Enhancing College Text Comprehension Through Brief Metalinguistic Training

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Academic reading is challenging for college students

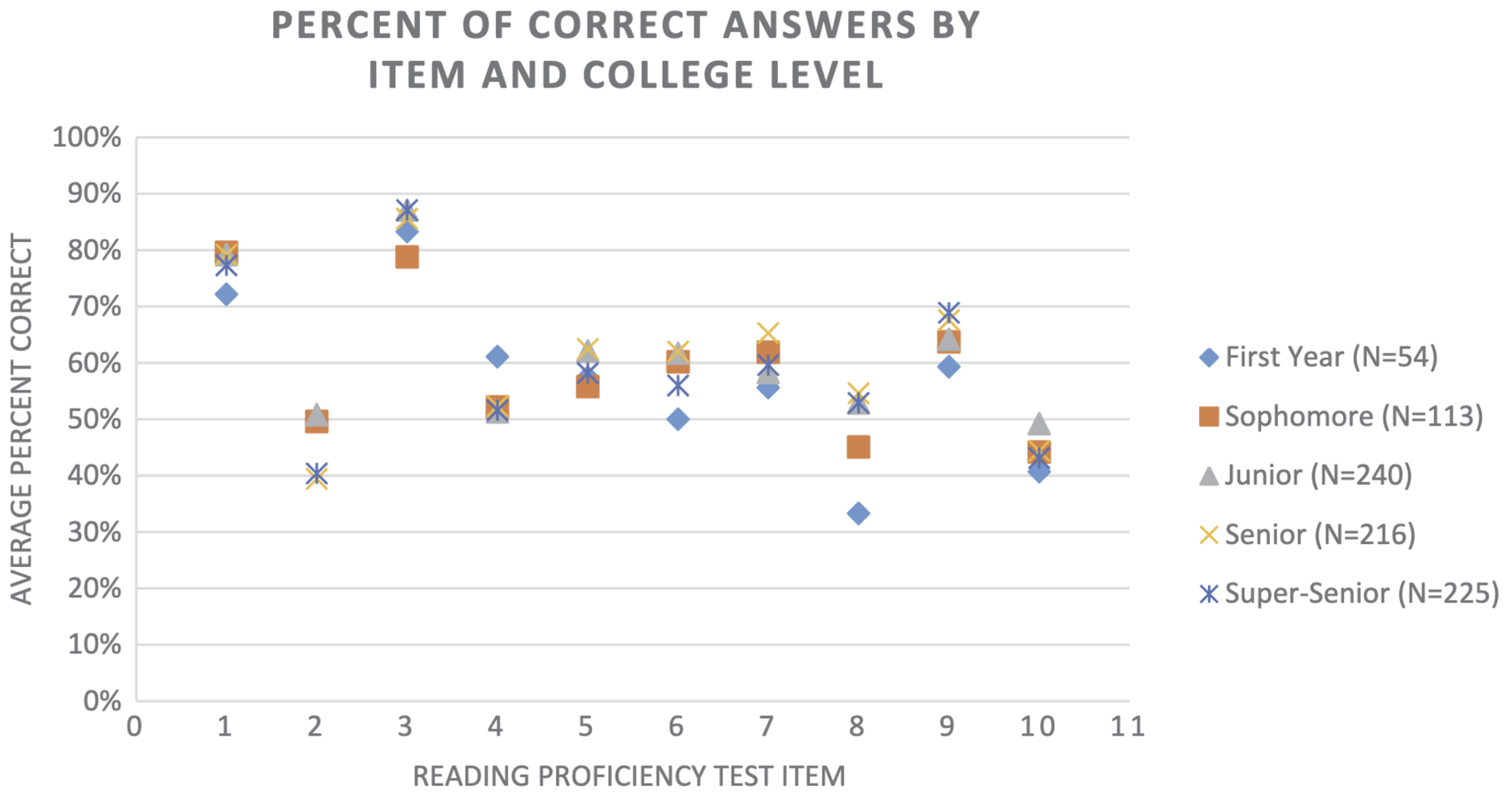


Figure 1. Informal Academic Reading Proficiency Test by item with corresponding cognitive skill and average percent correct by college level.

Gorzycki et al., 2016; Bowen & Berry, 2017

College students' attitude towards academic reading varies

96% of students agree that *reading is important*

66% of students think they are *fine with their reading skills*

86% of students think that *reading assignments are ineffective*

3% of students think that *the amount of reading assigned is appropriate*

Gorzycki et al., 2019

Student Statements

Theme Statement	Undergraduate comments
Reading is important	“ Reading is an essential tool for learning, but not for everyone.”
Reading assignments are ineffective	“Some instructors assign mass amounts of reading that doesn’t always hold significant relevance to the course.
Self-assessment: I am fine with my reading skills	“It’s hard for me to comprehend a lot of readings that I am given.”
Amount of reading assigned is appropriate	” Reading assignments sometimes are heavy burdens.”

Gorzycki et al., 2019

Why Reading Matters

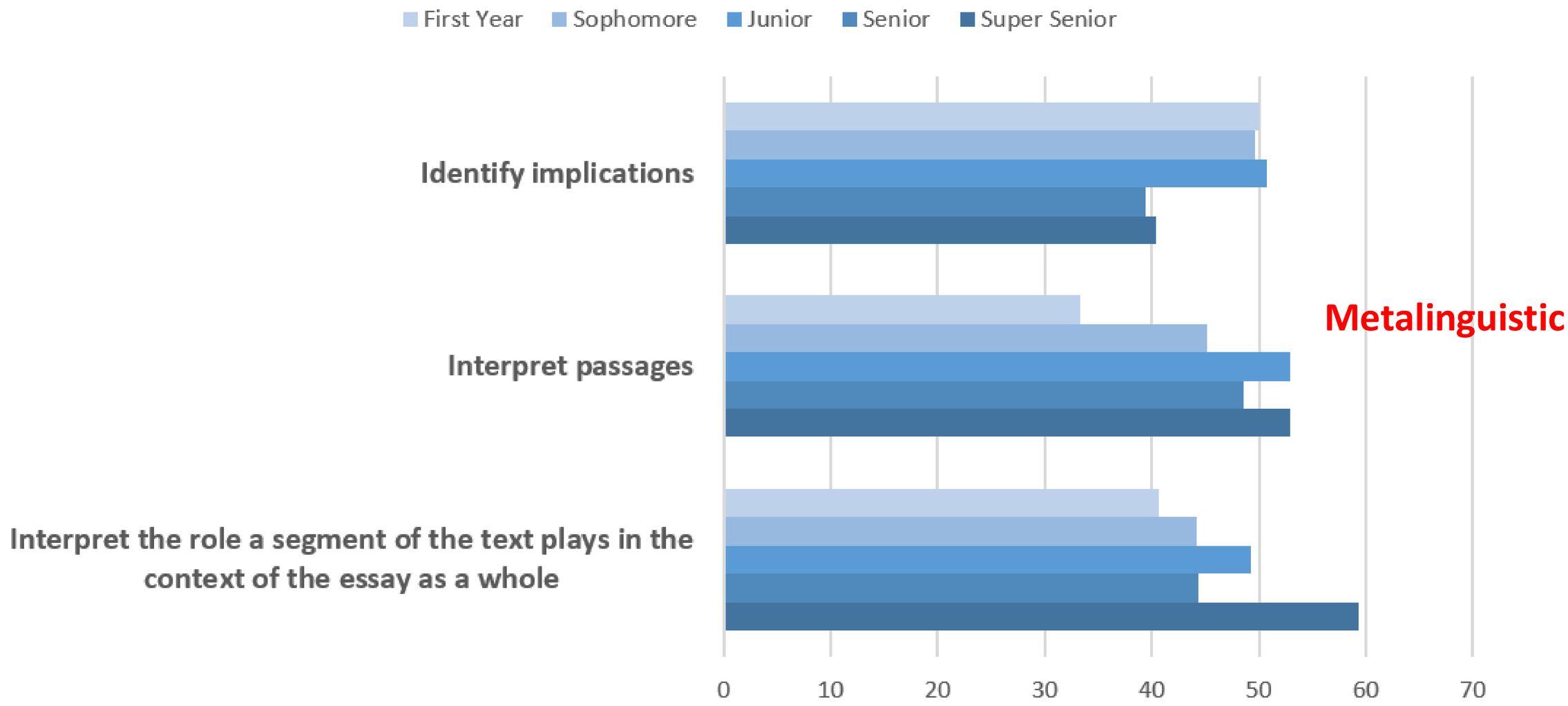
Reading proficiency is crucial for academic success

- Students received little formal instruction in academic reading and did not update their reading strategies to engage deeply with assigned texts during college.

How can we help students improve their academic reading skills and better engage with complex texts?

Anderson, 1985; Diwan, 2020; Sikora, Evans, & Kelley, 2019; Alsaeedi, 2021

Some of the Most Challenging Cognitive Skills



Metalinguistic

*Percent responding correctly by college level per question

Gorzycki et al., 2016

Research Question

Does metalinguistic training improve reading comprehension of complex scientific texts?

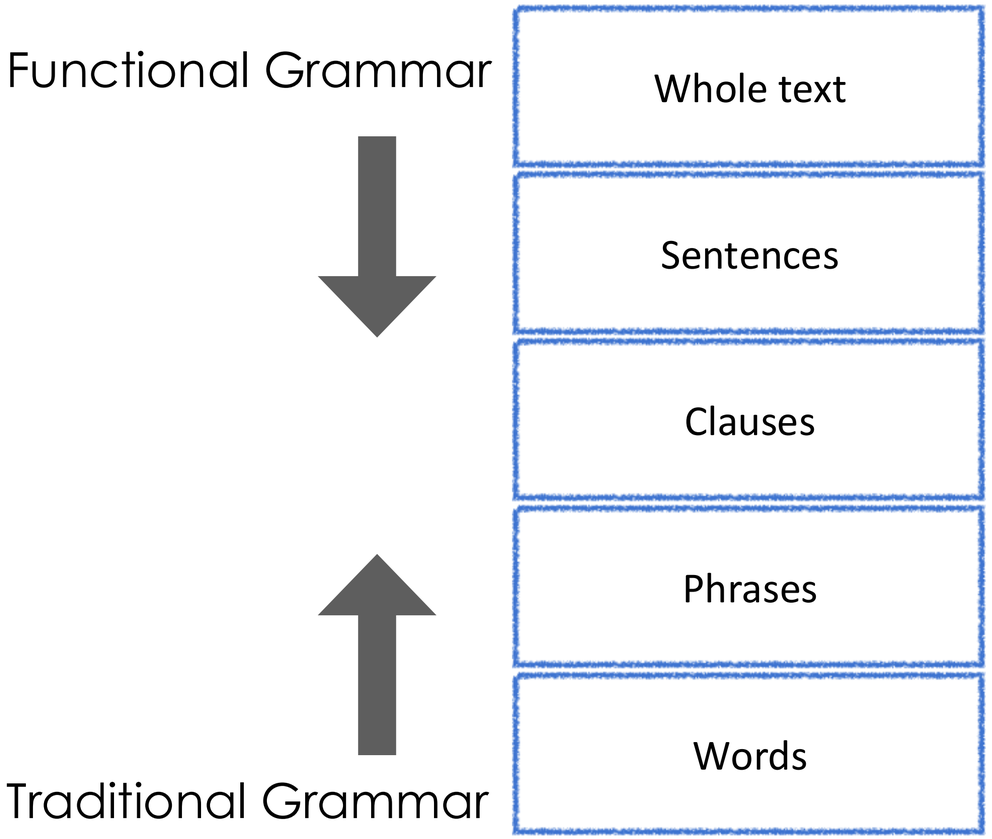
Prediction: YES!

Theoretical Framework:
Systematic Functional Linguistics (SFL)

See language as a social semiotic system

- construct and organize ideas
- communicate experiences
- make sense of the world

grammar serves as a specific communicative purposes.



Halliday, 1975, 1979; Moore & Schleppegrell, 2014; Schleppegrell, 2011

SFL and Reading Comprehension

- Enhances understanding of complex material through thematic progression analysis.
- Help students recognize links between sentences or clauses, improving cohesion and coherence in reading.
- Supports comprehension of difficult texts by providing meaning-based metalinguistic knowledge.

Rose, 2020; O'Hallaron et al., 2015; Authors, 2014, 2015, 2024a; Authors, 2024b; Fang, & Coatoam, 2013; Shanahan, & Shanahan, 2012; 2017

Thematic Progression: Zig Zag Patterning

Clausal Unit	Theme Complete Subject	Rheme Complete Predicate
1	The heroic act Bimbo did	was save Tito from dying in a volcanic explosion.
2	*When Bimbo heard the explosion* he	went and got up quickly and started to take Tito to the sea gate.
3	*When Bimbo felt that Tito tried to go in the opposite direction* Bimbo	had to pull him harder.
4	Bimbo	saved Tito
5	because Bimbo	was intelligent and caring
6	and most importantly Bimbo	loved Tito.

Why Zig Zag Pattern

- Prevalent in academic writing
  - Academic texts tend to display linear thematic patterns, or Zig Zag patterns, reflecting complex arguments in which subsequent ideas expand on the preceding sentence.
- Needed for coherent elaboration
- Focused on topic

Wang, 2007; Arancón, 2013; Eggins, 2004

Conditions

- SFL Training:
  - Thematic progression
  - Experimental condition
- Subject-Predicate:
  - Only read within the sentence level
  - Identify theme and rhyme
- Transitivity:
  - Strong metalinguistic training but within sentence

Wang, 2007; Arancón, 2013; Eggins, 2004

Study Design

Summary of Data Collection

- Recruited 171 participants from the SONA pool of a small, diverse four-year university in California.
- Initial sample demographics:
  - 30 males, 116 females, 3 non-binary/third-gender individuals.
  - 22 participants did not indicate gender or left it blank.
- Final sample after screening: 133 participants
- Conditions: 44 (SFL), 35 (Subject-Predicate), 54 (Verb Transitivity).

Procedure

SFL Training

Subject
Predicate

Verb
Transitivity

SFL Training

EXAMINE TEXT

Complete Subject	Complete Predicate
The most common type of **clay**	**is** earthware.
Earthware clay	**needs** firing to temperatures of between 1000-1800 C.
These high temperatures	**result** in a smooth, hard surface.
The surface	**is** perfect for painted designs or mosaic finishes.

SFL Training

ZIG ZAG PATTERN – SIGNAL ELABORATION/FOCUS

Unit	Theme Complete Subject	Rheme Complete Predicate
1	The most common type of **clay**	is **earthware**.
2	**Earthware** clay	needs firing to **temperatures** of between 1000-1800 C
3	These high **temperatures**	result in a smooth, hard **surface**.
4	The **surface**	is perfect for painted designs or mosaic finishes.

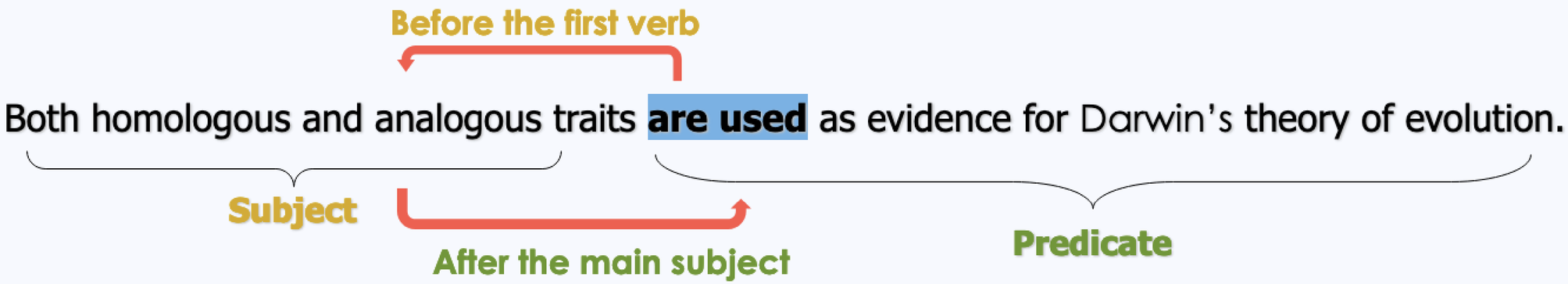
Subject Predicate Training

DEFINITION

Subject	Predicate
Part of the sentence that tells what or whom the sentence is about	Part of the sentence that tells what the subject in the sentence is doing
A subject tells "Who" or “What" in the sentence is all about	The Predicate tells what the subject “is” or “does”.
The subject can only be an object i.e. noun or pronoun	The predicate will contain verbs to tell what the subject is doing.
Types of Subject: •Simple Subject •Complete Subject •Compound Subject	Types of Predicate •Simple Predicate •Complete Predicate •Compound Predicate

Subject Predicate Training

EXAMPLE 1



Verb Transitivity Training

- Property of verbs
- Indicates the number of object chunks a verb can have

3 Types of Chunks

1. Subject Phrase
2. Direct Object Phrase
3. Indirect Object Phrase

She gives the teacher the book.

Verb Transitivity Training

TYPES OF TRANSITIVITY

INTRANSITIVE

- Verb **does not allow** for object chunks
- Subject only

Example
The bird flies.
The city grew.

She knelt ground*.
The fish swam river*.

TRANSITIVE

- Verb **allows for 1** object chunk
- Direct Object

Example
He punched the criminal.
We surprised her.

They persuaded*.

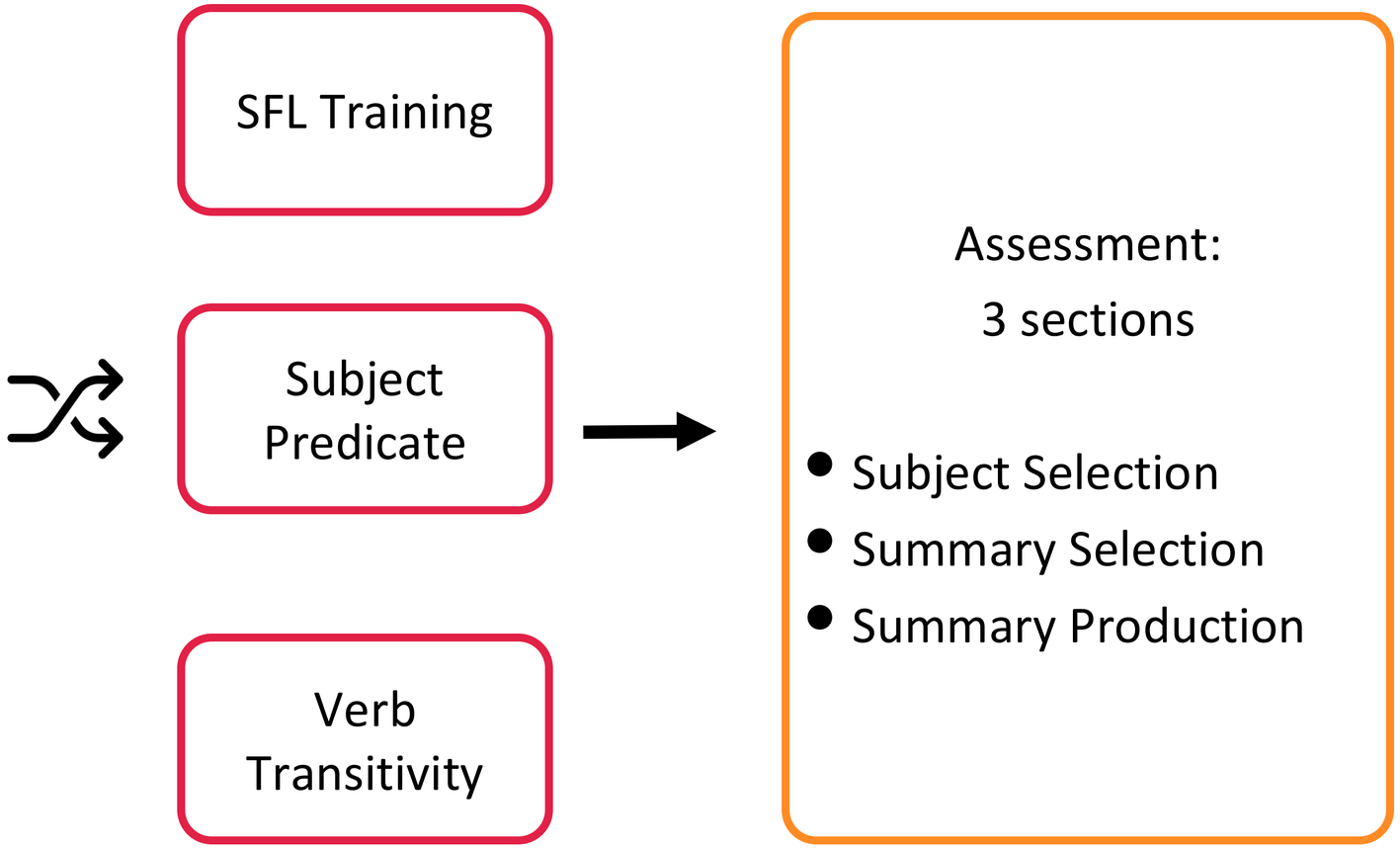
DITRANSITIVE

- Verb **allows for** 2 object chunks
- Subject + Direct Object & Indirect Object

Example
He sent her an email.
The kid threw the ball to the coach.

They granted me*.

Procedure


SFL Training
Subject
Predicate
Verb
Transitivity
Assessment:
3 sections
Subject Selection
Summary Selection
Summary Production

Measures

- All stimuli are taken from a college-level evolution biology textbook

Subject Identification: (2p, 20Q)

Read the first sentence carefully and identify the subject of the following sentence.

Paragraph Summary Selection: (2p, 15Q)

Select the sentence that best summarizes each paragraph provided.

Paragraph Summary Production: (1 example, 10Q)

Please write a summary sentence for each given paragraph.

Subject Identification

Practice Question:

We have been presenting a particular coevolutionary relationship as involving only two species; that is, what is often called pairwise coevolution. _____ is so common that sometimes the word coevolution is used as a synonym for it. In many instances, though, coevolution will involve more than two species.

Choose the word that completes the sentence in the text below.

- Pairwise coevolution
- Coevolutionary relationship

Summary Selection

Practice Question:

We are also developing a better understanding of how our species has been involved in coevolutionary associations.Many of these associations appear to be very old. Bedbugs were likely acquired from bats and evolved to become hominin-specific pathogens before the divergence of Homosapiens from other hominins. Hominids appear to have acquired tapeworms long before the origins of Homo sapiens, perhaps due to the shift to a meat-based diet.

Which of the following statements best summarizes the paragraph?

Bedbugs and tapeworms have coevolved with human ancestors since before Homo sapiens emerged, possibly due to dietary changes.

The recent development of pathogens like bedbugs and tapeworms that have specifically adapted to modern Homo sapiens.

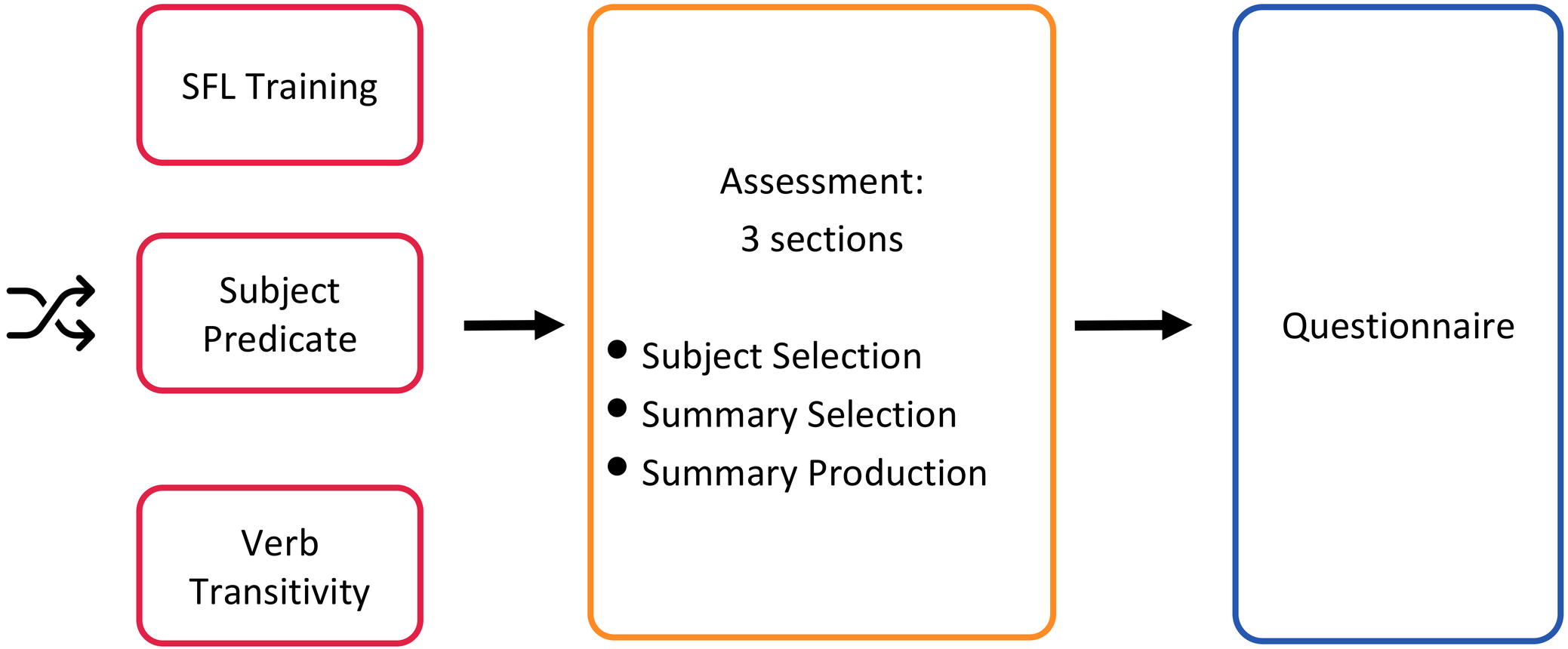
Summary Production

Example:
To answer this question, we return to a subject: the phenomenon of coevolutionary arms races. Such arms races are particularly important in the evolution of hosts and pathogens. Pathogens are selected to do whatever furthers their own reproduction and transmission, and this often involves exploiting the host. Hosts are selected to minimize the harm caused by pathogens.

Summarize this paragraph in the box.

The coevolutionary arms race between hosts minimizing harm and pathogens maximizing reproduction.

Procedure


SFL Training
Subject
Predicate
Verb
Transitivity
Assessment:
3 sections
Subject Selection
Summary Selection
Summary Production
Questionnaire

Background Questionnaire

Perceptions of the Training

- Training helpfulness
- Perceived difficulty level

Covariates

- Demographic (age, gender, year)
- Experience with college-level biology
- Knowledge of English grammar
- Confidence in understanding in grammar/ reading biology/ understanding college text

Results

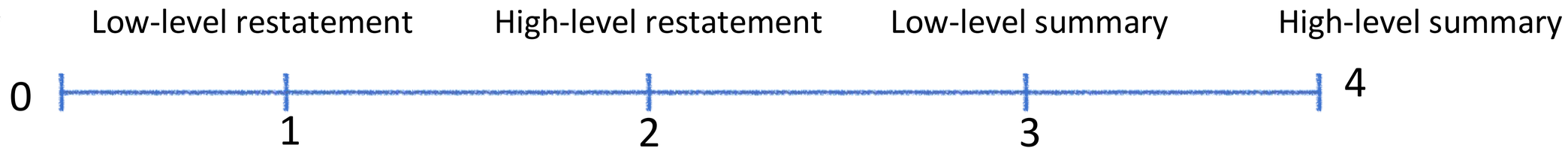
Analysis

- Software: The R stats package was used for all models.
- Generalized linear model (GLM) for Subject Identification & Summary Selection using logistic regression.
- Linear regression model (LM) for Summary Production.

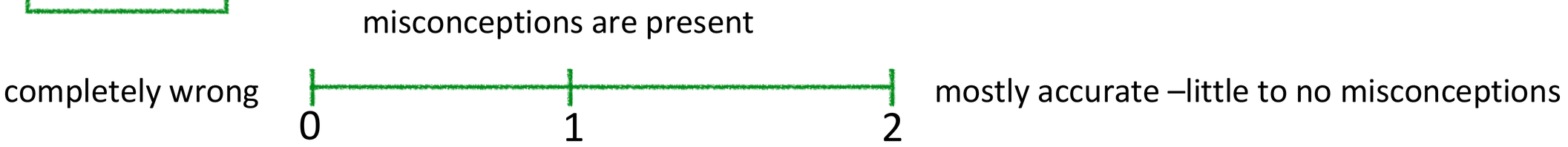
$$\text{Score}=\beta 0 +\beta 1\ (\text{Treatment})+\beta 2\ (\text{gender})+\beta 3\ (\text{year})+\beta 4\ (\text{confident of grammar}) +\beta 5\ (\text{grammar knowledge}) +\beta 6\ (\text{confident in reading college level text}) + \beta 7(\text{biology semester taken}) + \epsilon$$

Summary Production Scoring Scheme

Quality

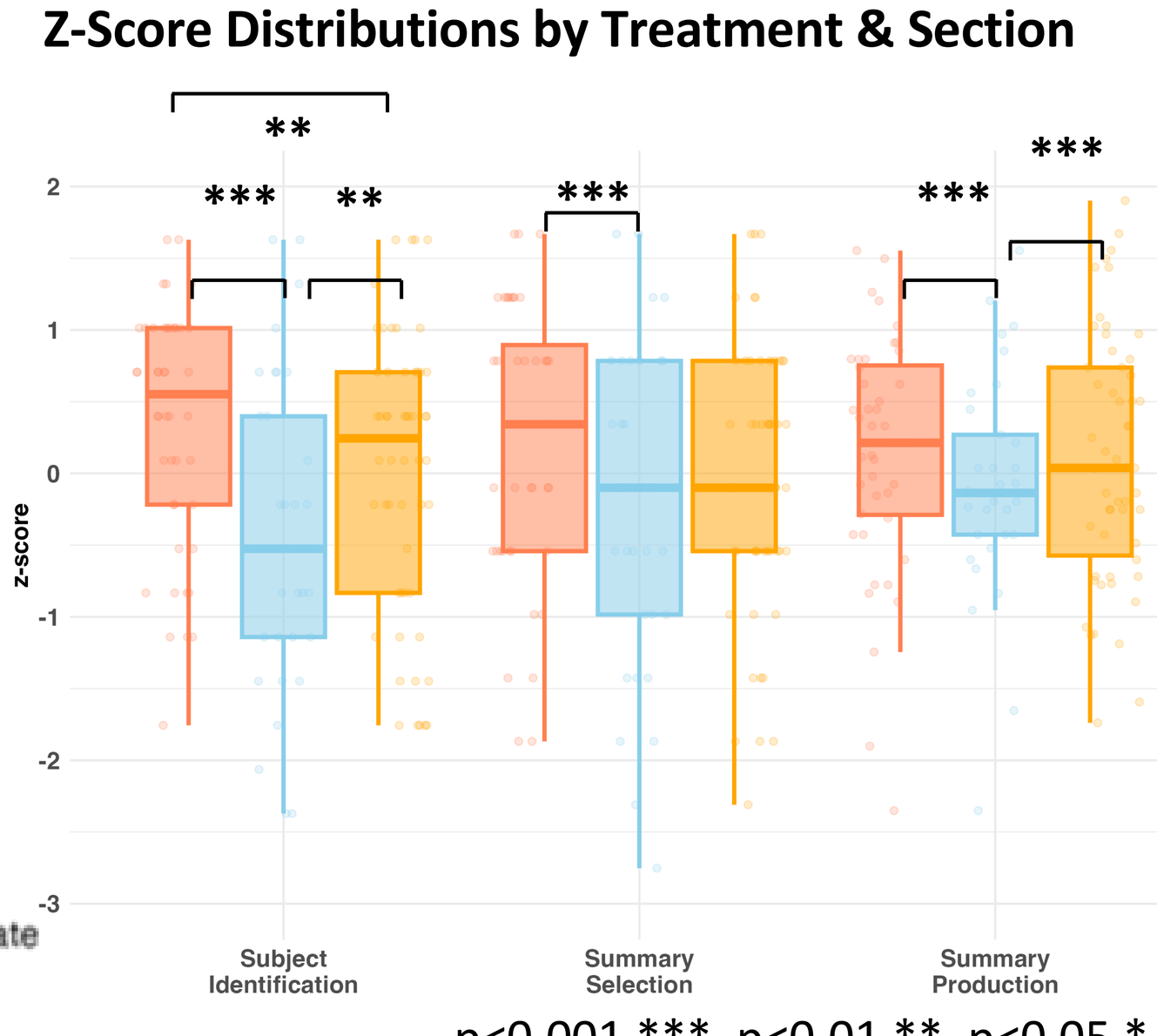


Accuracy



Key Findings

- SFL group had higher mean scores across all three measures
- Significant difference between SFL and SP conditions.
- VT group showed better performance than SP in the Subject identification and summary production section

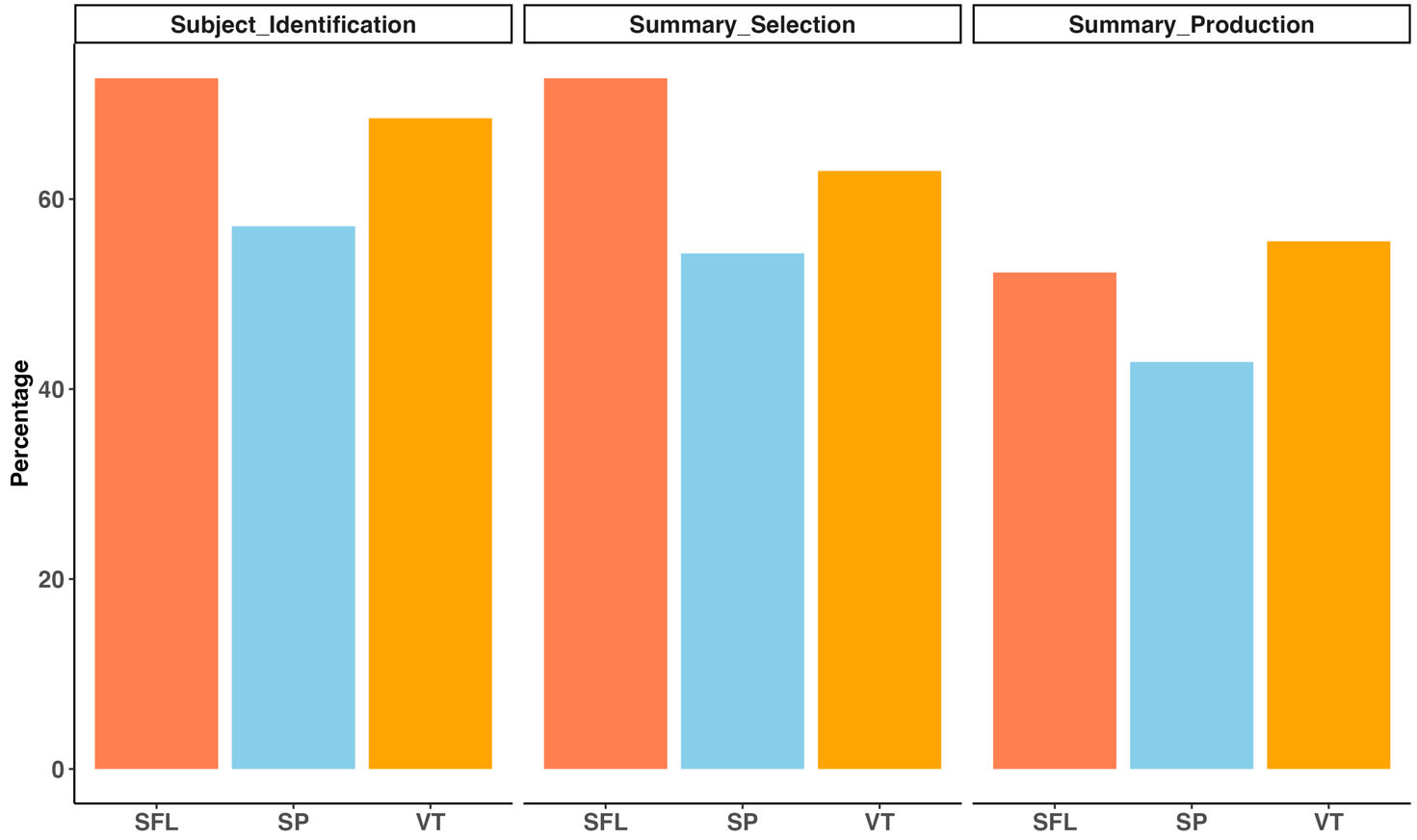


p<0.001 ***, p<0.01 **, p<0.05 *

Key Findings

- Participants reported SFL training as more helpful
- SP condition was reported as least favorable

Self-Reported Helpfulness of Training Across Three Tasks by Treatment



Conclusions

Does metalinguistic training improve reading comprehension of complex scientific texts?

1. Metalinguistic content improved reading comprehension.
2. Both SFL and Verb Transitivity positively impacted comprehension due to their more complex structures than Subject-predicate training
3. Limited differences between SFL and VT may be due to reliance on multiple cues without reaching the context level.

Limitations

1. Short passages (3-4 sentences)
2. Brief training sessions (only 12-14 minutes)
3. No no-training control group
4. Training focused exclusively on the zig-zag pattern of thematic progression
5. Fatigue towards the end of the study

Implications

Addressing the problem

1. Integrate approaches like SFL to provide a holistic framework for understanding language as a resource for meaning-making
2. Emphasize the role of metalinguistic awareness in effective reading practices
3. Tailor instructional strategies to reflect the multifaceted nature of academic reading

Reference

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Questions

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