INTELLECT | Eminent visual ARTISTS display high levels of *analytic thinking styles + cog processes* comparable to SCIENTISTS

KATHRYN S. KELLEY, MOLLY E. IRELAND & DAVID R.W. SEARS | LANGUAGE USE + SOCIAL INTERACTION and PERFORMING ARTS RESEARCH LAB | TEXAS TECH UNIVERSITY

ABSTRACT

Past research suggests that **Openness to Experience but not Intellect, predicts creative achievement in the arts**, whereas Intellect predicts achievement in the sciences. Based on eminent visual artists' propensity to write and the nature of their writings, we hypothesized that in conjunction with Openness, Intellect predicts high achievement in the visual arts. We used a computerized text analysis program, Linguistic Inquiry and Word Count (LIWC), to analyze published writing samples (N = 2,101) by visual artists and scientists.

Artists, like scientists, used a significantly higher frequency of categories associated with analytical thinking style, advanced vocabulary, and cognitive processes than the LIWC norms (N = 177,779), with no statistical differences between eminent artists and scientists. Greater usage of these categories is correlated with Intellect, academic success, and analytic reasoning (Boyd & Pennebaker, 2015). Both scientists and artists showed low rates of social and emotion word categories. **Results suggest that intellectual engagement, ability, and cognitive complexity are associated with high-achievement among real-world visual artists.**

HYPOTHESES

H*¹:** Highly creative achievers, ***scientists + ***artists***, will ***not*** differ along linguistic dimensions associated with ***Intellect*** —***analytic thinking style*** + ***cognitive processes***.

H*²:** High creative achievers, ***scientists + ***artists***, ***will differ*** from ***LIWC 2015 corpus population norms*** along linguistic dimensions associated with ***Intellect***.

H*³:** In the ***visual arts, ***Intellect*** *is* associated with creative ***achievement*** but not creative ***activity*** alone.

Yves Klein, Artist, *Leap into the Void*

Marcel Duchamp, Artist

Openness | **Intellect**

INTRODUCTION

The **capacity** and **predilection** to "**seek, detect, comprehend** and **utilize**" **ideas** and **experiential data**, trait level **Openness/Intellect**, are robustly linked with **creativity** (the novel and satisfying clarification or resolution of a problem).[1]

Sub-facets of Openness/Intellect:

1. ***Openness* to experience:** involves a proclivity for intuitively engaging the world through sensory, aesthetic and affect means;
2. ***Intellect:*** entails an inclination and ability for intentionally and rationally engaging with IDEAS.[2]

1 DeYoung, Grazioplene, and Peterson, "From Madness to Genius,"
2 Chamorro et al., "Openness/Intellect: The Core of the Creative Personality,"
3 Kaufman et al., "Openness to Experience and Intellect Differentially Predict Creative Achievement in the Arts and Sciences,"
DeYoung et al., "Openness to Experience, Intellect, and Cognitive Ability,"
Hong et al., "Meta-Analytic Investigations of the Relation Between Intuition and Analysis."

Experimental research of in-person predictors of creative achievement most often sample from *pre-adulting, non-professional populations*, and generalize findings across varied levels of activity/achievement and distinct artistic fields, e.g. painters, performers, composers, writers.

Personality/creativity researchers common correlative conclusion:

Openness but ***NOT*** **Intellect** is a predictor of **creative achievement** in the ***ARTS***[3]

Which is penned by the artist and scientist?

Sample excerpts: Analytical Thinking Style scores of 97 with advanced vocabulary

SAMPLE X:

Personhood II: Attachment's Turbulent Causation

The dichotomy of veridical and illusory perceptions is required in the intensive analysis to follow. But I may note that this dichotomy understates the problematicity of perception. The straightforward perceptions are achieved by tendentious selectivity and mental reversal of the sense-evidence. Veridical perceptions are something like habitual paranoid imputations to sense-contents. You continually seize an obscure cues in the apparition to mentally twist the apparition into your preselected theory of the substantial world […]

Fixation to a Cumulating Social Role

[…] It is commonplace for a person's whole thematic identity to be a matter of attachment to one's social identity as it has accumulated in the past. One is overwhelmed by the significance society thrusts upon one. One is overwhelmed by the pursuits, goals, and cues for one's judgments which society thrusts upon one. […] the dynamic balance of attachment can be such that your self is submerged by parts which come from society and for which you are not exclusively responsible—by the assortment of privileges and disadvantages which society has thrust upon you. Your self is submerged by what has been done to you by your intimate associates and by the more impersonal community—and the assessments of the "venture of living" which you have formed there from.

SAMPLE Y:

Causality and Complementarity

The other aim was to express the hope that the epistemological attitude which had led to the clarification of the much simpler physical problems could prove itself helpful also in the discussion of psychological questions. In fact, the use which we make of words like "thought" and "feeling," or "instinct" and "reason" to describe psychic experiences of different types, shows the existence of characteristic relationships of complementarity conditioned by the peculiarity of introspection.

Above all, just the impossibility in introspection of sharply distinguishing between subject and object as is essential to the idea of causality would seem to provide the natural play for the feeling of free will. I am afraid that the short indications to which I have been obliged to restrict myself with respect to the last and many other points of this lecture will remind you only too well that in the last resort the direct use of any word must stand in a complementary relationship to an analysis of its meaning. I hope, however, that I have to some extent succeeded in giving you the impression that my attitude is in no way in conflict with our common endeavors

Sample X: Henry Flynt, conceptual artists (1940)
Sample Y: Niels Bohr, physicist (1885-1962)

METHODS: *Psycholinguistic text analysis w/ LIWC 2015*

Subject selection: Eminent artists, Big-C, were selected based on inclusion in multiple critical/historical art anthologies and survey textbooks; professional artists, pro-c, writings for online art magazine Glasstire.org; scientists, names were drawn from the Nobel Laureate website and/or a Google search of top 100 scientists of the 20th and 21st century.

Writing Sample Harvesting: Texts were scanned/OCR with Abby Finescanner/Reader or webscraped manually and with R programing environment (R Core Team, R: A Language and Environment for Statistical Computing.

Preprocessing of Samples: All samples were converted to text files and processed according to LIWC2015 Operator's Manual (Pennebaker et al., 2015).

LIWC 2015 Variables: Analytic thinking style, cognitive processes (cause and insight) and attentional focus (social, emotion, perceptual).

Processing + Analysis: Variable, word class frequency, scores for each sample were imported from Linguistic Inquiry and Word Count, LIWC software (Pennebaker et al., 2015) for each text. These were imported into the R environment for statistic analyzed and data visualization. In conjunction with mixed effect linear regression, we ran Welch's *t*-test for artist samples to norms published in the LIWC 2015 Language manual. These norms were derived from a pooled corpus of natural, literary and experimental writing samples (Pennebaker, et al., 2015).

Big-C [EMINENT] **visual artists**
pro-c [PROFESSIONAL] **visual artists**
Big-C [EMINENT] **scientists**

DATA: *Natural language samples*

writing **samples**	*EMINENT* Big-C **artists**	*EMINENT* Big-C **scientists**	*PROFESSIONAL* pro-c **artists**	*Norms* **LIWC 2015***
individuals	189	57	64	80,000+
writing samples	522	86	1,436	117,779
total words	880,004	2 16,951	1,175,448	231,190,022
mean word count	1663.52	2522.68	818.56	---
by female (%)	33	21	33	---
dates written	M = 1976.5 (1906-2018)	1973.33 (1859-2018)	M = 2010 (2001-2018)	(1983-2015)
genre	PUBLISHED essays, letters lecture scripts autobios statements	PUBLISHED essays, letters lecture scripts autobios statements	PUBLISHED essays on art + practice	Linguistic Inquiry + Word Count LIWC 2015 blogs, twitter, novels, NYTimes psyc expressive writing, natural speech

*Pennebaker, J.W., Boyd, R.L., Jordan, K., & Blackburn, K. (2015). *The development and psychometric properties of LIWC2015*. Austin, TX: University of Texas at Austin.

RESULTS

We found ***NO*** **meaningful differences** across the linguistic cues associated with Intellect **between eminent artists and scientists**.

Relative to **LIWC norms** on Welch *t*-test, as scientists, **eminent artists** use frequency was significantly

above the **LIWC norms** for
- **analytic thinking style** ($t(533.16) = 35$; $p < .001$)
- **causal processing** ($t(530.07) = 10.5$; $p < .001$)

below the **LIWC norms** for
- **affect** ($t(527.93) = -23.05$; $p < .001$)
- **social** ($t(526.21) = -21.89$; $p < .001$)

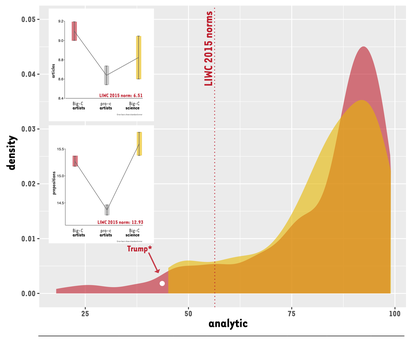
However, **scientists** used **lower rates** than eminent artists of
- **perceptual words** ($t(733) = -5.06$; $p < .001$)
- **abstract mental/emo state verbs** ($t(371) = -3.32$; $p < .001$)

Professional artists used more perceptual words and concrete language and far fewer cognitive processing words than eminent artists or scientists. Yet professional artists' analytic scores were above the LIWC norms while cognitive processing cues were below.

ANALYSIS: *Psycholinguistic category frequencies for each sample by group w/ LIWC 2015*

LINGUISTIC CUES OF INTELLECT: analytic thinking style + cog processes

Analytic thinking style score

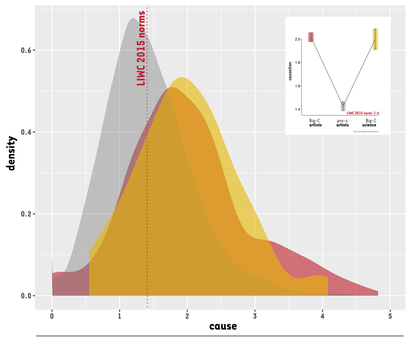


Predictors	*Est*	*SE*	*CI*	*t*	*p*	*df*
Intercept Big-C Artists	82.12	0.92	80.61 – 83.64	89.39	<0.001	225
Scientists	0.10	0.17	-0.23 – 0.44	0.60	**0.54**	303
Observations	608					
Groups	247					
Marginal R2/ Conditional R2	0.044 / 0.497					

p values calculated using Satterthwaite *df*

Welch t-tests : Eminent Artists (M = 82.09) + LIWC 2015 norm (M = 56.34): $t(533.16) = 35.12$ $p < .001$

Causal word frequency



Predictors	*Est.*	*SE*	*CI*	*t*	*p*	*df*
Intercept Big-C Artists	2.02	0.05	1.95 – 2.10	44.92	<0.001	345
pro-c Artists	-0.56	0.07	-0.68 – -0.44	-7.79	<0.001	172
Scientists	0	0.1	-0.17 – 0.17	-0.02	**0.982**	565
Observations	2051					
Groups	310					
Marginal R2/ Conditional R2	0.095 / 0.307					

LIWC 2015 Grand Mean 1.4

Welch t-tests : Eminent Artists (M = 2.02) + LIWC 2015 norm (M = 1.4): $t(530.70) = 10.24$ $p < .001$

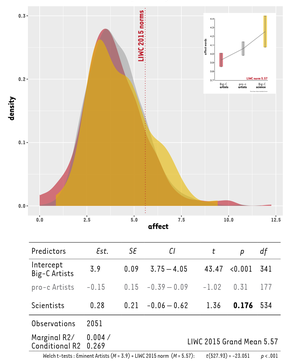
MEANS: *LIWC + Creatives*

LIWC 2015 Word Type Categories	LIWC*	Big-C Artist	Big-C Scientists	pro-c Artist
Analytic thinking	56.34	82.21	82.78	88.61
Articles	6.51	9.11	8.82	8.64
Prepositions	12.93	15.27	15.59	14.37
Cog processes	10.61	12.17	12.74	8.82
Insight	2.16	3.06	3.14	1.94
Causation	1.40	2.02	2.00	1.43
Discrepancy	1.44	1.23	1.36	0.82
Tentative	2.52	2.66	3.06	2.30
Certainty	1.35	1.68	1.64	1.07
Differentiation	2.99	3.25	3.21	2.42
Comparisons	2.23	2.50	2.65	2.44
Social	9.74	6.68	6.58	6.16
Affiliation	2.05	1.65	2.09	1.33
1st Person Sing	4.99	2.15	2.21	1.55
1st Person plural	0.72	0.81	1.37	0.46
2nd person	1.70	0.52	0.74	0.59
Impersonal pron	5.26	5.55	5.20	4.23
Family	0.44	0.14	0.13	0.16
Affect	5.57	3.93	4.25	4.06
Positive emo	3.67	2.45	2.69	2.63
Negative emo	1.84	1.39	1.45	1.35
Emotional Tone	54.22	45.52	49.20	49.59
LIWC Dic Words Captured	85.18	81.65	81.63	75.24
Large Words	15.60	24.57	23.72	23.77
Words Per Sentence	17.40	23.31	23.41	20.35

*Not under this large category in LIWC2015. GRAND MEANS. Pennebaker, J.W., Boyd, R.L., Jordan, K., & Blackburn, K. (2015). The development and psychometric properties of LIWC2015. Austin, TX: University of Texas at Austin.

LINGUISTIC CUES: attentional focus

Affect word frequency

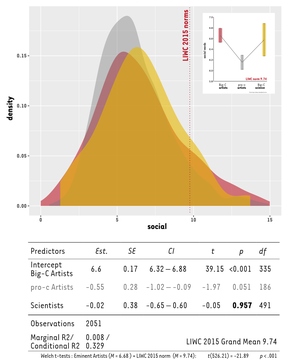


Predictors	*Est.*	*SE*	*CI*	*t*	*p*	*df*
Intercept Big-C Artists	3.9	0.09	3.75 – 4.05	43.47	<0.001	341
pro-c Artists	-0.15	0.15	-0.39 – 0.09	-1.02	0.31	177
Scientists	0.28	0.21	-0.06 – 0.62	1.36	**0.176**	534
Observations	2051					
Marginal R2/ Conditional R2	0.004 / 0.269					

LIWC 2015 Grand Mean 5.57

Welch t-tests : Eminent Artists (M = 3.9) + LIWC 2015 norm (M = 5.57): $t(327.93) = -21.051$ $p < .001$

Social word frequency

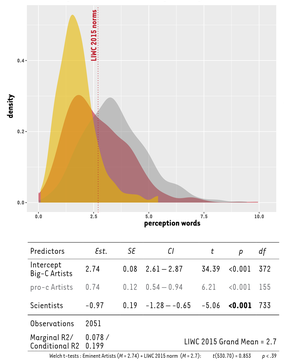


Predictors	*Est.*	*SE*	*CI*	*t*	*p*	*df*
Intercept Big-C Artists	6.6	0.17	6.32 – 6.88	39.15	<0.001	335
pro-c Artists	-0.55	0.28	-1.02 – -0.09	-1.97	0.051	186
Scientists	-0.02	0.38	-0.65 – 0.60	-0.05	**0.957**	491
Observations	2051					
Marginal R2/ Conditional R2	0.008 / 0.329					

LIWC 2015 Grand Mean 9.74

Welch t-tests : Eminent Artists (M = 6.68) + LIWC 2015 norm (M = 9.74): $t(526.21) = -21.89$ $p < .001$

Perceptual word frequency

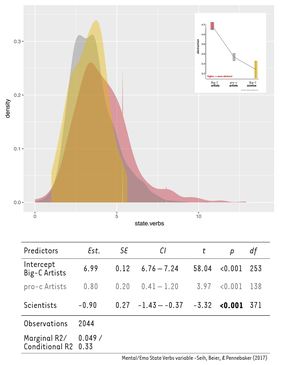


Predictors	*Est.*	*SE*	*CI*	*t*	*p*	*df*
Intercept Big-C Artists	2.74	0.08	2.61 – 2.87	34.39	<0.001	372
pro-c Artists	0.74	0.12	0.54 – 0.94	6.21	<0.001	155
Scientists	-0.97	0.19	-1.28 – -0.65	-5.06	**<0.001**	733
Observations	2051					
Marginal R2/ Conditional R2	0.078 / 0.199					

LIWC 2015 Grand Mean = 2.7

Welch t-tests : Eminent Artists (M = 2.74) + LIWC 2015 norm (M = 2.7): $t(530.70) = 0.853$ $p = .39$

Abstract mental + emo verb frequency



Predictors	*Est.*	*SE*	*CI*	*t*	*p*	*df*
Intercept Big-C Artists	6.99	0.12	6.76 – 7.24	58.04	<0.001	253
pro-c Artists	0.80	0.20	0.41 – 1.20	3.97	<0.001	138
Scientists	-0.90	0.27	-1.43 – -0.37	-3.32	**<0.001**	371
Observations	2044					
Marginal R2/ Conditional R2	0.049 / 0.33					

Mental/Emo State Verbs variable - Seih, Beier, & Pennebaker (2017)

DISCUSSION

Our results suggest that **Intellect**—the capacity and inclination toward deliberate analytical cognitive processing as measured by LIWC—is **associated with high creative achievers in the arts**, much as it is in the sciences.

It is common for the highly creative to be exposed to ongoing **evaluative-threat** from implicit biases against creative ideas/ideators and stressors from histories of psychological inconveniences, persnickety personalitytraits, anddevelopmentaladversities. As both **eminent scientists and artists have robust writing practices**, their **rational processing through writing** may example a **common coping mechanism employed** by those **high in trait Intellect and creativity**.

The **expressive writing paradigm** and **self-affirmation** studies have shown that **writing in particular ways** about highly self-relevant experiences can function as a regulatory **mechanism for enhancing cognitive** flexibility, working memory, problem solving, divergent thinking, scholarly performance and persistence while **attenuating negative** mood, intrusive thinking and detrimental self-enhancement tendencies. Based on these findings perhaps creative achievers' writing practices are a significant factor involved with switching between cognitive and emotional states believed to bolster creative cognition, attention and persistence, likewise buffering psychological inconveniences associated with the highly creative. **High creative achievers appear to be spontaneously and implicitly managing their creative and mental health through their writing practices.**

ARTIST SAMPLE: *Louise Bourgeois*
LIWC 2015 analytic (score: 94.6) and
cog processing (fre: 9.92) **words** highlighted

One of my favorite collectors collected white stones, each the size of a pebble and each representing a beautiful moment. These stones had a mysterious value to him and to no one else. Some people collect good luck charms like a penny on the street. Every time they find one they get titillated.

Is the social worker collecting a collection of saved lives? What about the need to collect friends? What about diaries? My diaries are a form of collecting and they have no use to anybody but me.

The only saving grace of collecting is its transitional value…hopefully there is a transition from the world of the object to the world of ideas.

Artist **Louise Bourgeois**, Artforum, vol 32, 1994

(Writing is) away into the mind […] It is important for me to write it down, to bring order to my thoughts. Isn't this what artists do: attend to and demand attentiveness to the intensity of everything? And sometimes just be silent and write"

Multimedia Artist **Anouk De Clercq**, 2013

ARTIST SAMPLE: *Sol LeWitt*
LIWC 2015 analytic (score: 73.97) and
cog processing (fre: 13.62) **words** highlighted

Dear Eva,
It will be almost a month since you wrote to me and you have possibly forgotten your state of mind (I doubt it though). You seem the same as always, and being you, hate every minute of it. Don't! Learn to say "Fuck You" to the world once in awhile. You have every right to. Just stop thinking, worrying, looking over your shoulder wondering, doubting, fearing, hurting, hoping for some easy way out, struggling, grasping, confusing, itchin, scratching, mumbling, bumbling, grumbling, humbling, stumbling, numbling, rumbling, gambling, tumbling, scumbling, scrambling, hitching, hatching, bitching, moaning, groaning, honing, boning, horse-shitting, hair-splitting, nit-picking, piss-trickling, nose sticking, ass-gouging, eyeball-poking, finger-pointing, alleyway-sneaking, long waiting, small stepping, evil-eyeing, back-scratching, searching, perching, besmirching, grinding, grinding, grinding away at yourself. Stop it and just DO!

Letter to Eva Hesse from artist Sol LeWitt, 1965

Kathryn.Kelley@ttu.edu | http://kathykelley.us | Texas Tech University, School of Art + Department of Psychological Sciences