Exploring the Relationship Between Lexical Measures and L2 Proficiency

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Outline

- Section 1. General Overview
- Section 2. Data
- Section 3. Results
- Section 4: Discussion

Section 1

General Overview

Rationale for the study

- Research shows that learners at higher proficiency levels generally use a more sophisticated vocabulary (e.g., Crossley & McNamara, 2009)
- There should be strong evidence that lexical characteristics of test-takers' productions vary with L2 proficiency as expected
- More research is needed on how vocabulary knowledge manifests itself in different item types in written and spoken assessments

Theoretical background

- Much research has been conducted to identify lexical features characterising the degree of complexity of a text *(e.g. research on L2 CAF and L2 development : Housen, Kuiken, & Vedder, 2012; Bulté and Housen, 2015)*

- Nowadays sophisticated tools exist to assess lexical complexity *(e.g.* ***IEA*** *by Pearson;* ***Coh-metrix*** *by Graesser et al., 2004; the* ***Gramulator*** *by McCarthy et al., 2014;* ***TAALES*** *by Kyle & Crossley, 2015)*

- In some studies, features of lexical complexity (e.g. LD) are found to:
  - ✓ Predict general proficiency, *e.g. Treffers-Daller, 2013 (up to 62% of variance explained); Yu, 2010*
  - ✓ Predict human judgements of lexical proficiency, *e.g. Crossley et al., 2011 (over 45% of variance explained)*
  - ✓ Affect holistic ratings of essay quality, *e.g. Yu, 2010 (about 11% of variance explained)*

Overview of the study

- An exploratory study of a corpus of test-takers’ responses from a test of general English
- Test-takers’ responses were analysed by means of lexical measures, human holistic ratings of oral and written proficiency, and test scores

Research questions

RQ1: To what extent can lexical measures predict human raters' CEFR estimates of test-takers' spoken and written proficiency?

RQ2: To what extent do different item types vary in their ability to predict test-takers' overall proficiency level?

Lexical Measures

nLemmatypes	Lexical diversity
medianFreq	Median word frequency
avgLength	Average word length
nContenttokens	Lexical density (tokens)
nContenttypes	Lexical density (types)
collocTokens	# of collocations (tokens)
collocTypes	Variety of collocations (types)
ExprTokens	# of multiword expressions (tokens)
ExprTypes	Variety of multiword expressions (types)
AvgExprFreq	Avg. frequency of multiword expressions
Entropy (IEA)	A measure of the Englishlikeness of a text
Vector Length (IEA)	A measure of word concreteness
WperS (IEA)	Avg. # of words per sentence (only for writing)
Zipf R^2 (IEA)	A measure of how close to real-life English a text is in terms of the distribution of word frequencies

Section 2

Data

Data

- *Progress* - General English proficiency test reported on Global Scale of English (GSE) and CEFR
- Fully automatically scored
- Field test data: *n*=10,074 test-takers from 57 countries
- A corpus of 5,000+ test-takers' responses
- 4 different productive item types

Describe Image

Look at an image and describe it out loud

Prep Time: 25 seconds
Response Time: 40 seconds

Story Retell

Listen to a short narrative (30-90 words) and then retell it in one’s own words

Prep Time: -
Response Time: 30 seconds

Sample Story

Molly took the bus home from work. When Molly got home, she realized she didn't have her bag. She thought she might have left it on the bus. Molly called the bus station and they had found her bag. She had to take the bus all the way back to the bus station near her work to pick it up.

Short Writing

Read a short prompt and write a response to the prompt.

Response Time: 10 minutes

Sample Prompts

- *Boys and girls should play sports together, rather than on separate teams. Do you agree or disagree with the statement? Why or why not?*
- *It is better to travel on your own than with a tour guide. Do you agree or disagree with the statement? Why or why not?*

Passage Recall

Read a short passage (45-75 words) for 30 seconds. After 30 seconds, the passage disappears. Reconstruct the passage in one's own words

Response Time: 90 seconds

Sample Passage

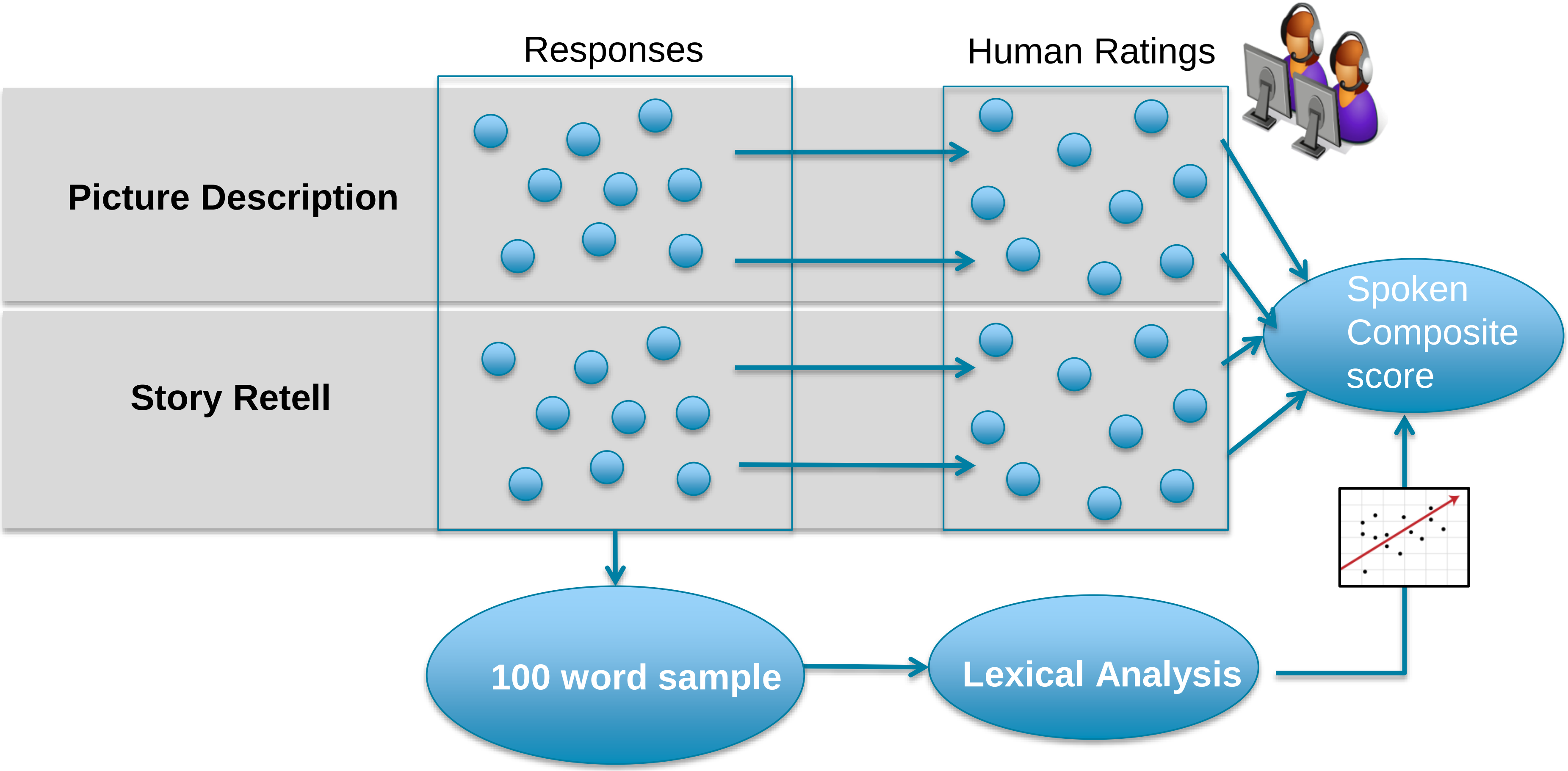
On Sunday Dave wanted to read the newspaper but he couldn't find his glasses anywhere. He remembered wearing them to read the menu at the restaurant the night before. However, when he called the restaurant, the waiter said they hadn't found any glasses when they were closing. Just as Dave had decided he had lost his glasses, he looked in the mirror and saw them on his head.

Data Preparation

- **Equalize text length for all test-takers**
  - Concatenated all spoken or written responses per test-taker, and then selected 100 words as a sample response
  - Purpose was to reduce the effect of text length to which LD measures are particularly sensitive

- **Spell-check of test-takers' responses**
  - Used human judgments to correct misspelled or partial words

Data Analyzed for Research Question 1



For Writing, the process is the same except: Tasks were Short Writing and Passage Recall. Human ratings were Written CEFR ratings.

Rating rubrics (overall written production)

Rating	Descriptors	
C2	Excellent command	Can write clear, smoothly flowing, complex texts in an appropriate and effective style and a logical structure which helps the reader to find significant points.
C1	Strong command	Can write, clear, well-structured texts of complex subjects, underlining the relevant salient issues, expanding and supporting points of view at some length with subsidiary points, reasons and relevant examples, and rounding off with an appropriate conclusion.
B2	Adequate command	Can write clear, detailed texts on a variety of subjects related to his/her field of interest, synthesizing and evaluating information and arguments from a number of sources.
B1	Partial command	Can write straightforward connected texts on a range of familiar subjects within his field of interest, by linking a series of shorter discrete elements into a linear sequence.
A2	Limited command	Can write a series of simple phrases and sentences linked with simple connectors like ‘and’, ‘but’ and ‘because’.
A1	Inadequate command	Can write simple isolated phrases and sentences.
0	No evidence	· Unintelligible/gibberish · Completely off-topic/irrelevant · Response is less than 5 words · Response is copied word-for-word from the prompt

Section 3

Results

RQ1: Spoken data
(Story retell and Picture description)

Variable
(Constant)
nLemmatypes
medianFreq
avgLength
nContenttokens
nContenttypes
collocTokens
collocTypes
ExprTokens
ExprTypes
AvgExprFreq
Entropy (IEA)
Vector length
Zipf R^2

RQ1: Spoken data R^2 (adj.)=.275, n=1492 (75 outliers removed) (Story retell and Picture description)

Variable	B	β	t	Sig	R^2	Semipartial^2
(Constant)	5.424		6.439	.000		
nLemmatypes	.026	.216	4.737	.000*	.083	.011
medianFreq	.000	-.141	-5.204	.000*	.061	.013
avgLength	.053	.016	.633	.527	.002	.000
nContenttokens	.011	.064	2.056	.040*	.020	.002
nContenttypes	-.008	-.050	-.994	.320	.067	.000
collocTokens	.048	.106	1.174	.241	.000	.001
collocTypes	-.074	-.150	-1.650	.099	.000	.001
ExprTokens	.003	.013	.179	.858	.007	.000
ExprTypes	-.009	-.035	-.461	.645	.013	.000
AvgExprFreq	.000	-.048	-2.135	.033*	.001	.002
Entropy	-.369	-.395	-16.806	.000*	.178	.137
Vector length	9.420	.127	4.389	.000*	.032	.009
Zipf R^2	-1.126	-.045	-1.498	.134	.000	.001

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RQ1: Written data
(Passage recall and short writing)

Variable
(Constant)
nLemmatypes
medianFreq
avgLength
nContenttokens
nContenttypes
collocTokens
collocTypes
ExprTokens
ExprTypes
AvgExprFreq
Entropy
Vector length
Words per sent.
Zipf R^2

RQ1: Written data R^2 (adj) = .035, n=1741 (94 outliers removed) (Passage recall and short writing)

Variable	B	β	t	Sig	R^2	Semipartial^2
(Constant)	4.120		7.596	.000		
nLemmatypes	-.024	-.182	-4.673	.000	.000	.012
medianFreq	.000	-.080	-2.759	.006	.005	.004
avgLength	-.081	-.031	-1.144	.253	.000	.001
nContenttokens	-.013	-.088	-2.286	.022	.005	.003
nContenttypes	.038	.254	5.183	.000	.017	.015
collocTokens	-.061	-.162	-1.094	.274	.000	.001
collocTypes	.042	.106	.713	.476	.000	.000
ExprTokens	-.077	-.360	-2.695	.007	.001	.004
ExprTypes	.088	.395	2.927	.003	.003	.005
AvgExprFreq	-.000	-.021	-.869	.385	.001	.000
Entropy	.022	.034	1.277	.202	.001	.001
Vector length	-.147	-.002	-.064	.949	.000	.000
Words per sent.	.000	-.024	-.926	.355	.000	.000
Zipf R^2	-.073	-.005	-.158	.874	.000	.000

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Entropy	.022	.034	1.277	.202	.001	.001
Vector length	-.147	-.002	-.064	.949	.000	.000
Words per sent.	.000	-.024	-.926	.355	.000	.000
Zipf R^2	-.073	-.005	-.158	.874	.000	.000

Pearson

RQ1: To what extent can lexical measures predict human ratings (CEFR estimates of test-takers' spoken and written proficiency)?

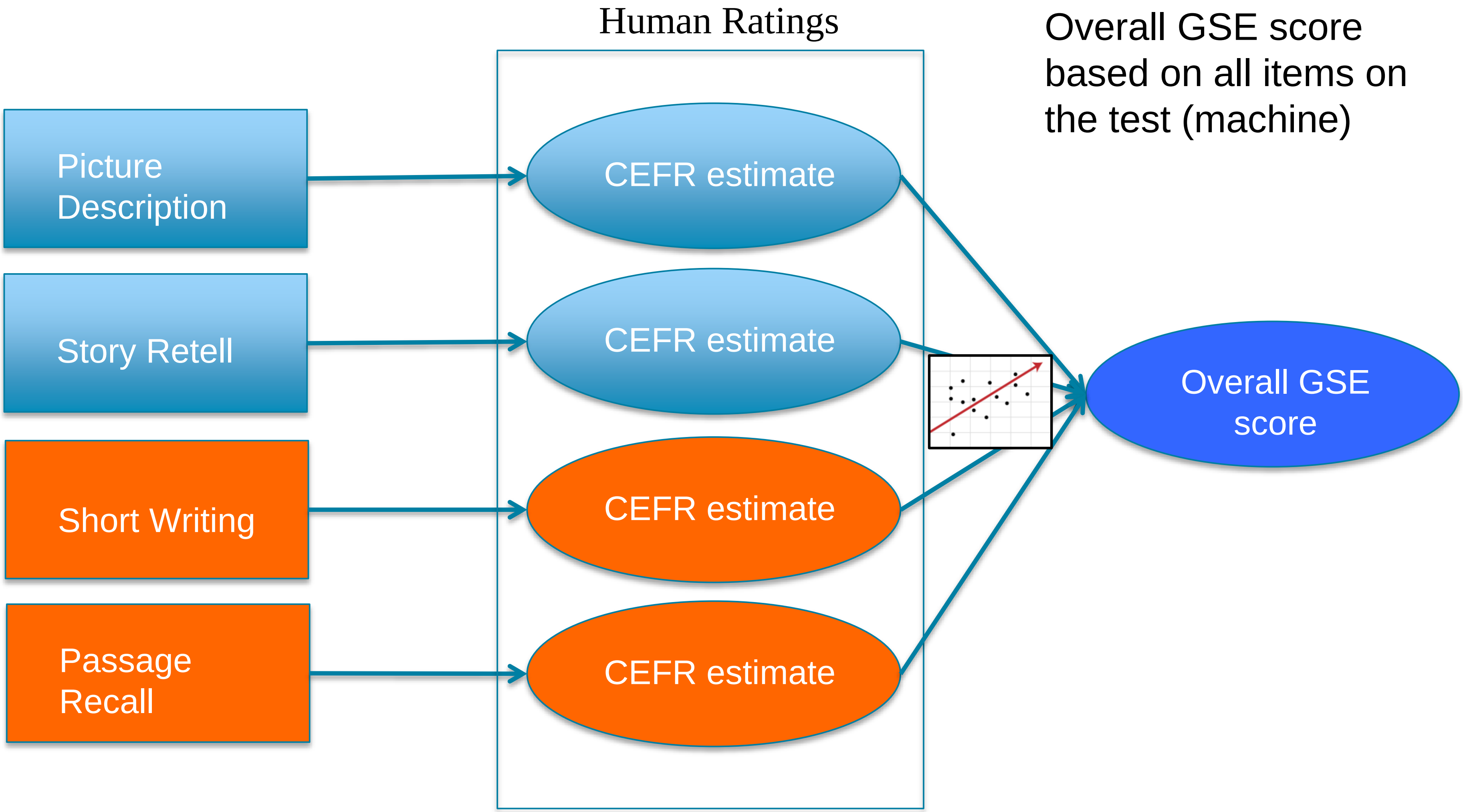
Speaking: A model with six statistically significant lexical measures provided small-to-moderate prediction of human ratings (R^2 adj.= .275).

- Entropy was by far the strongest predictor, with most of the explained variance uncorrelated with other variables

Writing: A model with six statistically significant lexical measures provided a negligible amount of prediction of holistic scores R^2 adj.= .035.

- No variables stood out as strong predictors

Data Analyzed for Research Question 2



Human Ratings

Overall GSE score based on all items on the test (machine)

Picture Description

Story Retell

Short Writing

Passage Recall

CEFR estimate

CEFR estimate

CEFR estimate

CEFR estimate

Overall GSE score

RQ2: Overall Proficiency Scores

Variable
Picture Description (spoken)
Story Retell (spoken)
Short Essay (written)
Passage Recall (written)

RQ2: Overall Proficiency Scores R^2 (adj) = .80, n=932 (37 outliers removed)

Variable	B	β	t	Sig	R^2	Semipartial^2
(Constant)	-5.383		-4.806	.000		
Picture Description (spoken)	3.720	.205	1.174	.000	.476	.022
Story Retell (spoken)	4.890	.298	13.127	.000	.612	.037
Short Essay (written)	2.873	.170	9.142	.000	.413	.018
Passage Recall (written)	7.883	.396	18.598	.000	.642	.074

RQ2: Overall Proficiency Scores R^2 (adj) = .80, *n*=932 (37 outliers removed)

Variable	B	β	t	Sig	R^2	Semipartial^2
(Constant)	-5.383		-4.806	.000		
Picture Description (spoken)	3.720	.205	1.174	.000	.476	.022
Story Retell (spoken)	4.890	.298	13.127	.000	.612	.037
Short Essay (written)	2.873	.170	9.142	.000	.413	.018
Passage Recall (written)	7.883	.396	18.598	.000	.642	.074

RQ2: To what extent do different item types vary in their ability to predict test-takers' overall proficiency level?

- The variables are highly predictive of machine-generated overall scores on Progress (adjusted $R^2 = .80$)
- The four variables were highly intercorrelated and each explains only negligible amounts of unique variance
- The item types requiring more constrained responses (Passage recall, Story retell) are better predictors of overall L2 proficiency than the more open-ended response item types (Picture description, Short essay)

Section 4

Discussion

Discussion

Our data suggest that…

- The two written item types do not tend to elicit the variety of lexical knowledge known to be associated with varying L2 proficiency levels
- The two spoken item types do elicit responses that appear to be more sensitive to lexical characteristic measures, in particular **entropy**, **number of lemmas**, and **overall word frequency**.

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ALWAYS LEARNING

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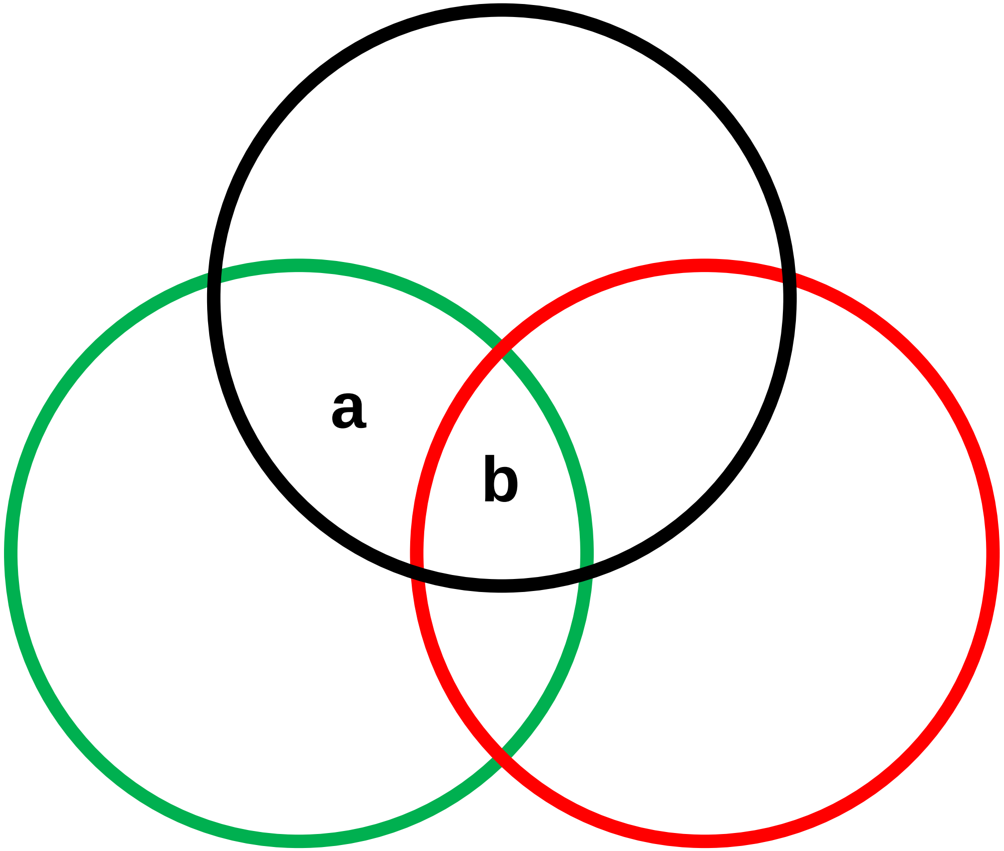

R2 = a+b/c

Semipartial2 =