIWC, converted the percentages of each category into raw counts, and screened the 95 variables by selecting those that presented a significant correlation. As some of the resulting categories contained many overlapping items and were umbrella categories (e.g., affect also included the separate categories of positive emotion and negative emotion), we conducted an additional screening process by analyzing collinearity and eliminating the broader variables (e.g., negative emotion) that highly correlated with more specific ones (e.g., anxiety, anger, sadness). In the end, three linguistic

[5] Due to time constraints, we included in the CPT corpus only interview transcripts or statements that were less than 40 pages long. Also excluded were third-person statements, secondhand summaries of confessions within police reports, and confessions given in a language other than English.

[6] This estimated word count is from the third LIWC dictionary released in 2015.

categories were identified as predictors: personal pronouns (e.g., "I", "he"), impersonal pronouns (e.g., "it", "that"), and conjunctions (e.g., "and", "otherwise"). We then ran a logistic regression to analyze whether a model could be delineated that would distinguish the corpora (CPT or CPF) using the three identified predictors which explained the greatest amount of variance without overfitting the model. In order to cross-validate our results, we created a second random sample of 12 CPT and 12 CPF with the same format proportions, and the predictors identified in the first sample were tested on this out-of-model sample.[7] In order to reveal which specific words provided the most weight within each multi-word predictor category, a word list was run on the confessions as a whole and the ten most frequent terms within each predictor category were identified for further research. Figures 1-3 in the analysis provide frequency and distribution information for each set of terms. Log-likelihood tests were run to determine which terms differed significantly between the two corpora, the results of which are included in the Figures.

The next part of the analysis investigated the linguistic contexts in which the top ten terms were found, as corpus analyses have long demonstrated that "[y]ou shall know a word by the company it keeps" (Firth, 1957, p. 11). For this stage of the analysis, we used the freeware corpus analysis program AntConc (Anthony, 2014), which is a concordancing software that allows for in-depth qualitative analysis of the context and function of the words identified by the quantitative results described above.

For terms that were significant and the most frequent in each of the predictive categories, key word in context (KWIC) searches were run using the concordance feature. This allows the analyst to reveal frequent linguistic patterns surrounding the term of interest (i.e., the node word) by sorting words alphabetically to the right and/or left of the node word. For example, when examining the collocates of "I," frequent terms immediately to the right were verbs such as "went," "know," and "will." Subsequent searches were then performed to identify clusters that contained the node and its frequent collocates (e.g., negative forms such as "I didn't kill" and "I didn't know"), as well as related lemma forms, which include all forms in which a word can appear, as in different verb tenses (e.g., present tense "kill" and past tense "killed") and in agreement with different pronoun use (e.g., first person "know" and third person "knows"). In order to ensure the patterns were represented across the set of texts within each corpus (and thus were not just the product of a single or a few speakers), we also used the concordance plot tool, which reports in how many texts within the corpus such a pattern is present. Finally, collocated terms for each node word were grouped into grammatical and functional categories such as modal verbs, lexical verbs, cognitive verbs, etc. (Biber et al., 1999). Since the total number of words differed between the two corpora, the raw counts were normed prior to performing the comparative analyses (Biber et al., 1998).

III Results

A. Baseline Characteristics of the Corpora

We conducted a bivariate correlation analysis on the output generated by LIWC after converting the percentages into raw counts. Table 2 below reports the categories that showed a

[7] Thanks goes to Professor Sean Murphy for guidance on the statistical analyses.

significant degree of correlation ($p < 0.05$, $r > 0.2$) with either CPT (if they had a positive *r* coefficient, as we coded CPT as "1"), or CPT (if they had a negative *r* coefficient, as we coded CPF as "0").

Table 2. Correlations between LIWC categories and the CPT/CPF corpora

LIWC Category	r	p	CPT	CPF
Analytic	- .336	< .001		x
Clout	-.219	.011		x
Words of six letters or more	.203	.019	x	
Function words	.365	< .001	x	
Impersonal pronouns	-.307	< .001		x
Personal pronouns	.207	.016	x	
I	.278	.001	x	
They	-.377	< .001		x
Conjunctions	.220	.011	x	
Adjectives	.323	.007	x	
Auxiliary verbs	.241	.005	x	
Words of assent	-.208	.016		x
Non-fluency	-.266	.002		x
Words representing drives	.210	.015	x	

The CPF corpus was correlated with the *analytic* category[8] ($r = -.366$, $p < .001$), suggesting that the speech is more formal, logical, and hierarchical, as opposed to informal and narrative. It was also correlated with the *clout* category ($r = -.219$, $p = .011$), pointing toward a confident speaker who perceives a high level of expertise regarding the topic being discussed, possibly indicating higher social status, confidence, and leadership (Kacewicz et al., 2013). Other categories that defined the CPF corpus were *they* ($r = -.377$, $p < .001$) which is characterized by words related to the third person plural such as "them" or "their", *ipron* ($r = -.307$, $p < .001$), consisting of impersonal pronouns like "it" and demonstrative pronouns like "this" or "those", *assent* ($r = -208$, $p = .016$), which includes terms of agreement such as "okay" or "yeah", and *nonflu* ($r = -266$, $p = .002$), which is characterized by discourse markers such as "hm", "oh", and "ahh". In summary, the speech in false confessions seems to be characterized by the use of impersonal pronouns, terms of agreement, discourse markers, a high level of confidence, and formal, logical language.

The CPT corpus was instead correlated with the category named *Sixltr* ($r = .203$, $p = .019$) consisting of words longer than six letters and used as a proxy for word complexity. The strongest correlation was found with the category *function* ($r = .365$, $p < .001$), which is comprised of many subdimensions, including personal pronouns, articles, and auxiliary verbs. As personal pronouns (*ppron*) and auxiliary verbs (*auxverb*) also stood out as single categories (respectively $r = .207$, *p*

[8] New to the 2015 version of LIWC were four summary variables: analytic thinking, clout, authenticity, and emotional tone. These variables were derived from previous studies that examined correlations between existing variables and their general functions. It should be noted that "the summary variables are the only non-transparent dimensions in the LIWC2015 output" (Pennebaker, Boyd et al., 2015, p. 6), so our discussions here are based on the functional understanding of each relevant summary category.

= .016; r = .241, p = .005), the significance of *function* was in turn influenced by these two categories. The category *I* was also found relevant (r = .278, p = .001) and since it is contained within *ppron* and therefore *function*, it suggests that in CPT speakers have a higher use of the first-person pronoun, along with its possessive forms and declinations (e.g., mine, me). CPT also correlated with the categories *conj* (r = .220, p = .011) representing conjunctions such as "and", "but", and "because", *adj* (r = .232, p = .007) consisting of adjectives, and *drives* (r = .210, p = .015), which is a general category including words associated with subcategories: *affiliation*, *achievement*, *power*, *risk*, and *reward*. It is important to note that none of these subcategories turned out to be significant, although *risk* reached a *p*-value of .055, and could partly explain the significance of the broader *drives*. Considering this, it is not surprising to find *risk* words associated with confession statements in general, as its vocabular includes words conveying loss and danger that would be expected in such high stakes situations. Yet, its correlation with CPT as opposed to CPF suggests further research should explore this pattern. Finally, while also non-significant, the LIWC category labeled *tone*, which corresponds to the emotional state of the speaker, varied between conditions. With lower scores indicating more negative emotions, speakers of the CPT scored 10 percentage points lower (20.70) than CPF speakers (30.88), possibly indicating the turmoil caused by the knowledge of having indeed committed the crime of the former.

B. Differences Between the Corpora

To test whether any variables or combination of variables would discriminate between the two types of confessions, we conducted logistic regression on a random sample of CPT (n = 25) and CPF (n = 25) containing the same proportion of first-person statements and Q&A to control for discourse format. As LIWC's output offers 95 variables, we ran a bivariate correlation analysis to identify variables which showed a significant degree of correlation with CPF and/or CPT (p < 0.05 and r > 0.2), and obtained the following predictors: *analytic*, *clout*, *function*, *pronoun*, *ppron*, *I*, *they*, *ipron*, *conj*, *female*, *comma*. As noted above, since some of LIWC's categories contain overlapping words, we generated a correlation table of these predictors to assess collinearity. If two or more categories showed a high degree of collinearity, we chose the variable with the highest level of specificity over the broader one.

Through this process, we eliminated the variables *analytic*, *clout*, *function* and *pronoun*, as they are umbrella variables containing the others. We then tested the remaining seven categories in different combinations to find out which ones would explain the most variance without overfitting the model. We found that *comma* and *female* did not add predictive power to the model, and hence we eliminated them. Lastly, as *I* and *they* belong to the *ipron* and *ppron* categories, and we found the latter categories to be more predictive than the individual two pronouns, we chose to keep the categories *ipron* and *ppron* over *I* and *they*. In summary, the three variables presented in Table 3 which account for the most variance without overfitting the model were: impersonal pronouns, personal pronouns, and conjunctions.

Table 3. Logistic regression of impersonal pronouns, personal pronouns, and conjunctions on CPT and CPF

Variables	Model 1 (n = 50)		Model 2 (n = 24)	
	B	Odds Ratio	*B*	Odds Ratio
Impersonal pronouns	-44.974	.000	-.529	0.589

Personal pronouns	.448	1.566	1.383	3.9787
Conjunctions	8.508	4958.482	1.006	2.734
Nagelkerke pseudo r-square	.482		.807	
Chi-square	22.439, $df = 3$, $p < .001$		22.309, $df = 3$, $p < .001$	

Notes: CPF was assigned a value of 0, while CPT was assigned a value of 1.

The overall model was predictive of the dependent variables of CPT or CPF ($\chi^2 = 22.439$, $df = 3$, $p <. 001$), and the three variables were able to correctly classify 37 of the 50 confessions (Table 4). Impersonal pronouns had a significant association with CPF ($B = -44.974$, $e^B < .001$), coded as 0, while CPT were coded as 1, therefore explaining the negative coefficient accompanying this variable. CPT, instead, presented an association with personal pronouns ($B = .448$, $e^B = 1.566$) and conjunctions ($B = 8.508$, $e^B = 4958.482$). These results suggest that CPF are characterized by a higher degree of impersonal pronouns while CPT contain more conjunctions and personal pronouns. In short, this model was able to discriminate between the confessions that were proven false vs. those presumed to be true with an overall accuracy rate of 74% (Table 4).

Table 4. Classification table for Model 1 (n = 50)

Observed	Predicted		
	CPF	CPT	% correct
CPF	19	06	76%
CPT	07	18	72%
Overall percentage			74%

We further tested our predictors on an out-of-model sample composed of 12 CPT and 12 CPF containing the same proportion of Q&A and first-person statements as Model 1. Model 2 was also predictive ($\chi^2 = 22.309$, df = 3, p < .001) and the direction of the variables replicated our previous results, associating impersonal pronouns with CPF, and personal pronouns and conjunctions with CPT (Table 5). Importantly, this model correctly classified 20 out of 24 confessions (83.3%; see Table 5). In summary, it appears that false confessions contain more impersonal pronouns, such as "it", "that", "what", etc., and fewer personal pronouns, such as "I", "he," and "me;" the latter are more likely to be more found in confessions presumed to be true. Conjunctions such as "and", "then", "but", etc., were also more frequently used in CPT.

Table 5. Classification table for Model 2 (n = 24)

Observed	Predicted		
	CPF	CPT	% correct
CPF	10	02	83.3%
CPT	02	10	83.3%
Overall percentage			83.3%

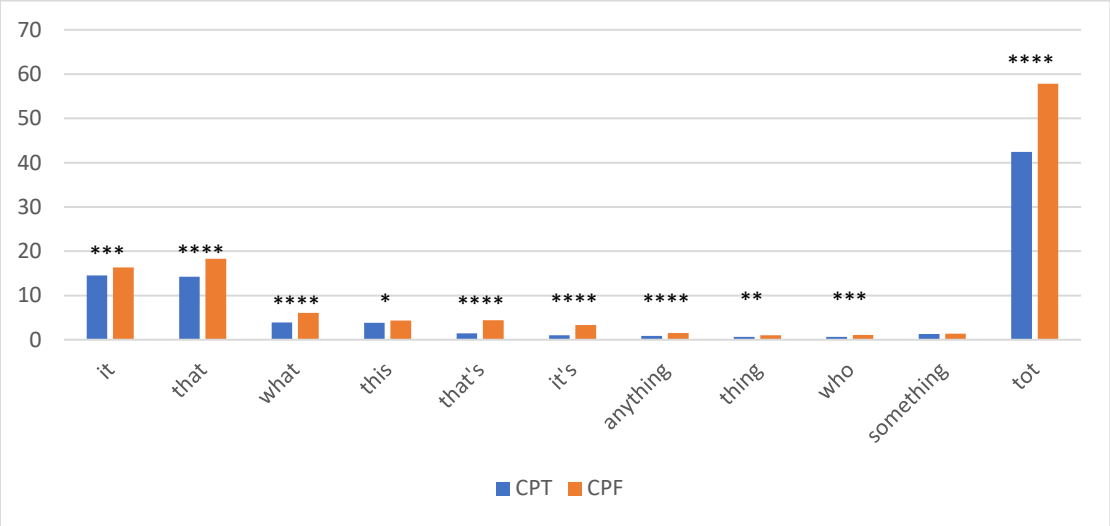
C. Predictors: Linguistic Function and Context

Impersonal pronouns, personal pronouns, and conjunctions represent three linguistic categories containing a multitude of lemmas that, during the development of LIWC, were

associated with each category by independent raters. In order to understand which words within the three categories influenced our results, we ran a word list of both corpora together in order to identify the top 10 words from each predictive category. Results were subsequently organized by their frequencies in the CPT vs. CPF (Figures 1-3 below), and log-likelihood tests were then run to determine if any of the features significantly distinguished between the two corpora (Rayson, 2021). Because counts for most common grammatical features "are relatively stable across 1000-word samples" (Biber et al., 1998, p. 249), frequencies are reported at a norming rate of X per 1000 words. Raw counts of each item are reported in Appendix A.

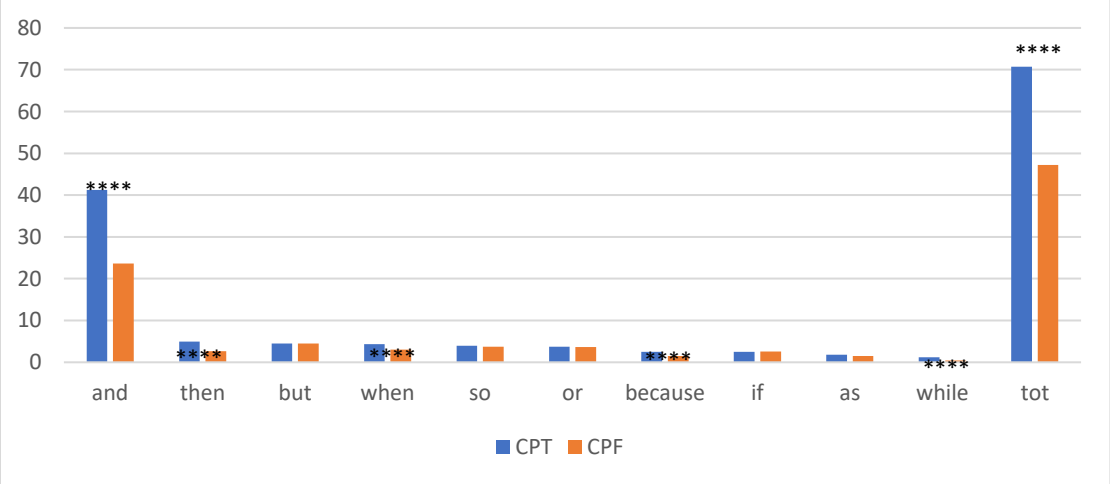
Starting with the impersonal pronoun category, "it" and "that" were the most frequent impersonal pronouns used in the CPF corpus (Figure 1). Because of the infrequent use of some of the weightier terms, this category was not explored further.

Figure 1. Frequency distribution of impersonal pronouns (per 1000 words)



* p < .05, ** p < .01, *** p < .001, **** p < .0001

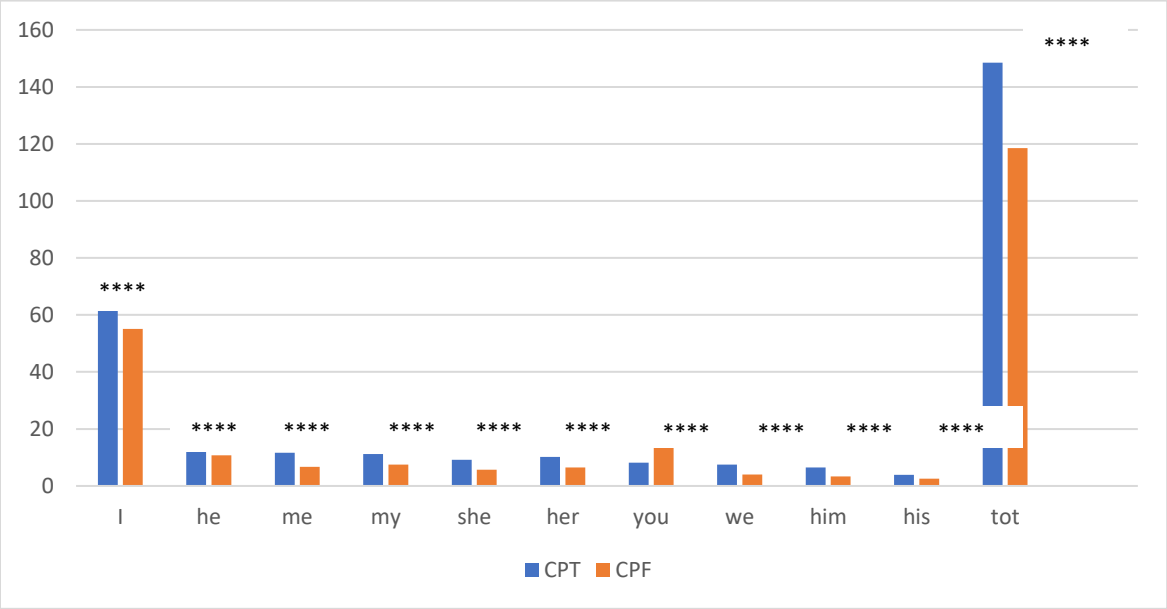
Figure 2. Frequency distribution of conjunctions (per 1000 words)



* p < .05, ** p < .01, *** p < .001, **** p < .0001

As displayed in Figure 2, the word "and" was responsible for the majority of the hits within the conjunctions category, Occurring more frequently in the CPT corpus, at a little over 4.1% while only 2.4% within CPF. Chafe (1993) analyzed the frequency of the most commonly occurring conjunctions in English and found that the word "and" comprises approximately 4.4% of all spoken English, while being only 1% of written language. Comparing these descriptive statistics to the ones that emerged from our sample, the frequency of "and" within CPT appears to fall within what is expected for spoken language, while its rate in CPF, the majority of which were also transcriptions of spoken first-person narratives and Q&A interrogations, suggests a closer proximity to written language.

Figure 3. Frequency distribution of personal pronouns (per 1000 words)



* p < .05, ** p < .01, *** p < .001, **** p < .0001

Finally, we conducted a more in-depth qualitative analysis in AntConc to understand the functions and context of "I," as it was the most commonly occurring pronoun in both corpora. The KWIC analysis revealed that the pronoun "I" in CPT collocated more often with lexical verbs, which express action and state (e.g., "go", "walk", "pick", "push", "find"), and include all verbs but auxiliary ones (Biber et al., 1999).

Given the topical nature of the confessions (i.e., violent crimes of murder and assault), a subset of lexical verbs concerning physical violence was further analyzed. Words like "hit", "cut", "killed", "raped", "shot", etc. were found to be on average 4.6 times more prominent in CPT than in CPF.

Another collocation category we identified with "I" were mental verbs, which express cognition (e.g., "know", "guess", "believe") (Biber et al., 1999). The lemmas "know" and "think" were the most frequently used in both CPT and CPF, but when comparing their usage between corpora, results showed that CPT contained slightly more "think" lemmas than CPF, and the latter contained more "know" lemmas than CPT. Interestingly, while the elevated frequency of the

lemma "know" in CPF initially suggested a higher level of knowledge of the facts of the crime, when we expanded our search to examine larger clusters using our collocates, a the proportion of negative instances (e.g., "I don't know", "I didn't know") represented 68% in CPF as compared to 56% in CPT. Thus, CPF speakers used the verb "to know" more often to express their lack of knowledge than CPT speakers.

Lastly, as a difference was observed in the frequency with which CPT and CPF used the sentence "I do not/don't remember/recall," the context surrounding it was examined. The sentence appeared 57 times in CPF across 13 confessions (35% of total CPF confessions), while in the CPT corpus it was uttered 86 times across 36 confessions (37.5% of total CPT confessions). When the words preceding and following it were inspected, a pattern emerged: in CPF, 49% of the total utterances ended the sentence and the speaker did not expand on what was not remembered, while in CPT, only 19% of the time the words terminated the sentence, and in the remaining 81% the speaker explained what was not remembered (e.g. "I don't remember what he was saying", "I don't remember if I had blood on them").

IV Discussion

This study compared the linguistic differences between presumed true and proven false confessions taking into account the contexts in which the grammatical and lexical patterns were found. First, we delineated the linguistic characteristics of both types of statements, with the language of CPF in our sample being characterized by impersonal pronouns, formality, and logical language suggesting a confident speaker, as well as a higher number of discourse markers and terms of agreement.[9] In contrast, CPT were characterized by more words longer than six letters, suggesting greater language complexity; more personal pronouns, especially "I", and auxiliary verbs, as well as conjunctions, adjectives, and possibly words regarding risk.[10]

Three linguistic predictors (impersonal pronouns, personal pronouns, and conjunctions) discriminated between CPT and CPF with an accuracy rate of 74% to 83.3%: Frequent use of impersonal pronouns was associated with proven false confessions, while personal pronouns and conjunctions were associated more with confessions presumed to be true. The lesser usage of first person singular by false confessors is consistent with research on language that has been linked to deception. For example, a 2008 study by Hancock et al. found that both participants who lied and were lied to use fewer first-person singular pronouns. It has been suggested that this reduced use of first-person singular pronouns may be an attempt to distance oneself from a negative event or context (Newman et al., 2003).

[9] These last two categories (non-fluency and terms of assent) were not considered significant, as the transcriptions of the confessions did not always include discourse markers (e.g., "ahh," "mmh," or ellipses), and the high frequency of terms of agreement depended on the preponderance of the Q&A format in the CPF.

[10] The prevalence of words longer than six letters in CPT, and therefore the corresponding lack thereof in CPF, could be linked to demographics and cognitive variables. In fact, we know that juveniles and individuals affected by a mental illness are more susceptible to producing a false confession (Drizin & Leo, 2004; Redlich et al., 2004; Redlich et al., 2008) and this could explain the lower lexical variety.

A qualitative analysis of collocations with "I" also revealed a pattern of association with lexical verbs (e.g., "put", "took", "killed", "hit", etc.) in CPT (e.g., "… and then eventually **I put** everything in the closet;" "**I hit** her in the side of the neck with my right forearm and she fell off the bed;" "**I raped** her, it was all a drug induced cloud"), and a lack thereof in CPF.

Moreover, the most frequent mental verb following "I" in CPF was found to be "I know/knew", while for CPT it was "I think/I thought", further raising the question of authorship, as it also ties to the higher level of confidence found in CPF by LIWC. However, both "I guess" and "I mean" were more frequently used in CPF (e.g. "I **guess** I was, yeah, I was kind of drunk by then, drinking pretty much;" "And **I mean** so I... that's why I got that gun for that purpose. But I don't... **I mean** I don't need no gun you know what **I mean**;" "So, **I guess** (name) her in the bedroom, in his bedroom, and started, I don't know, he beat her up, **I guess**. He knocked her out of something like that; he said in order to make love to her; she started yelling against and started fighting him, **I guess** he beat her up real bad and (name) got pissed about it."), adding a tentative aspect to the narrative and contrasting the previous finding, perhaps suggesting partial authorship.

Lastly, a close examination of the variations of the sentence "I don't remember" revealed that in CPF, the phrase tended to complete the sentence in approximately half of the cases (e.g., "**I don't remember**, I don't think, I don't know nothing;" "Not that I remember, **I don't remember** nothing, **I don't remember** nothing;" "**I** was – **don't** – **don't remember.** I was drinking that night;" "**I don't remember** exactly.") In contrast, in CPT, the sentence was followed in the majority of the cases by an explanation of what was not remembered (e.g. "**I don't remember** how many times I stabbed him; "I guess, **I don't remember** if it was on the bed or the floor;" "**I don't remember** the exact words I used, but I told him what happened and where it was;" "**I don't remember** if she was in or out of the car when she asked.").

This discrepancy could be due to the actual lack of knowledge of CPF in regard to the facts of the crime, therefore their "I don't remember" would symbolize a more general absence of memory caused by absence of the facts, while for CPT the context shifts toward a forgetfulness of specific details of the crime. This difference could also be tied to the cognitive processes involved in the production of images rather than false memories when it comes to CPF. These cognitive processes are in turn tightly connected to the concept of suggestibility, which has been found to be a crucial factor in the production of false confessions (Otgaar, 2021). False memories involve the actual belief of having experienced the remembered event, while images are conceptualized as associated with the suggested event but not experienced as memories of the event (Lindsay et al., 2004; Desjardins & Scoboria, 2007; Hessen-Kayfitz & Scoboria, 2012). Another study further distinguished the two by stating that people generating false memories "claimed to remember the event and reported at least two specific details about it," while individuals who experience images only "speculated about at least three different aspects of the event" (Strange et al., 2008, p. 479). Thus, false confessors may be generating images rather than false memories in the majority of the cases, and that could be the reason behind the lack of detail following the unremembered events.

Knowing how pronouns are used in different types of confessions is an important factor in the determination of the nature of a confession, and this model could be used in the future to help assess the possible veracity of a confession, within some probabilistic level of certainty (Adams, 1996). However, it is yet unknown why the speech of CPF turned out to be different from that of

CPT. A possible explanation could consist of different speech patterns between innocent confessors and guilty confessors, or it could be due to the different types of pressure these two populations find themselves under.

Another plausible explanation instead involves differences in the authorship of the confession. History presents all too many instances in which police appeared to write an innocent person's confession. In 1963, New York City detectives questioned George Whitmore, a 19-year-old African American man for 26 hours, which produced a detailed 61-page confession to two high-profile murders. Whitmore was ultimately exonerated. His false confession, however, plainly authored by the police, was so troubling that in *Miranda v. Arizona* (1966), the U.S. Supreme Court cited Whitmore as a "conspicuous" example of police coercion in the interrogation room (Kassin, 2017; English, 2011; Shapiro, 1969).

With 95% of false confessions containing accurate crime facts known to police that the innocent suspect could not have known, it is possible that in the case of CPF there may have been a heavier contamination of police speech into the suspect's speech, or even more directly, some of the confessions may have been authored by the officers. Yet, it is to be noted that also among the sample of CPT some confessions were transcribed by police officers upon request of the suspect, or because of departmental regulations on confession evidence, therefore a base level of contamination was to be expected in both samples. However, the different degree in which such contamination happened in CPT vs. CPF may be responsible for the observed linguistic differences between them.

A. Limitations and Future Research

Although current software programs can quantify and categorize psychological, social, and linguistic features in a text or corpus of texts, they are not without limitations. LIWC, for instance, does not consider context when categorizing language into its pre-determined dictionary categories, which means that some of the categories may have included terms whose contextual meanings had been misinterpreted (e.g., the sentence "I am crying of laughter" would increase the percentages under both the positive and negative emotions categories). While we aimed to partially obviate this shortcoming by examining the context of the top words in each predictor category using AntConc, more qualitative analysis can be done to further flesh out functional patterns produced by language in context.

Another limitation of this study lies in the archival nature of the data, which results in our inability to know the circumstances under which each confession was taken and the level of accuracy of the transcriptions where video or audio recordings were not present in the files. Interrogations and the process leading to a confession are currently largely a black box, unknown to both the public and the judicial system. Historically, the final confession has oftentimes been the only evidence revealed during legal proceedings, with little or no record of what preceded it. Because of the incredible weight that confession evidence holds, it is of paramount importance for the interrogation process to be video and audio recorded—from start to finish. Fortunately, with more states requiring recordings of interrogations, especially of more serious crimes that result in lengthier sentences (Bang et al., 2018) more research can be performed in the future on these previously under-documented processes.

In addition to further exploration of the patterns with "I" discussed above, future research should also follow up on the context and functions of "it", as we found this word to be the most frequent within the impersonal pronouns category. Similarly, further investigation of variations in the contexts in which "and" occurs, as it was the most common conjunction in our corpora, may also provide fruitful results.

Finally, future research should also investigate the language in confessions that have been contaminated during the interrogation process, including the effect of interjected law enforcement speech on the suspect's narrative, and of possible police authorship on the final statement. This would also help isolate whether there is a stylistic difference inherent to innocent and guilty speech beyond the contamination.

In conclusion, this study outlined the linguistic baselines of confessions proven false and confessions presumed true and demonstrated which classes of features and individual terms and their collocates provided avenues of further research to help distinguish between the two. While the results of this research do not presume to suggest a clear-cut way of distinguishing between true and false confession statements, they highlight the potential of corpus linguistics as an analytical tool for future research in the field and raise interesting questions on the possible causes of the stylistic differences.

References

American Psychological Association. (2009). *APA Amicus Briefs by Issue*, online: http://www.apa.org/about/offices/ogc/amicus/index-issues.aspx

Adams, Susan H. (1996). Statement analysis: What do suspects' words really reveal. *FBI Law Enforcement Bulletin*, *65*, 12.

Alceste, Fabiana, Jones, Kristyn A., & Kassin, Saul M. (2020). Facts only the perpetrator could have known? A study of contamination in mock crime interrogations. *Law and Human Behavior*, *44*(2), 128–142, online: https://web.williams.edu/Psychology/Faculty/Kassin/files/Alceste%20Jones%20Kassin%20(2020)%20-%20Contamination.pdf

Anthony, Laurence. (2014) AntConc (Version 3.4.3) [Computer Software]. Tokyo, Japan: Waseda University.

Appleby, Sara C., & Perillo, Jennifer T. (2015). *Confessions as Hollywood Productions: A Content Analysis Comparison of Corroborated and False Confessions.* Paper presented at the Meeting of the American Psychology-Law Society, San Diego.

Appleby, Sara C., Hasel, Lisa E., & Kassin, Saul M. (2013). Police-induced confessions: An empirical analysis of their content and impact. *Psychology, Crime & Law*, *19*(2), 111-128, online: https://doi.org/10.1080/1068316X.2011.613389

Appleby, Sara C., & Kassin, Saul M. (2016). When self-report trumps science: Effects of confessions, DNA, and prosecutorial theories on perceptions of guilt. *Psychology, Public Policy, and Law*, *22*(2), 127–140.

Baker, Paul (2006). *Using corpora in discourse analysis*. A&C Black.

Bang, Brandon L., Stanton, Duane, Hemmens, Craig, & Stohr, Mary K. (2018). Police recording of custodial interrogations: A state-by-state legal inquiry. *International Journal of Police Science & Management*, *20*(1), 3-18, online: https://journals.sagepub.com/doi/pdf/10.1177/1461355717750172

Biber, Douglas (2010). Corpus-based and corpus-driven analyses of language variation and use. In *The Oxford Handbook of Linguistic Analysis.* Oxford: Oxford University Press.

Biber, Douglas, Conrad, Susan, and Reppen, Randi (1998). *Corpus linguistics: Investigating language structure and use.* Cambridge: Cambridge University Press.

Biber, Douglas, Johansson, Stieg, Leech, Geoffrey, Conrad, Susan, & Finegan, Edward (1999). *Longman grammar of spoken and written English* (Vol. 2). London: Longman.

Chafe, Wallace (1993). Integration and involvement in speaking, writing, and oral literature. In: Deborah Tannen (ed.), *Spoken and Written Language: Exploring Orality and Literacy*, 35-53. Norwood, N.J.: Ablex.

Desjardins, Tracy, & Scoboria, Alan (2007). "You and your best friend Suzy put Slime in Ms. Smollett's desk": Producing false memories with self-relevant details. *Psychonomic Bulletin & Review*, *14*(6), 1090-1095, online: https://link.springer.com/content/pdf/10.3758/BF03193096.pdf

Drizin, Steven A., & Leo, Richard A. (2004). The problem of false confessions in the post-DNA world. *North Carolina Law Review*, *82*, 891-1007.

DNA Exoneration Database (2021). Accessed 10 June 2021, online: https://www.convictingtheinnocent.com

English, Thomas J. (2011). *The Savage City: Race, Murder, and a Generation on the Edge*. New York: Morrow.

Firth, John R. (1957). *Papers in Linguistics, 1934-1951*. London: Oxford University Press.

Garrett, Brendon. L. (2010). The substance of false confessions. *Stanford Law Review*, *62*, 1051-1118.

Garrett, Brendon L. (2015). Contaminated confessions revisited. *Virginia Law Review*, *101*, 395.

Geven, Linda M., Ben-Shakhar, Gershon, Kassin, Saul M., & Verschuere, Bruno (2020). Distinguishing true from false confessions using physiological patterns of concealed information recognition: A proof of concept study. *Biological Psychology*, *154*, 107902, online:https://www.sciencedirect.com/science/article/pii/S0301051120300624

Granger, Sylviane, & Leech, Geoffrey (2014). *Learner English on computer*. Routledge.

Hancock, Jeffrey T., Curry, Lauren E., Goorha, Saurabh, & Woodworth, Michael (2008). On lying and being lied to: A linguistic analysis of deception in computer-mediated communication. *Discourse Processes*, *45*(1), 1-23, online: https://www.tandfonline.com/doi/pdf/10.1080/01638530701739181

Hessen-Kayfitz, Joanna K., & Scoboria, Alan (2012). False memory is in the details: Photographic details differentially predict memory formation. *Applied Cognitive Psychology*, *26*(3), 333-341, online:

https://onlinelibrary.wiley.com/doi/pdf/10.1002/acp.1839

Honts, Charles R., Kassin, Saul M., & Craig, Ronald A. (2014). 'I'd know a false confession if I saw one': a constructive replication with juveniles. *Psychology, Crime & Law*, *20*(7), 695-704, online: https://www.tandfonline.com/doi/pdf/10.1080/1068316X.2013.854792

Honts, Charles R., Forrest, Krista, & Stepanescu, Adela (2019). Polygraph examiners unable to discriminate true and false juvenile confessions. Polygraph and Forensic Credibility Assessment: *Journal of Science and Field Practice, 48*(1), 1-9.

Innocence Records. Retrieved on 14 May 2018, online: www.innocencerecord.org

Kacewicz, Ewa, Pennebaker, James W., Davis, Matthew, Jeon, Moongee, & Graesser, Arthur C. (2014). Pronoun use reflects standings in social hierarchies. *Journal of Language and Social Psychology*, *33*(2), 125-143, online: https://journals.sagepub.com/doi/pdf/10.1177/0261927X13502654

Kassin, Saul M. (1997). The psychology of confession evidence. *American Psychologist*, *52*(3), 221, online: https://web.williams.edu/Psychology/Faculty/Kassin/files/Kassin1997.pdf

Kassin, Saul M. (2012). Why confessions trump innocence. *American Psychologist, 67*, 431-445, online: https://doi.org/10.1037/a0028212

Kassin, Saul M. (2017). False confessions: How can psychology so basic be so counterintuitive? *American Psychologist, 72*, 951-964.

Kassin, Saul M., Drizin, Steven A., Grisso, Thomas, Gudjonsson, Gisli H., Leo, Richard A., & Redlich, Allison D. (2010). Police-induced confessions: Risk factors and recommendations. *Law and human behavior*, *34*(1), 3-38, online: https://idp.springer.com/authorize/casa?redirect_uri=https://link.springer.com/article/10.1007/s10979-009-9188-6

Kassin, Saul M., Meissner, Christian A., & Norwick, Rebecca J. (2005). "I'd know a false confession if I saw one": A comparative study of college students and police investigators. *Law and Human Behavior*, *29*(2), 211-227, online: https://link.springer.com/content/pdf/10.1007/s10979-005-2416-9.pdf

Kassin, Saul M., & Neumann, Katherine (1997). On the power of confession evidence: An experimental test of the "fundamental difference" hypothesis. *Law and Human Behavior, 21*, 469-484.

Kassin, Saul M., Redlich, Allison D., Alceste, Fabiana, & Luke, Timothy J. (2018). On the general acceptance of confessions research: Opinions of the scientific community. *American Psychologist, 73,* 63-80, online: https://web.williams.edu/Psychology/Faculty/Kassin/files/Kassin%20et%20al.%20(2018)%20-%20AP%20Frye.pdf

Kassin, Saul M., & Sukel, Holly (1997). Coerced confessions and the jury: An experimental test of the "harmless error" rule. *Law and Human Behavior, 21*, 27-46, online: https://link.springer.com/content/pdf/10.1023/A:1024814009769.pdf

Kassin, Saul M., & Wrightsman, Lawrence S. (1985). Confession evidence. In S. Kassin & L. Wrightsman (Eds.). *The psychology of evidence and trial procedure*, (pp. 67-94). Beverly Hills, CA: Sage Books.

Leo, Richard, & Drizin, Steven A. (2010). *The three errors: Pathways to false confession and wrongful conviction.* Washington: American Psychological Association, 2010.

Leo, Richard A., & Ofshe, Richard J. (1998). The consequences of false confessions: Deprivations of liberty and miscarriages of justice in the age of psychological interrogation. *Journal of Criminal Law and Criminology*, *88*, 429-496, online: https://doi.org/10.2307/1144288

Lindsay, Stephen D., Hagen, Lisa, Read, Don J., Wade, Kimberley, & Garry, Maryanne. (2004). True photographs and false memories. *Psychological Science*, *15*, 149–154, online: https://journals.sagepub.com/doi/pdf/10.1111/j.0956-7976.2004.01503002.x

National Institute of Justice, Office of Justice Programs, *Crime Scene Investigation: A Guide for Law Enforcement* 42 (Department of Justice 2000), online: https://www.ojp.gov/pdffiles1/nij/178280.pdf

National Registry of Exonerations. *The National Registry of Exonerations*. Retrieved on 10 April 2019, online: www.law.umich.edu/special/exoneration/Pages/False-Confessions.aspx

Neuschatz, Jeffrey S., Lawson, Deah S., Swanner, Jessica K., Meissner, Christian A., & Neuschatz, Joseph S. (2008). The effects of accomplice witnesses and jailhouse informants on jury decision making. *Law and Human Behavior*, *32*, 137–149, online: https://link.springer.com/article/10.1007/s10979-007-9100-1

Newman, Matthew L., Pennebaker, James W., Berry, Diane S., & Richards, Jane M. (2003). Lying words: Predicting deception from linguistic styles. *Personality and Social Psychology Bulletin*, *29*(5), 665-675, online: https://journals.sagepub.com/doi/pdf/10.1177/0146167203029005010

Nirider, Laura H., Tepfer, Jonshua A., & Drizin, Steven A. (2012). Combating Contamination in Confession Cases (reviewing Convicting the Innocent: Where Criminal Prosecutions Go Wrong by Brandon L. Garrett). *University of Chicago Law Review*, *79*(2), 7.

Otgaar, Henry, Schell-Leugers, Jennifer M., Howe, Mark L., Vilar, Alejandra De La Fuente, Houben, Sanne T., & Merckelbach, Harald (2021). The link between suggestibility, compliance, and false confessions: A review using experimental and field studies. *Applied Cognitive Psychology*, *35*(2), 445-455, online: https://onlinelibrary.wiley.com/doi/pdf/10.1002/acp.3788

Pennebaker, James W., Booth, Roger J., & Francis, Martha E. (2015). Linguistic inquiry and word count: LIWC [Computer software]. *Austin, TX: liwc.net*, *135*.

Pennebaker, James W., Boyd, Ryan L., Jordan, Kayla, & Blackburn, Kate. (2015). *The development and psychometric properties of LIWC2015*, online: https://repositories.lib.utexas.edu/bitstream/handle/2152/31333/LIWC2015_LanguageManual.pdf

Pennebaker, J. W., Mehl, Matthias R., & Niederhoffer, Kate G. (2003). Psychological Aspects of Natural Language Use: Our Words, Our Selves. *Annual Review of Psychology, 54,* 547-577, online: https://www.annualreviews.org/doi/full/10.1146/annurev.psych.54.101601.145041

Rayson, Paul. Log-likelihood and effect size calculator. (2021, August 10), online: http://ucrel.lancs.ac.uk/llwizard.html

Redlich, Allison D., Quas, Jodi A., & Ghetti, Simona (2008). Perceptions of children during a police interrogation: Guilt, confessions, and interview fairness. *Psychology, Crime & Law, 14*, 201–223, online: https://www.tandfonline.com/doi/pdf/10.1080/10683160701652542

Redlich, Allison D., Silverman, Melissa, Chen, Julie, & Steiner, Hans (2004). The police interrogation of children and adolescents. In *Interrogations, confessions, and entrapment* (pp. 107-125). Springer, Boston, MA, online: https://www.researchgate.net/profile/Allison-Redlich/publication/290469506

Shapiro, Fred C. (1969). *Whitmore*. New York: Bobbs-Merrill.

Shuy, Robert W. (1998). *The language of confession, interrogation, and deception*. Thousand Oaks, CA: Sage.

Strange, Deryn, Wade, Kimberley, & Hayne, Harlene (2008). Creating false memories for events that occurred before versus after the offset of childhood amnesia. *Memory, 16*, 475–484, online: https://doi.org/10.1080/09658210802059049

Trainum, James L. (2008, October 24). The case for videotaping interrogations: A suspect's false confession to a murder opened an officer's eyes. *The Los Angeles Times*.

Villar, Gina, Arciuli, Joanne, & Paterson, Helen (2013). Linguistic indicators of a false confession. *Psychiatry, Psychology and Law, 20*(4), 504-518, online: https://www.tandfonline.com/doi/pdf/10.1080/13218719.2012.712834

Wallace, Brian D., & Kassin, Saul M. (2012). Harmless error analysis: How do judges respond to confession errors? *Law and Human Behavior*, *36*(2), 151.

Wigmore, John H. (1985). *Wigmore on evidence* (4th ed.). Boston, MA: Little, Brown. (Original work published 1904)

Wrightsman, Lawrence S., & Kassin, Saul M. (1993). *Confessions in the courtroom*. Newbury Park, CA: Sage.

Appendix A

Raw counts of top ten impersonal pronouns

	CPT	CPF
it	1642	2654
that	1608	2968
what	444	989
this	430	705

that's	162	714
it's	118	542
anything	99	251
thing	75	167
who	76	176
something	147	217
tot	4801	9383

Raw counts of top ten conjunctions

	CPT	CPF
and	4666	3836
then	560	428
but	508	725
when	495	496
so	448	606
or	424	586
because	286	249
if	281	414
as	201	249
while	136	76
tot	8005	7665

Raw counts of top ten personal pronouns

	CPT	CPF
I	7339	8934
he	1742	1751
me	1314	1097
my	1263	1223
she	1043	934
her	1153	1052
you	920	2637
we	853	656
him	738	545
his	443	410
tot	16808	19239