Introduction to Systematic Observation: Foundations, Designs, and Data Analysis for Research in Intellectual Disability and Neurodevelopmental Disorders

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27 Νοεμβρίου 2024

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Advance Warning

Observational methodology can seriously affect your interpersonal relationships

The observational methodology can cause episodes of anxiety, depression, headaches and difficulty falling asleep

Consult with your therapist, shaman, coach, or psychoanalyst if this method affects your mental health

This presenter is not responsible

1. Foundations of Systematic Observation

1.1. Definition and purpose of systematic observation

1.2. Systematic Observation as a mixed method

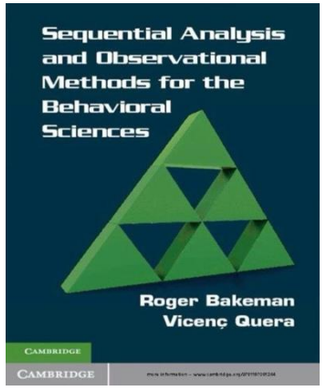
1.3. General process

1.4. Applicability

1.5. Why we use systematic observation

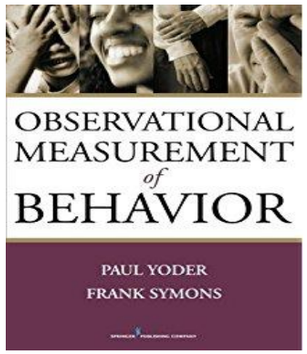
1.1. Definition and purpose of systematic observation (1)

A scientific procedure, both **quantitative and qualitative**, that enables the detection of relationships between behaviours (Anguera, 2003)



(…) as we understand the term, observational methods are **unabashedly quantitative**

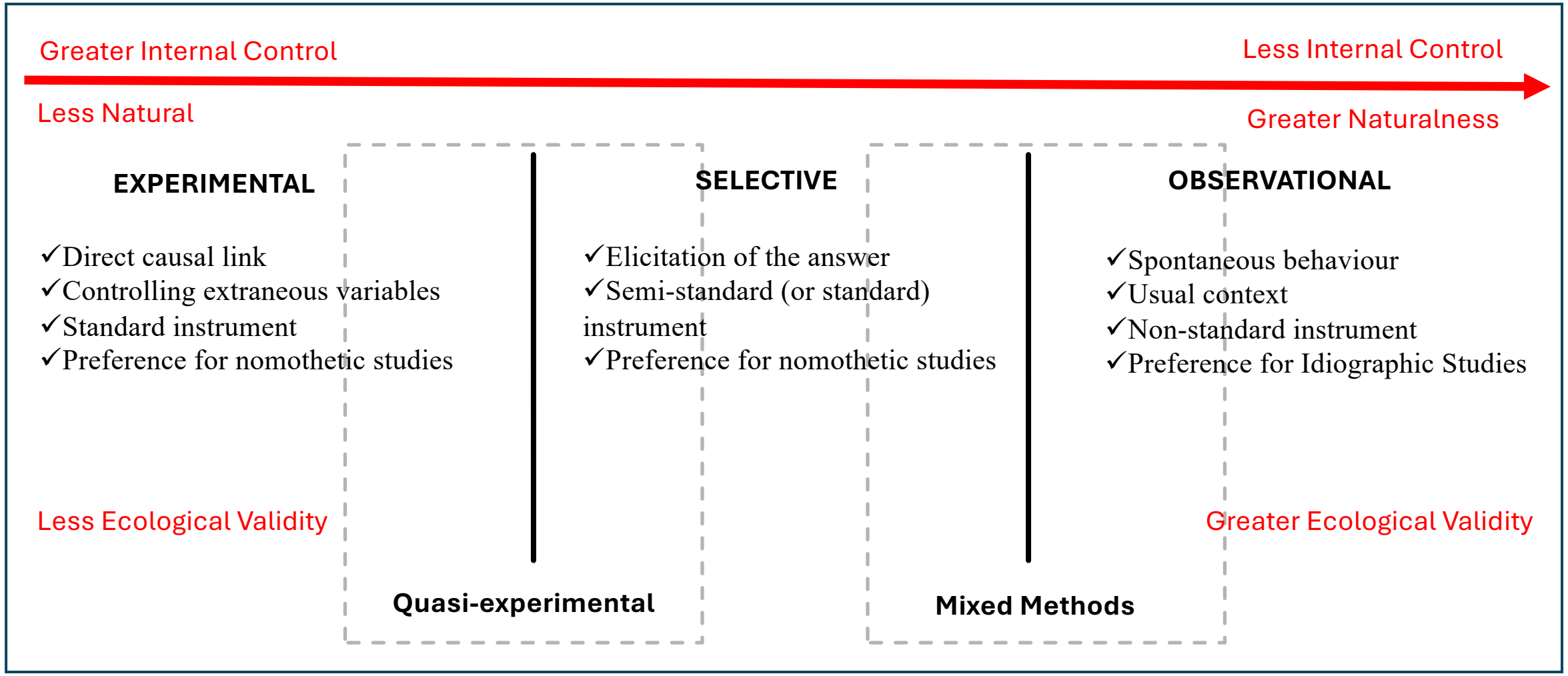
(Bakeman y Quera, 2011, p. 2)



The set of measurement principles we address is particularly well suited to falsifying hypotheses **using a quantitative approach**

(Yoder y Symons, 2010, p. 2)

1.2. Systematic Observation as a mixed method (1)



The observer LISTENS to nature while the experimenter INTERROGATES it
(Cuvier, 1817)

1.2. Systematic Observation as a mixed method (2)

Sequential designs

Exploratory

QUAL → QUAN

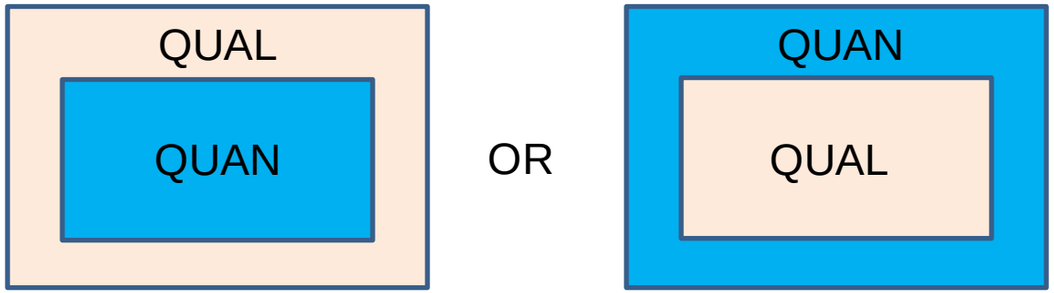
Qualitative data collection → Qualitative analysis → Quantitative data collection → Quantitative analysis → Interpretation

Explanatory

QUAN → QUAL

Quantitative data collection → Quantitative analysis → Qualitative data collection → Qualitative analysis → Interpretation

Concurrent (convergent) designs



Basic designs in mixed methods

1.2. Systematic Observation as a mixed method (3)

Sequential designs

Exploratory

QUAL → QUAN

Qualitative data collection → Qualitative analysis → Quantitative data collection → Quantitative analysis → Interpretation

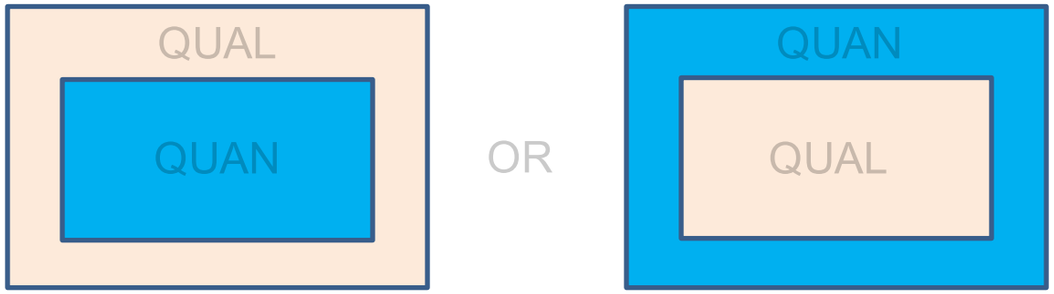
Explanatory

QUAN → QUAL

Quantitative data collection → Quantitative analysis → Qualitative data collection → Qualitative analysis → Interpretation

These designs involve two or more stages of data collection

Concurrent (convergent) designs

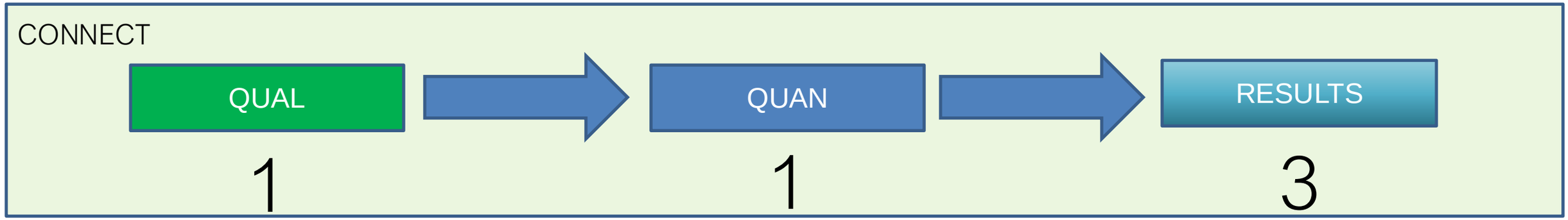


Basic designs in mixed methods

1.2. Systematic Observation as a mixed method (4)

The 1 + 1 = 3 Integration Challenge

(Fetters & Freshwater, 2015)

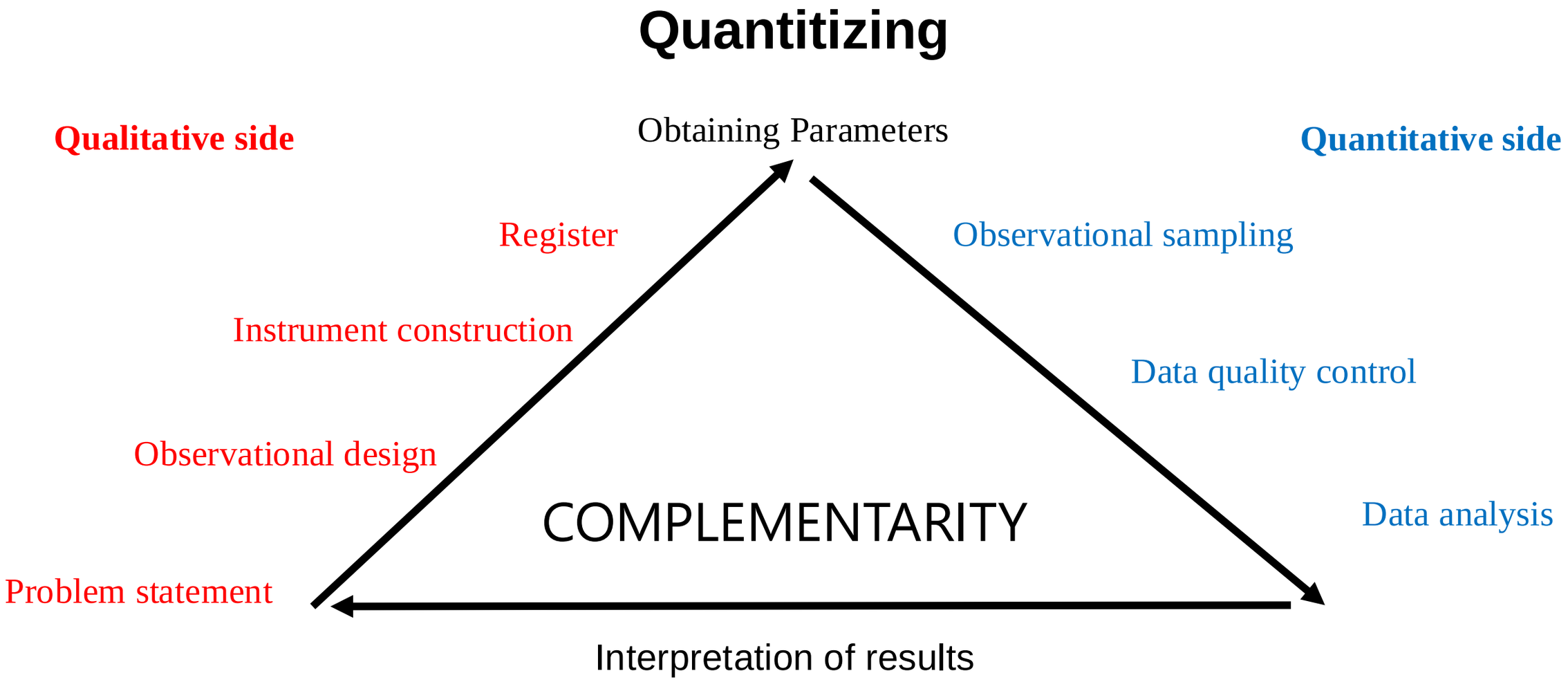


Check for updates

Mixed Methods Approach to Describe Social Interaction During a Group Intervention for Adolescents With Autism Spectrum Disorders

Carlota Alcover[1,2], Mª. Ángeles Mairena[2,3], Marcela Mezzatesta[2,3], Neus Elias[2,3], María Díez-Juan[2,3], Gemma Balañá[2,3], Mireia González-Rodríguez[2,3], Jairo Rodríguez-Medina[4], M. Teresa Anguera[5] and Eulàlia Arias-Pujol[1]*

1.3. General Process of the Observational Method (1)

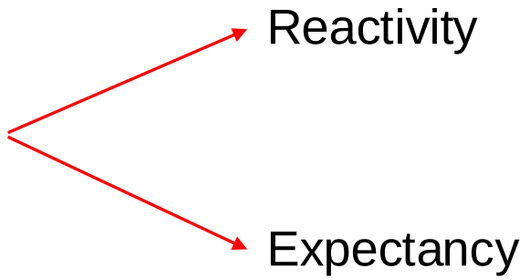


Anguera, Blanco-Villaseñor, Losada, & Portell, 2018

1.3. General Process of the Observational Method (2)

Functional equation of observation

$$O = P + I + Pk - Bias$$



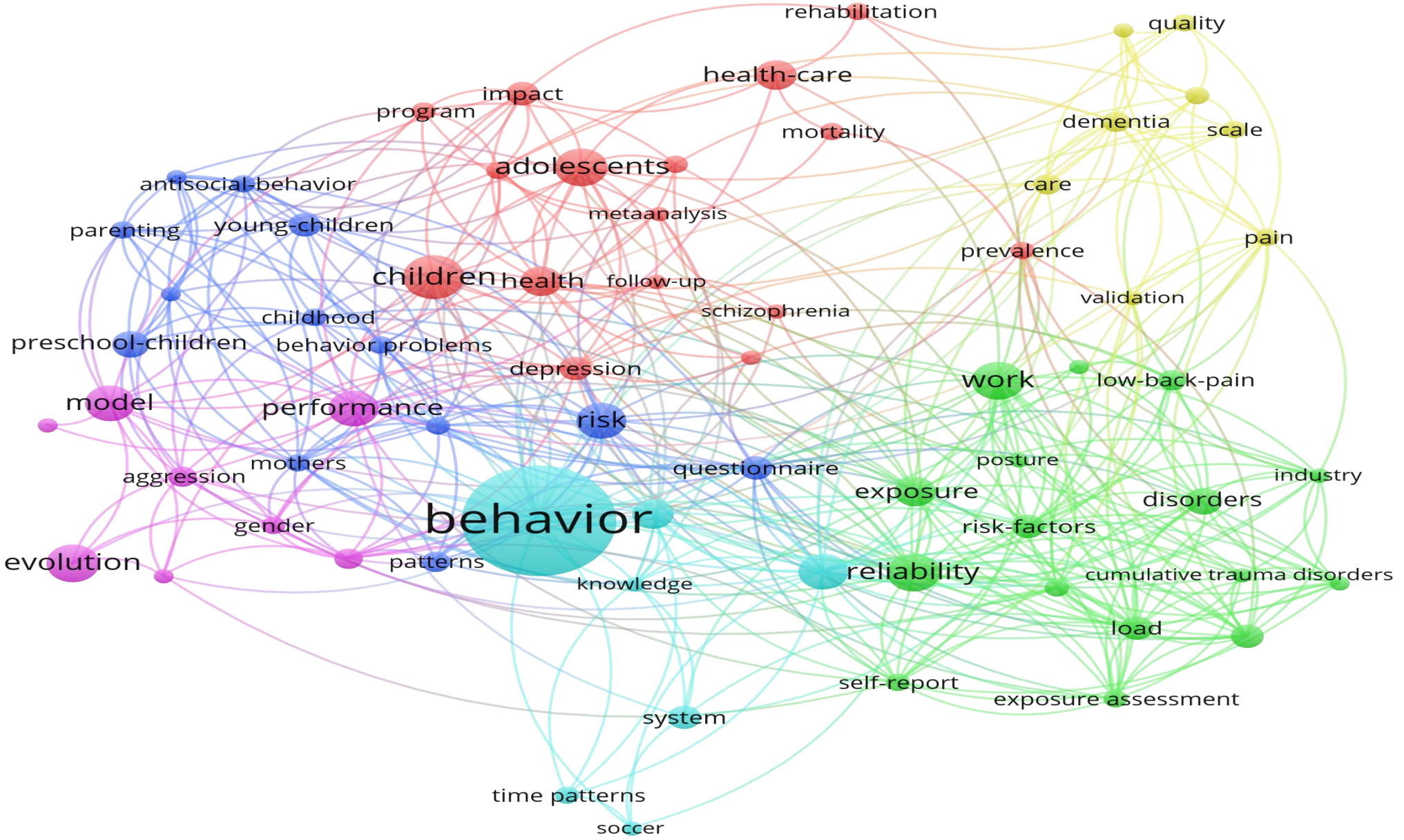
O = Observation

P = Perception

I = Interpretation

Pk = Previous Knowledge

1.4. Applicability (1)



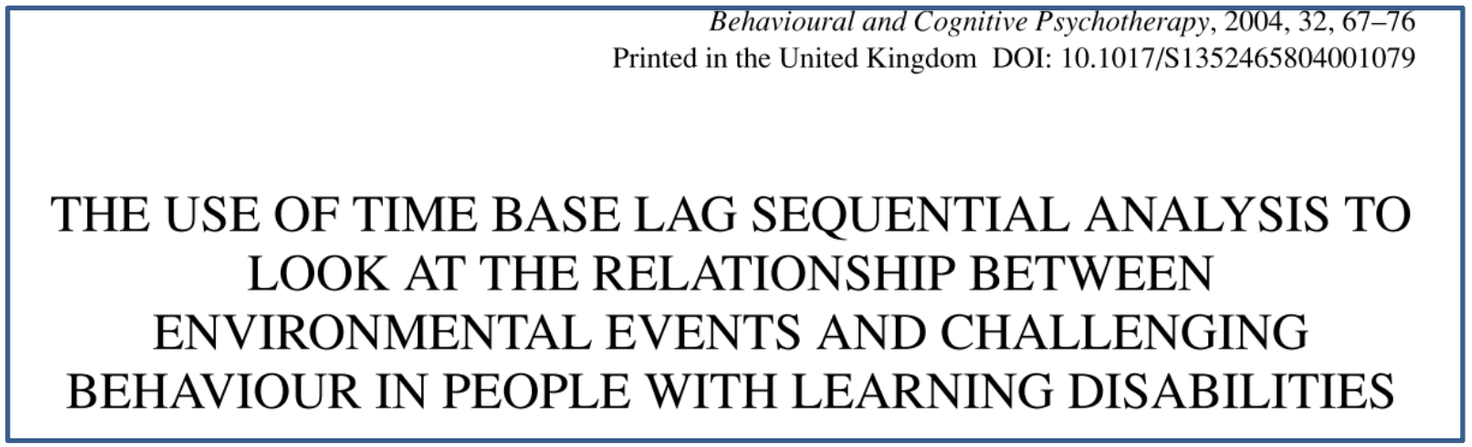
1.4. Applicability (2)

260 Journal of Intellectual Disability Research

VOLUME 40 PART 3 pp 260–274 JUNE 1996

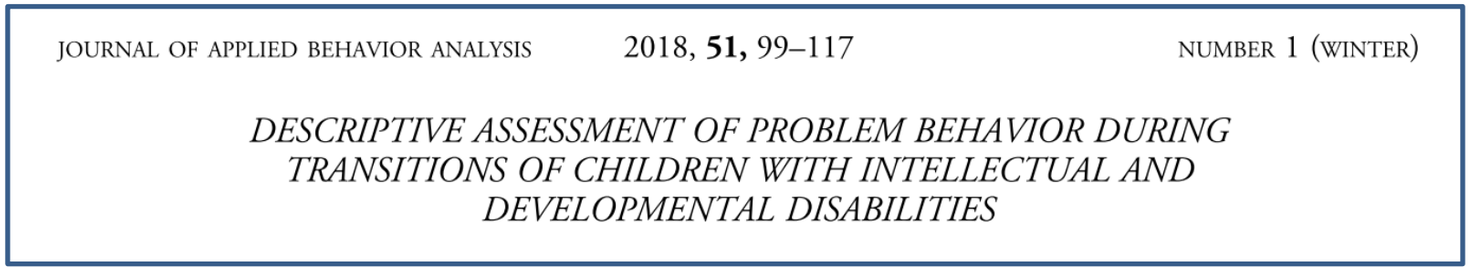
Time-based lag sequential analysis and the functional assessment of challenging behaviour

E. Emerson, D. Reeves, S. Thompson, D. Henderson, J. Robertson & D. Howard



Behavioural and Cognitive Psychotherapy, 2004, 32, 67–76
Printed in the United Kingdom DOI: 10.1017/S1352465804001079

THE USE OF TIME BASE LAG SEQUENTIAL ANALYSIS TO LOOK AT THE RELATIONSHIP BETWEEN ENVIRONMENTAL EVENTS AND CHALLENGING BEHAVIOUR IN PEOPLE WITH LEARNING DISABILITIES



JOURNAL OF APPLIED BEHAVIOR ANALYSIS 2018, **51,** 99–117 NUMBER 1 (WINTER)

DESCRIPTIVE ASSESSMENT OF PROBLEM BEHAVIOR DURING TRANSITIONS OF CHILDREN WITH INTELLECTUAL AND DEVELOPMENTAL DISABILITIES

Functional Analysis

Analysis of the relationship between challenging behaviours and environmental factors

1.4. Applicability (3)

Received: 25 May 2023 | Accepted: 25 October 2023

DOI: 10.1002/aur.3052

RESEARCH ARTICLE

The effect of recasting by mothers with different conversational styles on the communication behavior of autistic children: Lag sequential analysis

Xiaoyan Li[1] | **Yonghan Peng**[1] | **Yiting Lu**[1] | **Yumin Zhang**[2]

CHILD DEVELOPMENT

Child Development, xxxx 2017, Volume 00, Number 0, Pages 1–10

Sequential Associations Between Caregiver Talk and Child Play in Autism Spectrum Disorder and Typical Development

Kristen Bottema-Beutel and Caitlin Malloy
Boston College

Blair P. Lloyd
Vanderbilt University

Rebecca Louick
Boston College

Linnea Joffe-Nelson
Boston Children's Hospital

Linda R. Watson
University of North Carolina-Chapel Hill

Paul J. Yoder
Vanderbilt University

Communicative interaction

Analysis of communicative interaction in autism

1.4. Applicability (4)

Journal of Autism and Developmental Disorders
https://doi.org/10.1007/s10803-018-3575-0

ORIGINAL PAPER

Non-reciprocal Friendships in a School-Age Boy with Autism: The Ties that Build?

Jairo Rodríguez-Medina[1,2] · Henar Rodríguez-Navarro[2] · Víctor Arias[3] · Benito Arias[4] · M. Teresa Anguera[5]

Journal of Autism and Developmental Disorders
https://doi.org/10.1007/s10803-022-05496-0

ORIGINAL PAPER

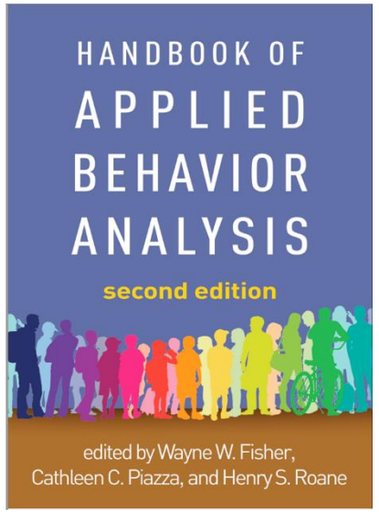
Measuring Changes in Social Skills Throughout an Intervention Program for Children with ASD, Contributions from Polar Coordinate Analysis

Carlota Alcover[1] · M. Ángeles Mairena[2] · Jairo Rodríguez-Medina[3] · Marcela Mezzatesta[2] · Gemma Balañá[2] · Neus Elias[2] · Maria Elias[2] · Eulàlia Arias-Pujol[1]

Social participation

Social Skills

1.4. Applicability (5)

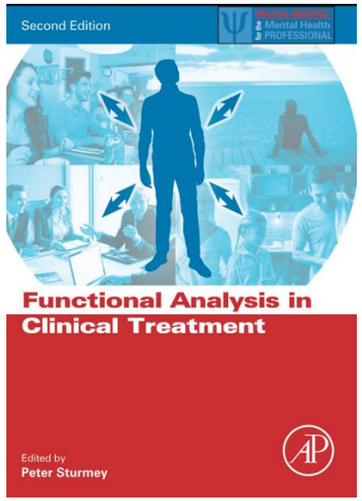


CHAPTER 12

Direct Observation

Rachel H. Thompson and John C. Borrero

2021



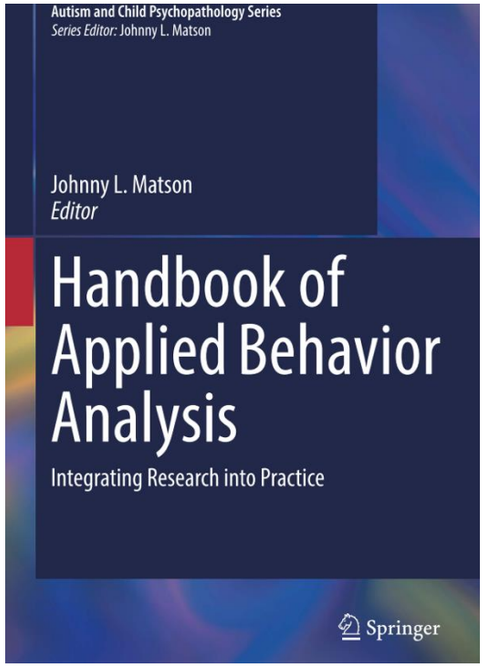
Chapter 4

Functional analysis methodology in developmental disabilities

Nienke Peters-Scheffer, Robert Didden

Behavioural Science Institute, Radboud University, Nijmegen, the Netherlands

2020



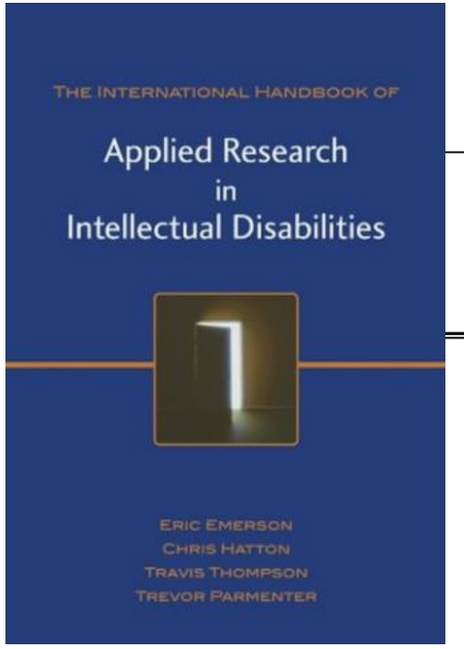
Check for updates

29

Precursor Behaviors to Severe Challenging Behaviors

Devon Ramey, Emma Craig, Ciara Gunning, and Jennifer Holloway

2023



CHAPTER 8

Measurement of Behavior with a Special Emphasis on Sequential Analysis of Behavior

Paul J. Yoder
Vanderbilt University, USA
Katherine Short-Meyerson
University of Wisconsin–Oshkosh, USA
and
Jon Tapp
Vanderbilt University, USA

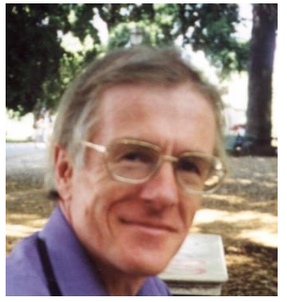
2004

1.5. Why use systematic observation (1)

Low informant accuracy

Classical studies:

- Bernard, Killworth, and Sailer (1980)
- Bernard, Killworth, Kronenfeld, and Sailer (1984)



About half of what people report about their own interactions is:

WRONG

THE PROBLEM OF INFORMANT ACCURACY: The Validity of Retrospective Data

H. Russell Bernard

Department of Anthropology, University of Florida, Gainesville, Florida 32611

Peter Killworth

Department of Applied Mathematics and Theoretical Physics, University of Cambridge, Cambridge, England

David Kronenfeld

Department of Anthropology, University of California, Riverside, California 92521

Lee Sailer

Department of Anthropology, University of Pittsburgh, Pittsburgh, Pennsylvania 15260

Lisa Haney en Markus & Borsboom (2013)
https://lisahaney.com/

1.5. Why use systematic observation (2)

Ecological Validity

- It refers to the degree to which the situation under investigation approximates the natural context
- Experimental situations lack ecological validity (Martínez Arias, 1981)
- However, it is maximized in observational studies (Bakeman & Gnisci, 2006)
- The artificiality of experimental situations always entails a simplification (Riba, 1991)

1.5. Why use systematic observation (3)

Optimal Profile

- Spontaneous behaviour
- Perceptible behaviour
- Natural context
- Non-standard instruments. Prepared *ad hoc*
- Preference for ideographic studies

- Special concern for the temporal evolution of behaviour (search for behaviour patterns)

Some Classic Examples

A Descriptive Analysis of the Relationships Between Social Context, Engagement and Stereotypy in Residential Services for People with Severe and Complex Disabilities

Eric Emerson, Chris Hatton, Janet Robertson, Dawn Henderson and Janet Cooper
Hester Adrian Research Centre, University of Manchester, Manchester M13 9PZ, UK

Paper accepted June 1998

Emerson, E., Hatton, C., Robertson, J., Henderson, D., & Cooper, J. (1999). A descriptive analysis of the relationships between social context, engagement and stereotypy in residential services for people with severe and complex disabilities. *Journal of Applied Research in Intellectual Disabilities*, *12*(1), 11–29. https://doi.org/10.1111/j.1468-3148.1999.tb00047.x

To determine the relationship between:

- User engagement
- Stereotypy
- The nature of staff support received

To illustrate the use of statistical approaches, appropriate to such analyses

Some Classic Examples

During the period of observation, the observer continuously recorded the *behaviour of the participant* in terms of one of four mutually exclusive states: (1) passive; (2) participation in activities which were either non-functional and/or inappropriate to the resident's chronological age; (3) engagement in activities which were both functional and age-appropriate; and (4) stereotypic behaviour. In the, relatively rare, situations in which stereotypy occurred simultaneously with engagement the participant was coded as engaged. In addition, *staff contact received by participants* was recorded as one of five mutually exclusive states: (1) no contact; (2) assistance (including instructing or prompting the participant); (3) negative or restraining contact; (4) providing care for participants; and (5) other forms of contact (usually general social contact). In addition, the onset of discrete occurrences of positive staff contact (e.g. praise), was recorded and given a duration of 1 s. For all other states, the onset and offset in time of each occurrence of each category of participant and staff behaviour were recorded.

Dimensions

Behaviour of the participant

Staff contact received by participants

To illustrate the use of statistical approaches, appropriate to such analyses

Emerson, E., Hatton, C., Robertson, J., Henderson, D., & Cooper, J. (1999). A descriptive analysis of the relationships between social context, engagement and stereotypy in residential services for people with severe and complex disabilities. *Journal of Applied Research in Intellectual Disabilities*, *12*(1), 11–29. https://doi.org/10.1111/j.1468-3148.1999.tb00047.x

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2. Research Design for Systematic Observation Studies

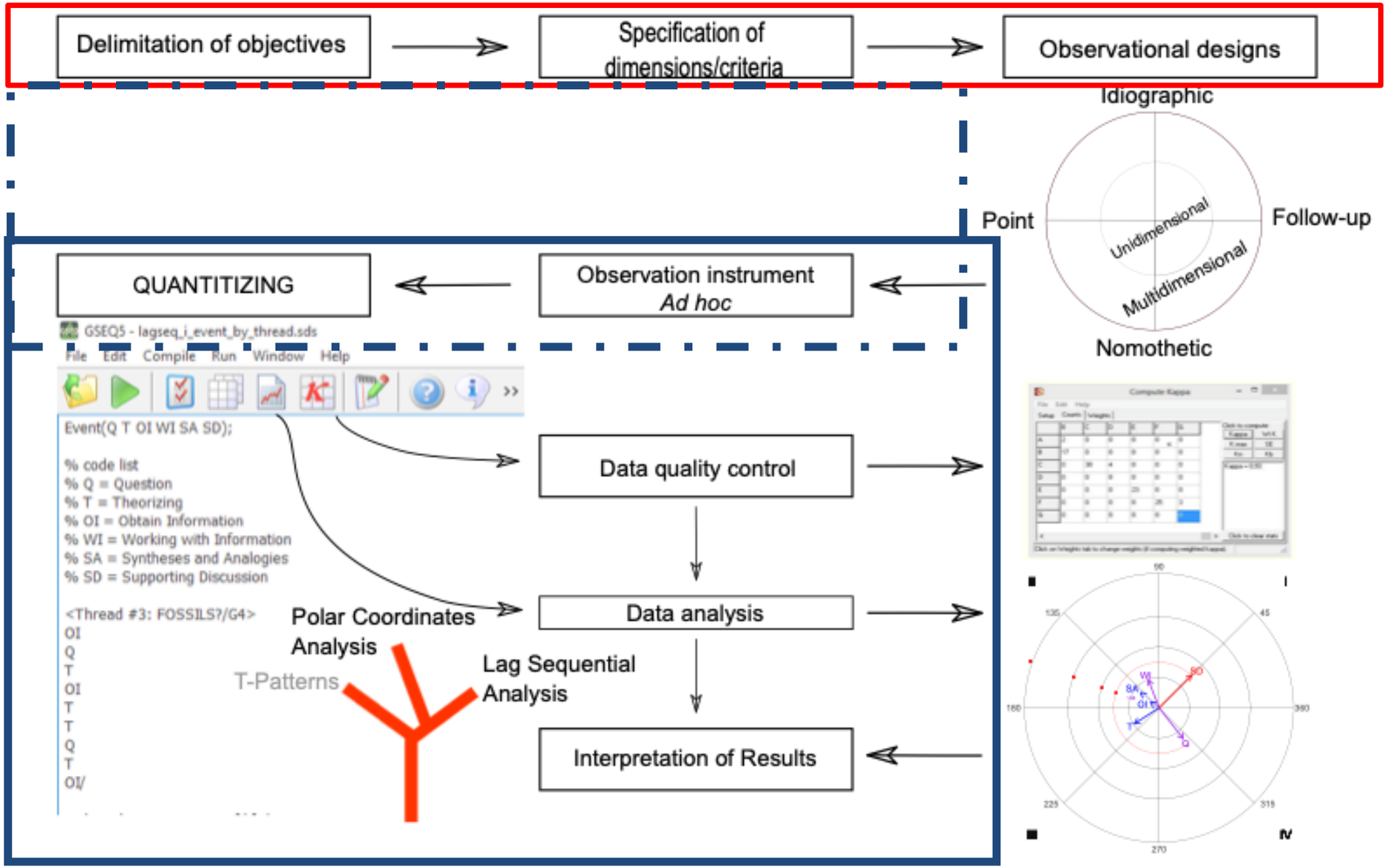
2.1. Stages of Systematic Observation Research

2.2. Types of research design

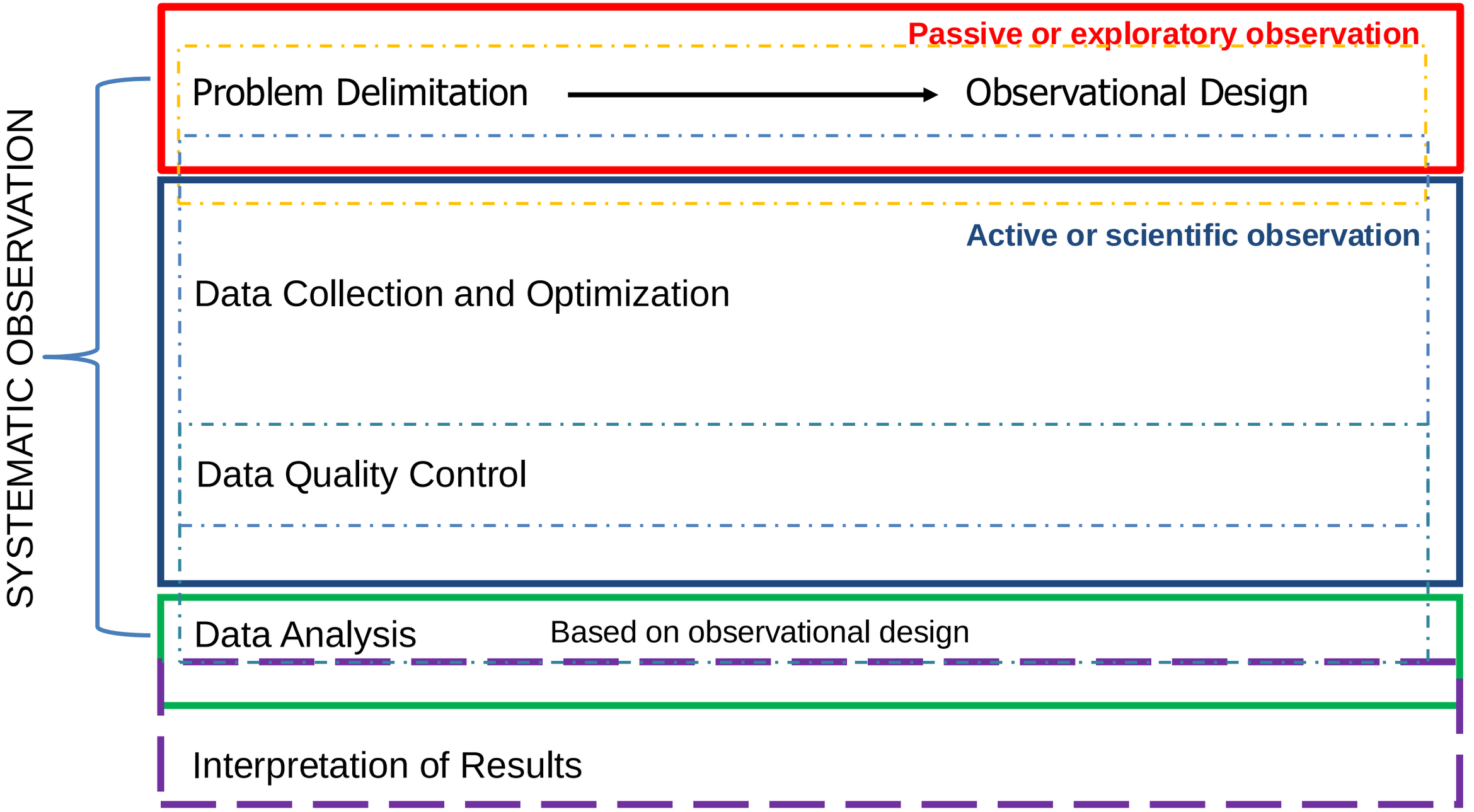
2.1. Stages of Systematic Observation Research (1)

Passive / Exploratory observation

Active / Scientific observation



2.1. Stages of Systematic Observation Research (2)



2.1. Stages of Systematic Observation Research (3)

Passive or exploratory observation

Problem Delimitation → Observational Design

Delimitation of objectives → Specification of dimensions/criteria → Observational designs

What behaviours to study?

In what physical context?

In what social context?

During what activity?

During what period?

Observed Units

Space-time coordinates

Inter/Intra session Record

Potential temporary disruptions

2.1. Stages of Systematic Observation Research (4)

Passive or exploratory observation

Purposes It is essential to prepare for active or scientific observation

- Define the problem precisely
- Natural Contexts
- Perceptible Behaviours
- *Ad hoc* Observation Instrument
- Reduce biases: Expectancy and Reactivity
- Training of observers
- Obtain sufficient information to make the appropriate decisions regarding the observational design
- Establish the Spatio-Temporal Coordinates in which the observation will be carried out
- Carefully define the objectives
- Define the data collection strategy

2.1. Stages of Systematic Observation Research (5)

Passive or exploratory observation

Delimitation of objectives

The first decision consists of the thematic delimitation of the perceptible behaviour of the individual or situation to be evaluated Anguera (2003)

- Perceptibility
- Natural context
- Spontaneous behaviour
- Interactive relationship with context

"The first task of all empirical research is to decide what is to be observed and recorded"
(Krippendorff, 1990, p. 81)

2.1. Stages of Systematic Observation Research (6)

Passive or exploratory observation

Delimitation of objectives

- What's the matter?
- Why is the problem important?
- How does this research relate to previous research?
- How is this study different from previous work?
- Why does the problem require further investigation?
- What are the hypotheses and/or research questions and/or objectives?
- How are hypotheses related to research design?
- What are the theoretical and practical implications of the study?

details about the materials used and the procedures followed (which should be sufficient to enable replication)

2.1. Stages of Systematic Observation Research (7)

Passive or exploratory observation

Delimitation of objectives

Types of observation

The nature of the data recorded allows us to differentiate two main types of observation:

- Direct observation
- Indirect observation

2.1. Stages of Systematic Observation Research (8)

Delimitation of objectives

Direct observation

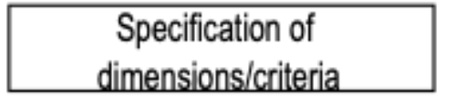
- Directly perceptible behaviours
- Very low inference
- Perceptual component predominates over the interpretative
- Basically, live recordings and video recordings

Indirect observation

- Behaviours that are not directly noticeable
- High level of inference
- Interpretative component predominates over the perceptual
- Mainly verbal/oral conduct and documentary material (interviews, focus groups, diaries, WhatsApp's, online forums, ...)

2.1. Stages of Systematic Observation Research (9)

Response Levels / Dimensions / Criteria



- Each of the facets that are part of the object of study can be understood as levels of response
- Initially there is no limit to the number of dimensions
- They must be considered in each case depending on:
  - the specific objective of the study
  - the theoretical framework considered
- Successive deployments in subdimensions are possible
- Depending on the dimensions/sub-dimensions, the decision on the use of direct observation or indirect observation will be taken

2.1. Stages of Systematic Observation Research (10)

Description Levels

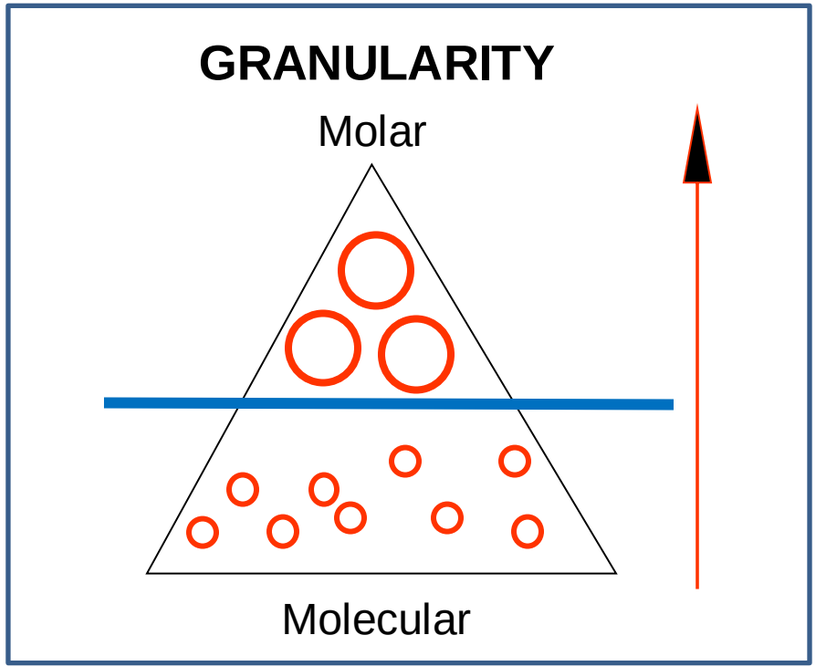
Specification of dimensions/criteria

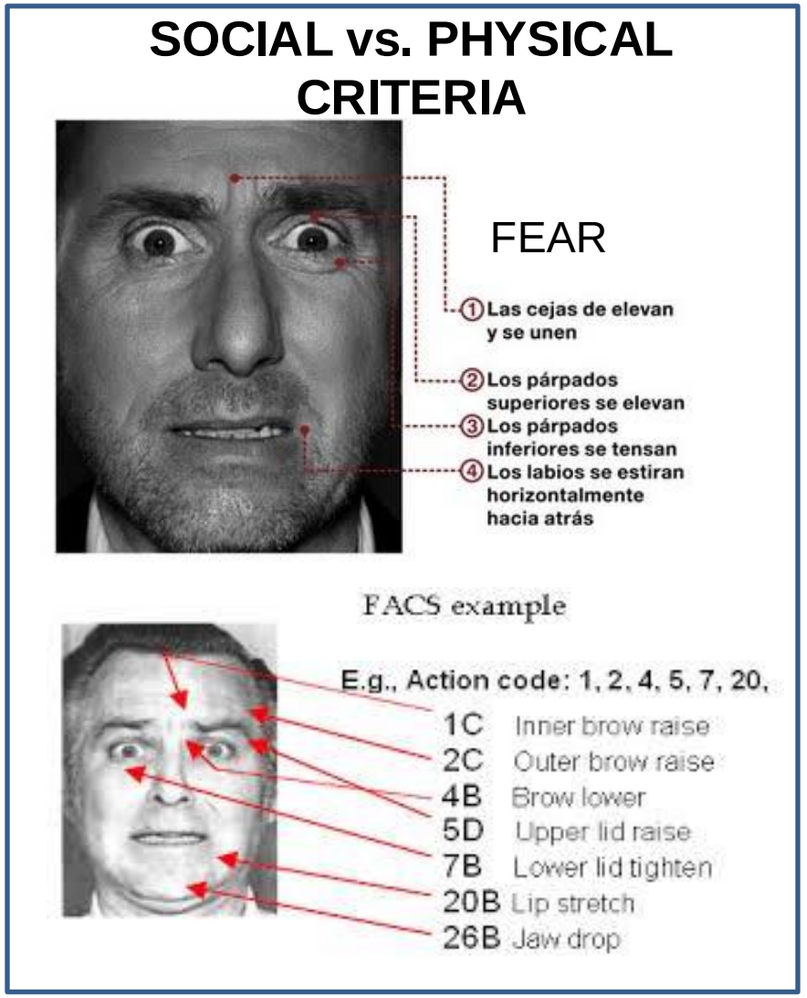
Each behaviour must be able to:

a) delimit (clear beginning and end)

b) name (give name to each conduct)

c) define by grasping all its nuances (describe what it consists of)





2.1. Stages of Systematic Observation Research (11)

Categories Conditions

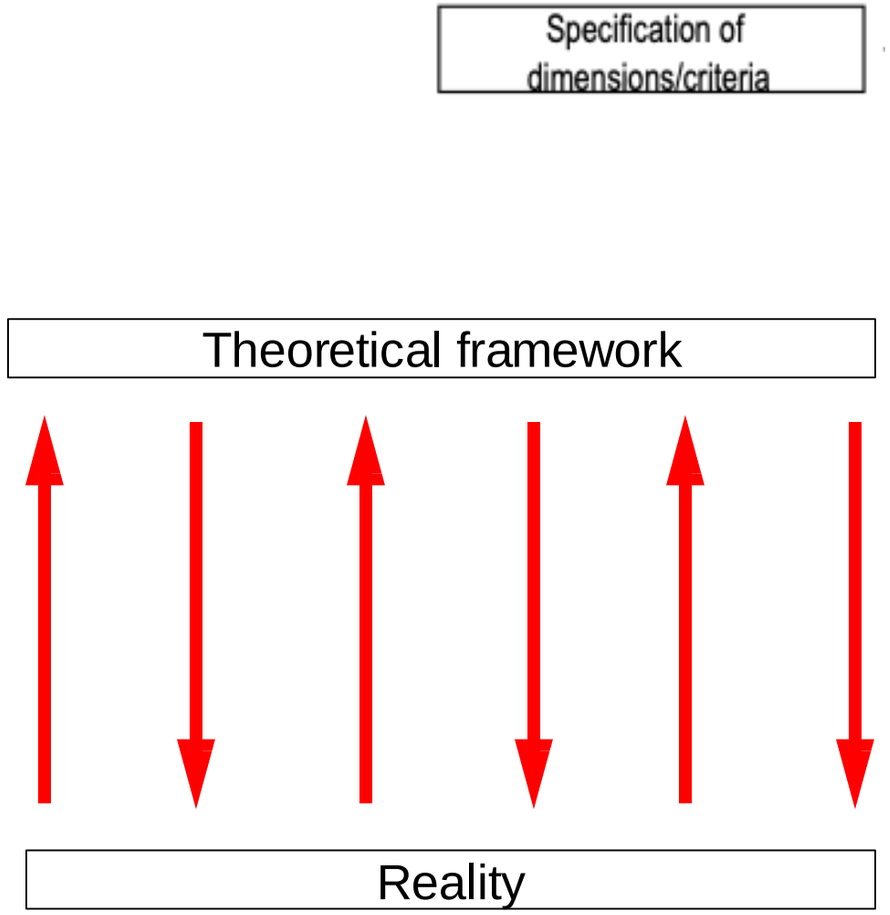
Exhaustiveness (E)

Mutual Exclusivity (ME)

Congruence between category name and its content

Once the three conditions are met:

- Final name of the categories
- Coding the categories
- Universal notation of the category system
- Detailed definition of categories
- Examples and counterexamples



Examples

Table 2 Dimensions and category systems of the social behavior observational instrument for participant

Dimensions categories (CODES)	Description	Examples
Interaction type		
Low-level interaction (LLI)	The child exhibits behaviors that indicate social intention, but with minimal social enactment, just to obtain something	Interactions between different participants: "It is your turn" "Pass me the token" Questions or comments related to the game
High level interaction (HLI)	The child exhibits verbal and nonverbal social behaviors that lead to an effective social process with peers. Behaviors that serve to start or maintain social interaction	"I like your t-shirt" "Do you want to play with me?" "How was your weekend?" "I want to play with you"
Negative level interaction (NLI)	Participant exhibits rude and unpleasant social behaviors	"You are a dumb" "I'm not going to let you play" Comments that include teasing or insults
Social behavior		
Responses to an interaction (RES)	The child responds verbally and/or nonverbally to social stimuli directed toward him/her by peers	"Which game do you want to play? Response: "I want to play Uno" "What did you do last weekend?" Response: "I went to the park"
Initiations of interaction (IN)	The child begins a new social sequence, distinguished from a continuation of a previous sequence by a change in activity	"Do you want to play with me?" "This weekend I had a problem" "My favorite animal is the lion, and yours?" "Can we change the game?"
Evitations (EV)	The child avoids any type of interaction or communication that is addressed to him/her	When someone asks to play or share something, the participant ignores or avoids the question/demand
Functional Play (FP)	The child play with another participant without talking. Some of the games do not require to speak directly	Two participants who play'three in line' without speaking. They do not share the experience, or talk about anything, but they play together

Alcover et al. 2023

Examples

DIMENSIONS

Table S2

Coding Definitions and Examples

Child Play*	Definition	Example
Exploratory	Object/s are examined or explored to gain information, with no apparent functional association between actions and actual object/s.	Child manipulates a set of beads, holding them in her hand and waving them back and forth.
Functional	Object/s are used in conventional ways and the typical functions of the object/s are explored.	Child rolls a truck along the ground.
Symbolic	Object/s are used to engage in pretense, where one object is substituted for another, objects are treated as if capable of action, or as if it has imaginary properties not actually present.	Child feeds baby a bottle, simulating slurping sounds for the baby and saying "my baby is hungry!"

Caregiver Talk**	Definition	Example
Caregiver-Focused Utterance	Caregiver talk in which the referent corresponds with the caregiver's focus of attention and not the child's.	Caregiver says, "I have this book, I'm going to read it" while the child is playing with the toy farm.
Follow-in Comment	Caregiver talk in which the referent corresponds with the child's focus of attention, and does not instruct or suggest that the child play with the toy in a new way.	Child is moving the ball across the room and the caregiver says, "the ball rolled away!"
Follow-in Directive	Caregiver talk in which the referent corresponds with the child's focus of attention, and instructs or suggests that the child play with the toy in a new way.	Child is moving the ball across the room and the caregiver says, "now kick it!"

Sequential Associations Between Caregiver Talk and Child Play in Autism Spectrum Disorder and Typical Development

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Paul J. Yoder
Vanderbilt University

Bottema-beutel, K., Malloy, C., Lloyd, B. P., Louick, R., Joffe-nelson, L., Watson, L. R., & Yoder, P. J. (2017). *Sequential Associations Between Caregiver Talk and Child Play in Autism Spectrum Disorder and Typical Development*. *00*(0), 1–10. https://doi.org/10.1111/cdev.12848

Examples

Table 2 Dimensions and category systems of the social behavior observational instrument for participant

Dimensions categories (CODES)	Description	Examples
Interaction type		
Low-level interaction (LLI)	The child exhibits behaviors that indicate social intention, but with minimal social enactment, just to obtain something	Interactions between different participants: "It is your turn" "Pass me the token" Questions or comments related to the game
High level interaction (HLI)	The child exhibits verbal and nonverbal social behaviors that lead to an effective social process with peers. Behaviors that serve to start or maintain social interaction	"I like your t-shirt" "Do you want to play with me?" "How was your weekend?" "I want to play with you"
Negative level interaction (NLI)	Participant exhibits rude and unpleasant social behaviors	"You are a dumb" "I'm not going to let you play" Comments that include teasing or insults
Social behavior		
Responses to an interaction (RES)	The child responds verbally and/or nonverbally to social stimuli directed toward him/her by peers	"Which game do you want to play? Response: "I want to play Uno" "What did you do last weekend?" Response: "I went to the park"
Initiations of interaction (IN)	The child begins a new social sequence, distinguished from a continuation of a previous sequence by a change in activity	"Do you want to play with me?" "This weekend I had a problem" "My favorite animal is the lion, and yours?" "Can we change the game?"
Evitations (EV)	The child avoids any type of interaction or communication that is addressed to him/her	When someone asks to play or share something, the participant ignores or avoids the question/demand
Functional Play (FP)	The child play with another participant without talking. Some of the games do not require to speak directly	Two participants who play'three in line' without speaking. They do not share the experience, or talk about anything, but they play together

DIMENSIONS

Alcover et al. 2023

Examples

Table 1 Dimensions, categories, codes, and definitions for observation social interaction during recess

Dimensions	Category systems (*codes*)	Definition
Interaction states	Adult (*A*)	The student interacts with teachers or caregivers
	Low-intensity interaction (*L*)	Proximity without communicative intention. The student remains next to or closely follows (< 1.5 m) a classmate or group of classmates, either without participating in a particular activity or as a mere observer
	Joint engagement (*J*)	The student participates actively in an activity with one or more classmates. They share a game, collaborate in an activity, talk, laugh, etc
	Inadequate interaction (*N*)	The student shows hostility or anger toward one or more classmates while participating in an activity
	Solitary (*S*)	The student is alone, without doing any activity or he performs some activity at a distance of more than 1.50 m from his classmates
Communicative acts	Initiates an interaction (*i*)	The student adequately starts a verbal, non-verbal, or mixed social interaction with one or more classmates; it is distinguished from the continuation of the prior social sequence because it involves a change in the recipient (in a group, he is talking to one classmate and then addresses a different one; or there is a change in the activity or in the reference)
	Responds to interaction (*r*)	The student responds adequately to a direct verbal or non-verbal interaction of one or more classmates, which is distinguished from the continuation of the previous social sequence by a change in the classmates to whom he responds or in the activity. There is a clear communicative intention
	Challenging interaction (*ch*)	The student initiates or responds inappropriately to an interaction with one or more of his classmates
Partners	1–14 15–n	Peers with whom target child interacted, including his classmates (1–14) as well as other children with whom he interacts during recess (15–n)

DIMENSIONS

Rodríguez-Medina et al. 2018

Criteria for Unit Segmentation

CRITERION	DESCRIPTION	ADVANTAGES	INCONVENIENCE
Orthographic	Segmentation of text based on punctuation marks	There are no doubts in its application except →	if oral conduct is transcribed
Thematic	Structural definition of content	Facilitates molarization	Possible increase in disagreement among observers
Interlocutory	By turns to speak	Easy application	Ineffective, each turn can cover different topics, emotional states, cognitive processes, etc.

Anguera, 2017; Krippendorff, 1990

2.2. Observational Designs (1)

Observational designs are developed based on three basic dichotomous criteria

1. Study units

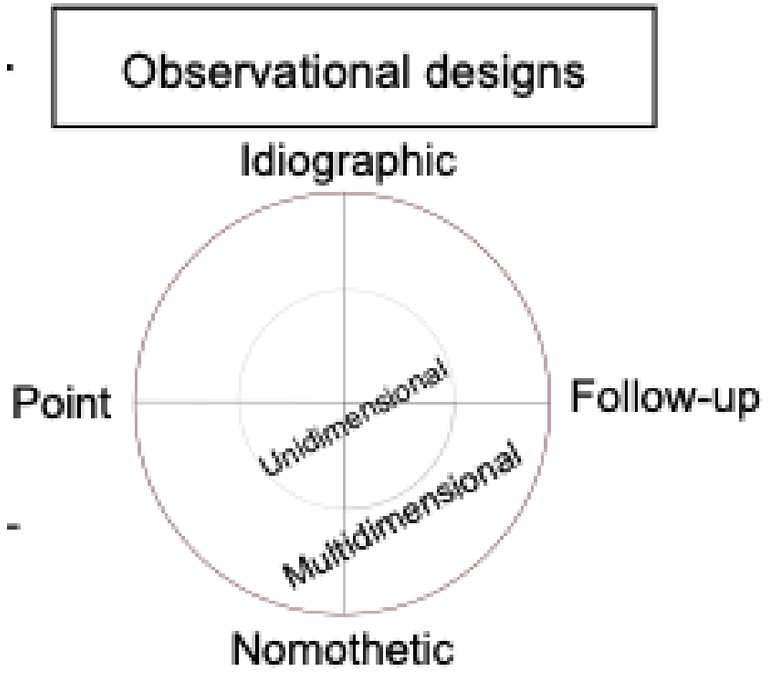
   Idiographic/Nomothetic

2. Temporality

   Punctual/Follow-up

3. Dimensionality

   One-dimensional/multidimensional



As a result of the intersection between them, eight possible observational designs are obtained

2.2. Observational Designs (2)

CRITERION 1: STUDY UNITS

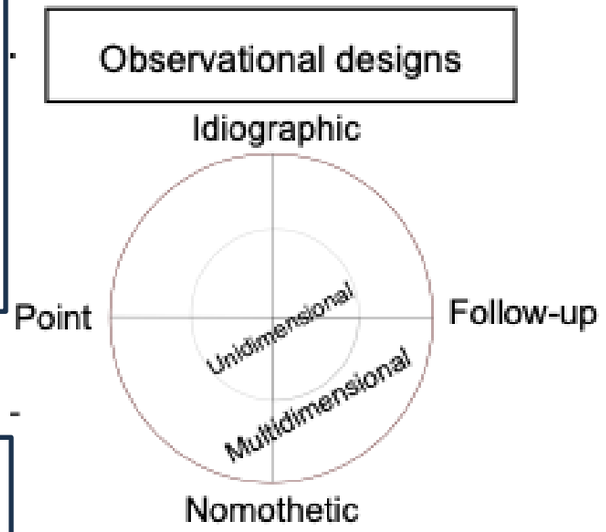
-IDIOGRAPHIC

One unit

Several cases if there is a stable link between them

-NOMOTHETIC

Plurality of cases without a relevant link, or interest in studying them separately



CRITERION 2: TEMPORALITY

-PUNCTUAL

A moment in time. Conventionally, it is considered a single session

-FOLLOW UP

Multiple sessions over time

CRITERION 3: DIMENSIONALITY

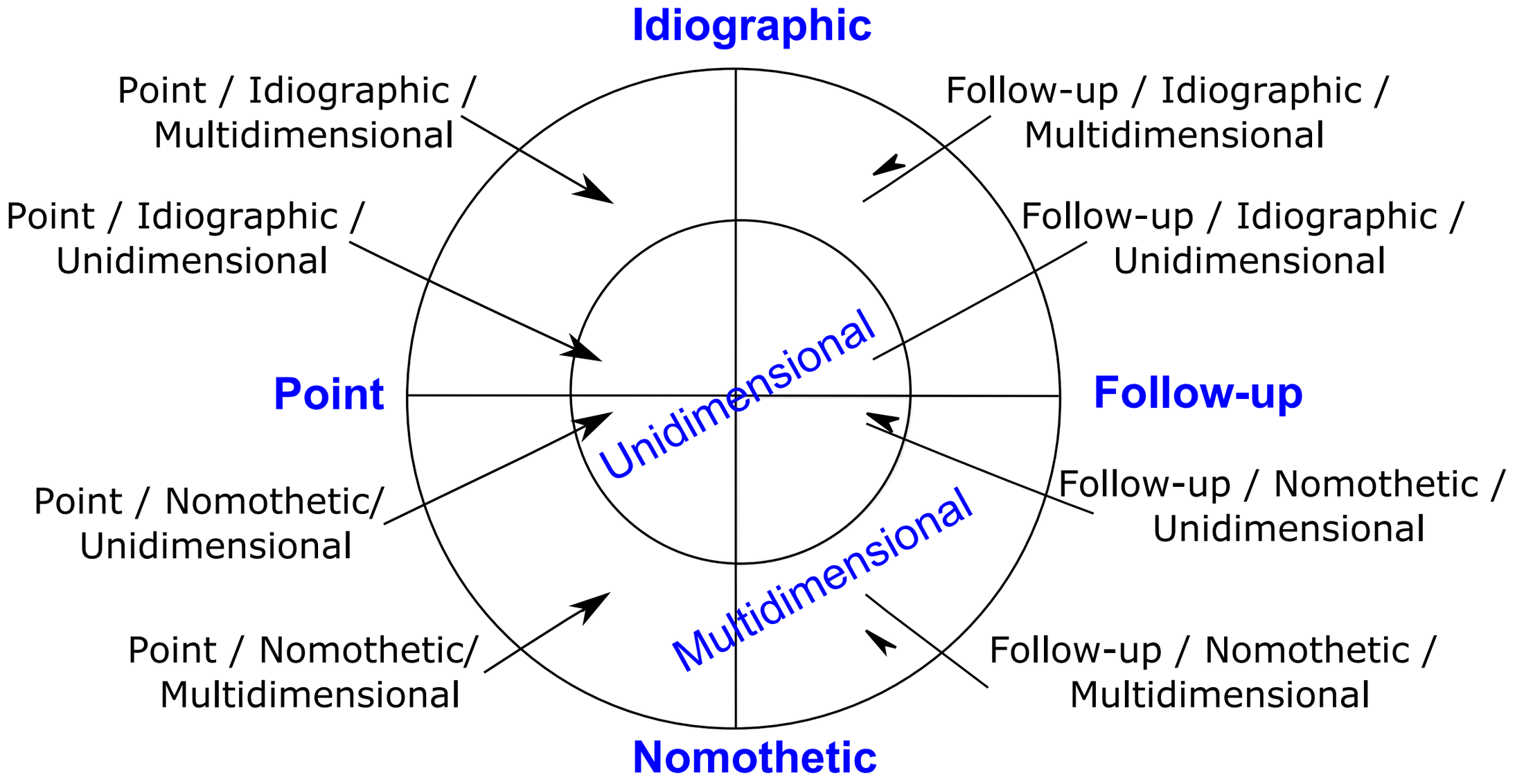
-UNIDIMENSIONAL

One level of response (one dimension)

-MULTIDIMENSIONAL

Different levels of response (various dimensions)

2.2. Observational Designs (3)



3. Data Collection and Management

3.1. Observation instruments

3.2. Coding systems (development and use)

3.3. Data entry and management

3.4. Quality control measures (Inter-rater reliability)

3.5. Software for data collection

3.1. Observation instruments

Category System (CS)

- Essential theoretical framework
- Closed system
- Unidimensional
- Unique code
- High rigidity

Field Format (FF)

Non-essential theoretical framework

Open system

Multidimensional

Multi-code

Self-regulating

FF/CS Combination

- Requires theoretical framework only in the criteria or sub-criteria that generate SC
- Closed list in the criteria that generate SC, and open in the others

All of them must be prepared *ad hoc* (tailor-made)

Sufficient documentation and experience in the specific field should be available

3.1. Observation instruments

Category System (CS)

- Essential theoretical framework
- Closed system
- Unidimensional
- Unique code
- High rigidity

TABLE 2
Revised Version of the Conversational Argument Coding Scheme (CACS)

Starting Points (SP)

ASRT: Assertions. Statements of belief or opinion.
PROP: Propositions. Statements that call for discussion or action.

Developing Points (DP)

ELAB: Elaborations. Statements that support other statements by providing evidence or clarification.
AMPL: Amplification. Explicit inferential statements.
JUST: Justifications. Statements that offer norms, values, or rules of logic to support the validity of other statements.

Convergence Markers (CM)

AGMT: Agreements. Statements that show agreement.
ACKN: Acknowledgements. Messages indicating recognition and/or understanding, but not agreement to, another's point.

Prompters (PO)

OBJC: Objections. Statements that deny the truth or accuracy of another statement.
CHAL: Challenges. Messages that present problems, questions, or reservations that must be addressed to reach agreement.
RESP: Responses. Statements that support other statements that have been explicitly refuted.

Delimiters (LM)

FRAM: Frames. Statements that provide a context and/or qualification for another statement.
F/SE: Forestall/Secure. Attempts to forestall discussion by securing common ground.
F/RE: Forestall/Remove. Attempts to forestall discussion by preventing conversation on a point.

Non-Argument

NARG: Non-arguables. Behaviors with no argumentative function.
*: An asterisk plus a turn number indicates that the thought is completed elsewhere.

From: Canary (1992; see also Canary, Weger, & Stafford, 1991). Initial CACS copyright was in 1987 by the Southern Speech Communication Association (Canary et al., 1987). The revised version

3.2. Coding systems (development and use)

Evolution of the coding system → Systematization of the registry

Growing external control

Passive phase

Active phase

Narrative

Descriptive

Semi-systematized

Systematized

El patio de la escuela es un hervidero de gritos, bullicio, movimiento. En un rincón, sentado en un banco, X trata de inflar un balón. Todos sus compañeros corren, excepto algún pequeño grupo de juego más sedentario, como el de las "chinas", o el de hacer conc
Hace poco que ha
limpio y olor a tier
de X por inflar e
pesar de probarlo
consigue, y ya r
soplar con la
obstante, el balór
enfadado consigo
correr a sus comp
para volver a las
despeja. Hoy, X se

relevancia porque es la expresión con la que precisamente se inicia el registro de observación

3:58. hay un grupo de.....

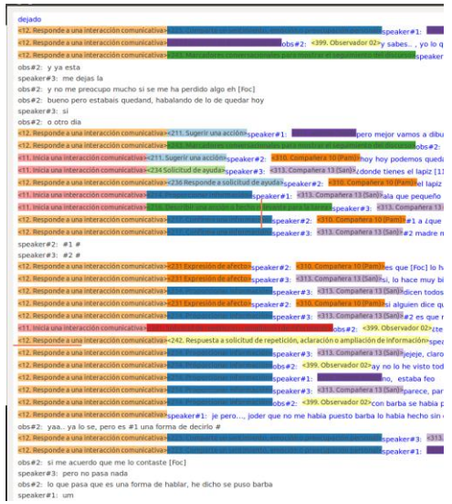
3:59. de...

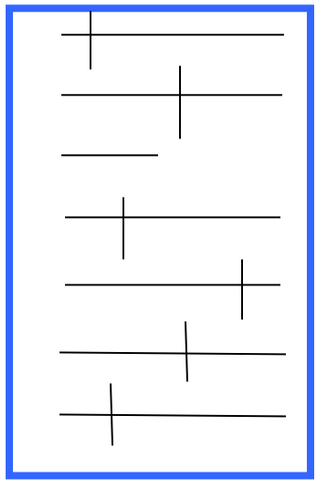
4:01. ……de clase de (alumno Focal)

esta repetición de: *de..... de* ; es la forma en la que han quedado registradas en una secuencia temporal de palabras las dudas del observador para encontrar una expresión adecuada para referirse al grupo del alumno focal. Finalmente el observador, como comprobamos en el registro de audio, opta por utilizar el nombre propio del alumno, pensando en la posibilidad de superponer un tono agudo en los registros de audio durante cualquier referencia a nombres propios, si estos registros fueran requeridos para su cotejo, indicando que con la finalidad de proteger el anonimato de los alumnos se ha eliminado de la copia entregada cualquier referencia que pudiera....., en cualquier caso el investigador podría..... Este proceso tiene una duración de 3 segundos desde que se inicia la oración.

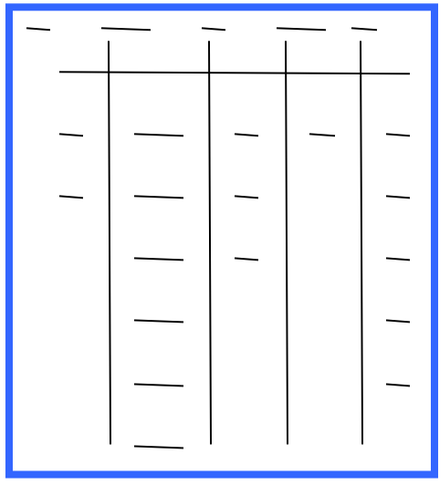
4:03. que son uno, dos, tres, compañeros

4:05. dos compañeros de Fc (de su grupo) y uno de





…

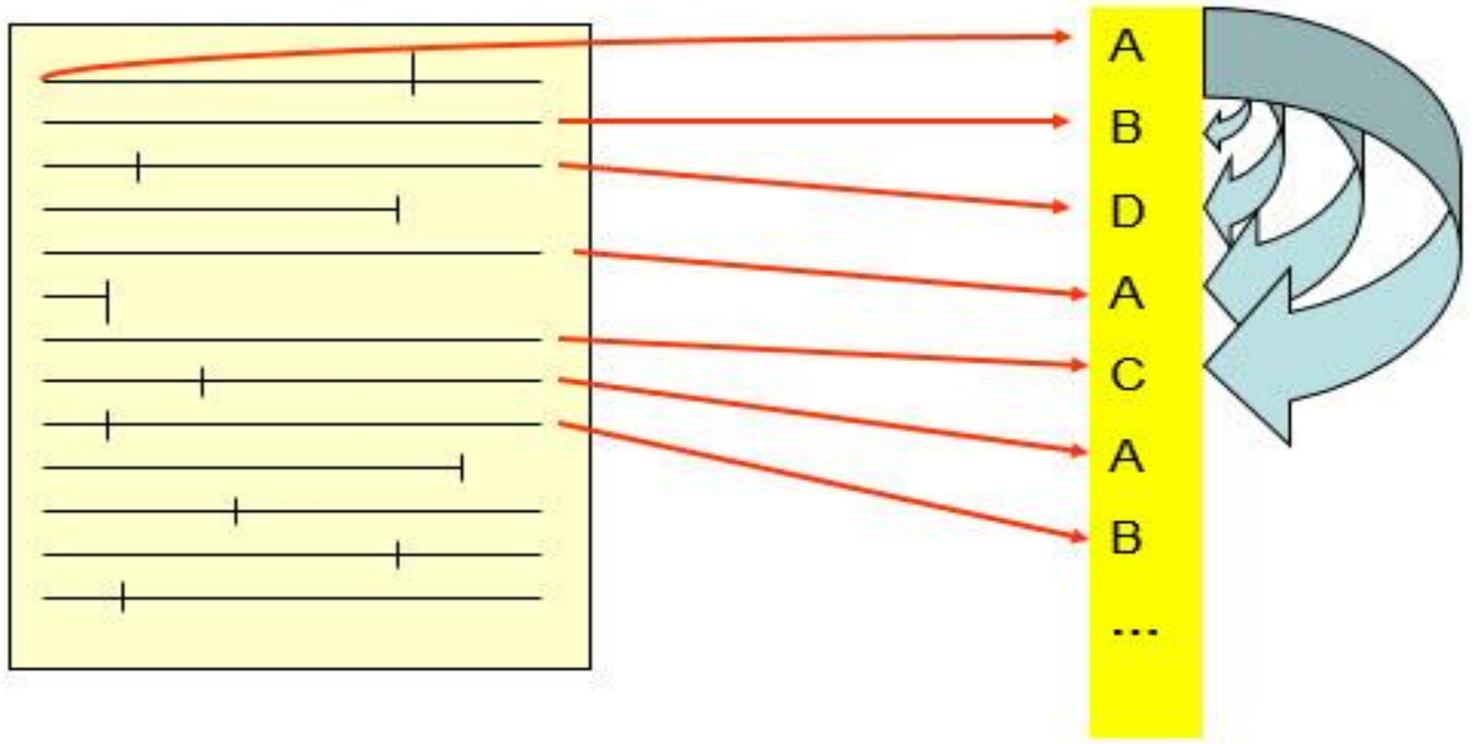


DEMATERIALIZATION OF THE REGISTER

3.2. Coding systems (development and use)

In indirect observation, an observation instrument will have been constructed, and each textual unit is assigned to a category.

SC = {A B C D} ⟹ **Must meet conditions E/ME**



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Partners	1–14 15–n	Peers with whom target child interacted, including his classmates (1–14) as well as other children with whom he interacts during recess (15–n)

3.2. Coding systems (development and use)

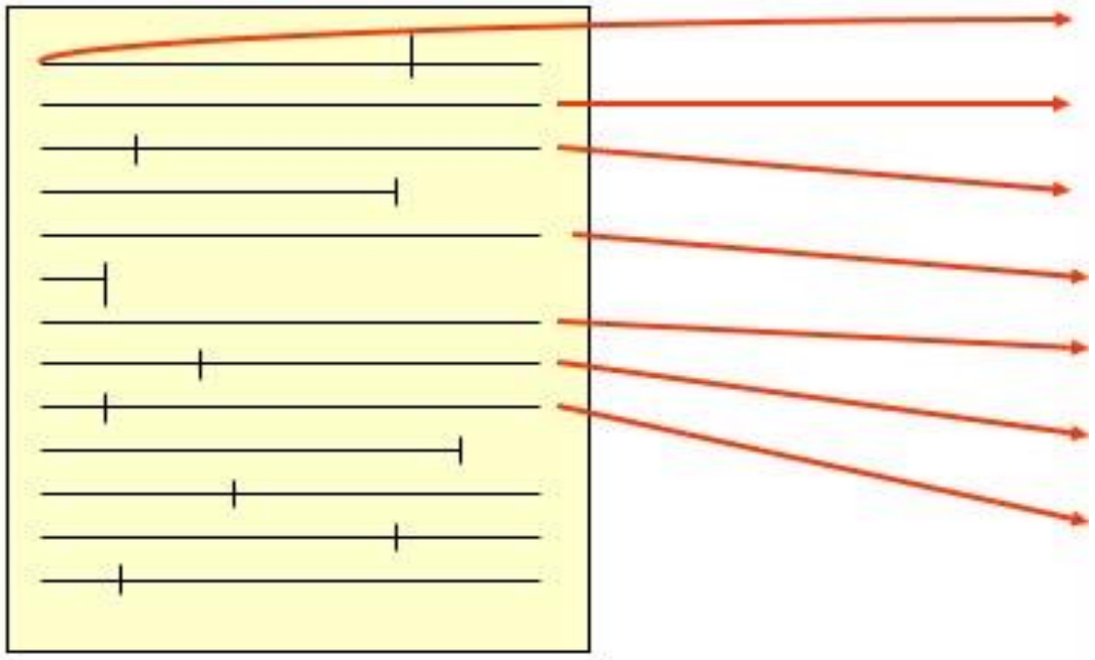
An important advantage is the possibility of using multidimensional instruments

Cs_{inter} = {A L J M N S} ⟶ **Must meet ME conditions**

FF_{part} = 1 2 3 4 5 6 7 8 …

Cs_{com} = {i r ch} ⟶ Must meet E/ME conditions

…



FF_{part}	**Cs_{inter}**	Cs_{com}
1	**A**	i
2	**L**	**r**
1	**J**	r
3	**M**	r
…		

CS = Category System
FF = Field Format

3.3. Data entry and management

Each textual unit shall be assigned at least one code, and at most as many as the dimensions established in the indirect observation instrument
A code matrix will be obtained

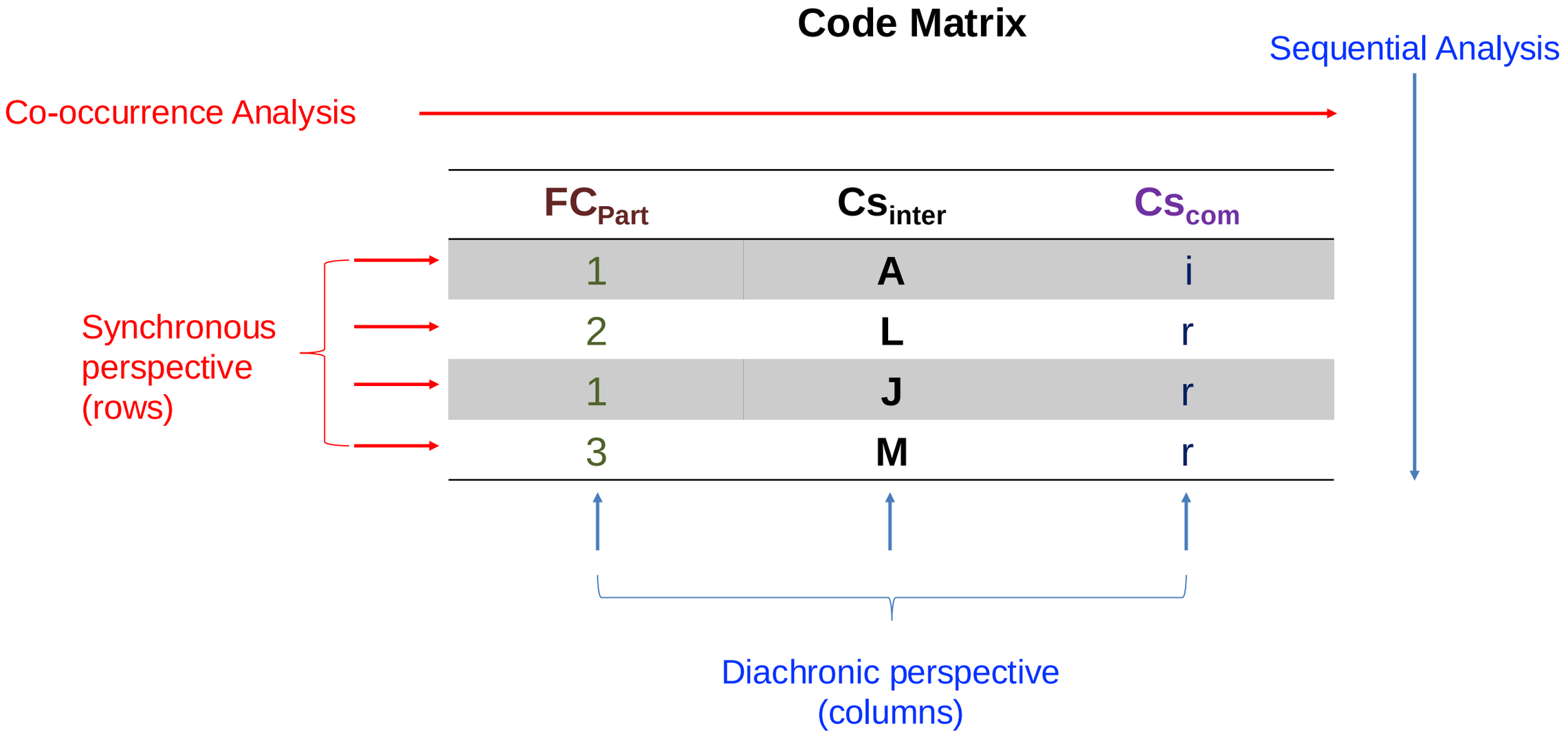
FF_{part}	Cs_{inter}	Cs_{com}
1	**A**	i
2	**L**	**r**
1	**J**	r
3	**M**	r
…		

Each row corresponds to one unit

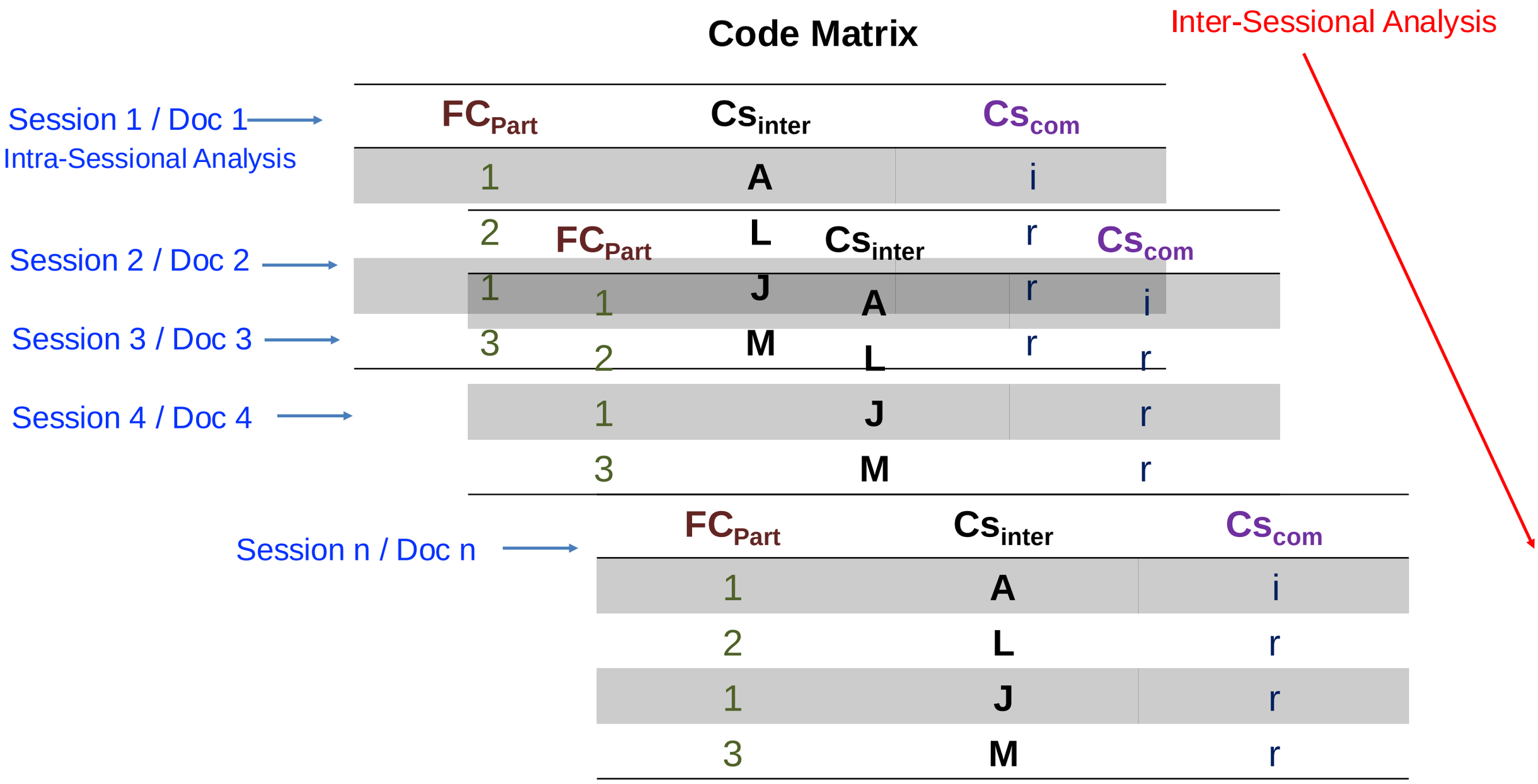
	FC_{Part}	Cs_{inter}	Cs_{com}
→	1	**A**	i
→	2	**L**	r
→	1	**J**	r
→	3	**M**	r

Each column corresponds to a dimension

3.3. Data entry and management

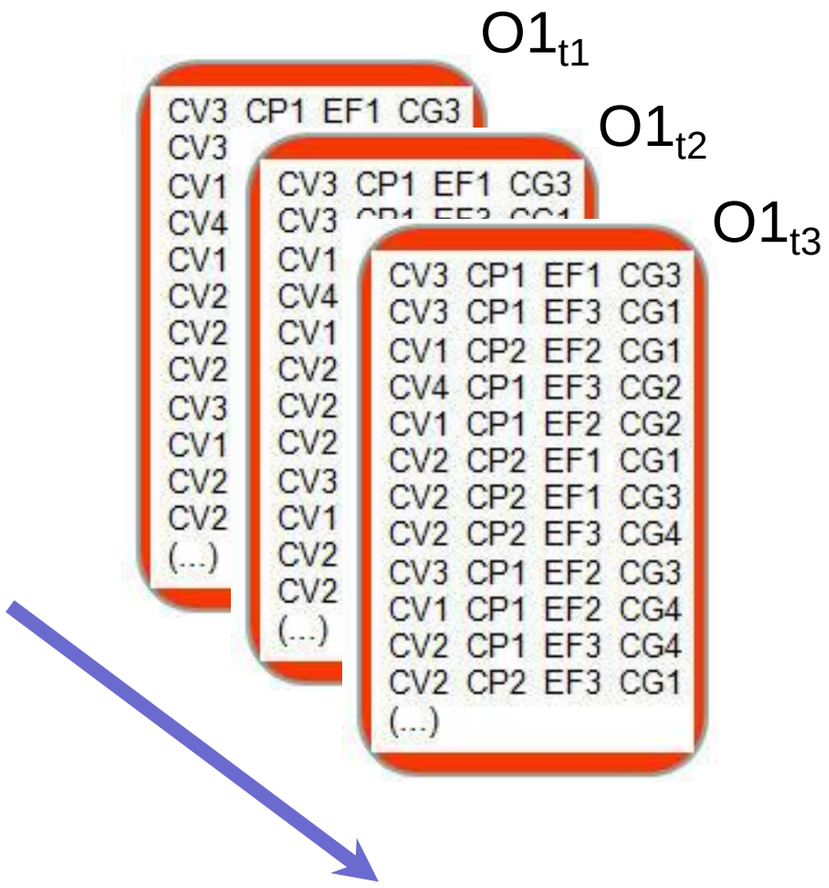


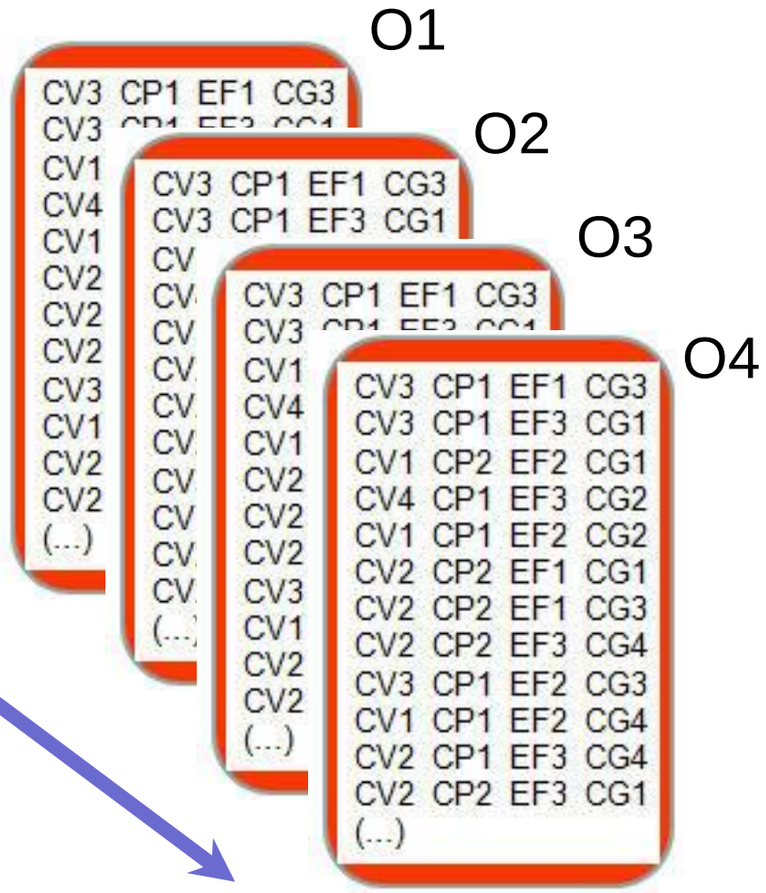
3.3. Data entry and management



3.4. Quality control measures (Inter-rater reliability)

HIGH NUMBER OF COEFFICIENTS OF AGREEMENT + CONSENSUS AGREEMENT





SOFTWARE

HOISAN
LINCE
R
SAS
SDIS-GSEQ
SPSS
Etc.

INTRA-OBSERVER AGREEMENT
(O1) AT DIFFERENT TIMES

INTER-OBSERVER AGREEMENT
(O1/O2/O3/O4)

3.5. Software for data collection

Software

DIRECT OBSERVATION

Hoisan	**SDIS-GSEQ**
Lince	The Observer
jWatcher	ThemeCoder

INDIRECT OBSERVATION

Aquad	**MAXqda2**
ATLAS.ti	Nvivo
RQDA	Nudist

OTHER ELECTRONIC MEDIA

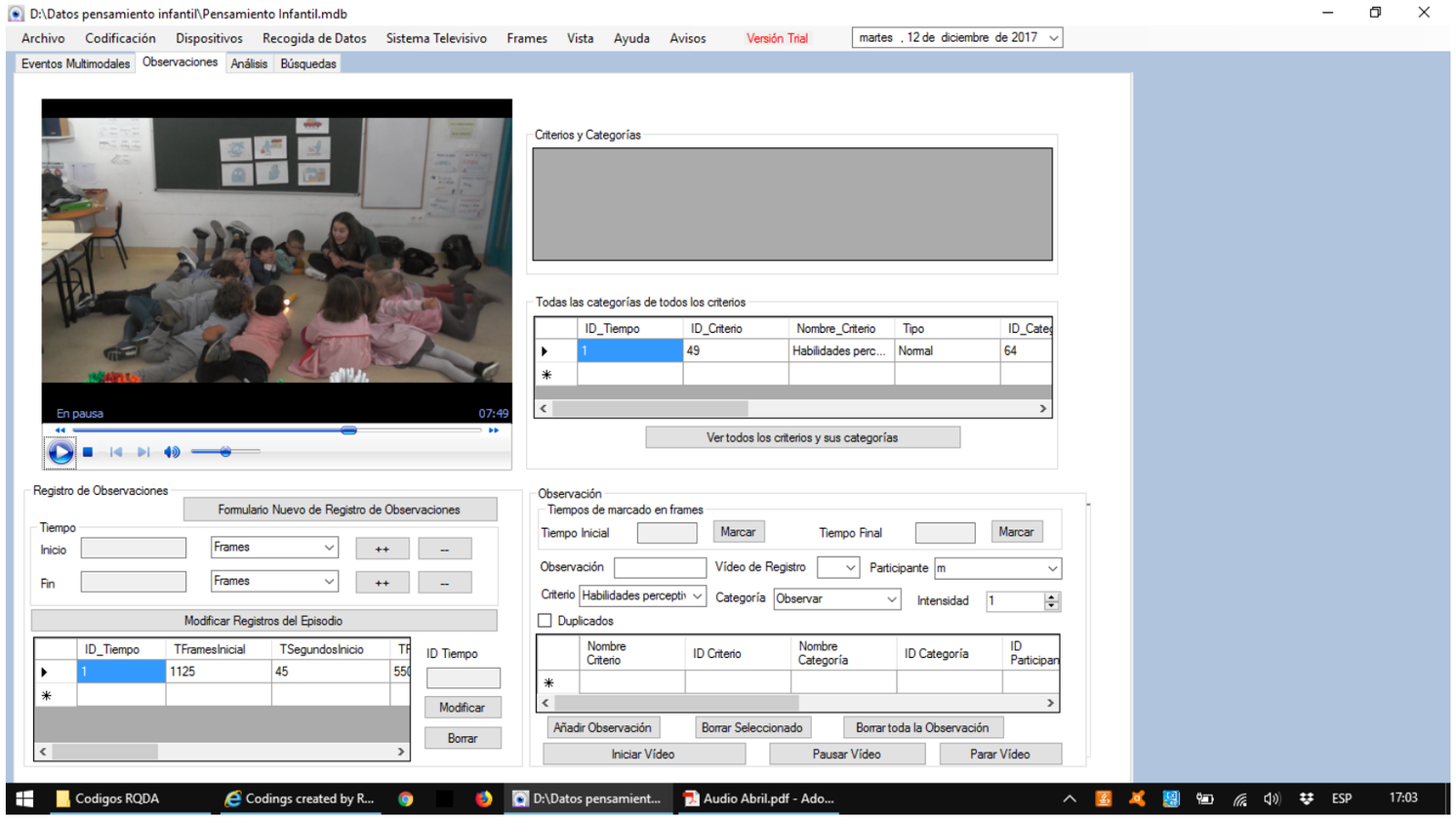
Motion Analysis
Spectral decomposition of the voice
Eye tracking...

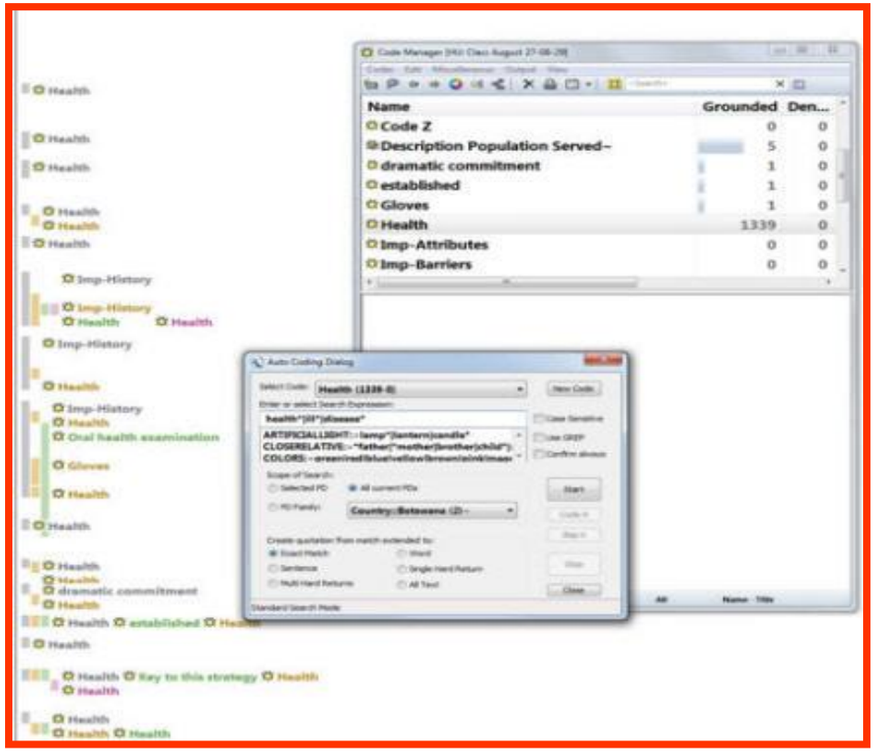
• • •

PAPER AND PENCIL

3.5. Software for data collection

COMPUTERIZED CODING





DIRECT OBSERVATION

Hoisan	**SDIS-GSEQ**
Lince	The Observer
jWatcher	ThemeCoder

INDIRECT OBSERVATION

Aquad	**MAXqda2**
ATLAS.ti	Nvivo
RQDA	Nudist

3.5. Software for data collection

COMPUTERIZED CODING

Edit Data - explo16.dat

Data Capture | Edit Data | Analysis | Summarize Results | Global Definition | Focal Master | Focal Analysis Master | Combinations Master | Sequential Analysis

Duration

HH : MM : SS

0 10 0

View - OSIR3.fmf

Behaviors

Modifiers

Elapsed(ms)	Time	Key Pressed	Behavior / *Modifier
17028	00:00:17:02	s	Permanece Solo
65751	00:01:05:75	j	*OBoj
188909	00:03:08:90	o	*OBcom
197502	00:03:17:50	j	*OBoj
600000	00:10:00:00	EOF	

Insert Rows...

Delete Row

Behaviors

Key Code	Behavior
-	Juego paralelo
a	Interactua con adulto
b	Baja Intensidad
d	Disruptiva
i	Inicia Interaccion
n	Interactua Inadecuadamente
p	Participa activamente
r	Responde a una interaccion
s	Permanece Solo

Close

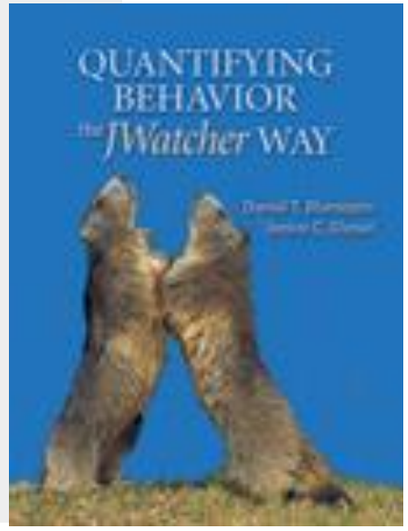
Modifiers

Key Code	Modifier
0	Pm
1	Sn
2	Br
3	Ev
4	An
5	In
6	Ar
7	Ll
8	Nr
9	Ab
c	En grupo de cuatro
e	Sn
j	OBoj
o	OBcom
q	Dv
v	En grupo de mas de cuatro
w	Ag
x	En trio
z	En pareja

Close

DIRECT OBSERVATION
In vivo

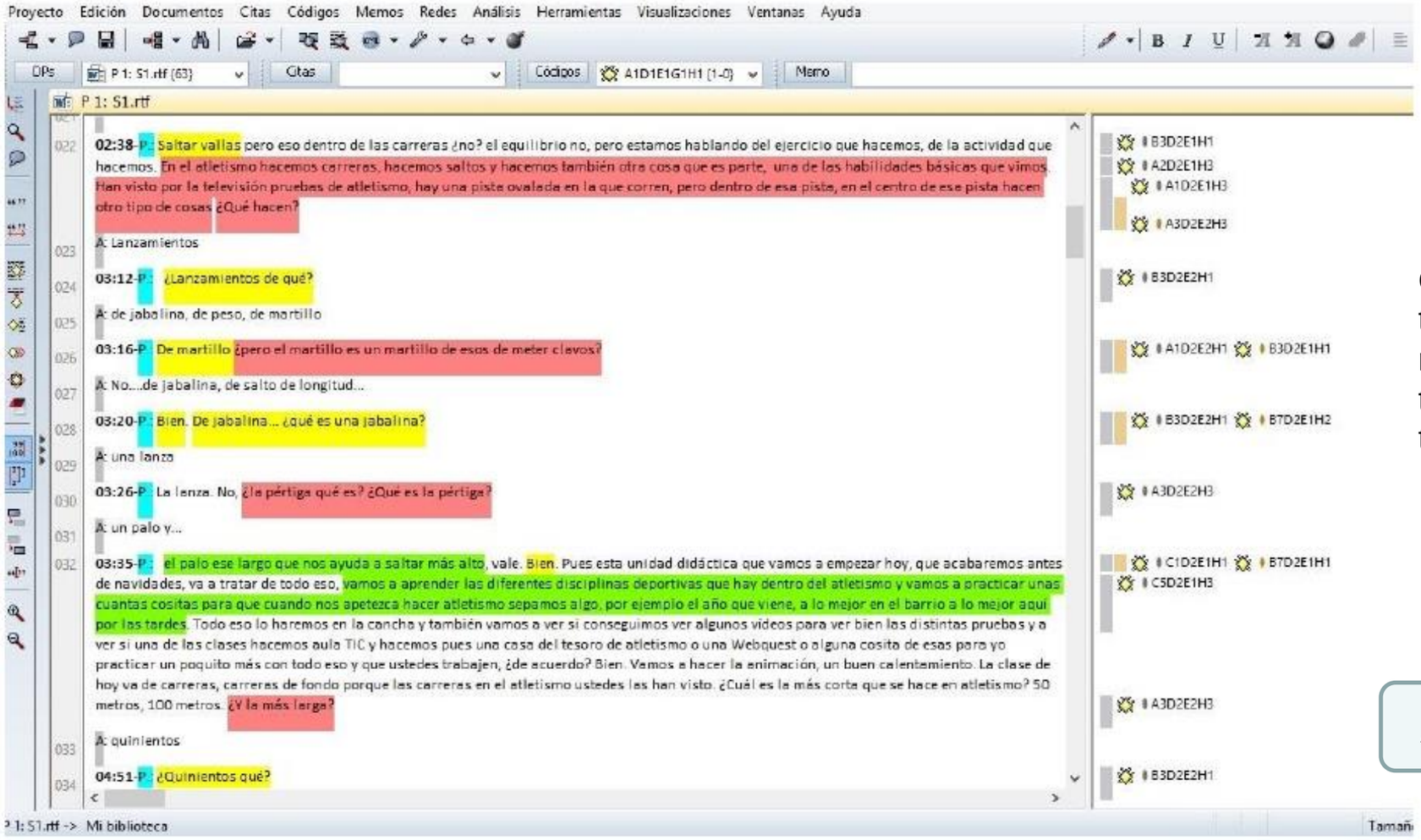
JWatcher™



3.5. Software for data collection

COMPUTERIZED CODING

INDIRECT OBSERVATION



García-Fariña, A. (2015). Analysis of the teaching discourse as a methodological resource for physical education teachers in the primary education stage. (Doctoral thesis). University of La Laguna.

ATLAS.ti

4. Data Analysis

4.1. Introduction

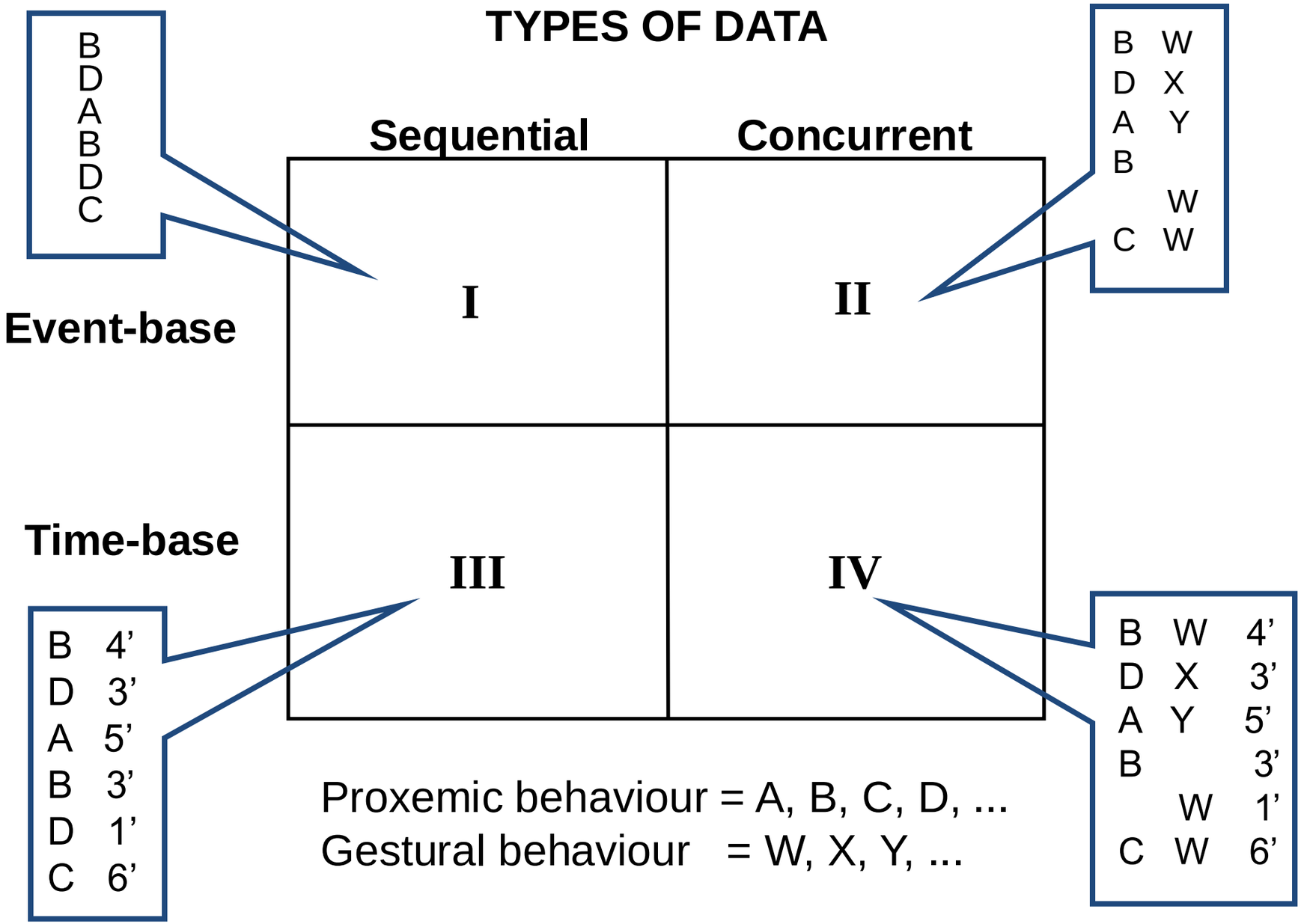
4.2. Lag Sequential Analysis

4.3. Polar Coordinates Analysis

4.4. Interpreting results and drawing conclusions

4.5. Software for data analysis

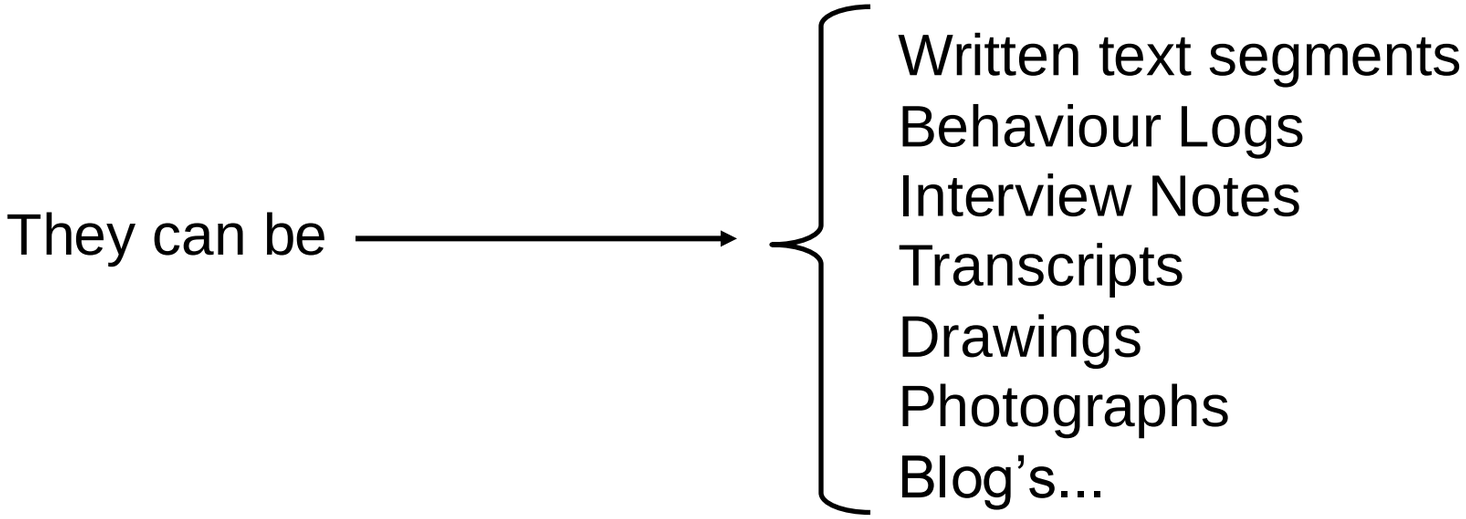
4.1. Introduction



4.1. Introduction

QUANTITIZING

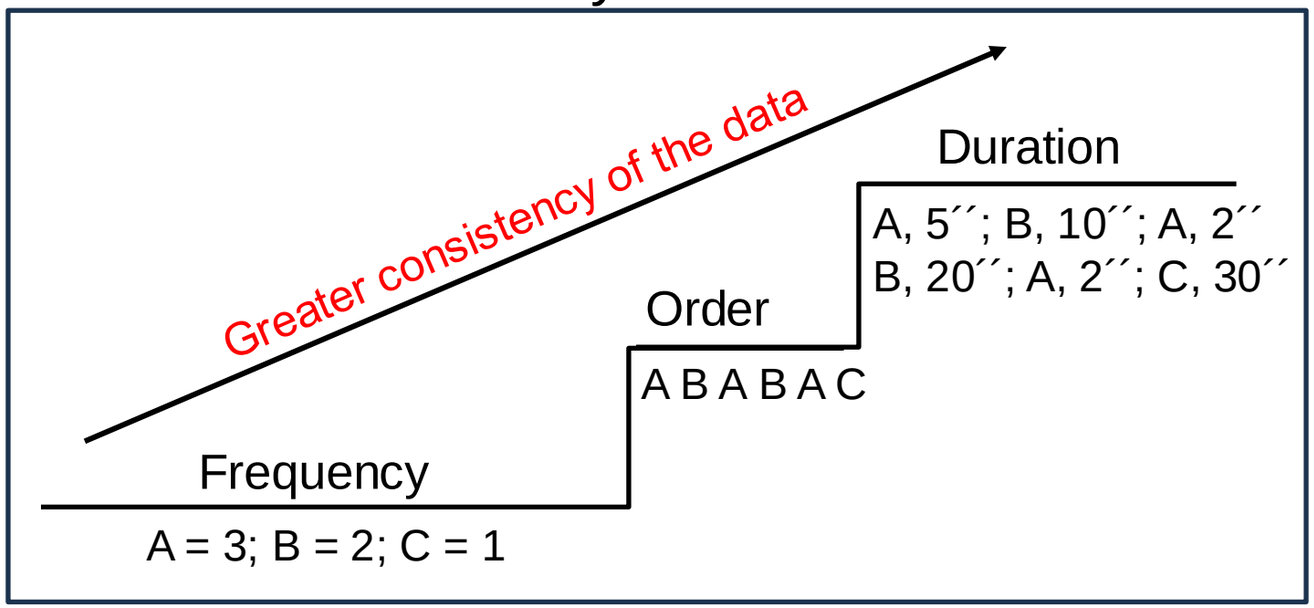
Process of assigning numeric values to data conceived as non-numeric



4.1. Introduction

Obtaining Parameters

Primary Measures



Mixed Measures

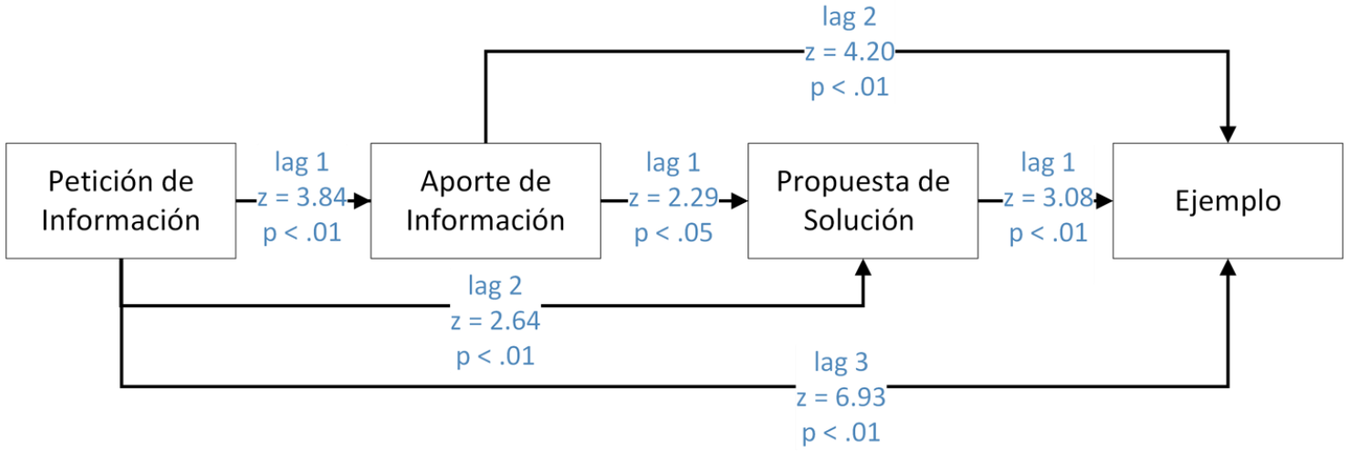
Transition frequency

Secondary measures

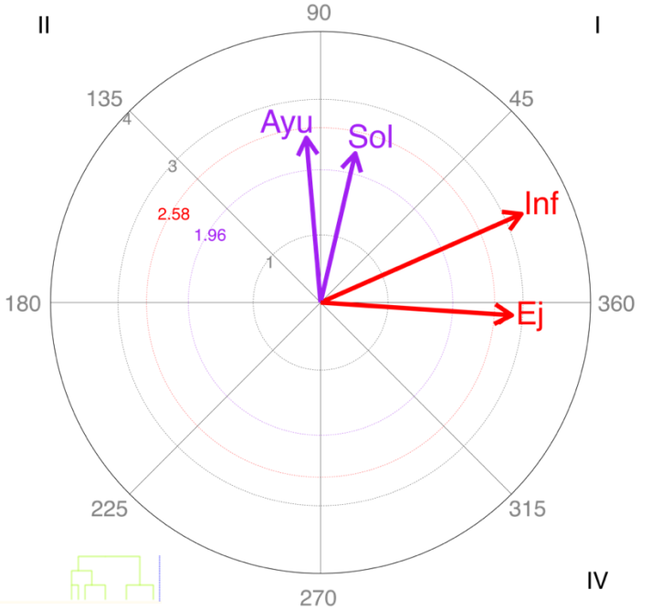
Relative frequency
Relative duration

4.1. Introduction

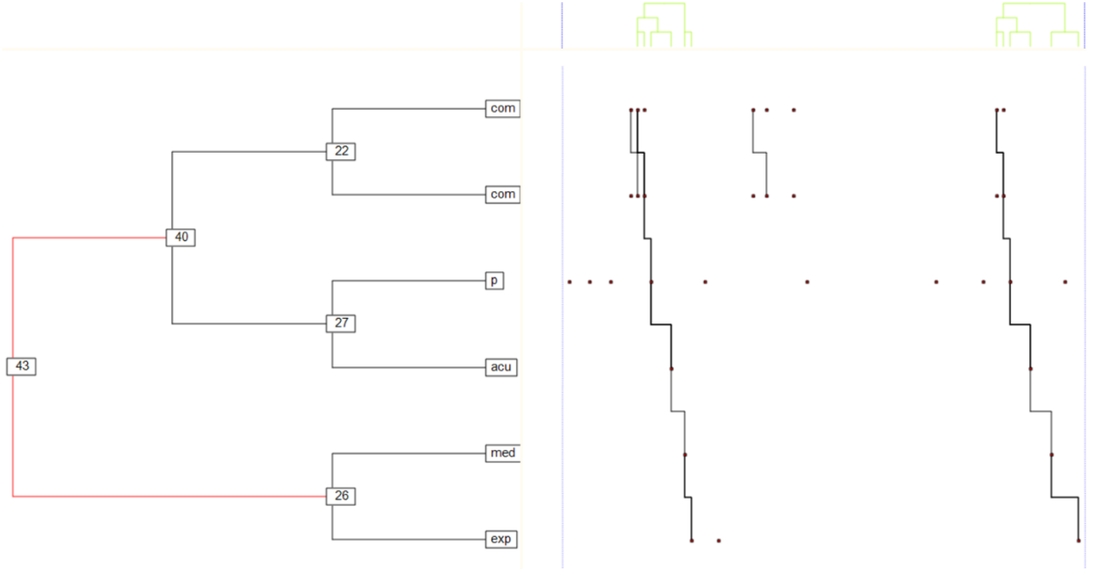
Lag Sequential Analysis



Polar Coordinate Analysis



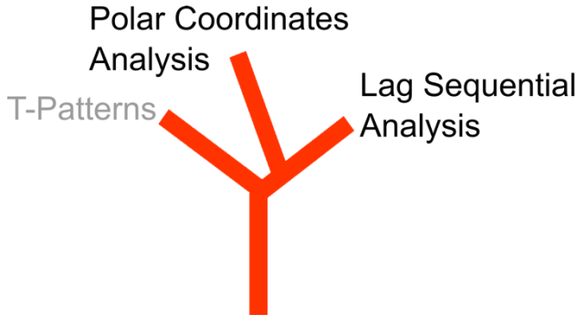
T-Patterns Analysis

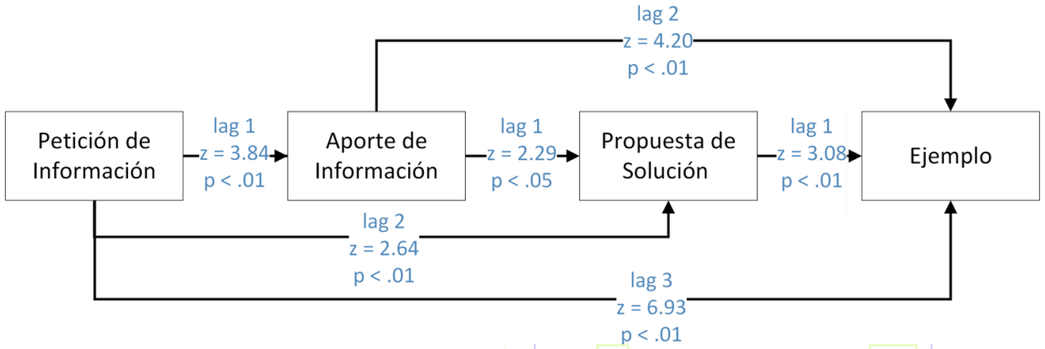


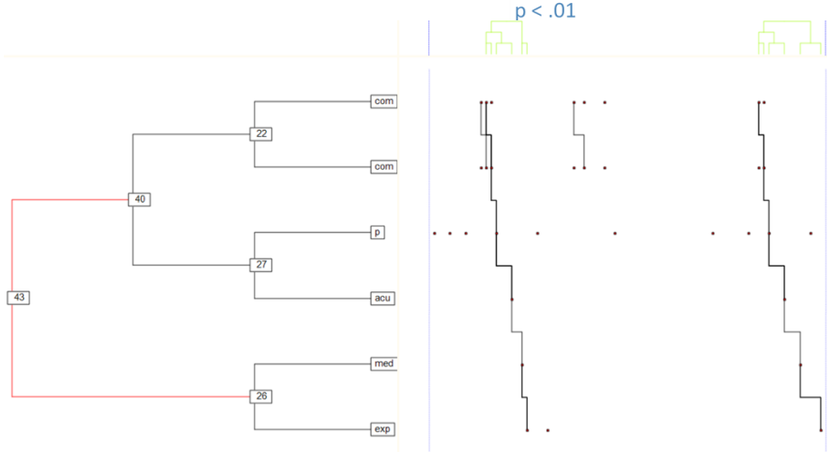
4.1. Introduction

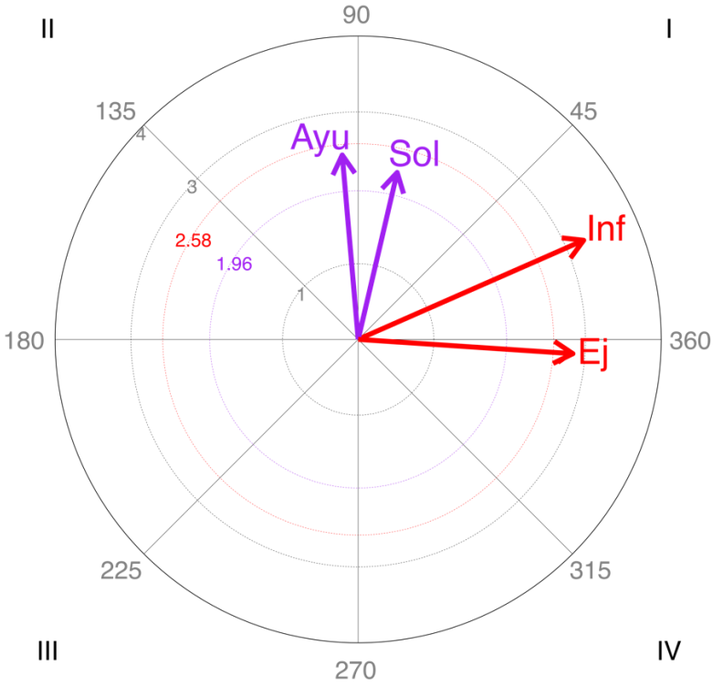
The quantitative analyses that allow **the detection of regularities** are:

- Lag-sequential analysis **(LSA)**
- Polar coordinates analysis
- Detection of hidden time patterns **(T-Pattern Analysis)**









4.2. Lag Sequential Analysis (LSA)

- Proposed by Bakeman in 1974
- The central objective of this technique is to detect regularities in behaviour
- Try to eliminate any effects of chance
- Develop a schema that represents the relationships between the behaviours that make up the registration system
- It is expected to find a pattern or patterns of relationships between the behaviours recorded

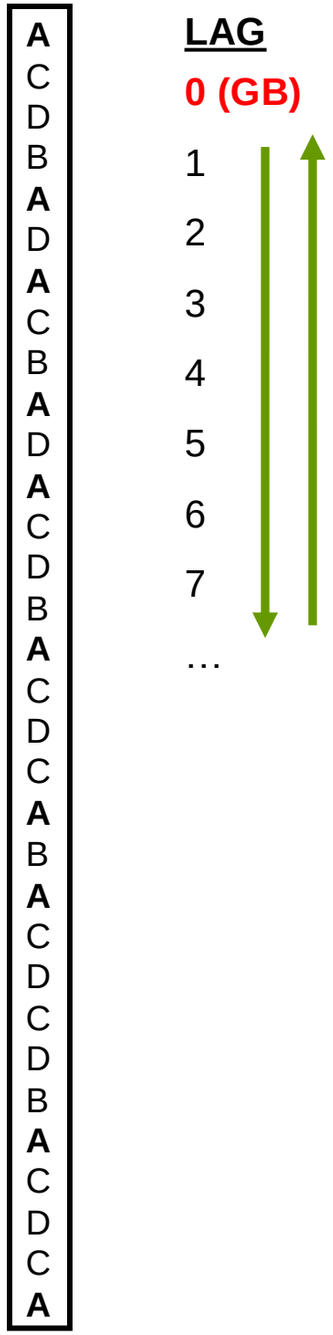
BASICS CONCEPTS

Given Behaviour

Target Behaviour

Lag

4.2. Lag Sequential Analysis (LSA)



We assume a category system = {A, B, C, D}

A: Caregiver Follow In Utterance

B: Caregiver Focused Utterance

C: Child Exploratory Play

D: Child Functional Play

Research Questions:

What do children do after caregiver follow-in utterances?

What do children do after caregiver focused utterances?

Prospective: What happens after the caregiver provides the utterance?

Retrospective: What happens before the caregiver provides the utterance?

4.2. Lag Sequential Analysis (LSA)

DIMENSIONS

Table S2

Coding Definitions and Examples

Child Play*	Definition	Example
Exploratory	Object/s are examined or explored to gain information, with no apparent functional association between actions and actual object/s.	Child manipulates a set of beads, holding them in her hand and waving them back and forth.
Functional	Object/s are used in conventional ways and the typical functions of the object/s are explored.	Child rolls a truck along the ground.
Symbolic	Object/s are used to engage in pretense, where one object is substituted for another, objects are treated as if capable of action, or as if it has imaginary properties not actually present.	Child feeds baby a bottle, simulating slurping sounds for the baby and saying "my baby is hungry!"

Caregiver Talk**	Definition	Example
Caregiver-Focused Utterance	Caregiver talk in which the referent corresponds with the caregiver's focus of attention and not the child's.	Caregiver says, "I have this book, I'm going to read it" while the child is playing with the toy farm.
Follow-in Comment	Caregiver talk in which the referent corresponds with the child's focus of attention, and does not instruct or suggest that the child play with the toy in a new way.	Child is moving the ball across the room and the caregiver says, "the ball rolled away!"
Follow-in Directive	Caregiver talk in which the referent corresponds with the child's focus of attention, and instructs or suggests that the child play with the toy in a new way.	Child is moving the ball across the room and the caregiver says, "now kick it!"

Sequential Associations Between Caregiver Talk and Child Play in Autism Spectrum Disorder and Typical Development

Kristen Bottema-Beutel and Caitlin Malloy
Boston College

Blair P. Lloyd
Vanderbilt University

Rebecca Louick
Boston College

Linnea Joffe-Nelson
Boston Children's Hospital

Linda R. Watson
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Paul J. Yoder
Vanderbilt University

Bottema-beutel, K., Malloy, C., Lloyd, B. P., Louick, R., Joffe-nelson, L., Watson, L. R., & Yoder, P. J. (2017). *Sequential Associations Between Caregiver Talk and Child Play in Autism Spectrum Disorder and Typical Development*. *00*(0), 1–10. https://doi.org/10.1111/cdev.12848

4.2. Lag Sequential Analysis (LSA)

A C D B A D A C B A D A C D B A C D C A B A C D C D B A C D C A

LAG

0 (GB)

1

2

3

4

5

6

7

…

What do children do after caregiver follow-in utterances?

BASICS CONCEPTS

Given Behaviour

Target Behaviour

Lag

A: Caregiver Follow In Utterance

B: Caregiver Focused Utterance

C: Child Exploratory Play

D: Child Functional Play

Prospective (Lag +1)

What do children do after caregiver follow-in utterances?

Target Behaviour

C: Child Exploratory Play

D: Child Functional Play

Given Behaviour

A: Caregiver Follow In Utterance

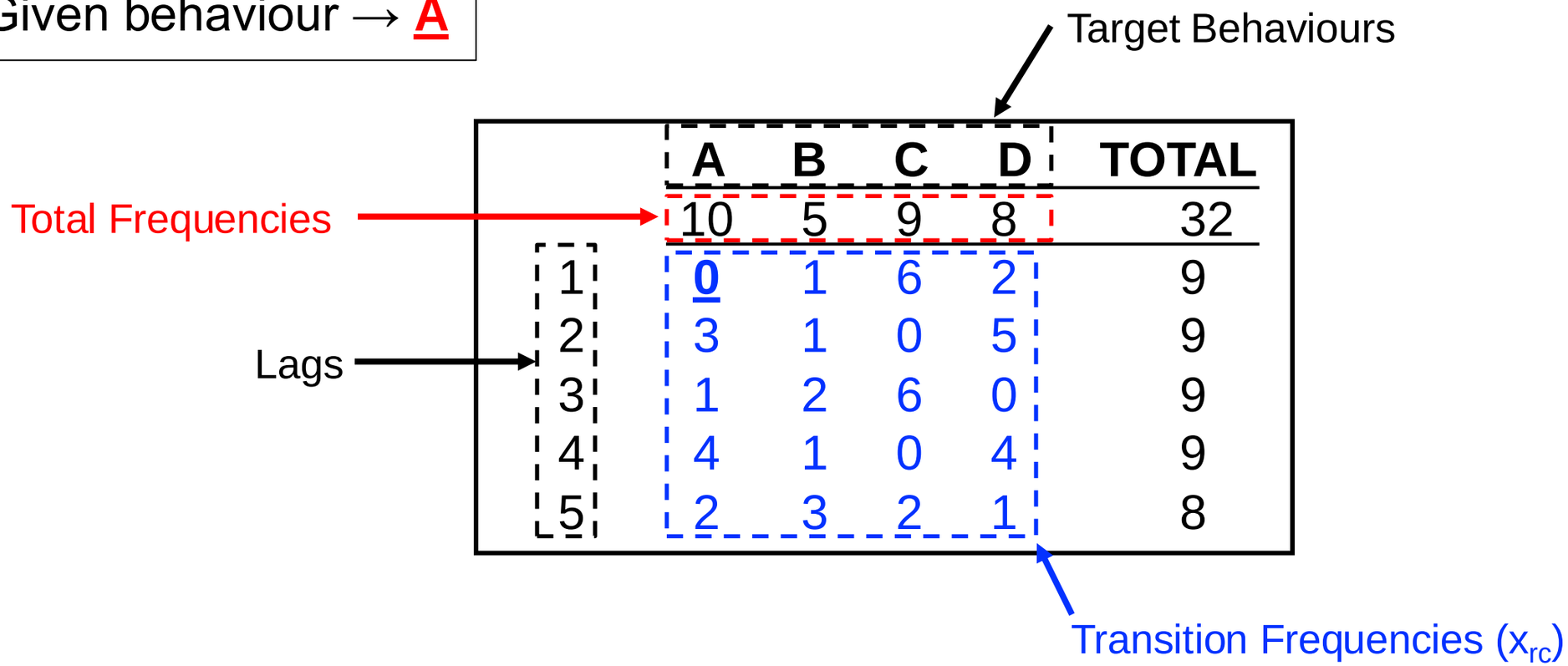
4.2. Lag Sequential Analysis (LSA)

A C D B A D A C B A D A C D B A C D C A B A C D C D B A C D C A

CS ={ A,B,C,D}

Given behaviour → **A**

Observed Joint Frequencies



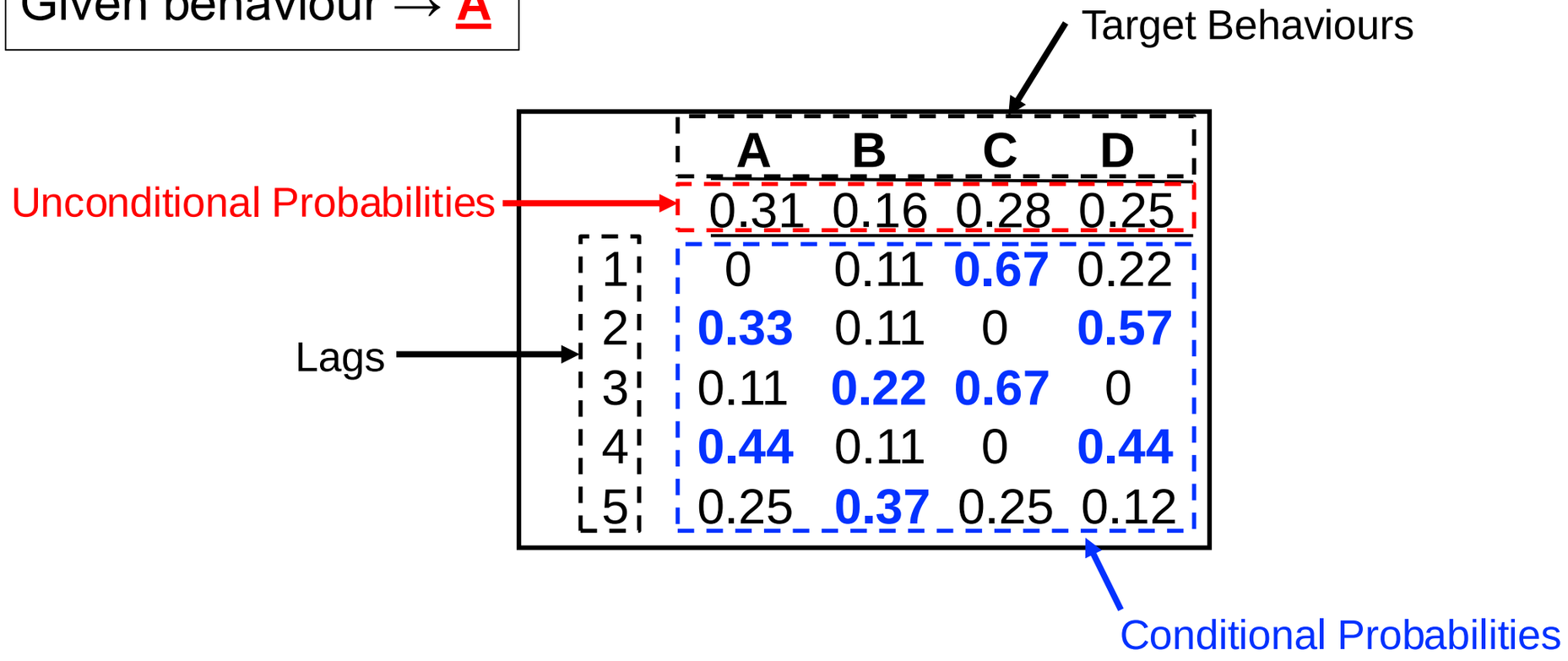
4.2. Lag Sequential Analysis (LSA)

A C D B A D A C B A D A C D B A C D C A B A C D C D B A C D C A

CS ={ A,B,C,D}

Given behaviour → **A**

Observed Joint Probabilities



4.2. Lag Sequential Analysis (LSA)

A C D B A D A C B A D A C D B A C D C A B A C D C D B A C D C A

CS ={ A,B,C,D}

Given behaviour → **A**

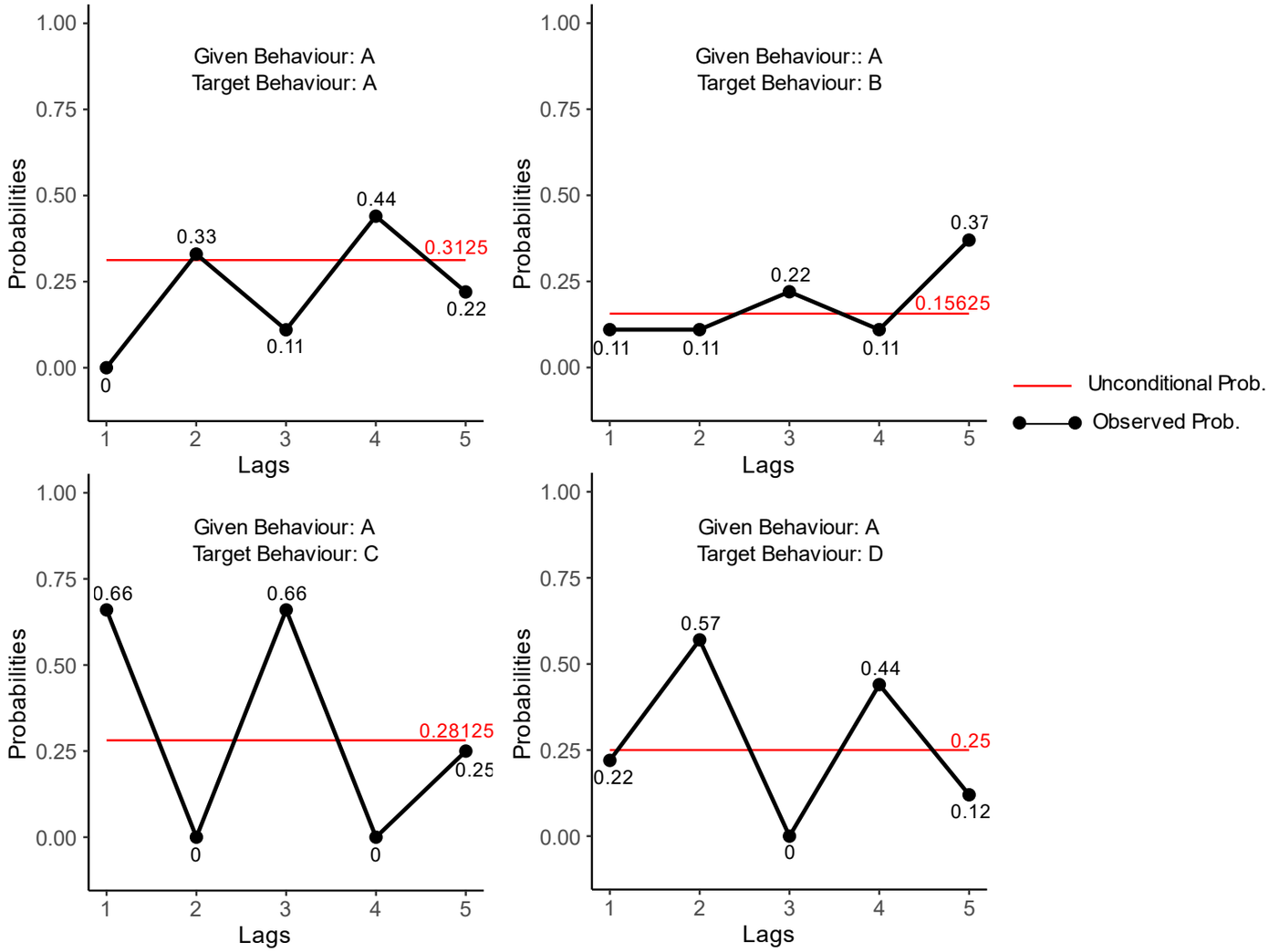
	A	B	C	D
	0.31	0.16	0.28	0.25
1	0	0.11	**0.67**	0.22
2	**0.33**	0.11	0	**0.57**
3	0.11	**0.22**	**0.67**	0
4	**0.44**	0.11	0	**0.44**
5	0.25	**0.37**	0.25	0.12

A: Caregiver Follow In Utterance

B: Caregiver Focused Utterance

C: Child Exploratory Play

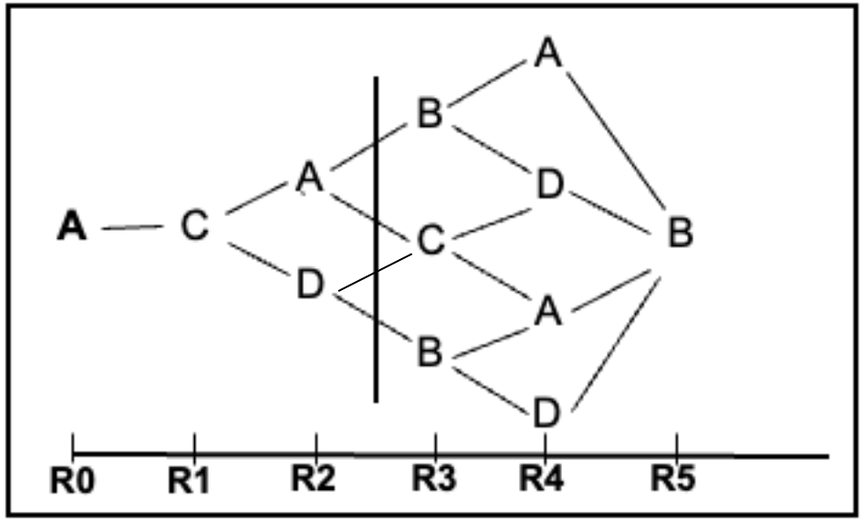
D: Child Functional Play



4.2. Lag Sequential Analysis (LSA)

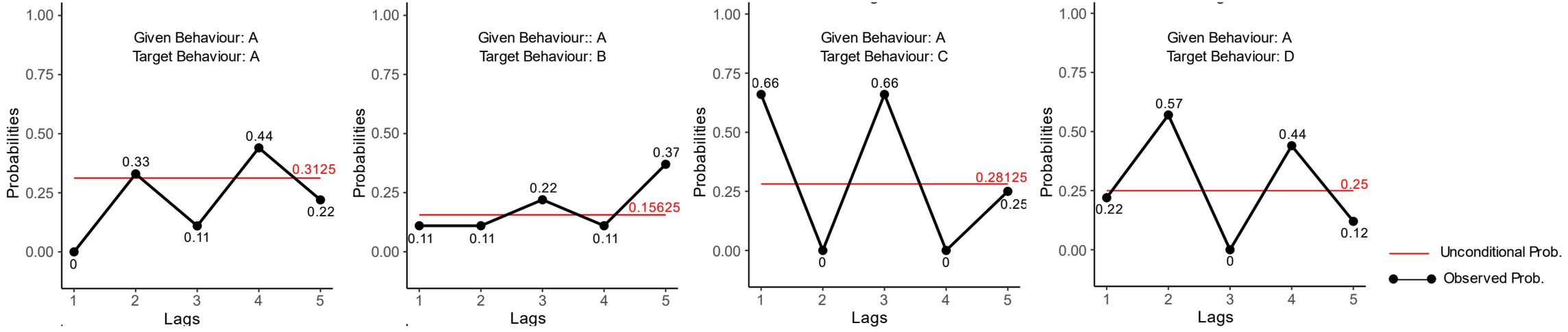
Identification of the pattern of behaviour
Application of conventional rules

Prospective pattern



Rules of Interpretation →

Behaviour patterns:
A – C – A
A – C – D

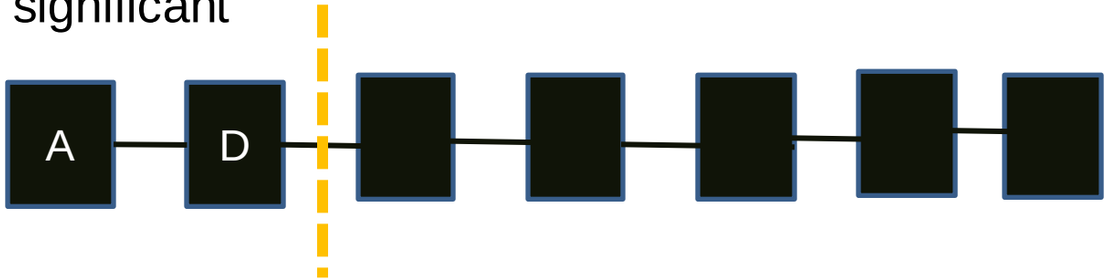


4.2. Lag Sequential Analysis (LSA)

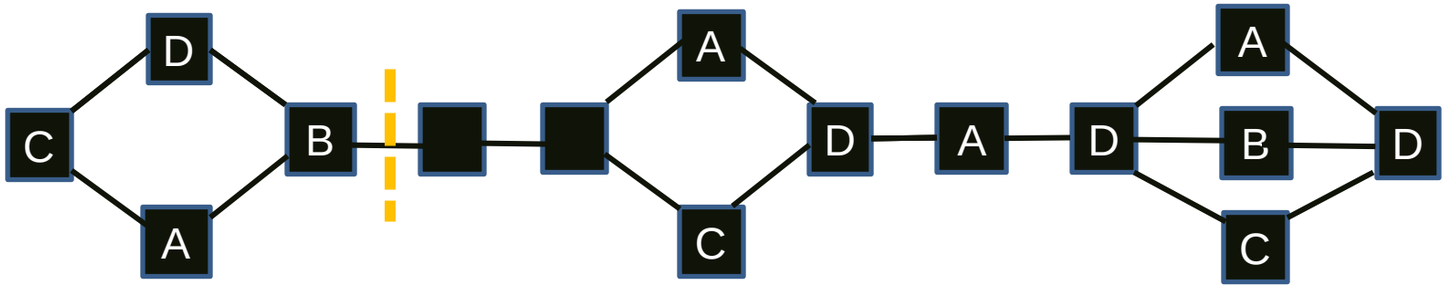
Identification of the pattern of behaviour
Application of conventional rules

Rules of Interpretation

1. We define the end of a behavioural pattern as the point where further behaviours are not statistically significant



2. A behavioural pattern ends when there are two consecutive empty lags

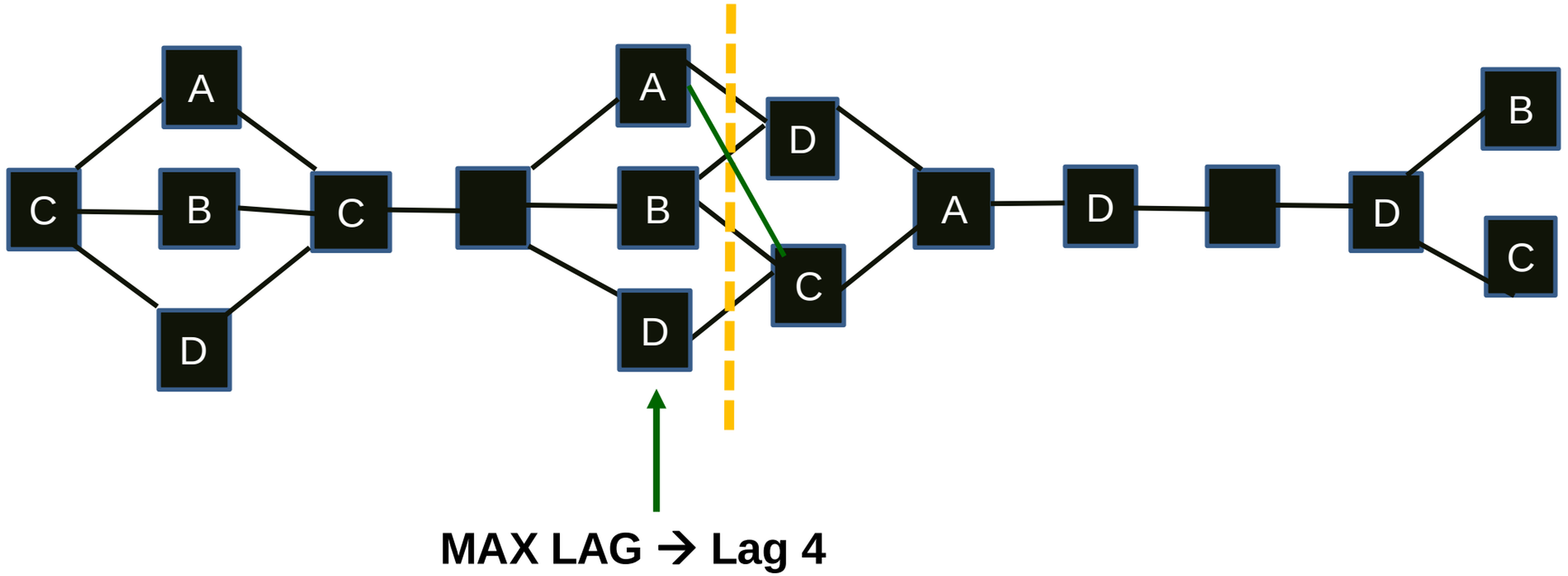


4.2. Lag Sequential Analysis (LSA)

Identification of the pattern of behaviour
Application of conventional rules

Rules of Interpretation

3. If two consecutive lags contain multiple statistically significant behaviours, the first lag (MAX LAG) is considered the end of the behavioural pattern

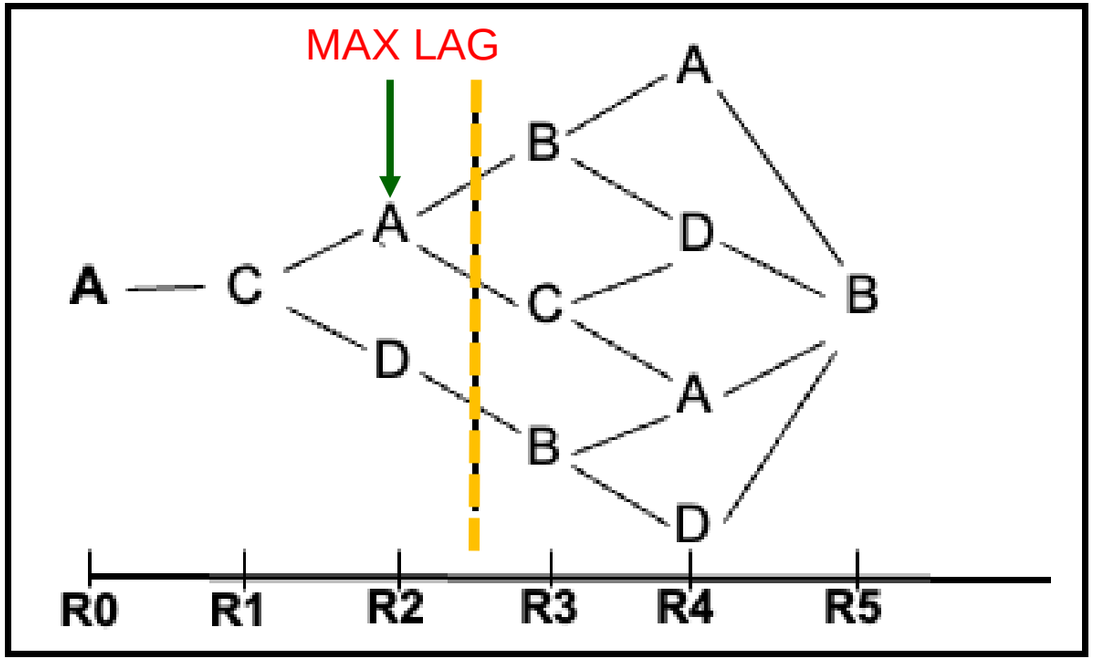


4.2. Lag Sequential Analysis (LSA)

Identification of the pattern of behaviour
Application of conventional rules

Rules of Interpretation

1. We define the end of a behavioural pattern as the point where further behaviours are not statistically significant
2. A behavioural pattern ends when there are two consecutive empty lags
3. If two consecutive lags contain multiple statistically significant behaviours, the first lag (MAX LAG) is considered the end of the behavioural pattern



Behaviour patterns:
A – C – A
A – C – D

4.2. Lag Sequential Analysis (LSA)

Optimisation of the behaviour pattern
Confidence Intervals Around Unconditional Probabilities

Prospective pattern

Behavior pattern:
A – C – D – C – D – B

	A	B	C	D
Unconditional Prob.	0.31	0.16	0.28	0.25
Upper Limit Conf. Interval	**0.61**	**0.39**	**0.57**	**0.53**
Lag 1	0	0.11	**0.66**	0.22
Lag 2	0.33	0.11	0	**0.57**
Lag 3	0.11	0.22	**0.66**	0
Lag 4	0.44	0.11	0	0.44
Lag 5	0.25	0.37	0.25	0.12

$$\text{Error} = z_{\alpha/2}\sqrt{\frac{p_{esp}(1-pesp)}{n(crit)}}$$

$$p_{esp\_corr} = p_{esp} + \text{Error}$$

$$\text{Error} = 1.96\sqrt{\frac{0.31(0.69)}{9}}$$

$$\text{Error} = 0.30$$

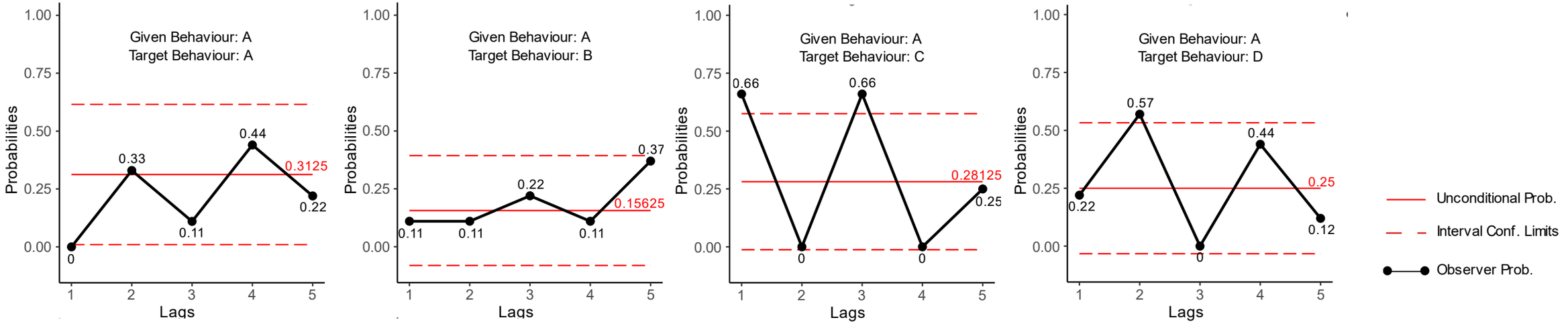
$$_{Uppr} = 0.31 + 0.30 = \mathbf{0.61}$$

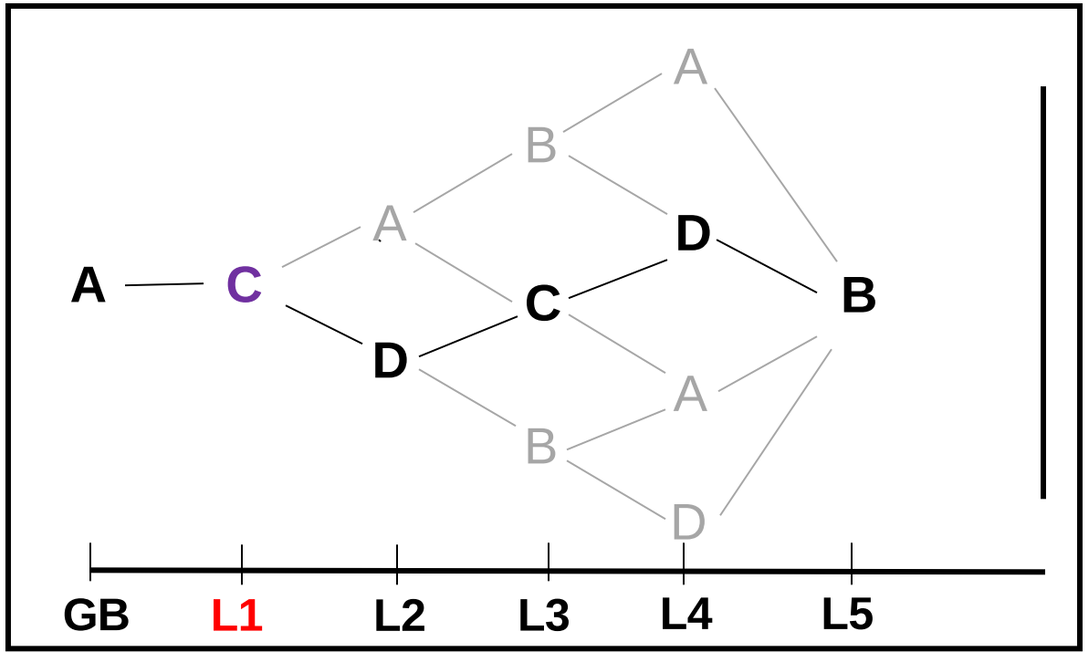
A: Caregiver Follow In Utterance

B: Caregiver Focused Utterance

C: Child Exploratory Play

D: Child Functional Play

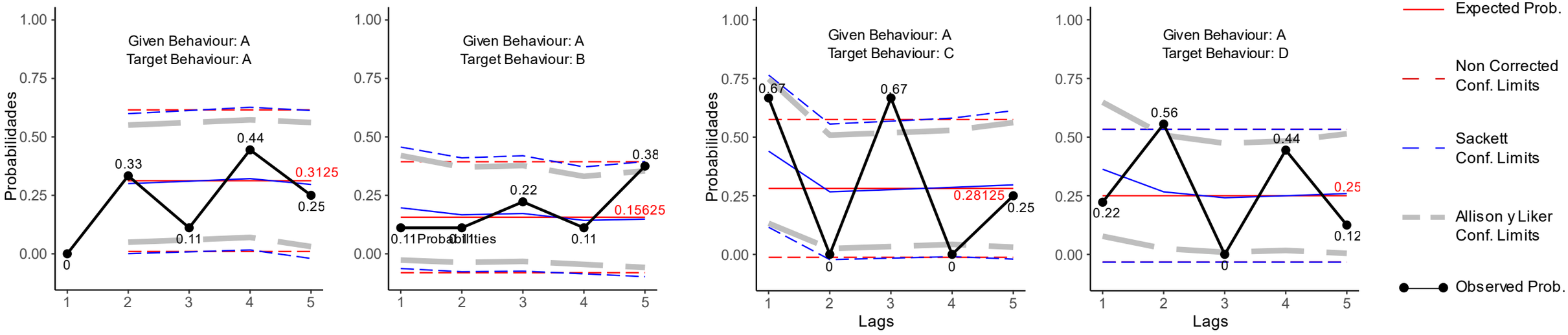




Lag: +1

ADJR Given:	Target: A	B	C	D
A	0,00	-0,75	1,44	-0,97
B	3,15	0,00	-1,72	-1,53
C	-1,39	-0,75	0,00	2,08
D	-0,97	1,61	-0,21	0,00

$$z_{rc}\ \text{adjusted residuals} = \frac{x_{rc} - e_{rc}}{\sqrt{e_{rc}(1 - p_c)(1 - p_r)}}$$



4.2. Lag Sequential Analysis (LSA)

Lag: +2

x_{rc} observed joint frequencies

JNTF Target:

Given:	A	B	C	D	Totals
A	3	1	0	5	9
B	0	0	3	2	5
C	1	4	3	0	8
D	5	0	2	1	8
Totals	9	5	8	8	30

x_{r+} Sum of the frequencies of row r

x_{+c} Sum of the frequencies of column c

$$z_{rc} \text{ adjusted residuals} = \frac{x_{rc} - e_{rc}}{\sqrt{e_{rc}(1 - p_c)(1 - p_r)}}$$

e_{rc} expected frequency = $p_{+c} \times x_{r+}$

(A|A) e_{rc} = (9/30) * 9 = 2.70
(B|A) e_{rc} = (5/30) * 9 = 1.50
(C|A) e_{rc} = (8/30) * 9 = 2.40
(D|A) e_{rc} = (8/30) * 9 = 2.40

Lag: +2

e_{rc} expected frequencies

EXPF Target:

Given:	A	B	C	D
A	2.70	1.50	2.40	2.40
B	1.50	0.83	1.33	1.33
C	2.40	1.33	2.13	2.13
D	2.40	1.33	2.13	2.13

Lag: +2

x_{r+} Sum of the frequencies of row r

x_{rc} observed frequencies

JNTF Target:

Given:	A	B	C	D	Totals
A	3	1	0	5	9
B	0	0	3	2	5
C	1	4	3	0	8
D	5	0	2	1	8
Totals	9	5	8	8	30

x_{+c} Sum of the frequencies of column c

e_{rc} expected frequencies

EXPF Target:

Given:	A	B	C	D
A	2.70	1.50	2.40	2.40
B	1.50	0.83	1.33	1.33
C	2.40	1.33	2.13	2.13
D	2.40	1.33	2.13	2.13

p_c: probability for the c-th column = $x_{+c} \div N$
(A)p_c = 9 / 30 = 0.3

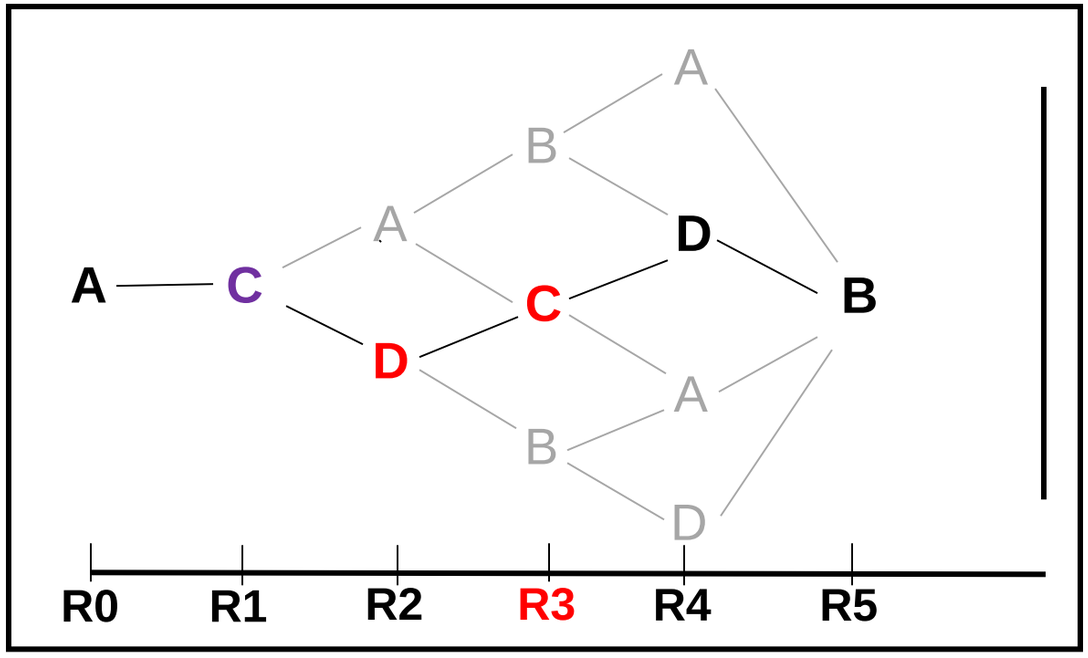
p_r: probability for the r-th row = $x_{r+} \div N$
(A)p_r = 9 / 30 = 0.3

$$z_{rc} = \frac{3 - 2.70}{\sqrt{2.70\,(1 - 0.3)(1 - 0.3)}} \qquad z_{rc} = 0.26$$

z_{rc} adjusted residuals $= \dfrac{x_{rc} - e_{rc}}{\sqrt{e_{rc}(1 - p_c)(1 - p_r)}}$

ADJR Target:

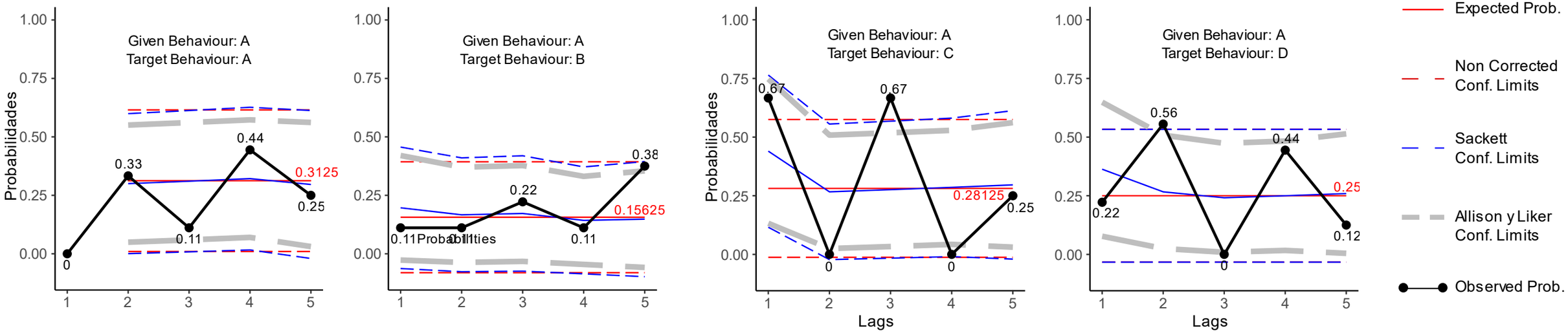
Given:	A	B	C	D
A	0.26	-0.53	-2.16	2.34
B	-1.60	-1.10	1.85	0.74
C	-1.26	2.95	0.81	-1.99
D	2.34	-1.48	-0.12	-1.06

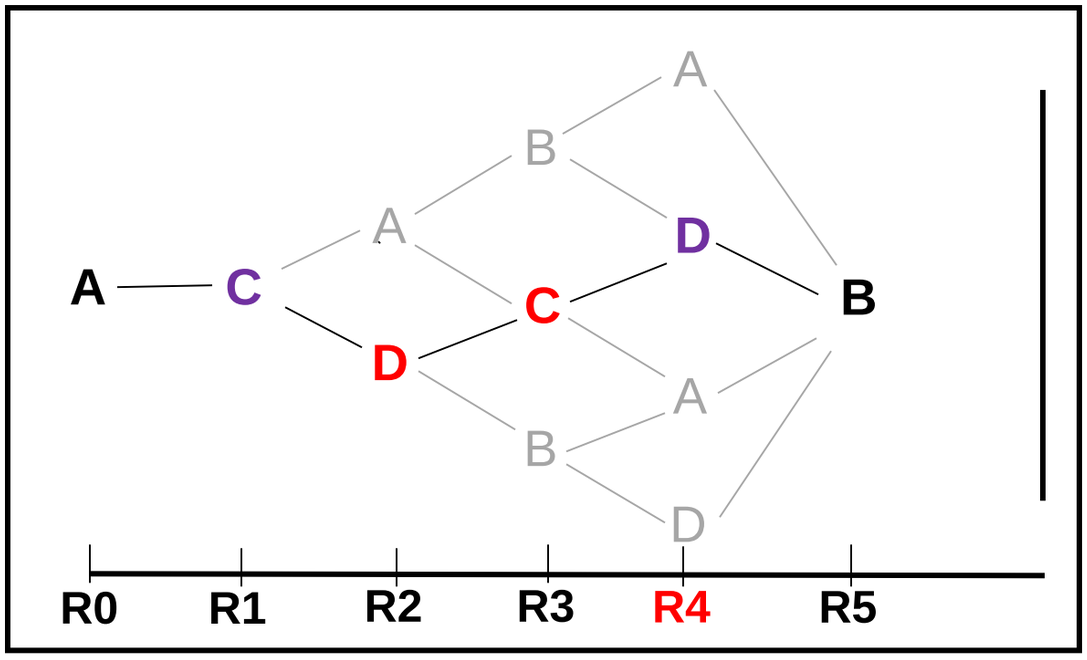


Lag: +3

ADJR Given:	Target: A	B	C	D
A	-1,56	0,48	3,16	-2,04
B	0,48	-1,12	-1,52	2,06
C	3,16	-1,52	-2,05	0,07
D	-2,04	2,06	0,07	0,31

$$z_{rc}\ \text{adjusted residuals} = \frac{x_{rc} - e_{rc}}{\sqrt{e_{rc}(1-p_c)(1-p_r)}}$$

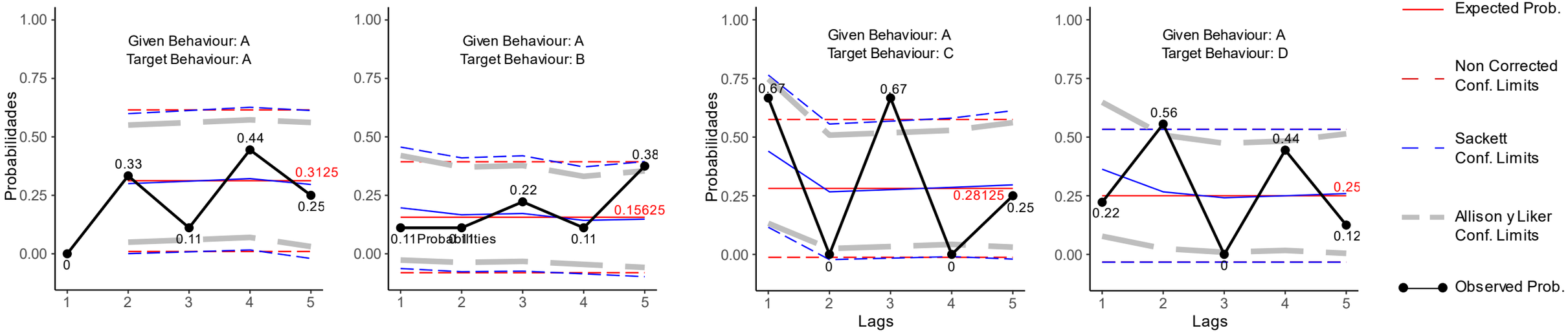


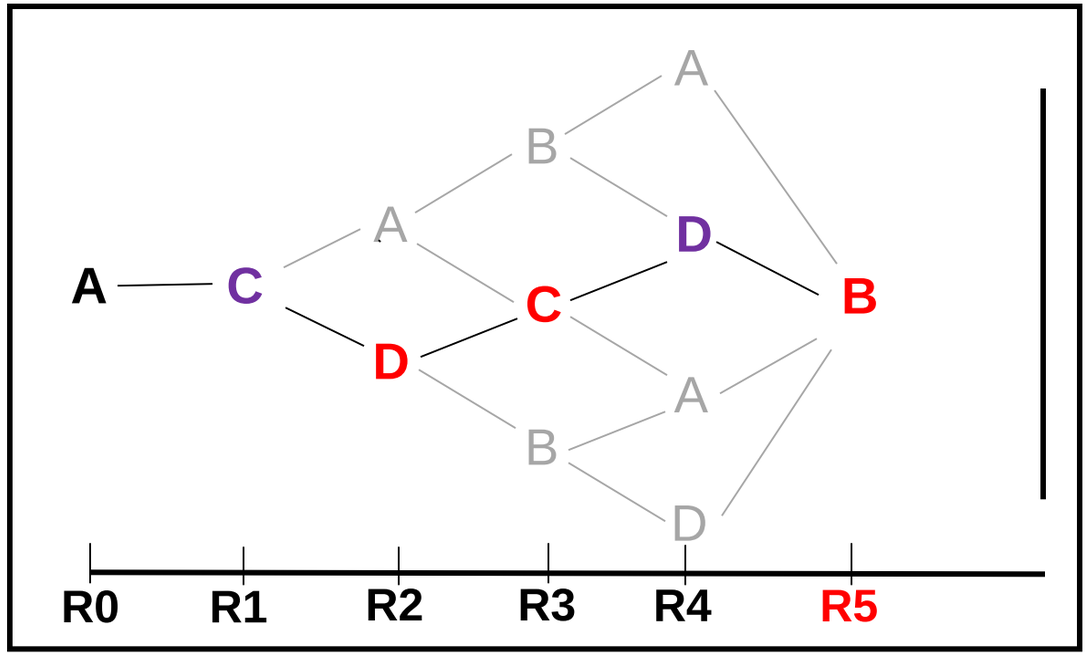


Lag: +4

ADJR Given:	Target: A	B	C	D
A	0,96	-0,33	-2,30	1,64
B	-1,70	-1,01	3,90	-1,42
C	-1,17	1,25	0,97	-0,76
D	1,64	0,00	-1,93	0,25

z_{rc} adjusted residuals = $$\frac{x_{rc} - e_{rc}}{\sqrt{e_{rc}(1 - p_c)(1 - p_r)}}$$

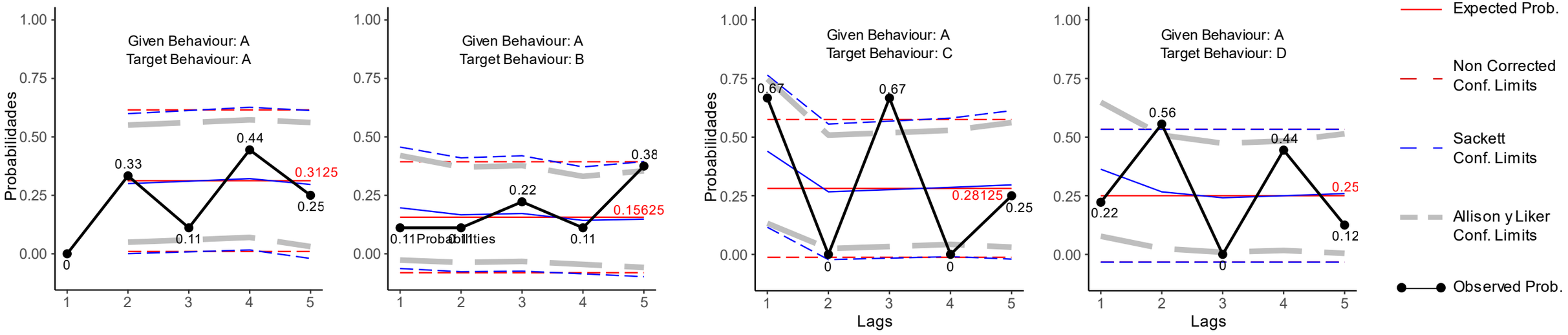




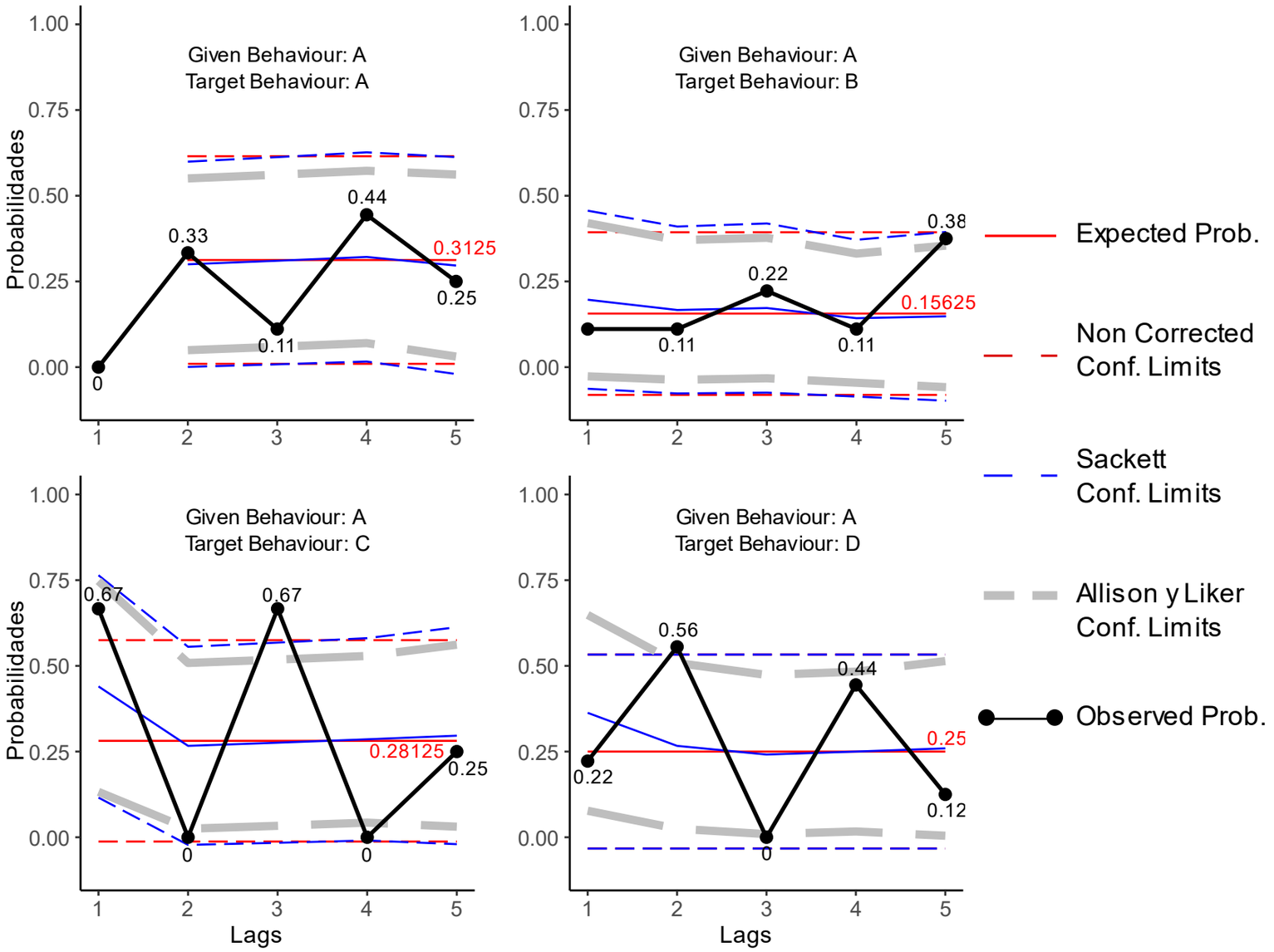
Lag: +5

ADJR Given:	Target: A	B	C	D
A	-0,34	2,15	-0,34	-1,03
B	0,56	0,36	-1,61	0,80
C	0,89	-1,28	-1,03	1,19
D	-1,03	-1,28	2,81	-0,82

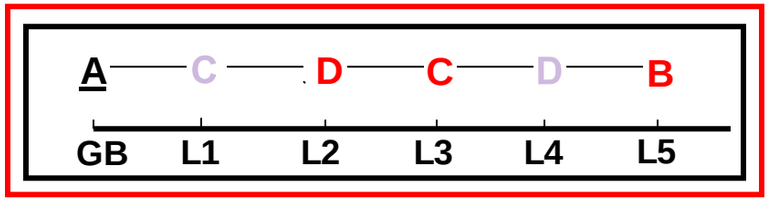
z_{rc} adjusted residuals $= \dfrac{x_{rc} - e_{rc}}{\sqrt{e_{rc}(1-p_c)(1-p_r)}}$



4.2. Lag Sequential Analysis (LSA)



Corrected Behaviour Pattern



A: Caregiver Follow In Utterance

B: Caregiver Focused Utterance

C: Child Exploratory Play

D: Child Functional Play

4.2. Lag Sequential Analysis (LSA)

What do children do after caregiver follow-in utterances?

Lag 1	Target:			
Given:	A	B	C	D
A	0,00	-0,75	1,44	-0,97
B	3,15	0,00	-1,72	-1,53
C	-1,39	-0,75	0,00	2,08
D	-0,97	1,61	-0,21	0,00

Lag 2	Target:			
Given:	A	B	C	D
A	0,26	-0,53	-2,16	2,34
B	-1,60	-1,10	1,85	0,74
C	-1,26	2,95	0,81	-1,99
D	2,34	-1,48	-0,12	-1,06

A: Caregiver Follow In Utterance

B: Caregiver Focused Utterance

C: Child Exploratory Play

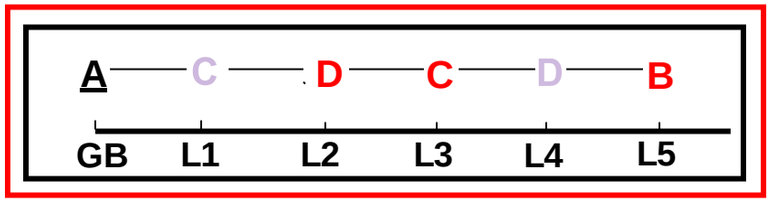
D: Child Functional Play

Lag 3	Target:			
Given:	A	B	C	D
A	-1,56	0,48	3,16	-2,04
B	0,48	-1,12	-1,52	2,06
C	3,16	-1,52	-2,05	0,07
D	-2,04	2,06	0,07	0,31

Lag 4	Target:			
Given:	A	B	C	D
A	0,96	-0,33	-2,30	1,64
B	-1,70	-1,01	3,90	-1,42
C	-1,17	1,25	0,97	-0,76
D	1,64	0,00	-1,93	0,25

Lag 5	Target:			
Given:	A	B	C	D
A	-0,34	2,15	-0,34	-1,03
B	0,56	0,36	-1,61	0,80
C	0,89	-1,28	-1,03	1,19
D	-1,03	-1,28	2,81	-0,82

Corrected Behavior Pattern



4.2. Lag Sequential Analysis (LSA)

What do caregiver do after children engaged in Exploratory Play?

Lag 1	Target:			
Given:	A	B	C	D
A	0,00	-0,75	1,44	-0,97
B	3,15	0,00	-1,72	-1,53
C	-1,39	-0,75	0,00	2,08
D	-0,97	1,61	-0,21	0,00

Lag 2	Target:			
Given:	A	B	C	D
A	0,26	-0,53	-2,16	2,34
B	-1,60	-1,10	1,85	0,74
C	-1,26	2,95	0,81	-1,99
D	2,34	-1,48	-0,12	-1,06

A: Caregiver Follow In Utterance

B: Caregiver Focused Utterance

C: Child Exploratory Play

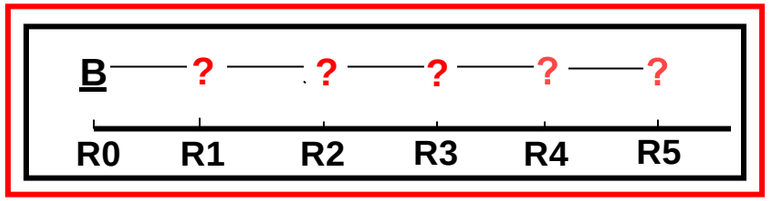
D: Child Functional Play

Lag 3	Target:			
Given:	A	B	C	D
A	-1,56	0,48	3,16	-2,04
B	0,48	-1,12	-1,52	2,06
C	3,16	-1,52	-2,05	0,07
D	-2,04	2,06	0,07	0,31

Lag 4	Target:			
Given:	A	B	C	D
A	0,96	-0,33	-2,30	1,64
B	-1,70	-1,01	3,90	-1,42
C	-1,17	1,25	0,97	-0,76
D	1,64	0,00	-1,93	0,25

Lag 5	Target:			
Given:	A	B	C	D
A	-0,34	2,15	-0,34	-1,03
B	0,56	0,36	-1,61	0,80
C	0,89	-1,28	-1,03	1,19
D	-1,03	-1,28	2,81	-0,82

Corrected Behavior Pattern



4.2. Lag Sequential Analysis (LSA)

What do caregiver do after children engage in Exploratory Play?

Lag 1 Given:	Target: A	B	C	D
A	0,00	-0,75	1,44	-0,97
B	3,15	0,00	-1,72	-1,53
C	-1,39	-0,75	0,00	2,08
D	-0,97	1,61	-0,21	0,00

Lag 2 Given:	Target: A	B	C	D
A	0,26	-0,53	-2,16	2,34
B	-1,60	-1,10	1,85	0,74
C	-1,26	2,95	0,81	-1,99
D	2,34	-1,48	-0,12	-1,06

A: Caregiver Follow In Utterance

B: Caregiver Focused Utterance

C: Child Exploratory Play

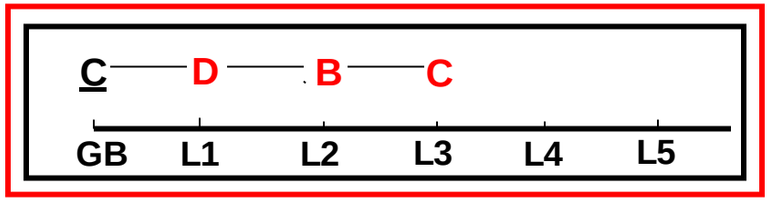
D: Child Functional Play

Lag 3 Given:	Target: A	B	C	D
A	-1,56	0,48	3,16	-2,04
B	0,48	-1,12	-1,52	2,06
C	3,16	-1,52	-2,05	0,07
D	-2,04	2,06	0,07	0,31

Lag 4 Given:	Target: A	B	C	D
A	0,96	-0,33	-2,30	1,64
B	-1,70	-1,01	3,90	-1,42
C	-1,17	1,25	0,97	-0,76
D	1,64	0,00	-1,93	0,25

Lag 5 Given:	Target: A	B	C	D
A	-0,34	2,15	-0,34	-1,03
B	0,56	0,36	-1,61	0,80
C	0,89	-1,28	-1,03	1,19
D	-1,03	-1,28	2,81	-0,82

Corrected Behavior Pattern

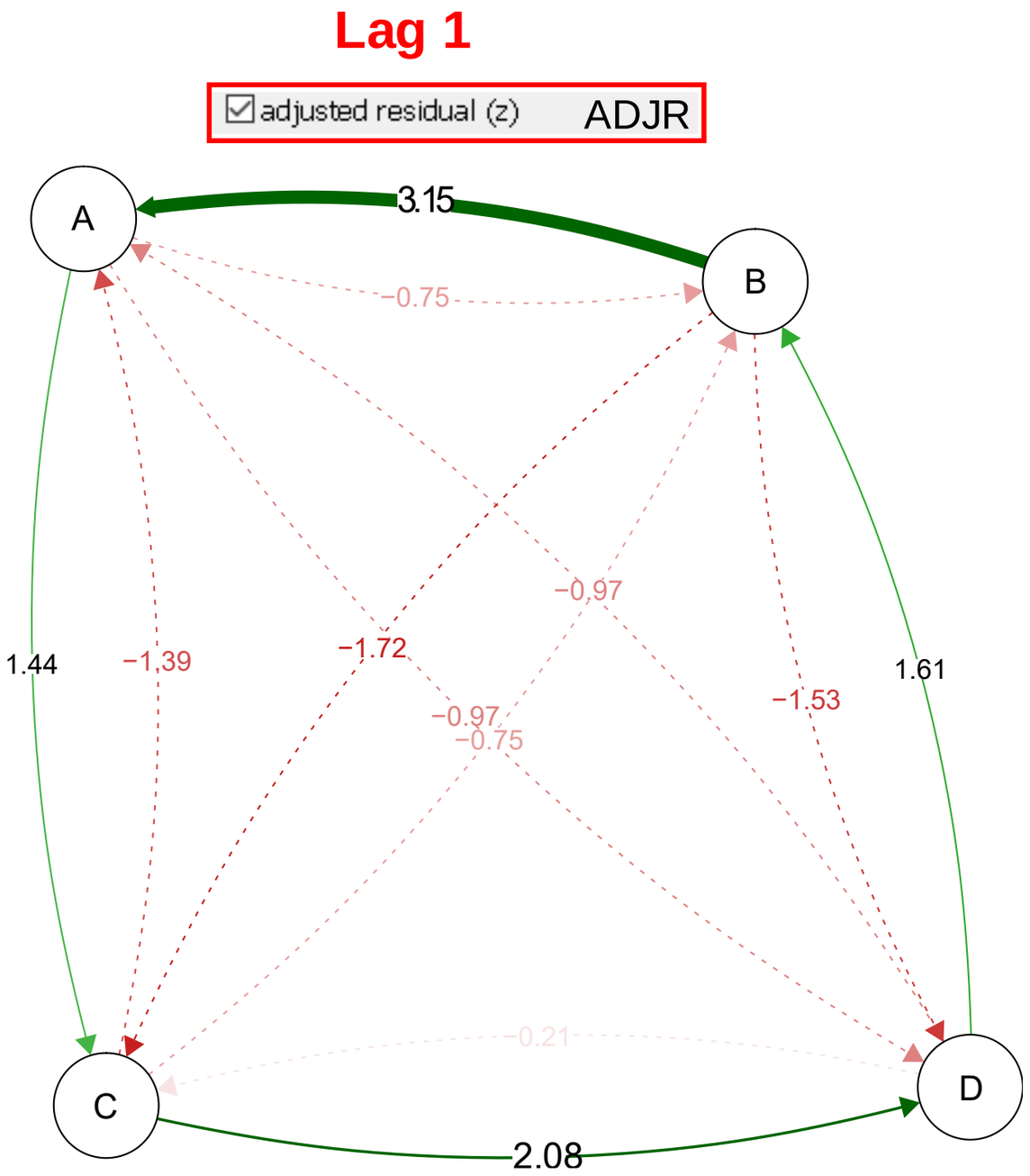


Lag 1 Given:	Target: A	B	C	D
A	0,00	-0,75	1,44	-0,97
B	3,15	0,00	-1,72	-1,53
C	-1,39	-0,75	0,00	2,08
D	-0,97	1,61	-0,21	0,00

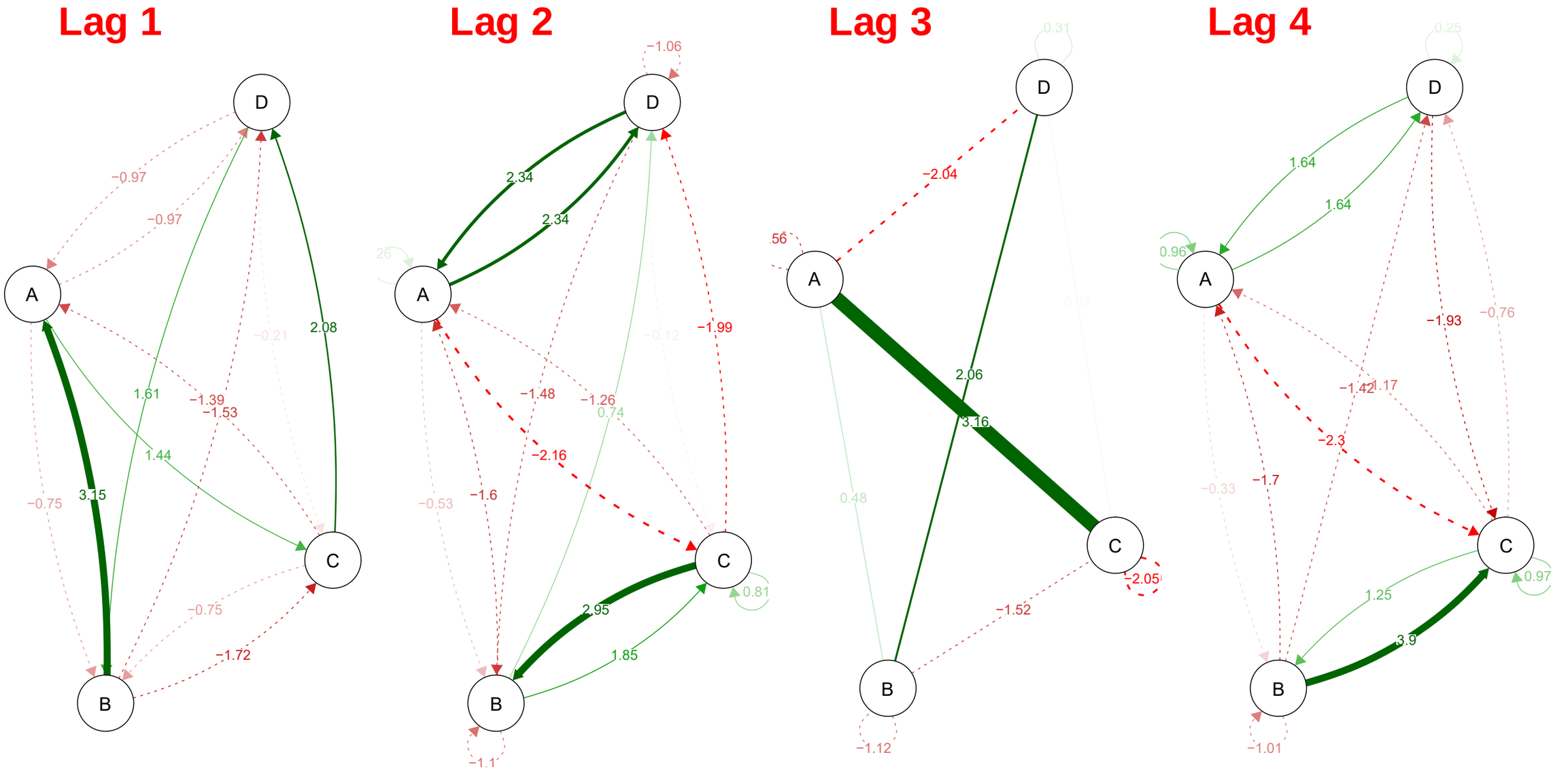
Nodes represent the codes

Edge thickness is proportional to adjusted residuals

It allows us to clearly identify which are the excitatory behaviours in each of the delays

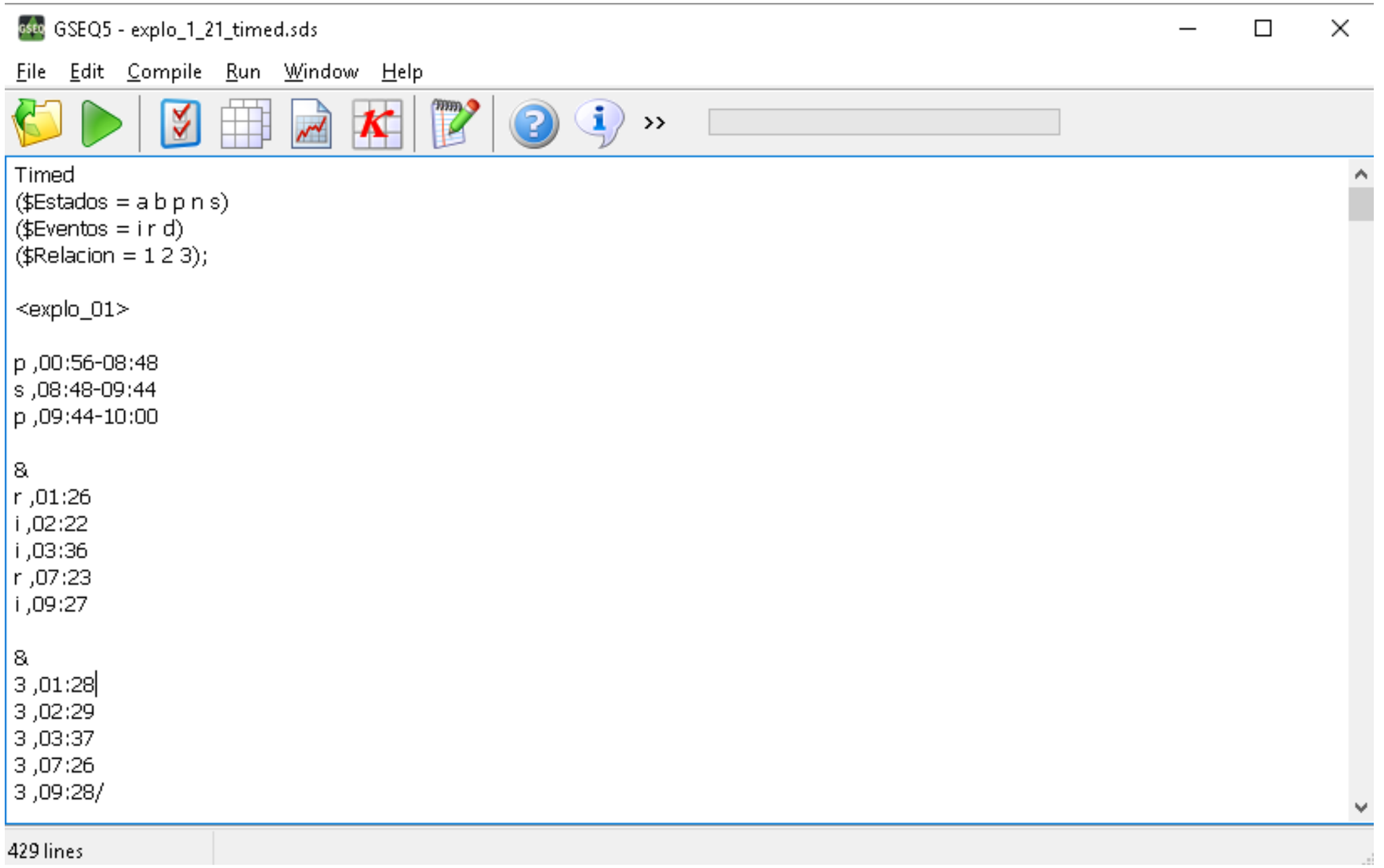


Graphical Representation



4.2. Lag Sequential Analysis (LSA)

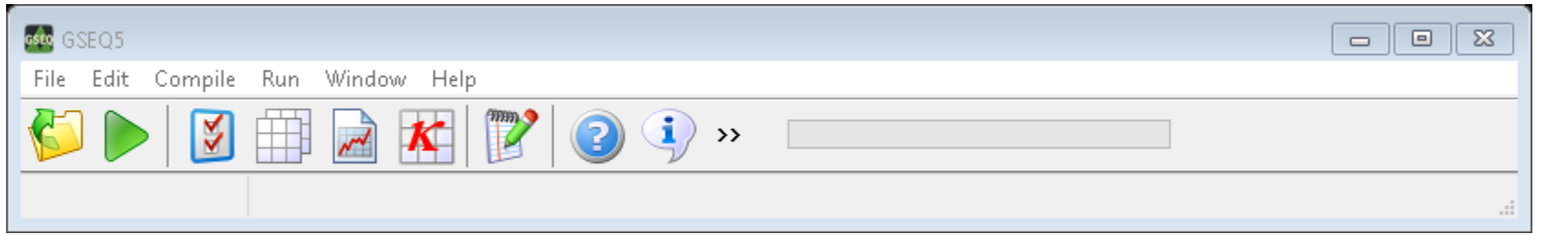
Example with SDIS-GSEQ

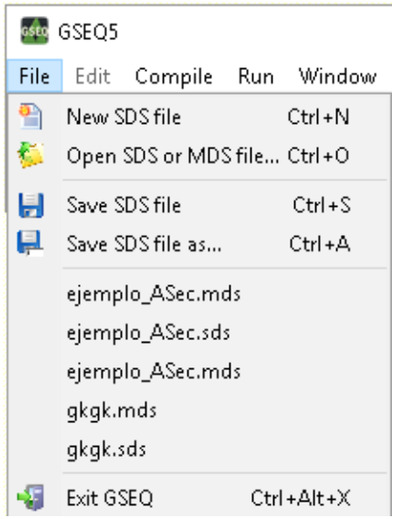


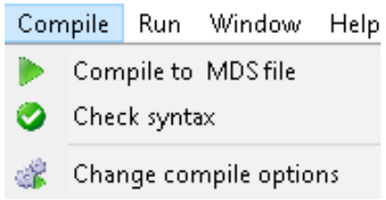
4.2. Lag Sequential Analysis (LSA)

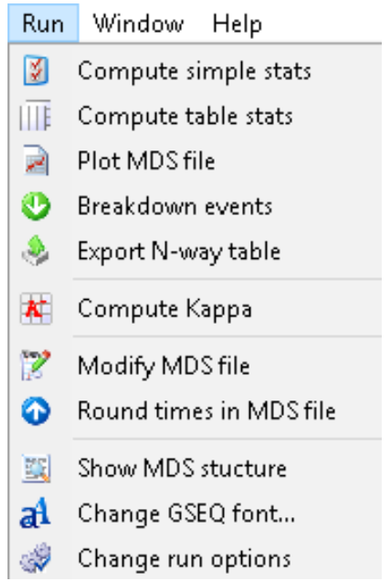
RUNNING IN SDIS-QSEQ v 5.1.23

Menú Principal



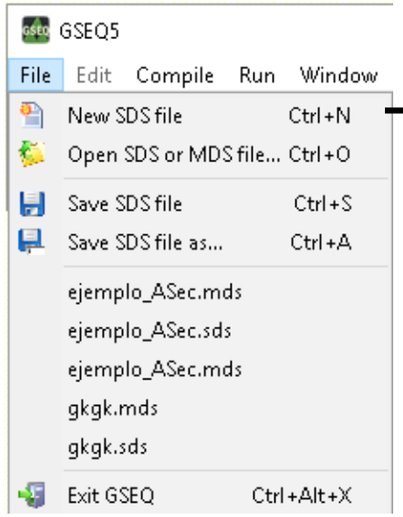






4.2. Lag Sequential Analysis (LSA)

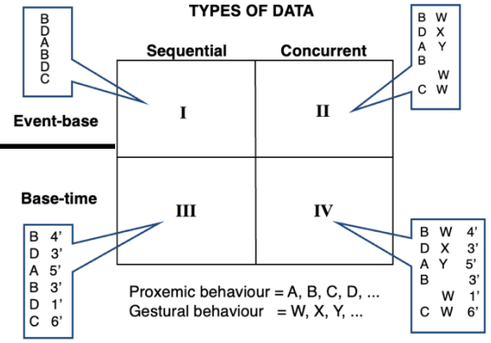
RUNNING IN SDIS-QSEQ v 5.1.23



SYNTAX

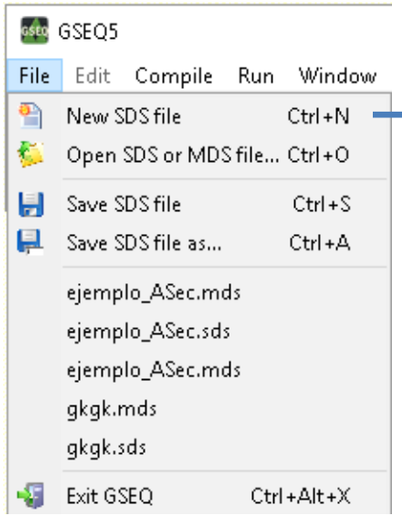
New SDS File

```
Data Type
Code Statement
Declaration of variables ;

<Session 1>
Registered codes
Registered codes/

<Session 2>
Registered codes
Registered codes/

<Session 3>
Registered codes
Registered codes/
```



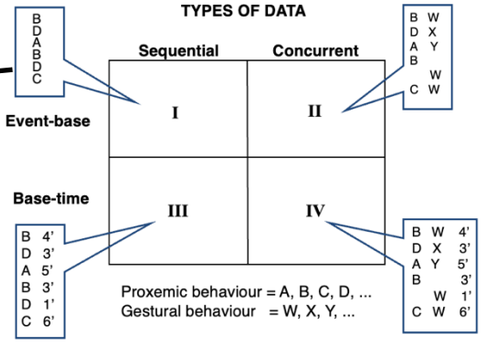
4.2. Lag Sequential Analysis (LSA)

RUNNING IN SDIS-QSEQ v 5.1.23



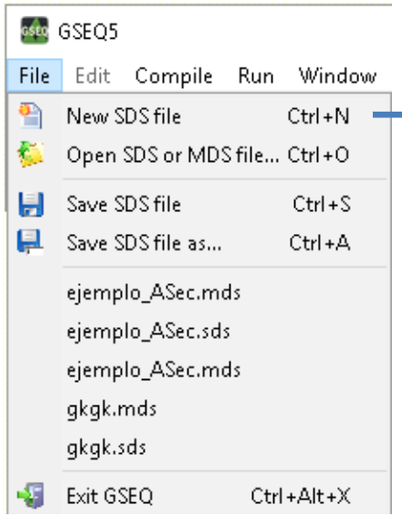
New SDS File

```
Event
($Events = A B C D);

<Session 1>
A
C
D
B
A
D
A
C
B/
```

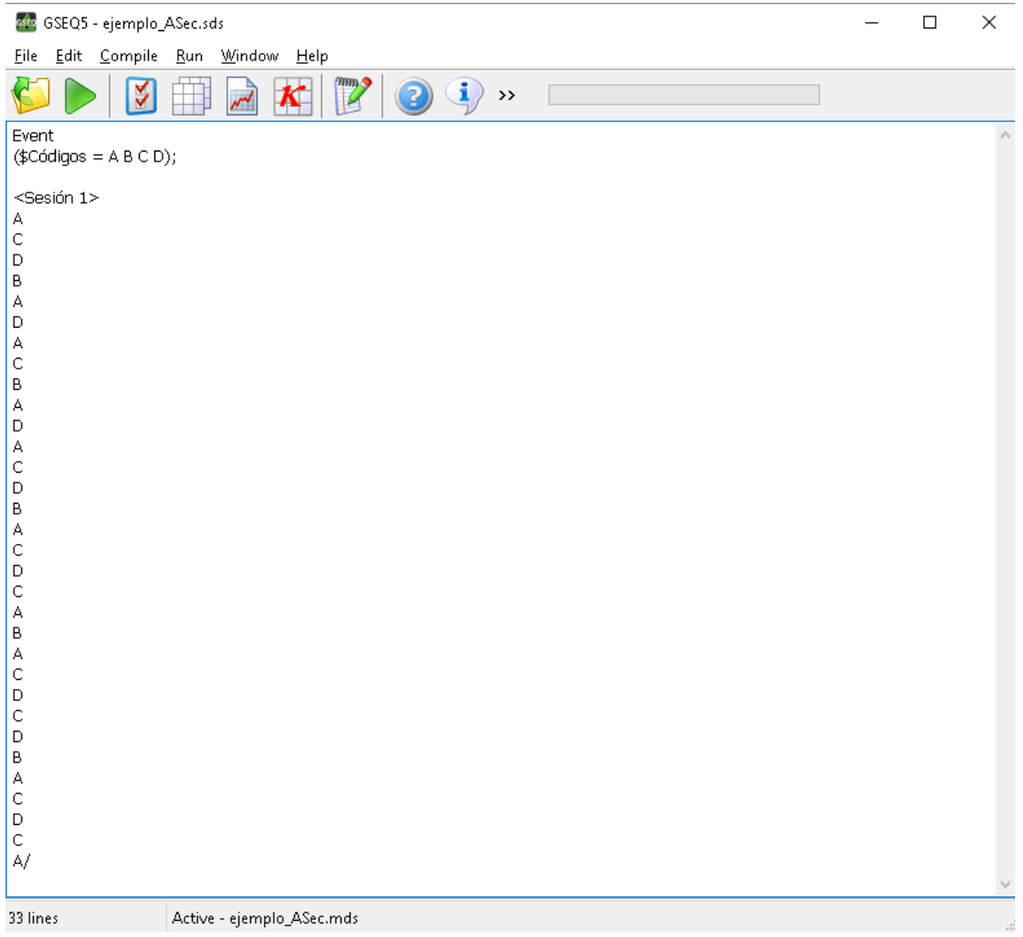


4.2. Lag Sequential Analysis (LSA)

RUNNING IN SDIS-QSEQ v 5.1.23

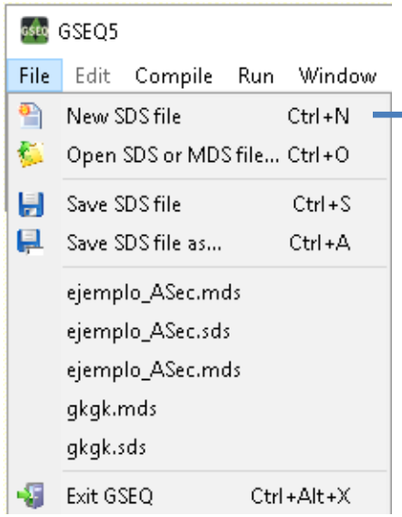


New SDS File



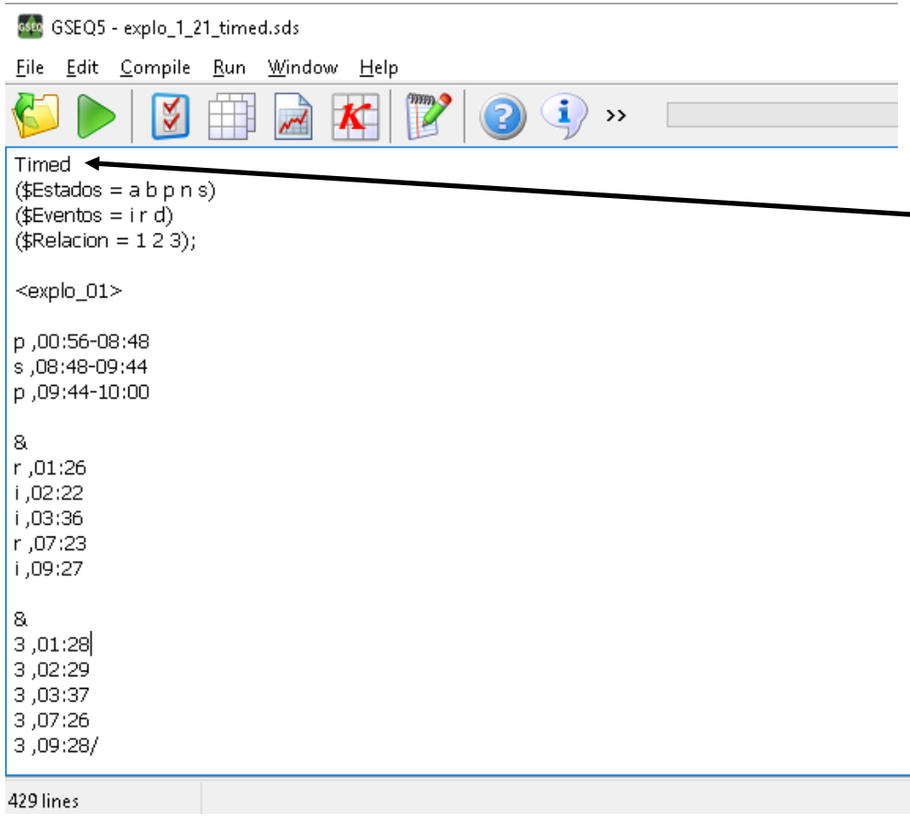
4.2. Lag Sequential Analysis (LSA)

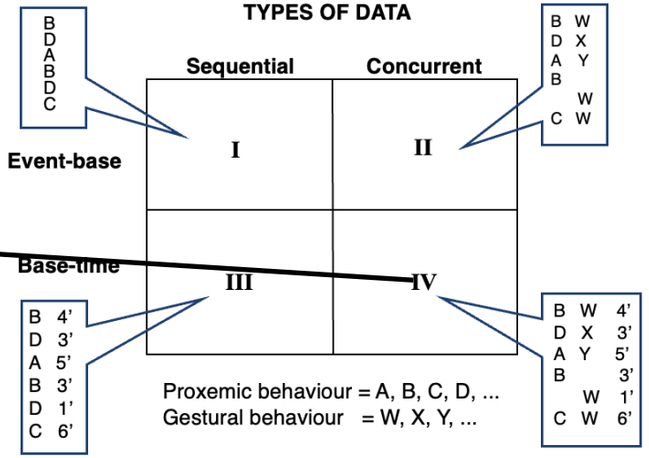
RUNNING IN SDIS-QSEQ v 5.1.23



New SDS File

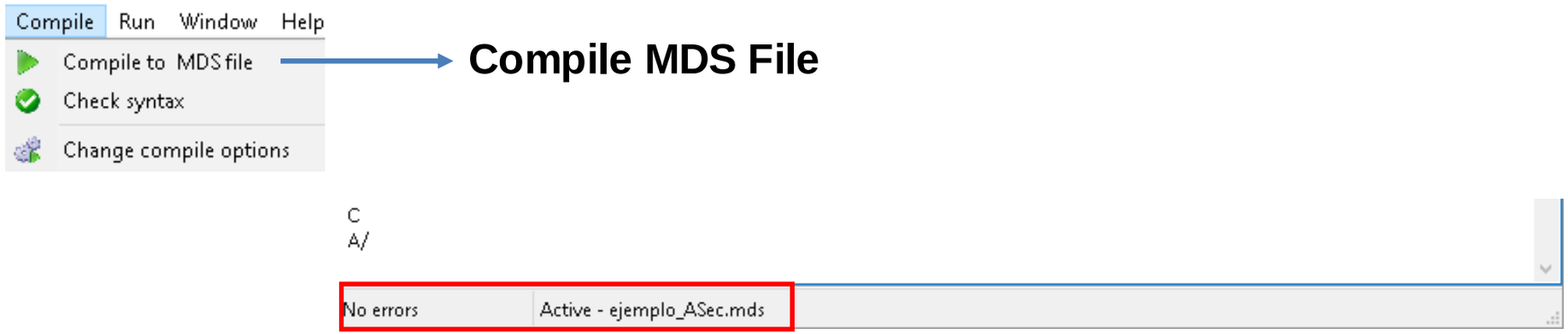
Example with Timed data





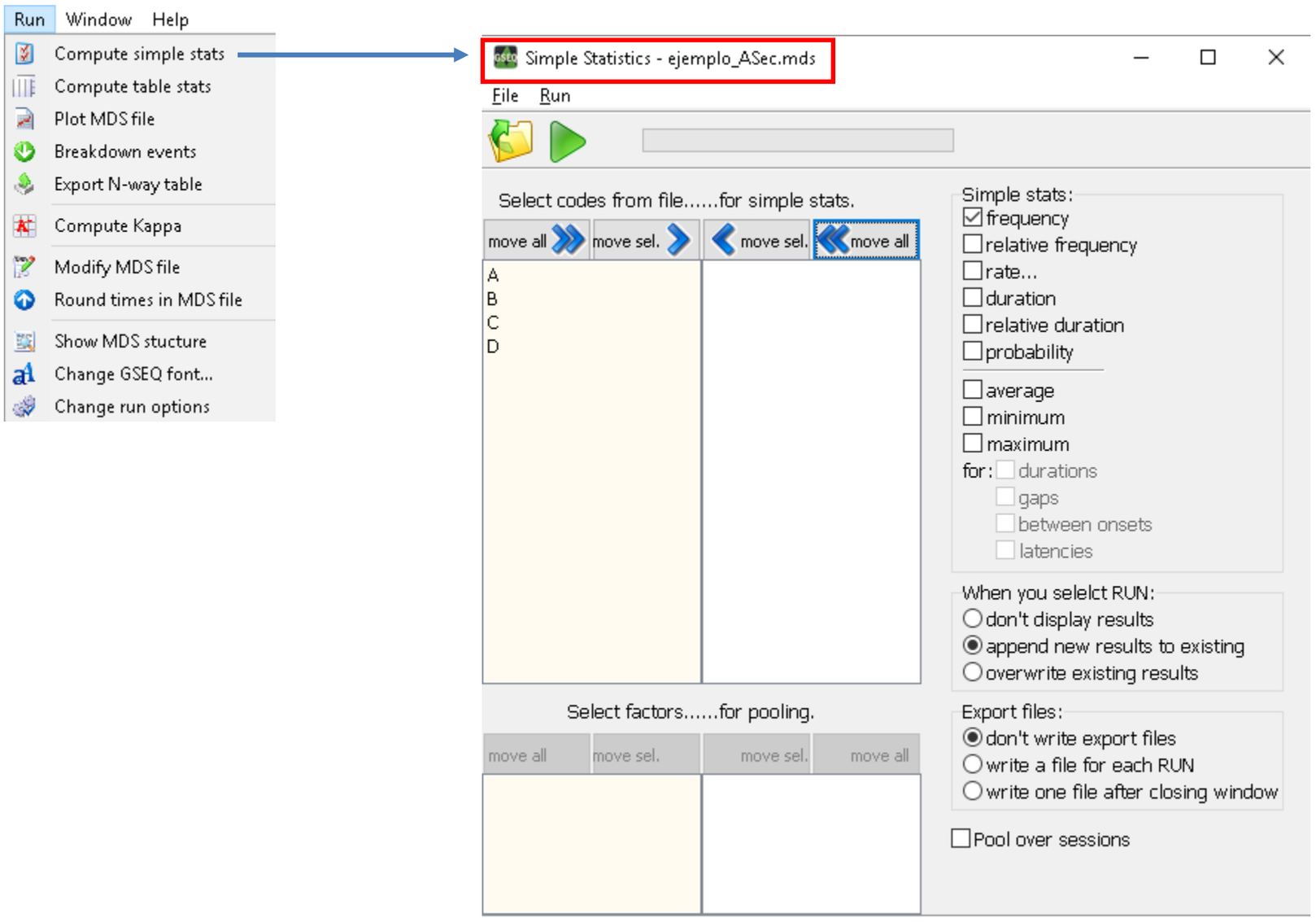
4.2. Lag Sequential Analysis (LSA)

RUNNING IN SDIS-QSEQ v 5.1.23



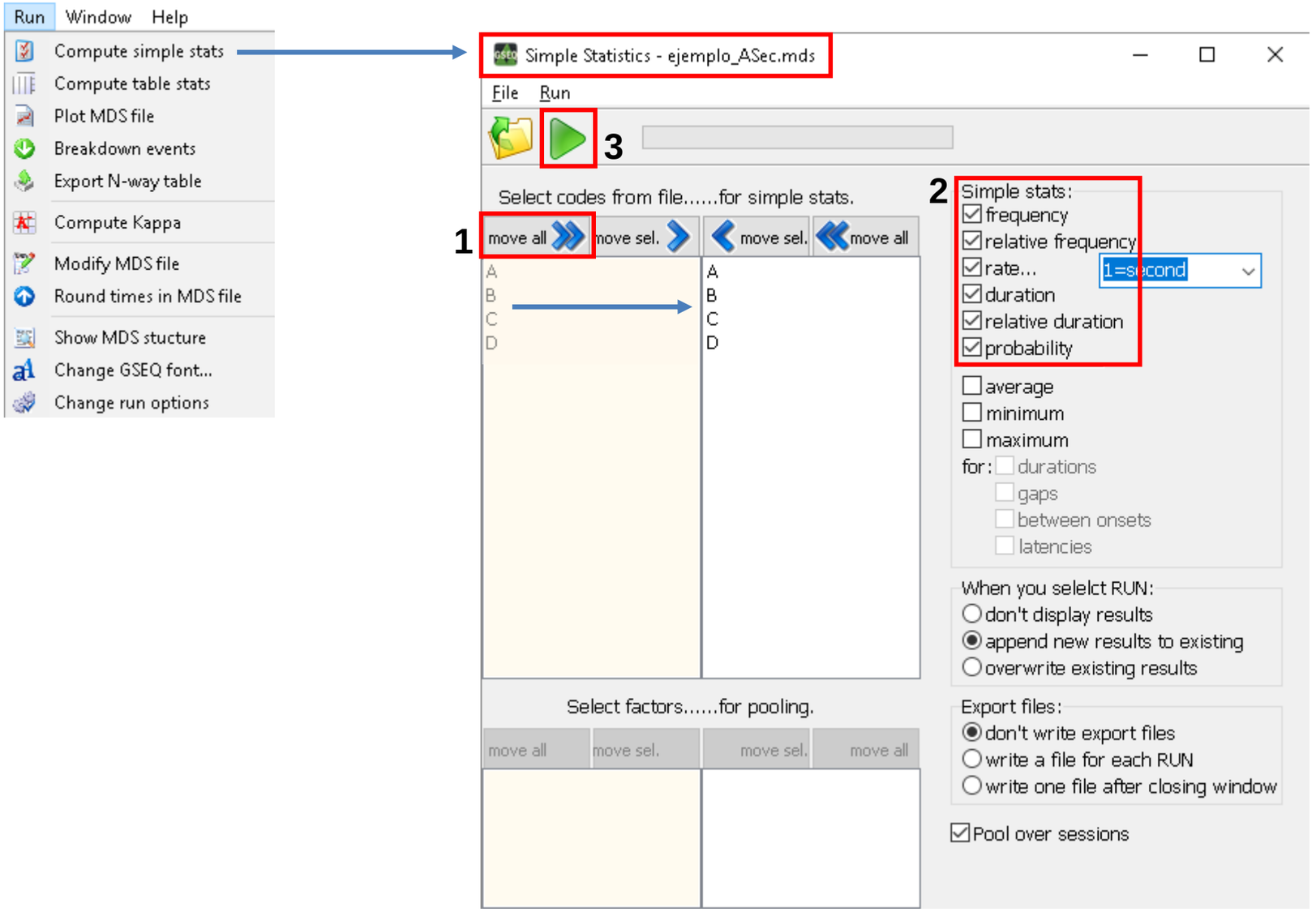
4.2. Lag Sequential Analysis (LSA)

RUNNING IN SDIS-QSEQ v 5.1.23



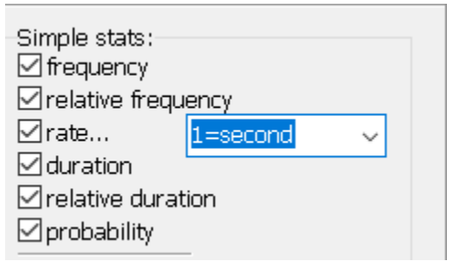
4.2. Lag Sequential Analysis (LSA)

RUNNING IN SDIS-QSEQ v 5.1.23



4.2. Lag Sequential Analysis (LSA)

RUNNING IN SDIS-QSEQ v 5.1.23



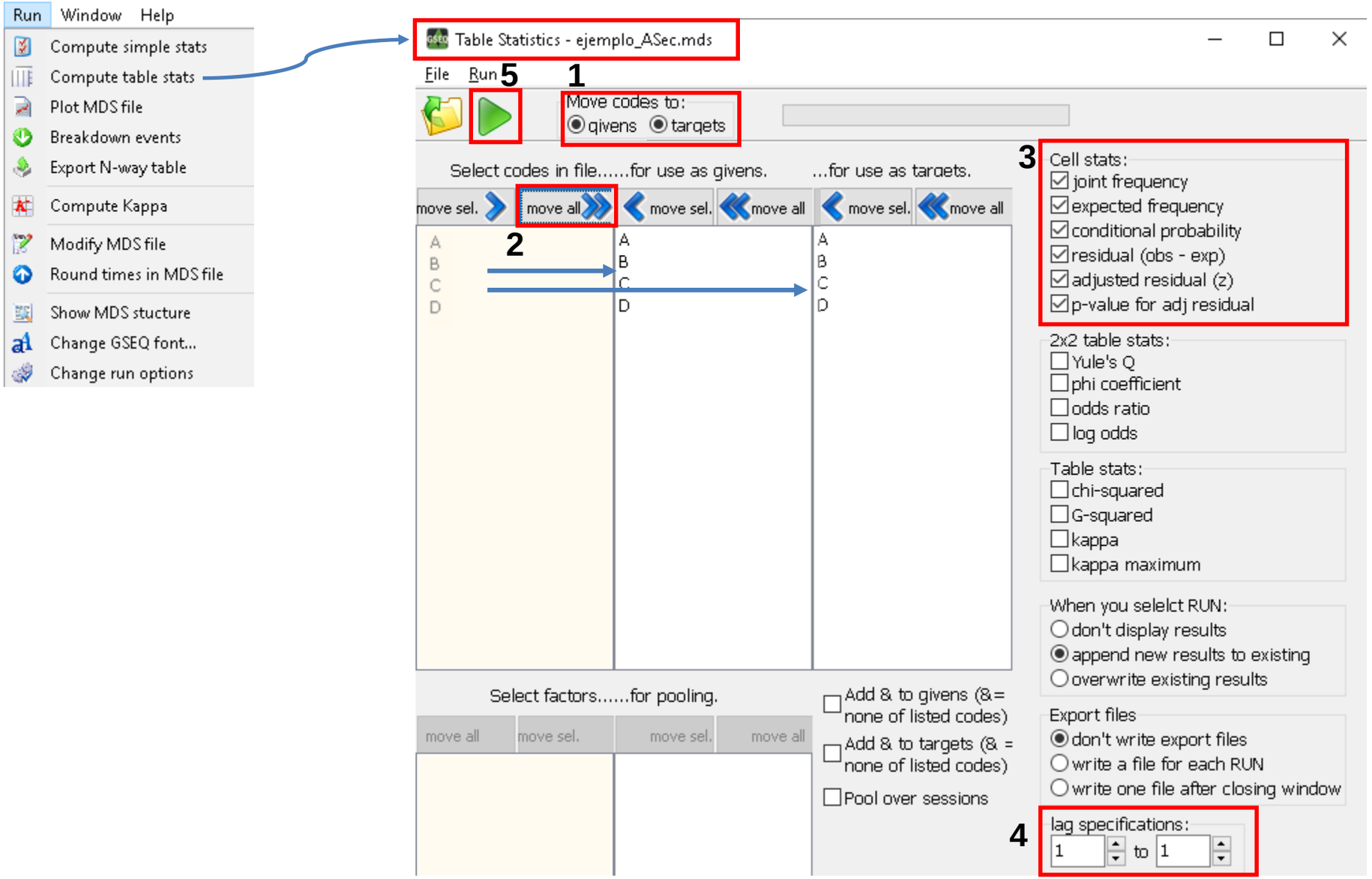
Rate: #/1 events

Codes:	freq	relf	rate	dura	reld	prob
A	10	,31	0,3125	10	,31	,31
B	5	,16	0,15625	5	,16	,16
C	9	,28	0,28125	9	,28	,28
D	8	,25	0,25	8	,25	,25
Totals:	32	1,00	1	32	1,00	1,00
Length:	32	events				

freq = frequency	Number of occurrences of a behavior
relf = relative frequency	Relative Frequency = Frequency / Sum of Frequencies
rate = rate	Rate = Session Frequency / Duration
dura = duration	Duration of each of the registered codes
reld = relative duration	Relative Duration = Duration / Sum of Durations
prob = probability	Probability = Duration / Total Duration

4.2. Lag Sequential Analysis (LSA)

RUNNING IN SDIS-QSEQ v 5.1.23



4.2. Lag Sequential Analysis (LSA)

RUNNING IN SDIS-QSEQ v 5.1.23

Definitions for basic cell statistics and the notation used

R	number of rows (given behaviours)
C	number of columns (target behaviours)
x_{rc}	**Observed joint frequency**
x_{+c}	Sum of the frequencies of column
x_{r+}	sum of the frequencies of row r
$N = x_{++}$	total sum of table R x C
p_c	probability of column c = x_{+c} / N
p_r	row probability r = x_{+r} / N
e_{rc}	**Expected frequency, by chance = $p_c \times x_{r+}$**
g_r	Code for the r-th row (given behaviour)
t_c	Code for the c-th column (target behaviour)
$P(t_c \mid g_r)$	**Conditional probability = x_{rc} / x_{r+}**
y_{rc}	**Residuals, difference between frequencies**
	Observed and expected = $x_{rc} - c_{kd}$
z_{rc}	**Adjusted residuals =** $\dfrac{x_{rc} - e_{rc}}{\sqrt{e_{rc}(1 - p_c)(1 - p_r)}}$

Cell stats:
- ☑ joint frequency
- ☑ expected frequency
- ☑ conditional probability
- ☑ residual (obs - exp)
- ☑ adjusted residual (z)
- ☑ p-value for adj residual

Adapted from (Bakeman & Quera, 2011, p. 105, Figure 9.1)

4.2. Lag Sequential Analysis (LSA)

RUNNING IN SDIS-QSEQ v 5.1.23

Cell stats:
- ☑ joint frequency
- ☑ expected frequency
- ☑ conditional probability
- ☑ residual (obs - exp)
- ☑ adjusted residual (z)
- ☑ p-value for adj residual

Retardo	A	B	C	D	TOTAL
	10	5	9	8	32
1	**0**	1	6	2	9
2	3	1	0	5	9
3	1	2	6	0	9
4	4	1	0	4	9
5	2	3	2	1	8

Lag: +1

Sesión 1

☑ joint frequency JNTF

JNTF Given:	Target: A	B	C	D	Totals
A	**0**	**1**	**6**	**2**	9
B	**5**	**0**	**0**	**0**	5
C	**2**	**1**	**0**	**6**	9
D	**2**	**3**	**3**	**0**	8
Totals	9	5	9	8	31

x_{r+}

x_{+c}

$N = x_{++}$

Xrc observed transition frequencies

4.2. Lag Sequential Analysis (LSA)

RUNNING IN SDIS-QSEQ v 5.1.23

Cell stats:
- ☑ joint frequency
- ☑ expected frequency
- ☑ conditional probability
- ☑ residual (obs - exp)
- ☑ adjusted residual (z)
- ☑ p-value for adj residual

Lag: +2

☑ joint frequency JNTF

JNTF	Target:				
Given:	A	B	C	D	Totals
A	3	1	0	5	9
B	0	0	3	2	5
C	1	4	3	0	8
D	5	0	2	1	8
Totals	9	5	8	8	30

x_{r+}

x_{+c}

$N = x_{++}$

Retardo	A	B	C	D	TOTAL
	10	5	9	8	32
1	**0**	1	6	2	9
2	**3**	**1**	**0**	**5**	**9**
3	1	2	6	0	9
4	4	1	0	4	9
5	2	3	2	1	8

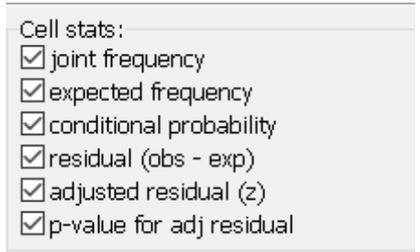
☑ expected frequency EXPF

EXPF	Target:			
Given:	A	B	C	D
A	2,700	1,500	2,400	2,400
B	1,500	0,833	1,333	1,333
C	2,400	1,333	2,133	2,133
D	2,400	1,333	2,133	2,133

e_{RC} Expected Frequency = p_c x x_{r+}
p_c = probability of column c = x_{+c} / N

4.2. Lag Sequential Analysis (LSA)

RUNNING IN SDIS-QSEQ v 5.1.23



Lag: +2

joint frequency JNTF

JNTF Given:	Target: A	B	C	D	Totals
A	3	1	0	5	9
B	0	0	3	2	5
C	1	4	3	0	8
D	5	0	2	1	8
Totals	9	5	8	8	30

x_{r+} (Totals column)

x_{+c} (Totals row)

$N = x_{++}$

x_{rc} observed transition frequencies

y_{rc} Residuals, difference between frequencies observed and expected = $x_{rc} - e_{rc}$

expected frequency EXPF

EXPF Given:	Target: A	B	C	D
A	2,700	1,500	2,400	2,400
B	1,500	0,833	1,333	1,333
C	2,400	1,333	2,133	2,133
D	2,400	1,333	2,133	2,133

residual (obs - exp) RSDL

RSDL Given:	Target: A	B	C	D
A	0,300	-0,500	-2,400	2,600
B	-1,500	-0,833	1,667	0,667
C	-1,400	2,667	0,867	-2,133
D	2,600	-1,333	-0,133	-1,133

e_{rc} Frecuencias Esperadas = $p_c \times x_r$

4.2. Lag Sequential Analysis (LSA)

RUNNING IN SDIS-QSEQ v 5.1.23

Cell stats:
- ☑ joint frequency
- ☑ expected frequency
- ☑ conditional probability
- ☑ residual (obs - exp)
- ☑ adjusted residual (z)
- ☑ p-value for adj residual

Lag: +2

☑ joint frequency JNTF **X_{rc} observed transition frequencies**

JNTF Given:	Target: A	B	C	D	Totals
A	3	1	0	5	9
B	0	0	3	2	5
C	1	4	3	0	8
D	5	0	2	1	8
Totals	9	5	8	8	30

x_{r+} (Totals column)

x_{+c} (Totals row)

$N = x_{++}$

☑ expected frequency EXPF

EXPF Given:	Target: A	B	C	D
A	2,700	1,500	2,400	2,400
B	1,500	0,833	1,333	1,333
C	2,400	1,333	2,133	2,133
D	2,400	1,333	2,133	2,133

e_{rc} Expected Frequencies= $p_c \times x_r$

☑ residual (obs - exp) RSDL $x_{rc} - e_{rc}$

RSDL Given:	Target: A	B	C	D
A	0,300	-0,500	-2,400	2,600
B	-1,500	-0,833	1,667	0,667
C	-1,400	2,667	0,867	-2,133
D	2,600	-1,333	-0,133	-1,133

☑ adjusted residual (z) ADJR

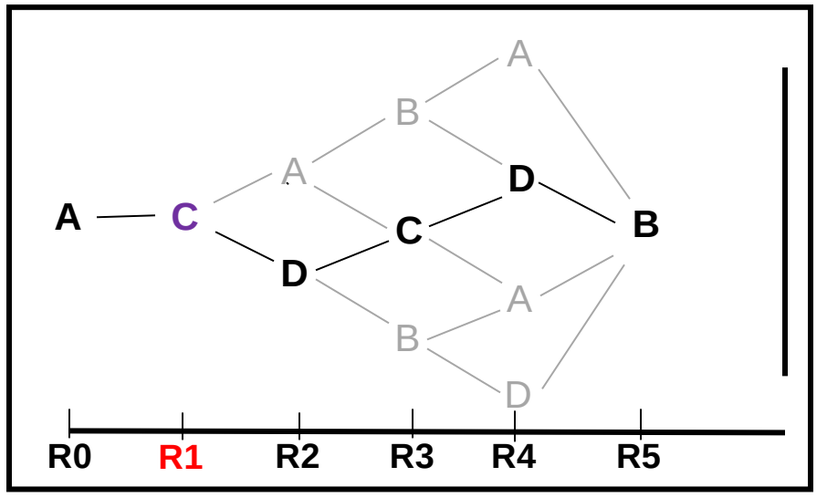
ADJR Given:	Target: A	B	C	D
A	0,26	-0,53	-2,16	2,34
B	-1,60	-1,10	1,85	0,74
C	-1,26	2,95	0,81	-1,99
D	2,34	-1,48	-0,12	-1,06

z_{rc} Adjusted Residuals = $$\frac{x_{rc} - e_{rc}}{\sqrt{e_{rc}(1 - p_c)(1 - p_r)}}$$

4.2. Lag Sequential Analysis (LSA)

RUNNING IN SDIS-QSEQ v 5.1.23

Lag: +1



☑ adjusted residual (z) ADJR

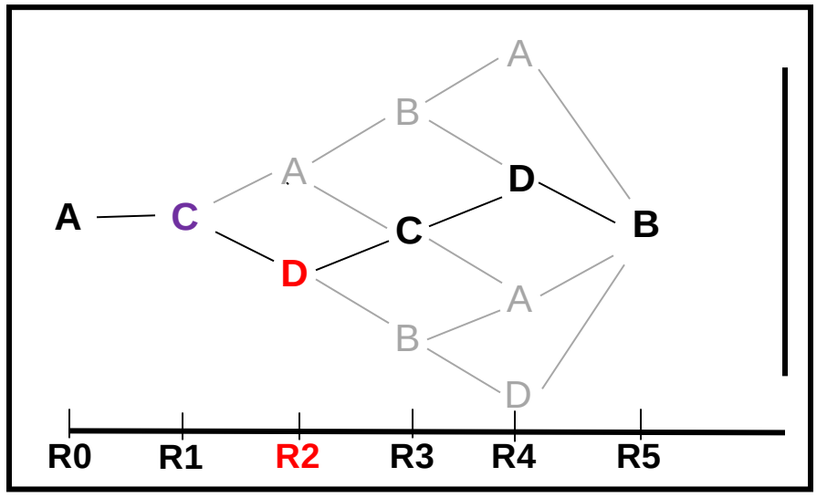
ADJR Given:	Target: A	B	C	D
A	0,00	-0,75	1,44	-0,97
B	3,15	0,00	-1,72	-1,53
C	-1,39	-0,75	0,00	2,08
D	-0,97	1,61	-0,21	0,00

z_{rc} Adjusted Residuals = $\dfrac{x_{rc} - e_{rc}}{\sqrt{e_{rc}(1 - p_c)(1 - p_r)}}$

4.2. Lag Sequential Analysis (LSA)

RUNNING IN SDIS-QSEQ v 5.1.23

Lag: +2



☑ adjusted residual (z) ADJR

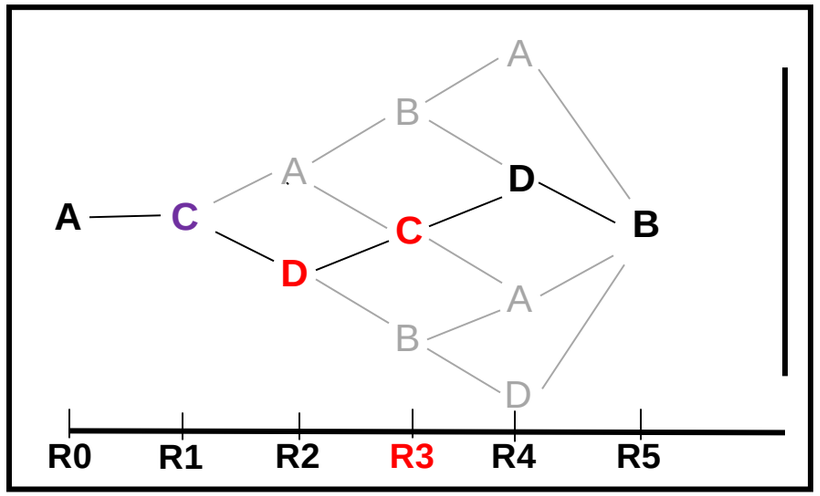
ADJR Given:	Target: A	B	C	D
A	0,26	-0,53	-2,16	2,34
B	-1,60	-1,10	1,85	0,74
C	-1,26	2,95	0,81	-1,99
D	2,34	-1,48	-0,12	-1,06

z_{rc} Adjusted Residuals = $$\frac{x_{rc} - e_{rc}}{\sqrt{e_{rc}(1 - p_c)(1 - p_r)}}$$

4.2. Lag Sequential Analysis (LSA)

RUNNING IN SDIS-QSEQ v 5.1.23

Lag: +3



☑ adjusted residual (z) ADJR

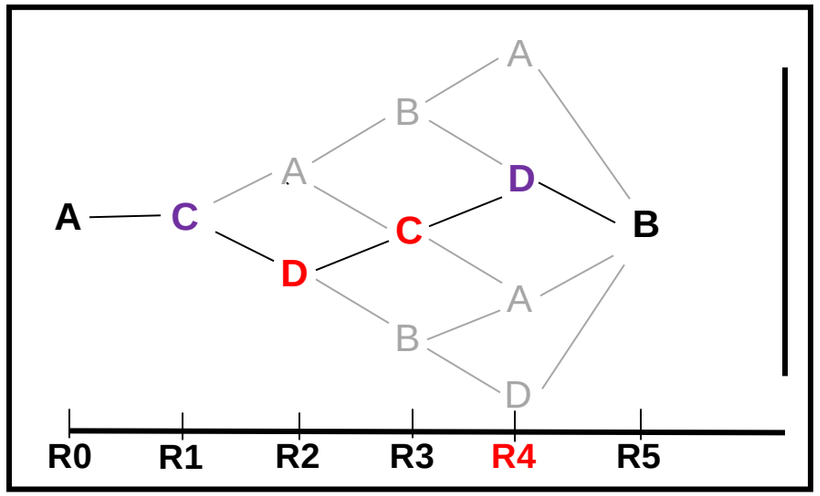
ADJR Given:	Target: A	B	C	D
A	-1,56	0,48	3,16	-2,04
B	0,48	-1,12	-1,52	2,06
C	3,16	-1,52	-2,05	0,07
D	-2,04	2,06	0,07	0,31

z_{rc} Adjusted Residuals = $\dfrac{x_{rc} - e_{rc}}{\sqrt{e_{rc}(1 - p_c)(1 - p_r)}}$

4.2. Lag Sequential Analysis (LSA)

RUNNING IN SDIS-QSEQ v 5.1.23

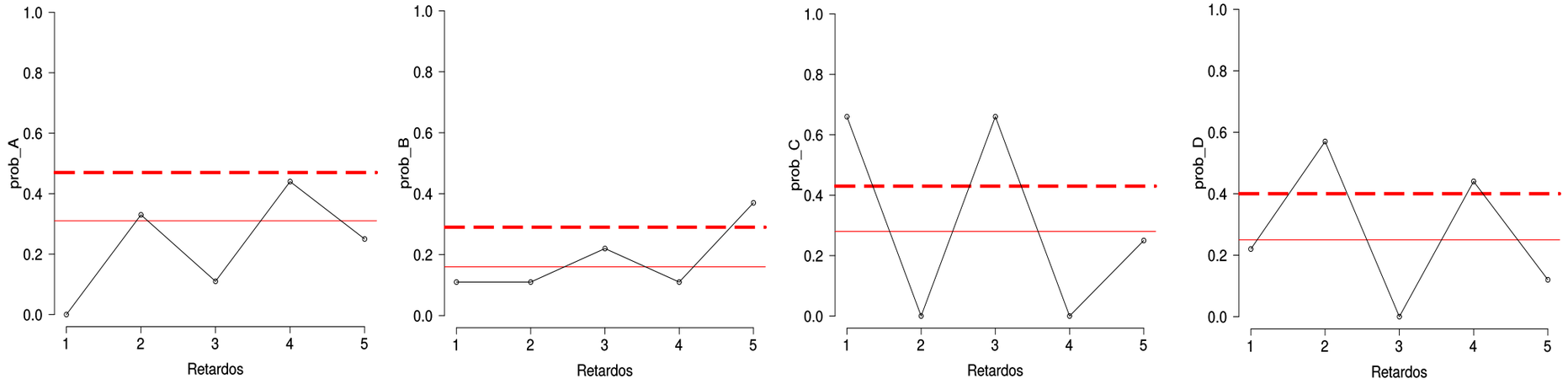
Lag: +4



☑ adjusted residual (z) ADJR

ADJR Given:	Target: A	B	C	D
A	0,96	-0,33	-2,30	1,64
B	-1,70	-1,01	3,90	-1,42
C	-1,17	1,25	0,97	-0,76
D	1,64	0,00	-1,93	0,25

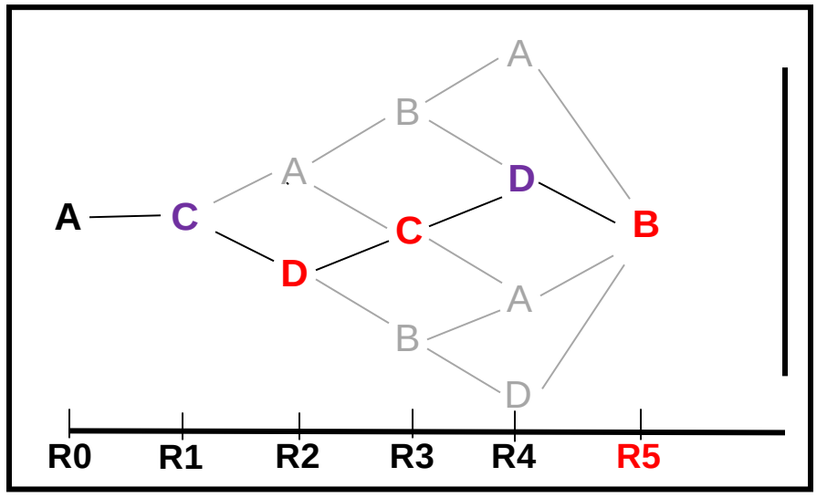
$$z_{rc}\ \textbf{Adjusted Residuals} = \frac{x_{rc} - e_{rc}}{\sqrt{e_{rc}(1-p_c)(1-p_r)}}$$



4.2. Lag Sequential Analysis (LSA)

RUNNING IN SDIS-QSEQ v 5.1.23

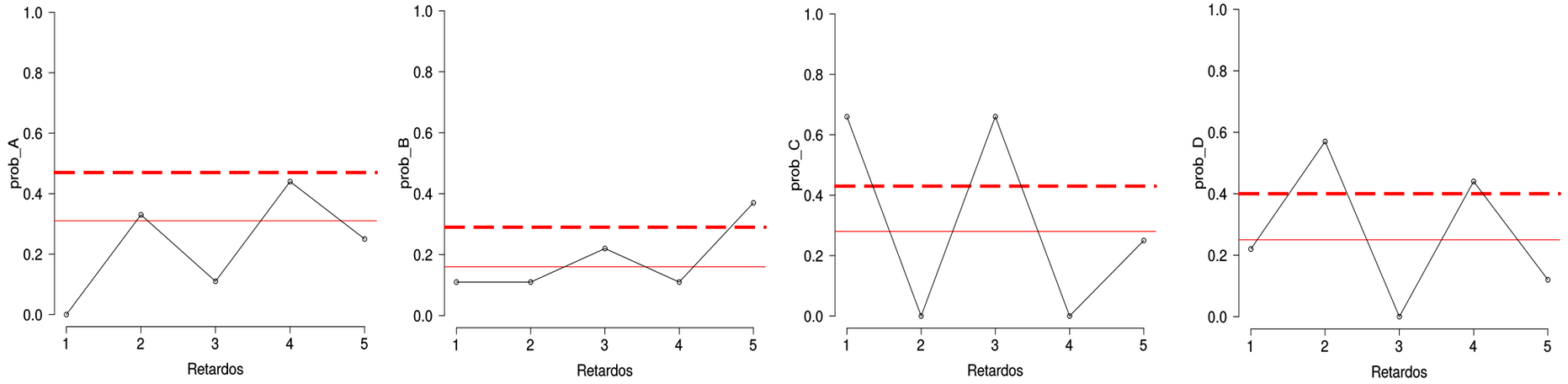
Lag: +5



☑ adjusted residual (z) ADJR

ADJR Given:	Target: A	B	C	D
A	-0,34	2,15	-0,34	-1,03
B	0,56	0,36	-1,61	0,80
C	0,89	-1,28	-1,03	1,19
D	-1,03	-1,28	2,81	-0,82

z_{rc} Adjusted Residuals = $$\frac{x_{rc} - e_{rc}}{\sqrt{e_{rc}(1-p_c)(1-p_r)}}$$



4.2. Lag Sequential Analysis (LSA)

RUNNING IN SDIS-QSEQ v 5.1.23

Lag 1	Target:			
Given:	A	B	C	D
A	0,00	-0,75	1,44	-0,97
B	3,15	0,00	-1,72	-1,53
C	-1,39	-0,75	0,00	2,08
D	-0,97	1,61	-0,21	0,00

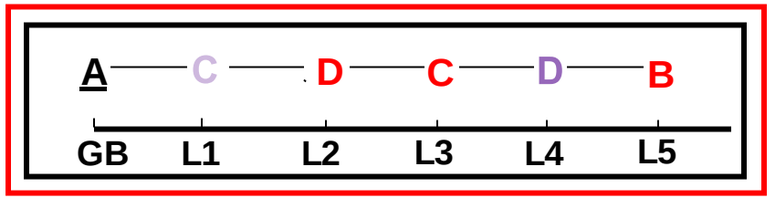
Lag 2	Target:			
Given:	A	B	C	D
A	0,26	-0,53	-2,16	2,34
B	-1,60	-1,10	1,85	0,74
C	-1,26	2,95	0,81	-1,99
D	2,34	-1,48	-0,12	-1,06

Lag 3	Target:			
Given:	A	B	C	D
A	-1,56	0,48	3,16	-2,04
B	0,48	-1,12	-1,52	2,06
C	3,16	-1,52	-2,05	0,07
D	-2,04	2,06	0,07	0,31

Lag 4	Target:			
Given:	A	B	C	D
A	0,96	-0,33	-2,30	1,64
B	-1,70	-1,01	3,90	-1,42
C	-1,17	1,25	0,97	-0,76
D	1,64	0,00	-1,93	0,25

Lag 5	Target:			
Given:	A	B	C	D
A	-0,34	2,15	-0,34	-1,03
B	0,56	0,36	-1,61	0,80
C	0,89	-1,28	-1,03	1,19
D	-1,03	-1,28	2,81	-0,82

Corrected Behaviour Pattern



4.3. Polar Coordinate Analysis

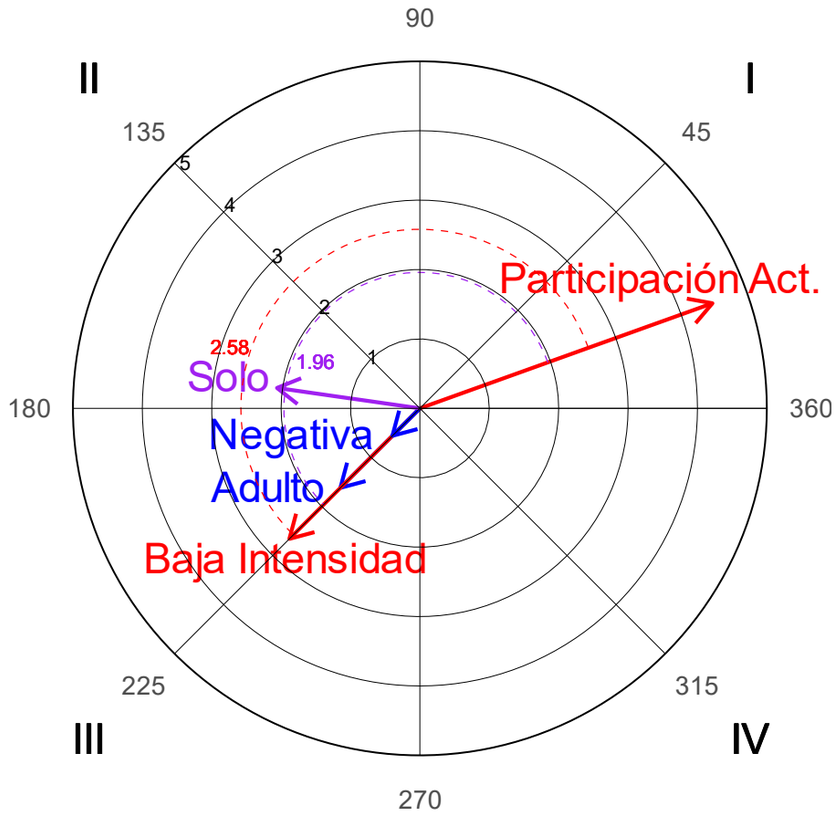
Definition

Directly linked to sequential analysis

Polar coordinate analysis is a data reduction technique that provides a vector image of the complex network of interrelationships between codes that correspond to the different dimensions of the observation instrument.

The structure of polar coordinate analysis complements the prospective and retrospective perspectives of lag sequential analysis

(Bakeman, 1978)



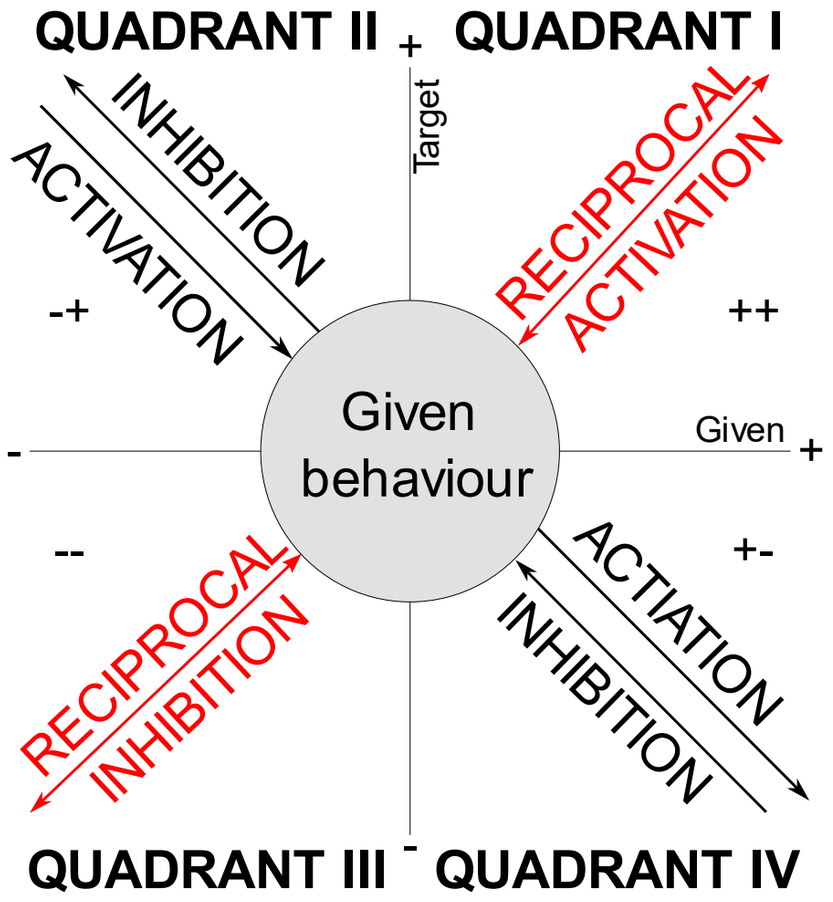
Objectives

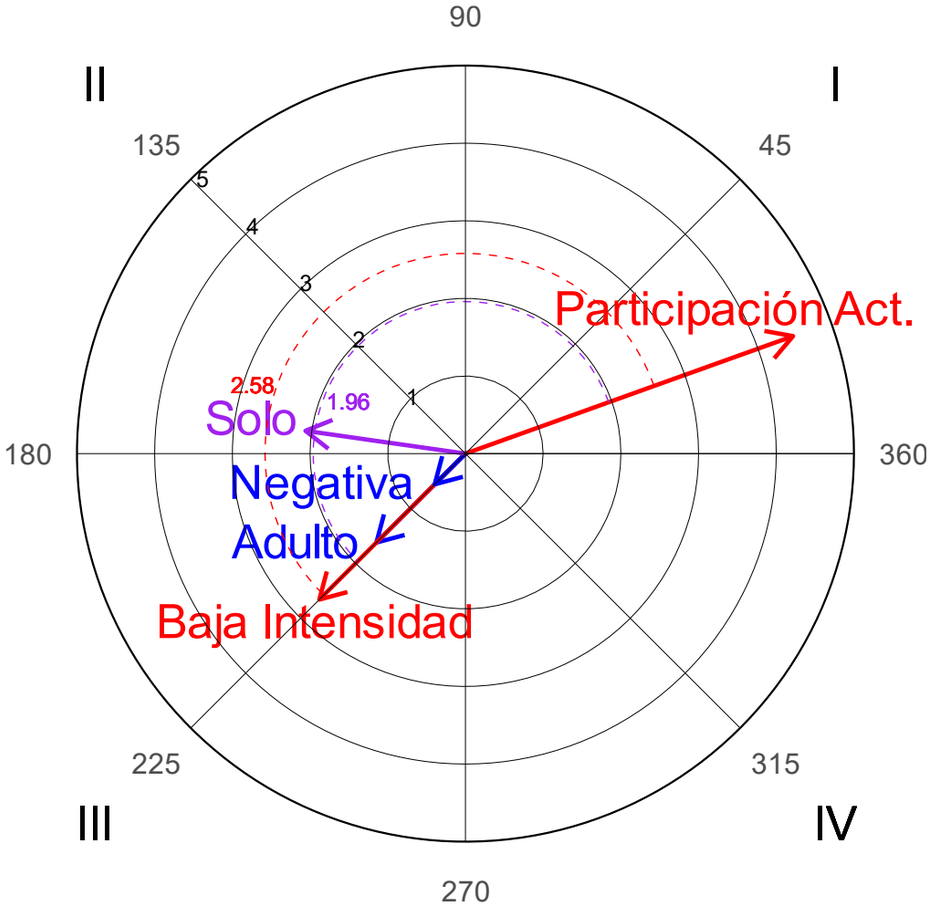
Develop a visual representation of how behaviours are interconnected

Vectorialization of behaviour

Data reduction

4.3. Polar Coordinate Analysis





Radius or Length ⟶ **Intensity**

Angle ⟶ **Nature of the interactive relationship**

4.3. Polar Coordinate Analysis

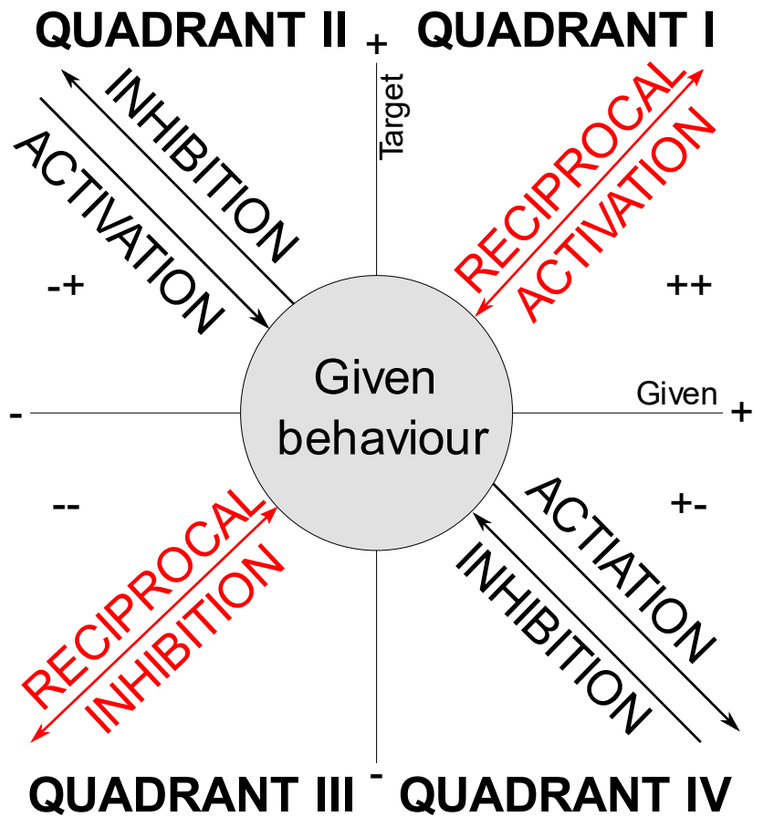
Interpretation

Quadrant I. Mutual activation (A activates B and B activates A)

Quadrant II. Inhibition-activation. Given behaviour inhibits target behaviour. Target behaviour activates given behaviour
(A inhibits B and B activates A)

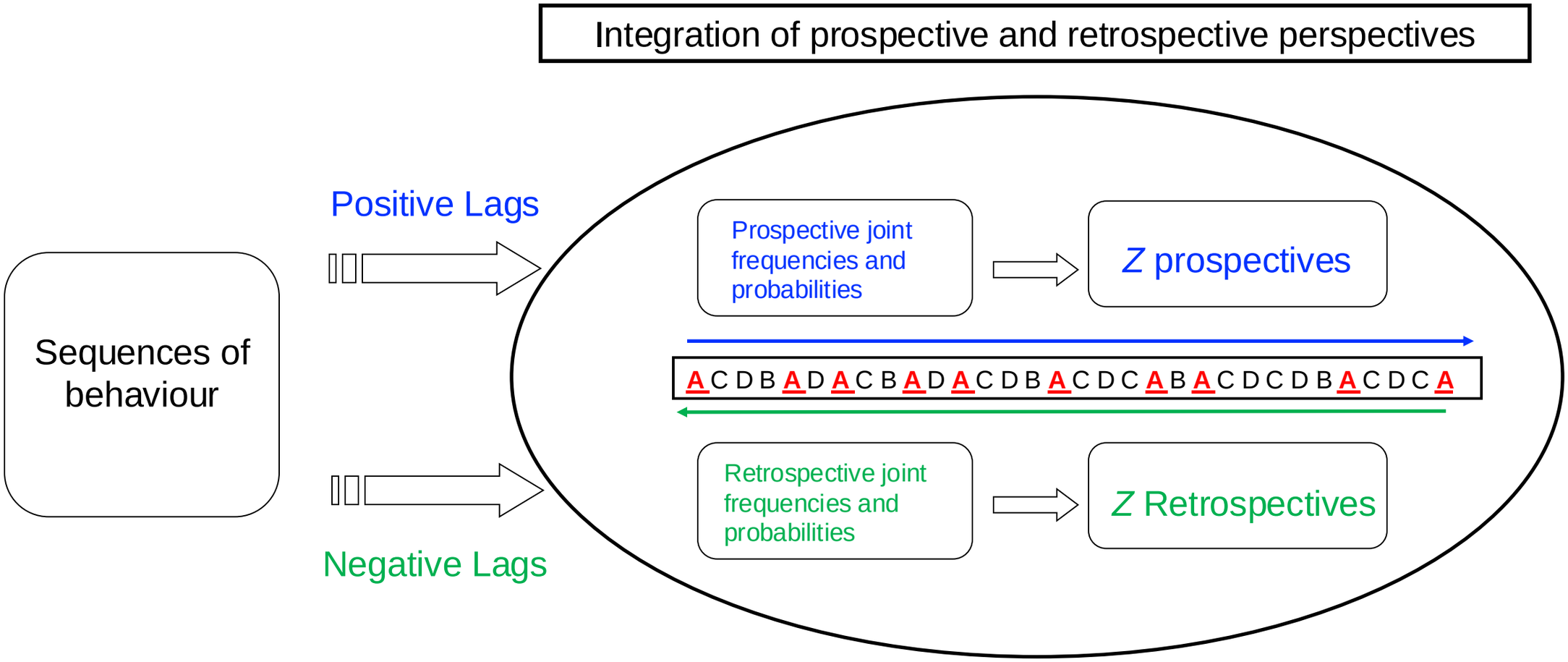
Quadrant III. Mutual inhibition. Given behaviour inhibits target behaviour. Target behaviour inhibits given behaviour.
(A inhibits B and B inhibits A).

Quadrant IV. Activation-inhibition. Given behaviour activates targer behaviour. Target behaviour inhibits criterion behaviour
(A activates B and B inhibits A)



4.3. Polar Coordinate Analysis

Development of the technique



4.3. Polar Coordinate Analysis

Development of the technique

Zsum Parameter

SOME METHODS FOR STRENGTHENING THE COMMON χ^2 TESTS*

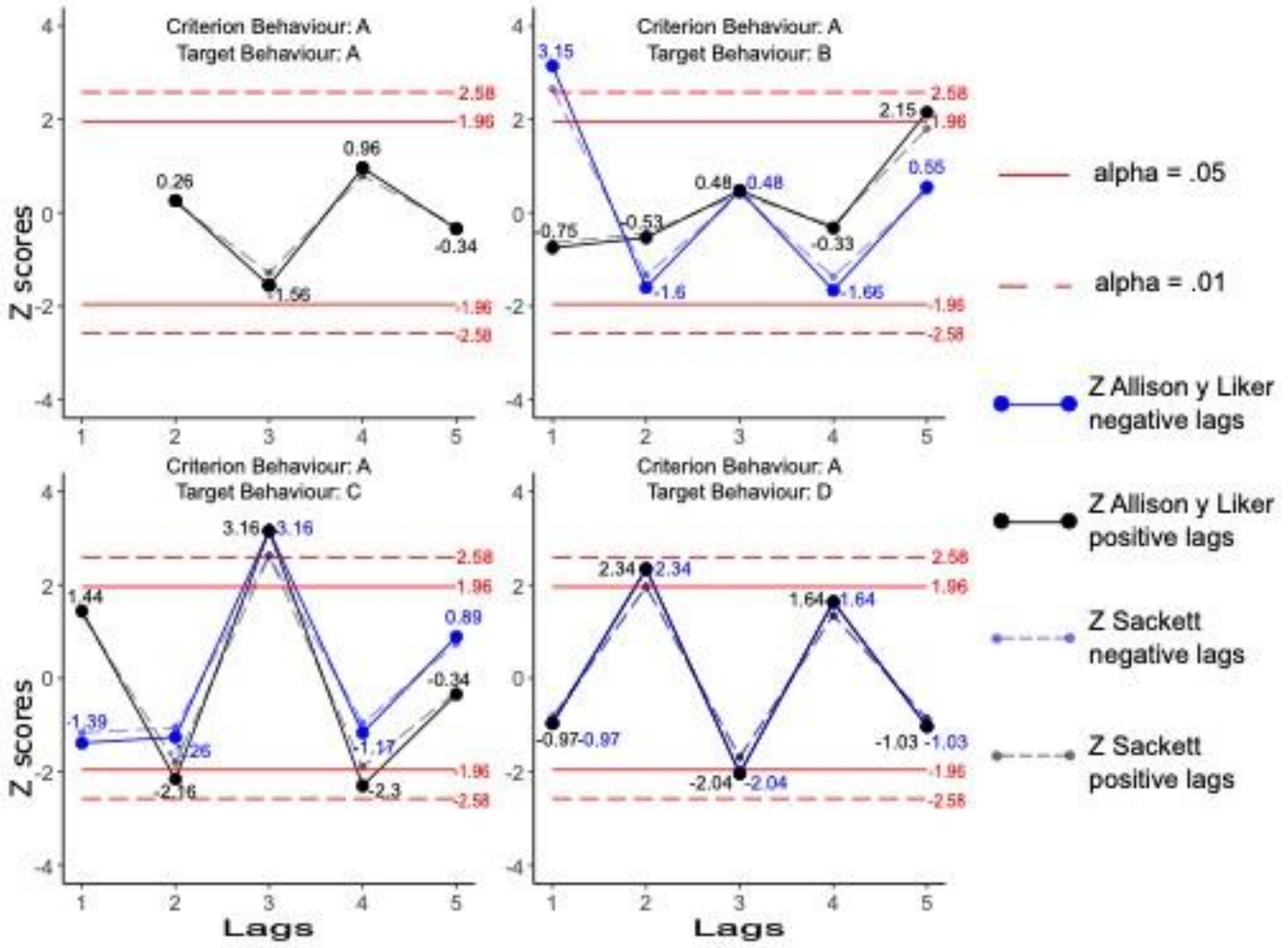
WILLIAM G. COCHRAN
The Johns Hopkins University

Cochran, 1954

$$\text{Zsum} = \frac{\sum z}{\sqrt{n}}$$

z = the independent values obtained from the adjusted residuals found for the respective lag -5 to -1 and 1 to 5

n = lag number

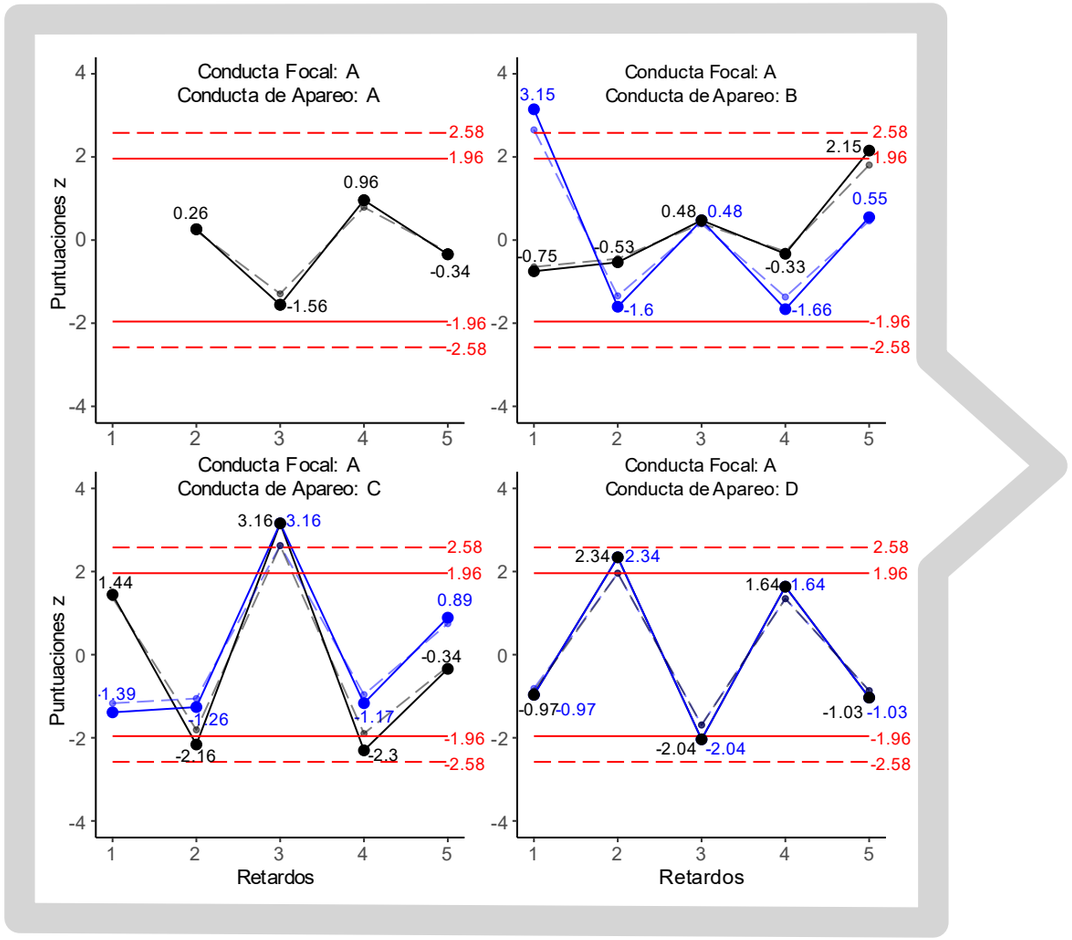


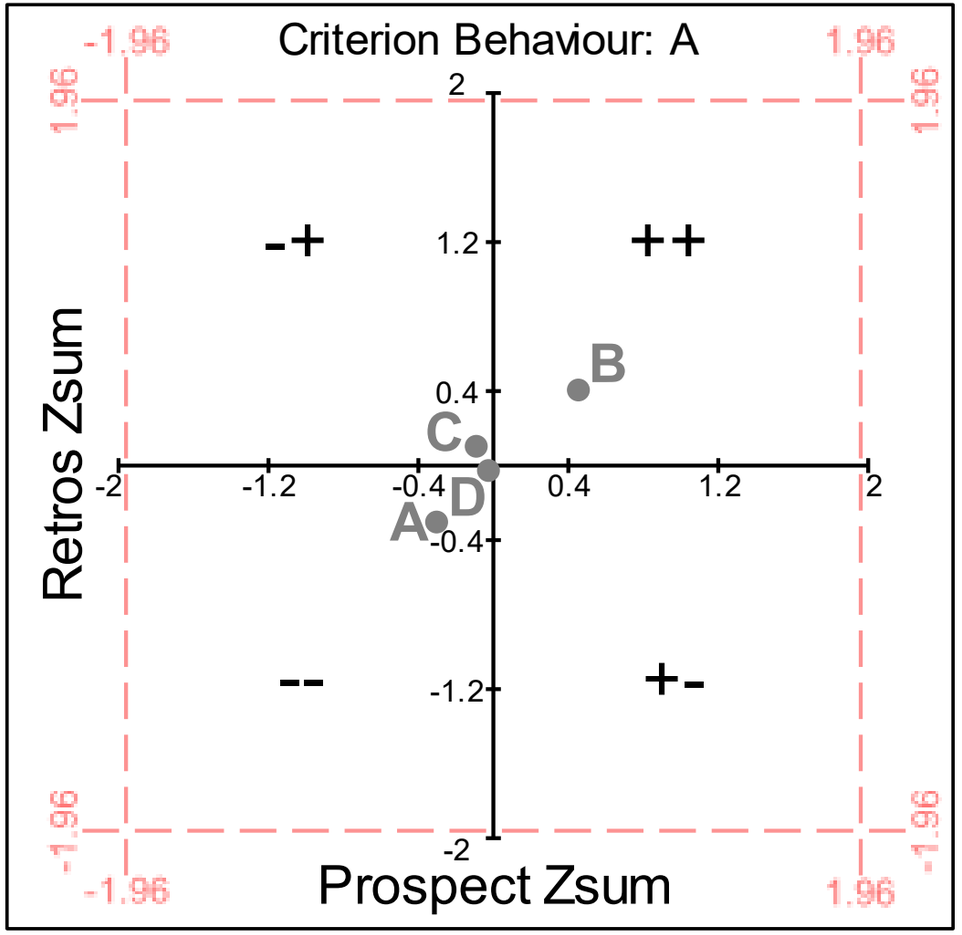
4.3. Polar Coordinate Analysis

Development of the technique

Zsum Parameter

$$\text{Zsum} = \frac{\sum z}{\sqrt{n}}$$





4.3. Polar Coordinate Analysis

Criterion Behavior A

	Retardos										Pros.	Retros.	Zsum Pros.	Zsum Retros.
	-1	-2	-3	-4	-5	1	2	3	4	5	∑z	∑z	∑z / √n	∑z / √n
A						0	0.26	-1.56	0.96	-0.34				
B						-0.75	-0.53	0.48	-0.33	2.15				
C						1.44	-2.16	3.16	-2.3	-0.34				
D						-0.97	2.34	-2.04	1.64	-1.03				

Lag 1	Target:			
Given:	A	B	C	D
A	0,00	-0,75	1,44	-0,97
B	3,15	0,00	-1,72	-1,53
C	-1,39	-0,75	0,00	2,08
D	-0,97	1,61	-0,21	0,00

Lag 2	Target:			
Given:	A	B	C	D
A	0,26	-0,53	-2,16	2,34
B	-1,60	-1,10	1,85	0,74
C	-1,26	2,95	0,81	-1,99
D	2,34	-1,48	-0,12	-1,06

Lag 3	Target:			
Given:	A	B	C	D
A	-1,56	0,48	3,16	-2,04
B	0,48	-1,12	-1,52	2,06
C	3,16	-1,52	-2,05	0,07
D	-2,04	2,06	0,07	0,31

Lag 4	Target:			
Given:	A	B	C	D
A	0,96	-0,33	-2,30	1,64
B	-1,70	-1,01	3,90	-1,42
C	-1,17	1,25	0,97	-0,76
D	1,64	0,00	-1,93	0,25

Lag 5	Target:			
Given:	A	B	C	D
A	-0,34	2,15	-0,34	-1,03
B	0,56	0,36	-1,61	0,80
C	0,89	-1,28	-1,03	1,19
D	-1,03	-1,28	2,81	-0,82

4.3. Polar Coordinate Analysis

Criterion Behavior A

	Retardos										Pros.	Retros.	Zsum Pros.	Zsum Retros.
	-1	-2	-3	-4	-5	1	2	3	4	5	∑z	∑z	∑z / √n	∑z / √n
A	0	0.26	-1.56	0.96	-0.34	0	0.26	-1.56	0.96	-0.34	-0.68	-0.68	-0.30	-0.30
B	3.15	-1.6	0.48	-1.7	0.56	-0.75	-0.53	0.48	-0.33	2.15	1.02	0.89	0.46	0.40
C	-1.39	-1.26	3.16	-1.17	0.89	1.44	-2.16	3.16	-2.3	-0.34	-0.2	0.23	-0.09	0.10
D	-0.97	2.34	-2.04	1.64	-1.03	-0.97	2.34	-2.04	1.64	-1.03	-0.06	-0.06	-0.03	-0.03

Lag -1	Target:			
Given:	A	B	C	D
A	0.00	3.15	-1.39	-0.97
B	-0.75	0.00	-0.75	1.61
C	1.44	-1.72	0.00	-0.21
D	-0.97	-1.53	2.08	0.00

Lag -2	Target:			
Given:	A	B	C	D
A	0.26	-1.60	-1.26	2.34
B	-0.53	-1.10	2.95	-1.48
C	-2.16	1.85	0.81	-0.12
D	2.34	0.74	-1.99	-1.06

Lag -3	Target:			
Given:	A	B	C	D
A	-1.56	0.48	3.16	-2.04
B	0.48	-1.12	-1.52	2.06
C	3.16	-1.52	-2.05	0.07
D	-2.04	2.06	0.07	0.31

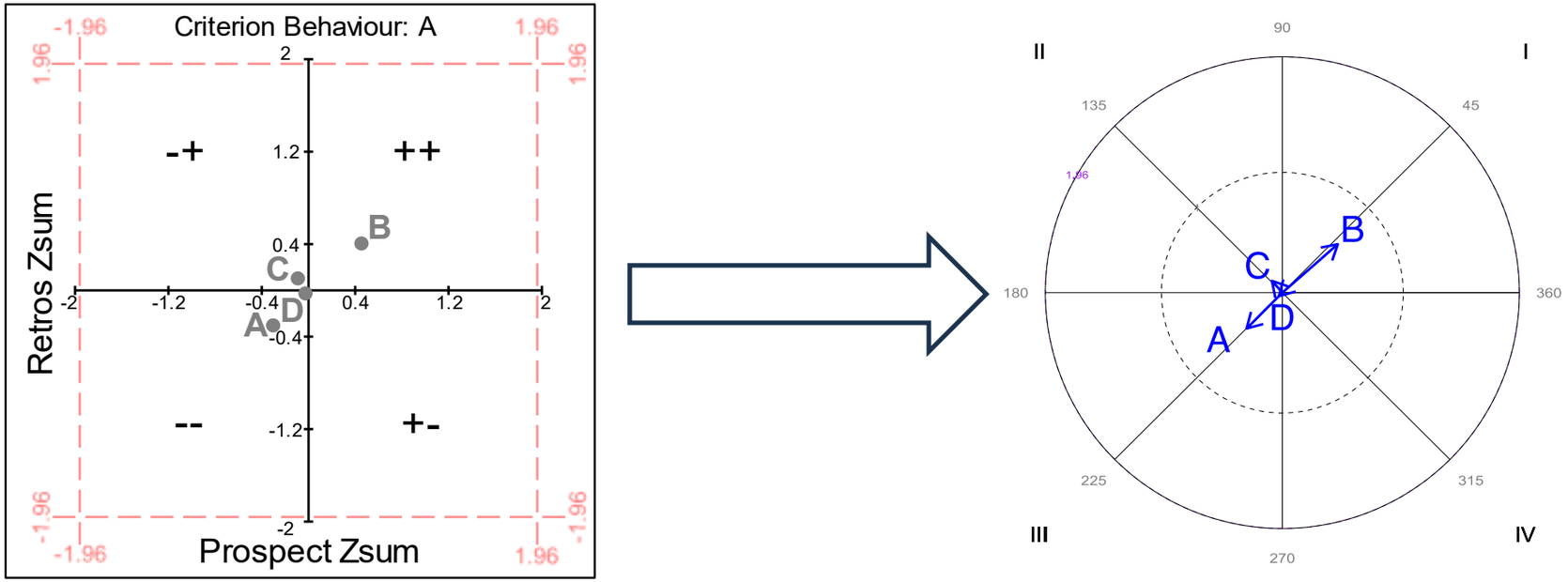
Lag -4	Target:			
Given:	A	B	C	D
A	0.96	-1.70	-1.17	1.64
B	-0.33	-1.01	1.25	0.00
C	-2.30	3.90	0.97	-1.93
D	1.64	-1.42	-0.76	0.25

Lag -5	Target:			
Given:	A	B	C	D
A	-0.34	0.56	0.89	-1.03
B	2.15	0.36	-1.28	-1.28
C	-0.34	-1.61	-1.03	2.81
D	-1.03	0.80	1.19	-0.82

4.3. Polar Coordinate Analysis

Criterion Behavior A

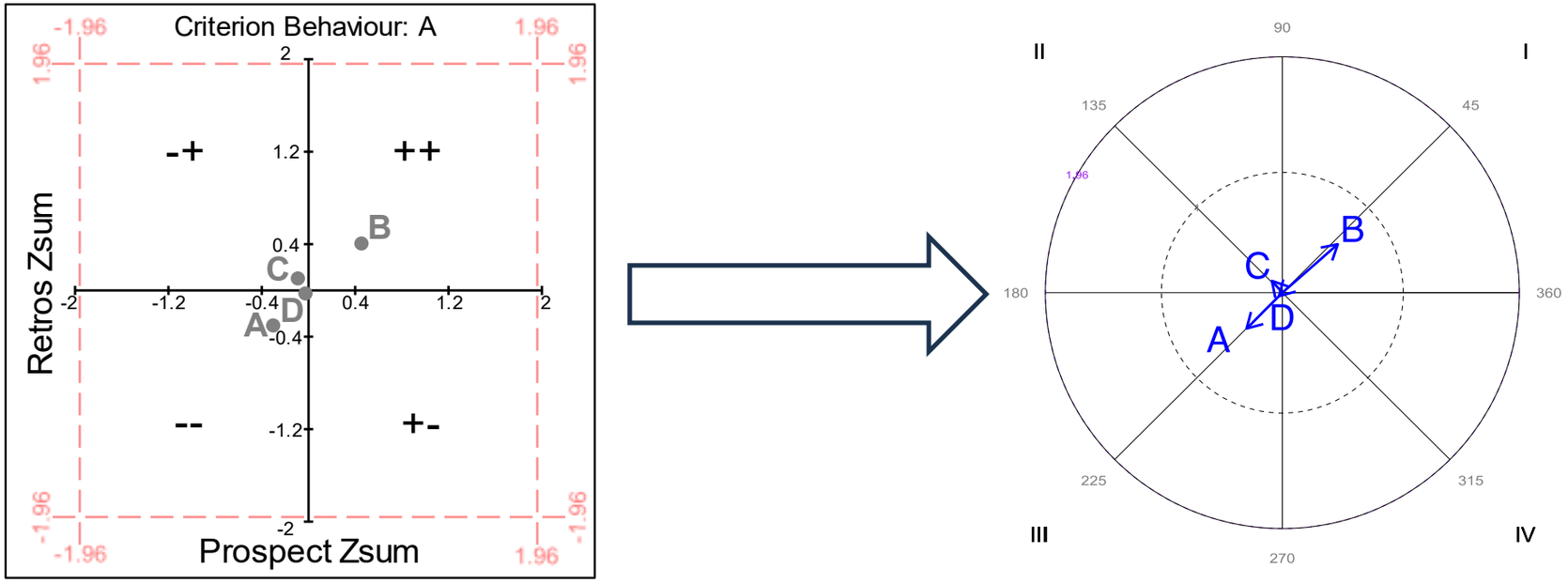
	Retardos										Pros.	Retros.	Zsum Pros.	Zsum Retros.
	-1	-2	-3	-4	-5	1	2	3	4	5	∑z	∑z	∑z / √n	∑z / √n
A	0	0.26	-1.56	0.96	-0.34	0	0.26	-1.56	0.96	-0.34	-0.68	-0.68	-0.30	-0.30
B	3.15	-1.6	0.48	-1.7	0.56	-0.75	-0.53	0.48	-0.33	2.15	1.02	0.89	0.46	0.40
C	-1.39	-1.26	3.16	-1.17	0.89	1.44	-2.16	3.16	-2.3	-0.34	-0.2	0.23	-0.09	0.10
D	-0.97	2.34	-2.04	1.64	-1.03	-0.97	2.34	-2.04	1.64	-1.03	-0.06	-0.06	-0.03	-0.03



4.3. Polar Coordinate Analysis

Criterion Behavior A

Código	Ret--5	Ret--4	Ret--3	Ret--2	Ret--1	Ret+1	Ret+2	Ret+3	Ret+4	Ret+5
A	-0.34	0.96	-1.56	0.26	0	0	0.26	-1.56	0.96	-0.34
B	0.56	-1.7	0.48	-1.6	3.15	-0.75	-0.53	0.48	-0.33	2.15
C	0.89	-1.17	3.16	-1.26	-1.39	1.44	-2.16	3.16	-2.3	-0.34
D	-1.03	1.64	-2.04	2.34	-0.97	-0.97	2.34	-2.04	1.64	-1.03
A										



4.3. Polar Coordinate Analysis

Development of the technique

Transforming Zsum into polar coordinates

Radio = $\sqrt{Zsum_{Pros}^2 + Zsum_{Retr}^2}$ Ratio = $Zsum_{Retr}/Radio$

Code	$Zsum_{Pros}$	$Zsum_{Retr}$	Quadrant	Radio	Ratio
	$\sum z_{Pros} / \sqrt{n}$	$\sum z_{Retr} / \sqrt{n}$	Signos Z_{Pros} Z_{Retr}	$\sqrt{Z_{Pros}^2 + Z_{Retr}^2}$	$Z_{Retr}/Radio$
A	-0.30	-0.30	III (– –)	0.42	-0.71
B	0.46	0.40	I (+ +)	0.61	0.66
C	-0.09	0.10	II (– +)	0.13	0.76
D	-0.03	-0.03	III (– –)	0.04	-0.71

4.3. Polar Coordinate Analysis

Development of the technique

Transforming Zsum into polar coordinates

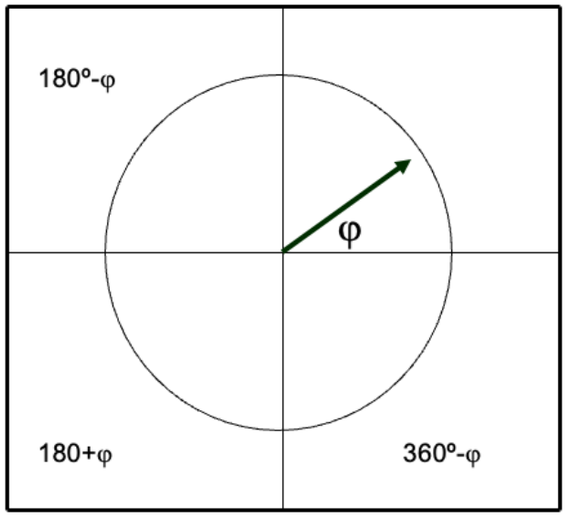
$Zsum_{Pros}$	$Zsum_{Retr}$	QUADRANT	Radio	Ratio	Angle	Transformed Angle
		Signos Z_{Pros} Z_{Retr}	$\sqrt{Z_{Pros}^2 + Z_{Retr}^2}$	$Z_{Retr}/Radio$		
-0.30	-0.30	III (–) +180º	0.42	-0.71	45.23	45.23 + 180 = 225.23
0.46	0.40	I (++) =	0.61	0.66	41.3	41.3
-0.09	0.10	II (-+) -180	0.13	0.74	48.6	48.6 – 180 = 131.4
-0.03	-0.03	III (–) +180º	0.04	-0.71	45.23	45.23 + 180 = 225.23

Quadrant I = (I; ++) Angle = Angle

Quadrant II = (II; -+) Angle = 180 – Angle

Quadrant III = (III; --) Angle = 180 + Angle

Quadrant IV = (IV; +-) Angle = 360 - Angle



4.3. Polar Coordinate Analysis

Development of the technique

Graphical Representation

https://jairodmed.shinyapps.io/ObseRtools_2023_beta/

file.xlsx

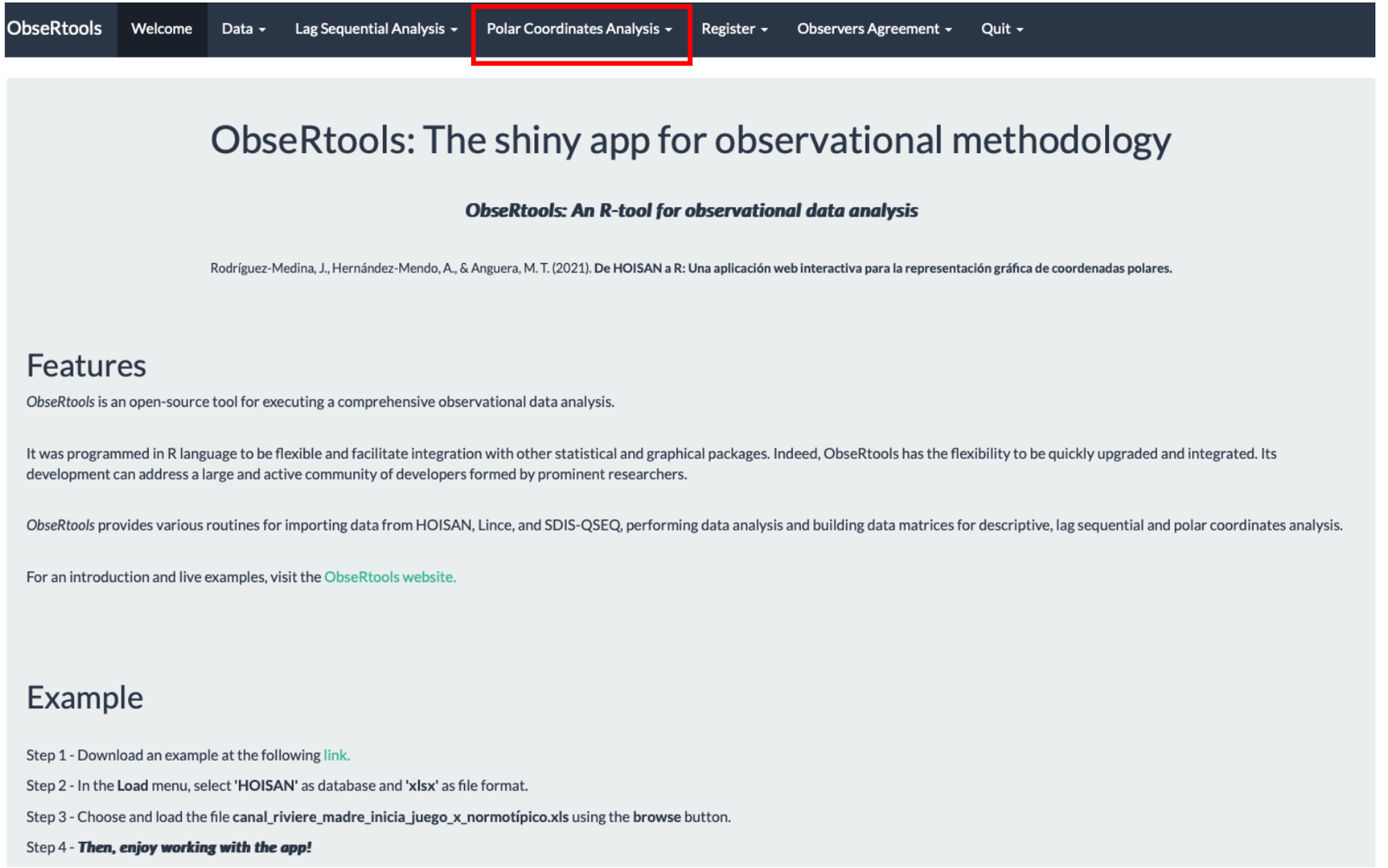
Categoria	Quadrant	Zsum Pros	Zsum Retros	Ratio	Radio	Sig.	Angulo
A	III	-0.30	-0.30	-0.71	0.42		225.23
B	I	0.46	0.40	0.66	0.61		41.3
C	II	-0.09	0.10	0.76	0.13		131.4
D	III	-0.03	-0.03	-0.71	0.04		225.23

4.3. Polar Coordinate Analysis

Development of the technique

Graphical Representation

https://jairodmed.shinyapps.io/ObseRtools_2023_beta/

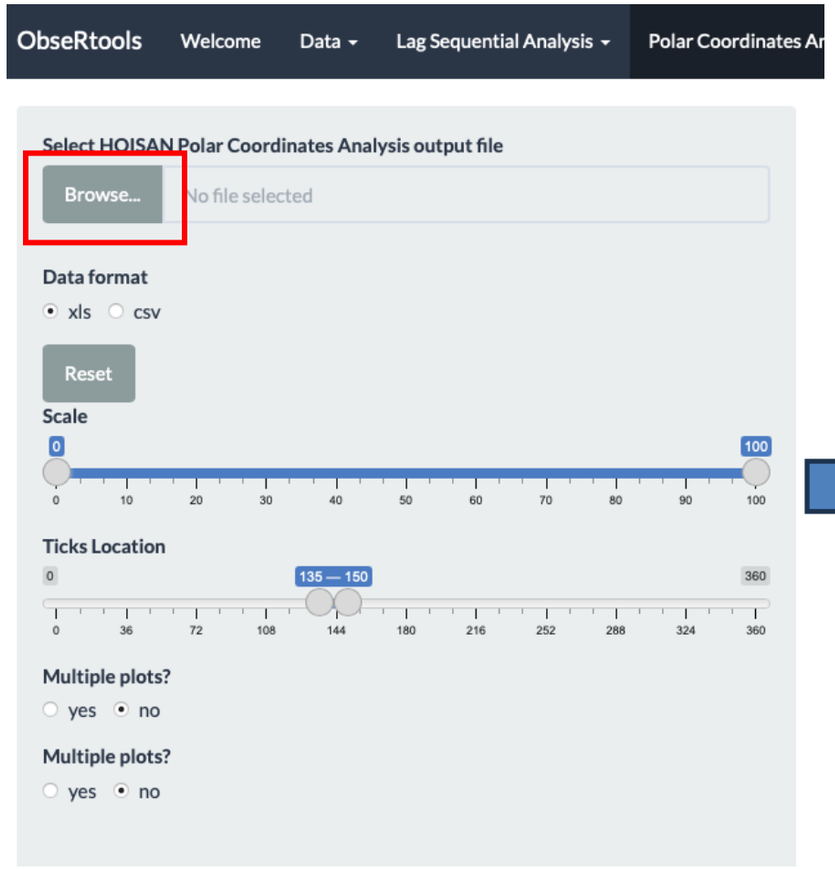


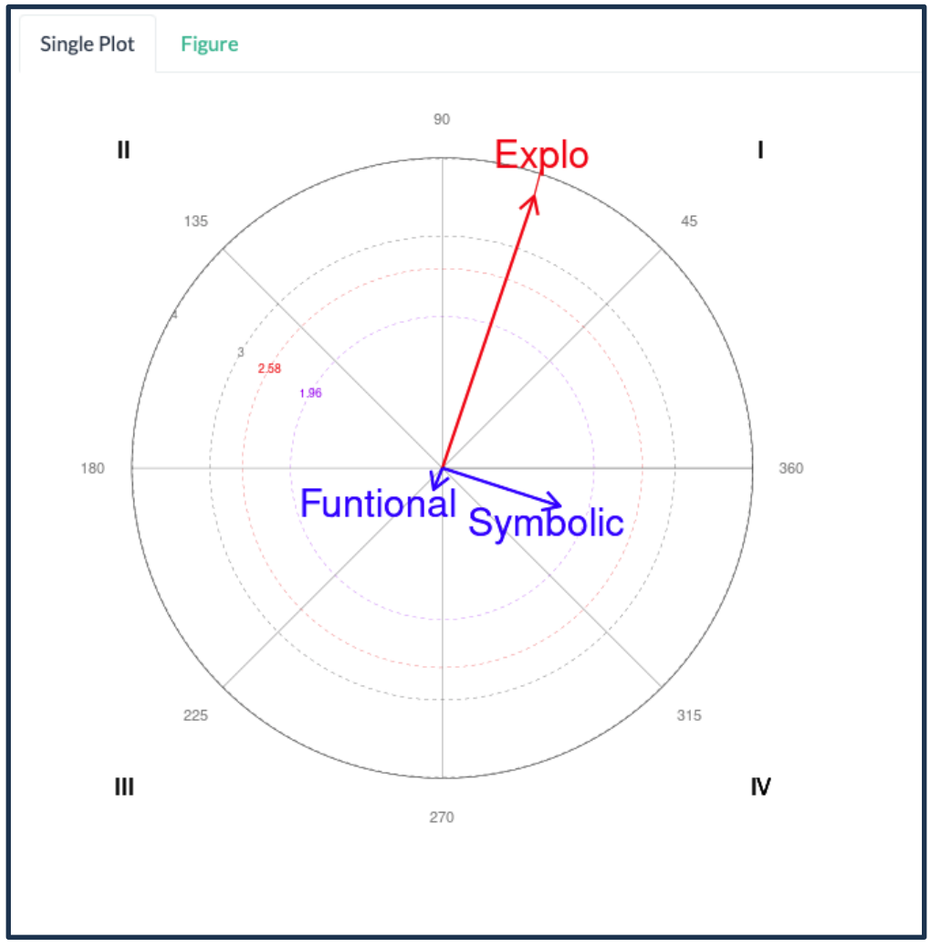
4.3. Polar Coordinate Analysis

Development of the technique

Graphical Representation

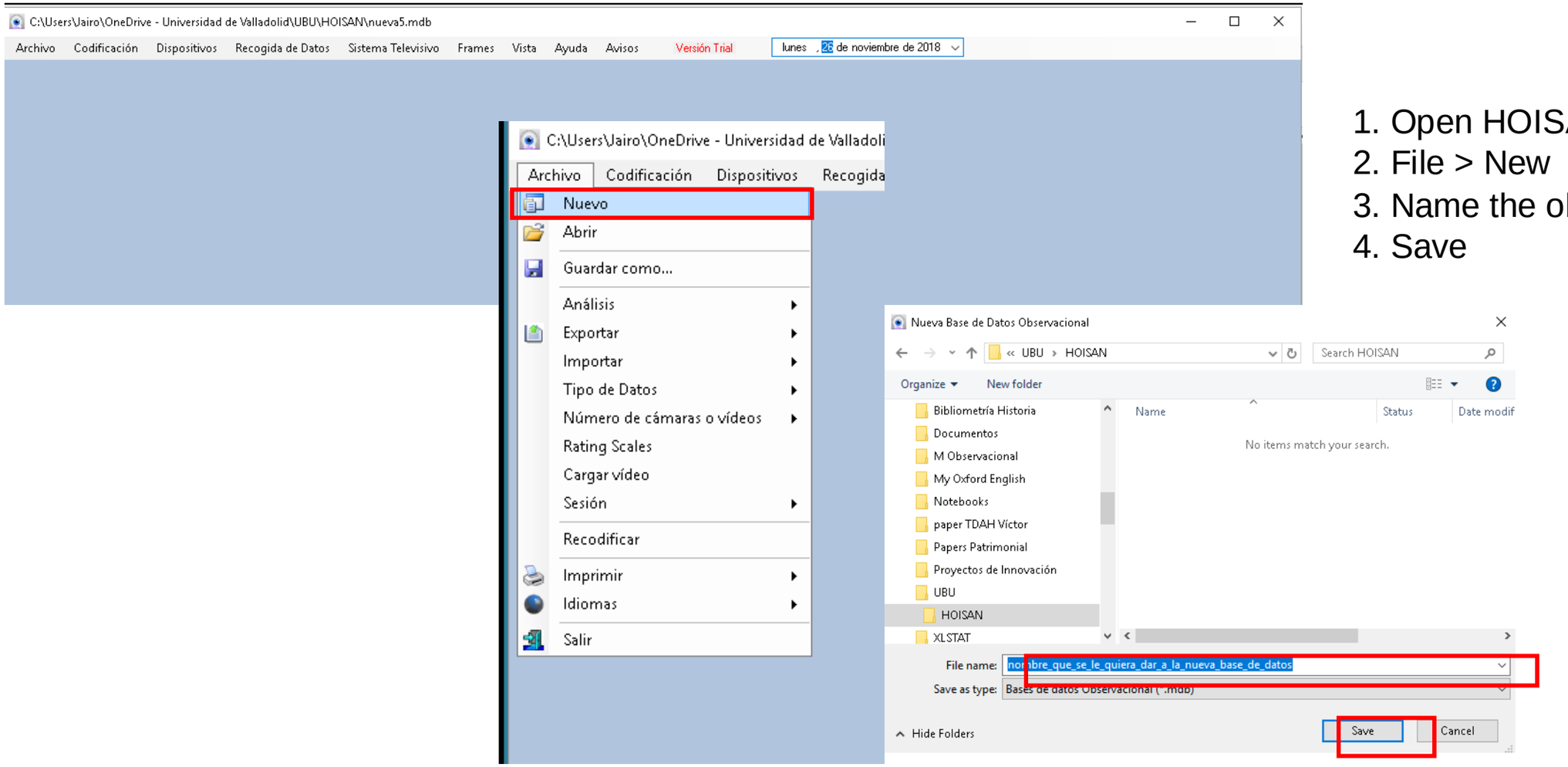
https://jairodmed.shinyapps.io/ObseRtools_2023_beta/





4.3. Polar Coordinate Analysis

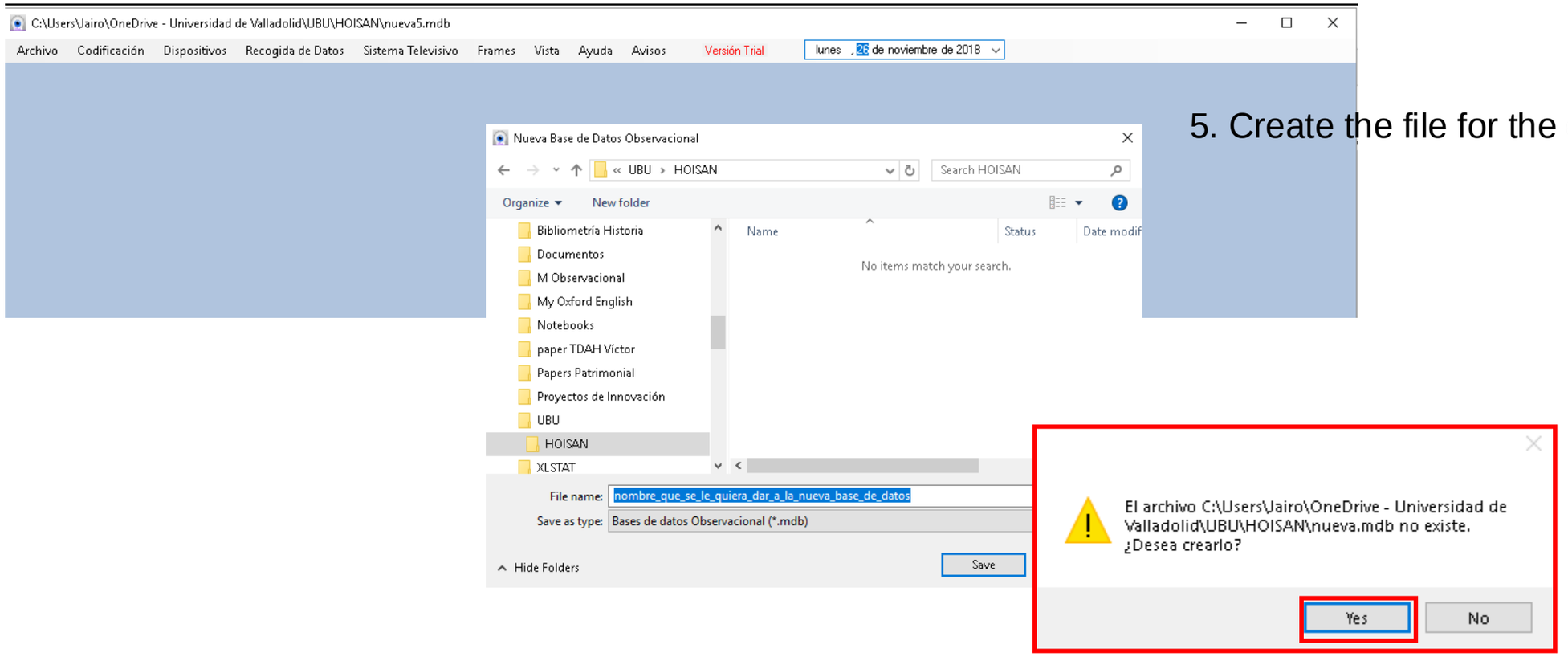
RUNNING IN HOISAN, v.2.0



1. Open HOISAN
2. File > New
3. Name the observational database
4. Save

4.3. Polar Coordinate Analysis

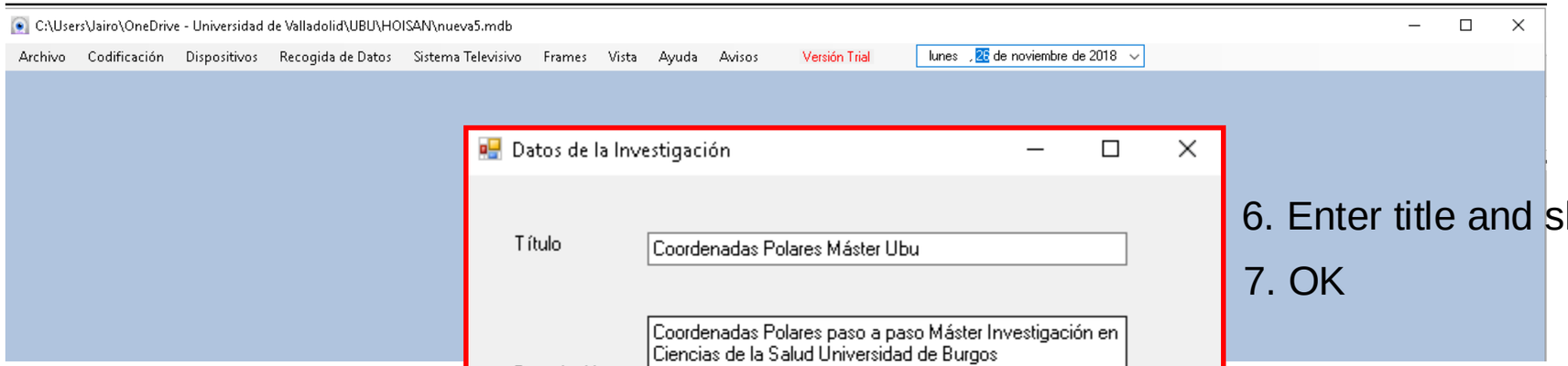
RUNNING IN HOISAN, v.2.0

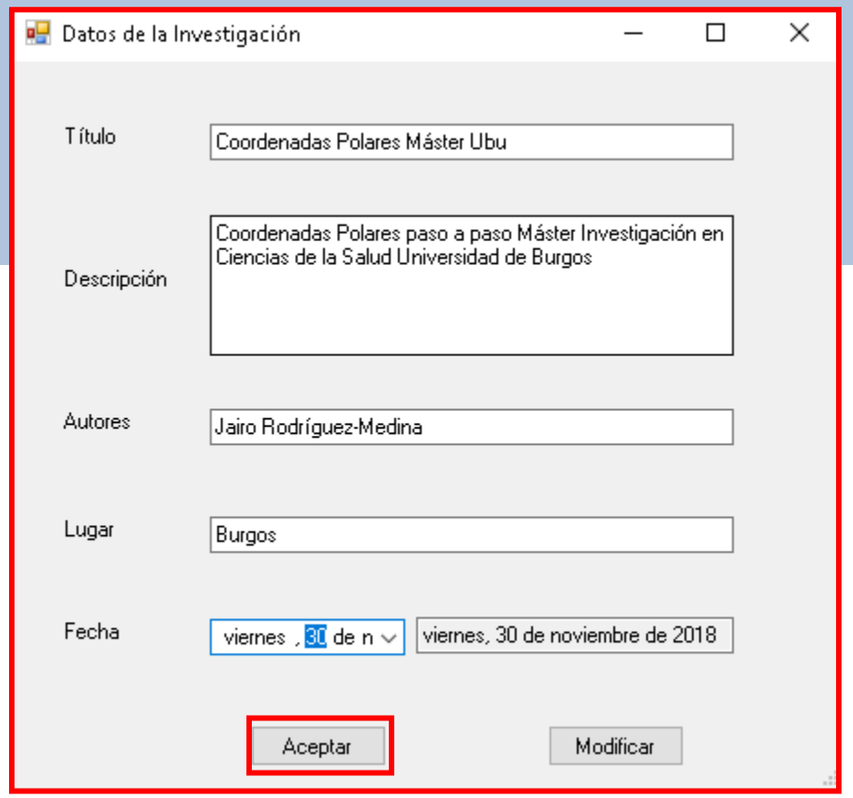


5. Create the file for the observational database

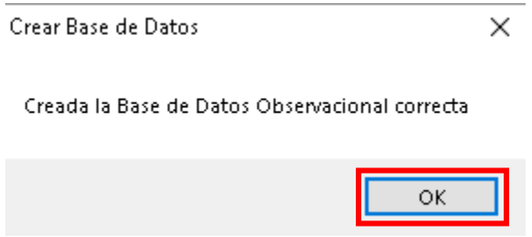
4.3. Polar Coordinate Analysis

RUNNING IN HOISAN, v.2.0



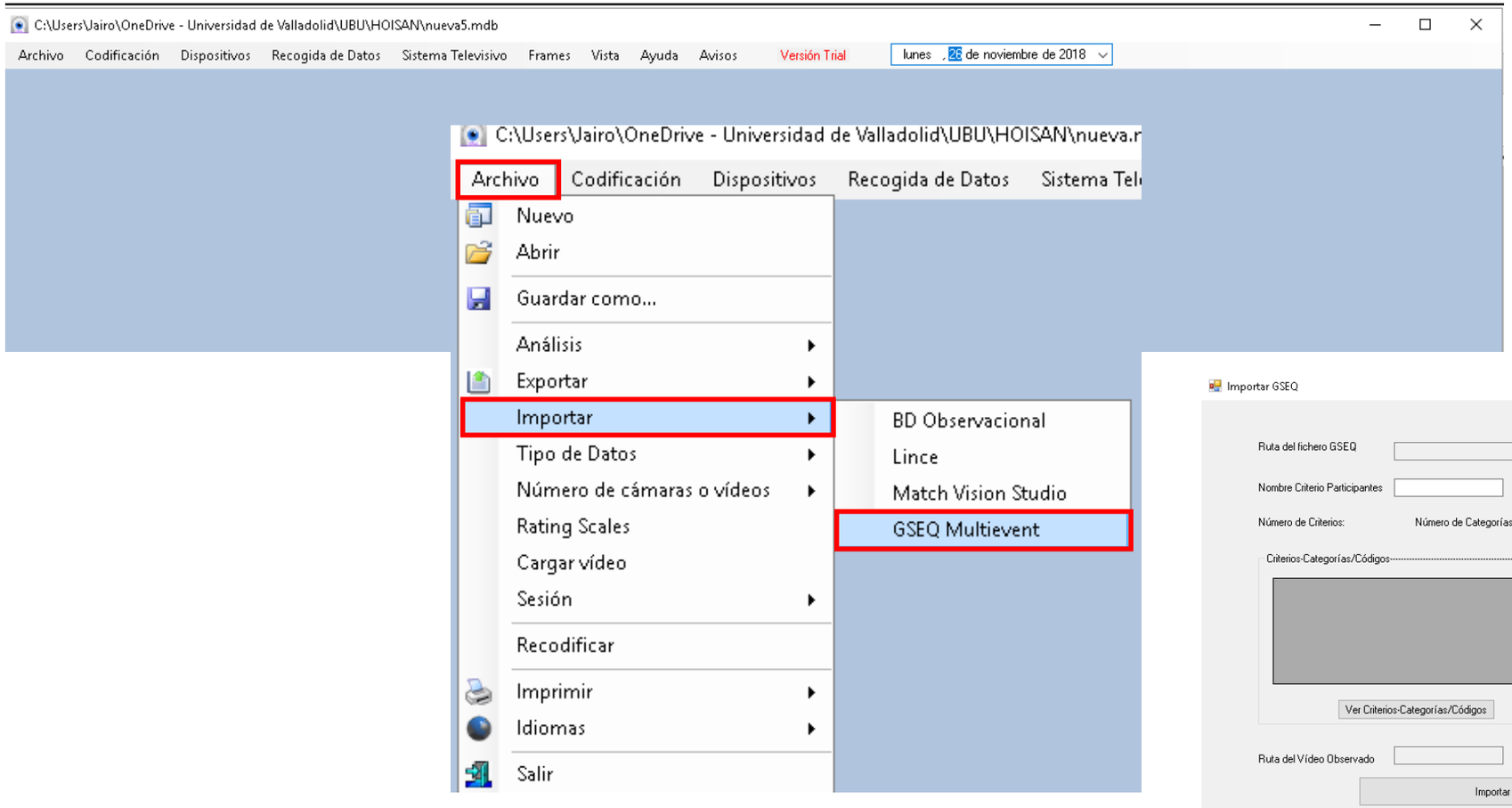


6. Enter title and short description of the investigation
7. OK



4.3. Polar Coordinate Analysis

RUNNING IN HOISAN, v.2.0

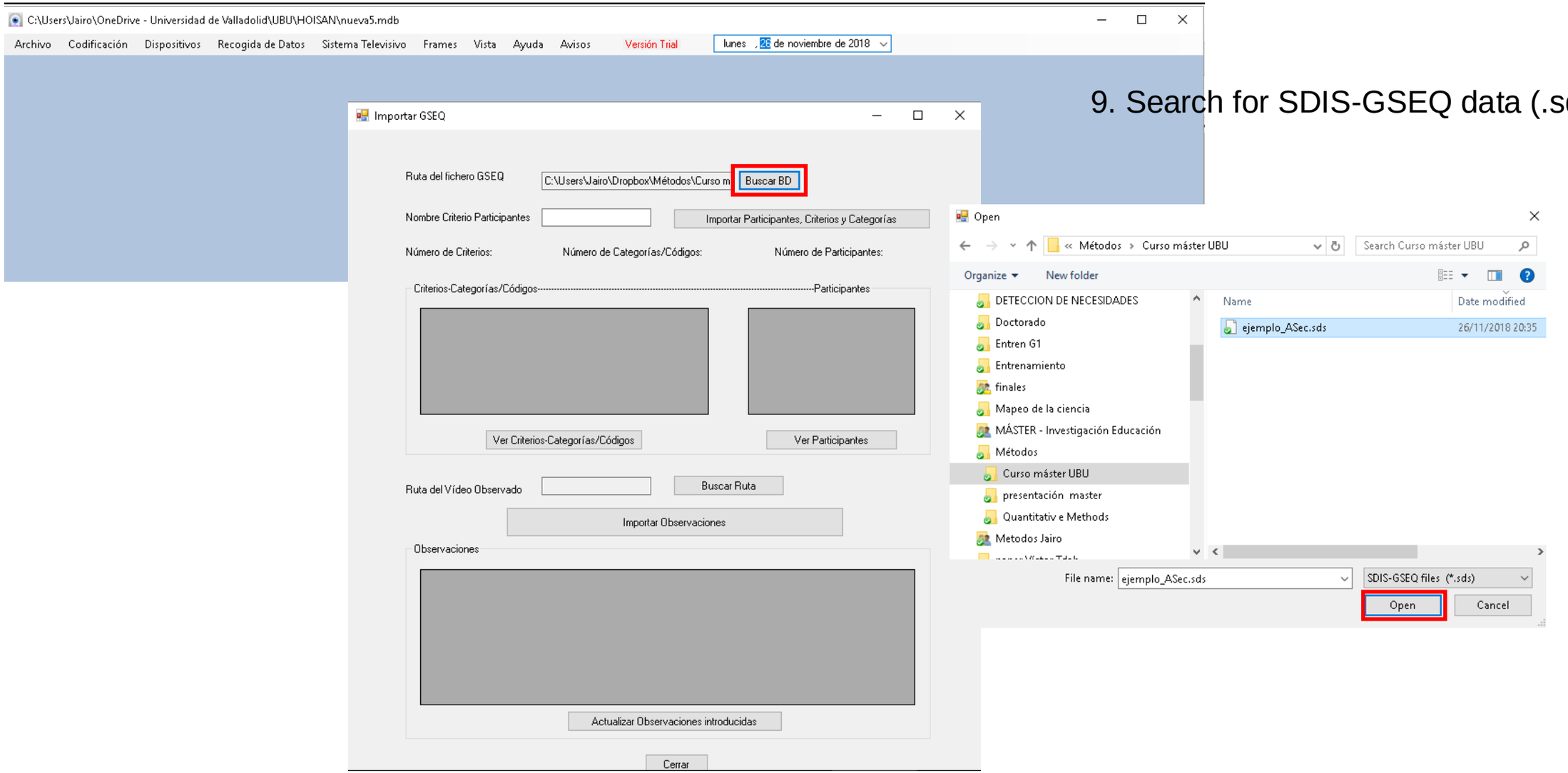


8. File > Import > GSEQ Multievent

4.3. Polar Coordinate Analysis

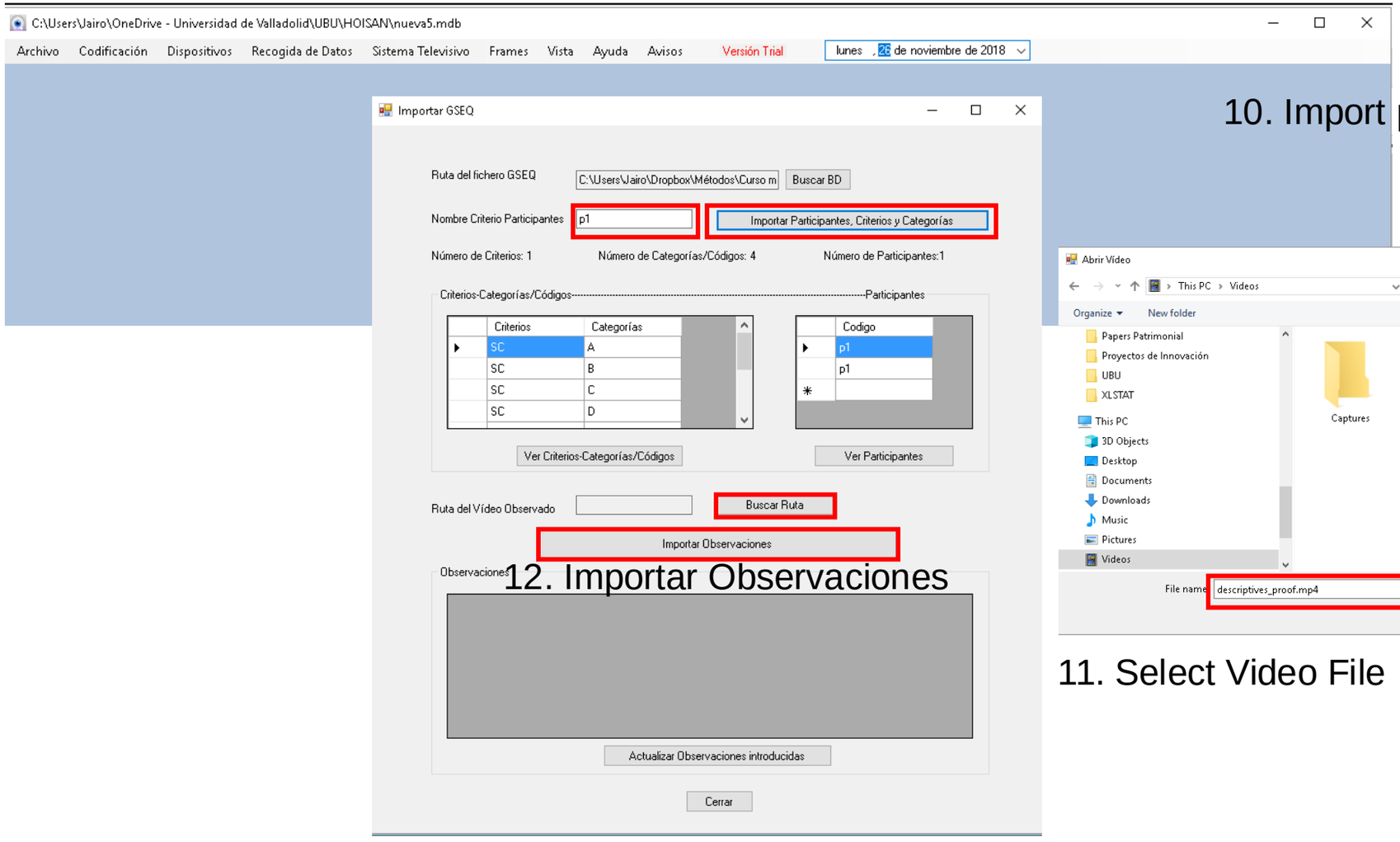
RUNNING IN HOISAN, v.2.0

9. Search for SDIS-GSEQ data (.sds file)



4.3. Polar Coordinate Analysis

RUNNING IN HOISAN, v.2.0



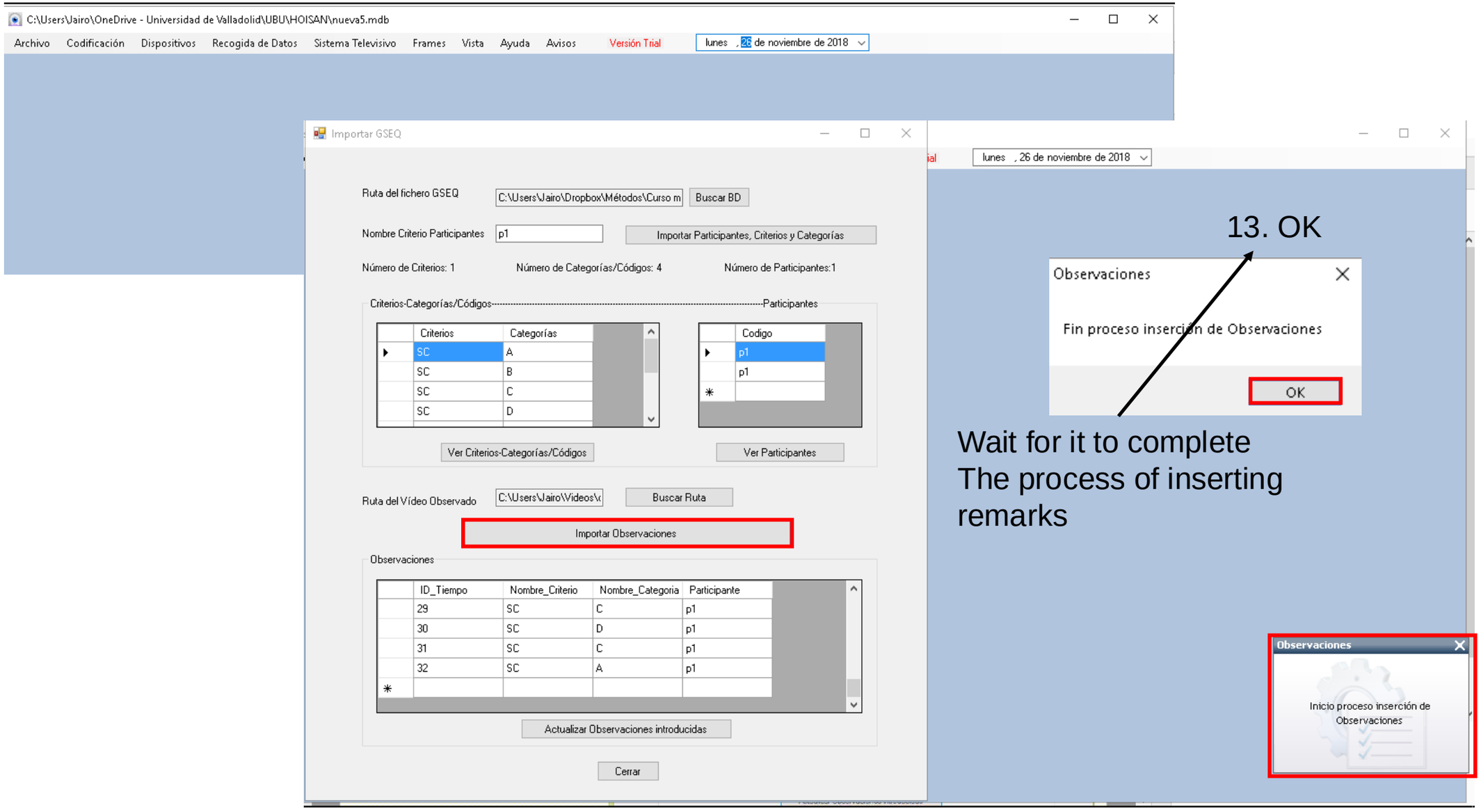
10. Import participants (p1), criteria and categories

11. Select Video File

12. Importar Observaciones

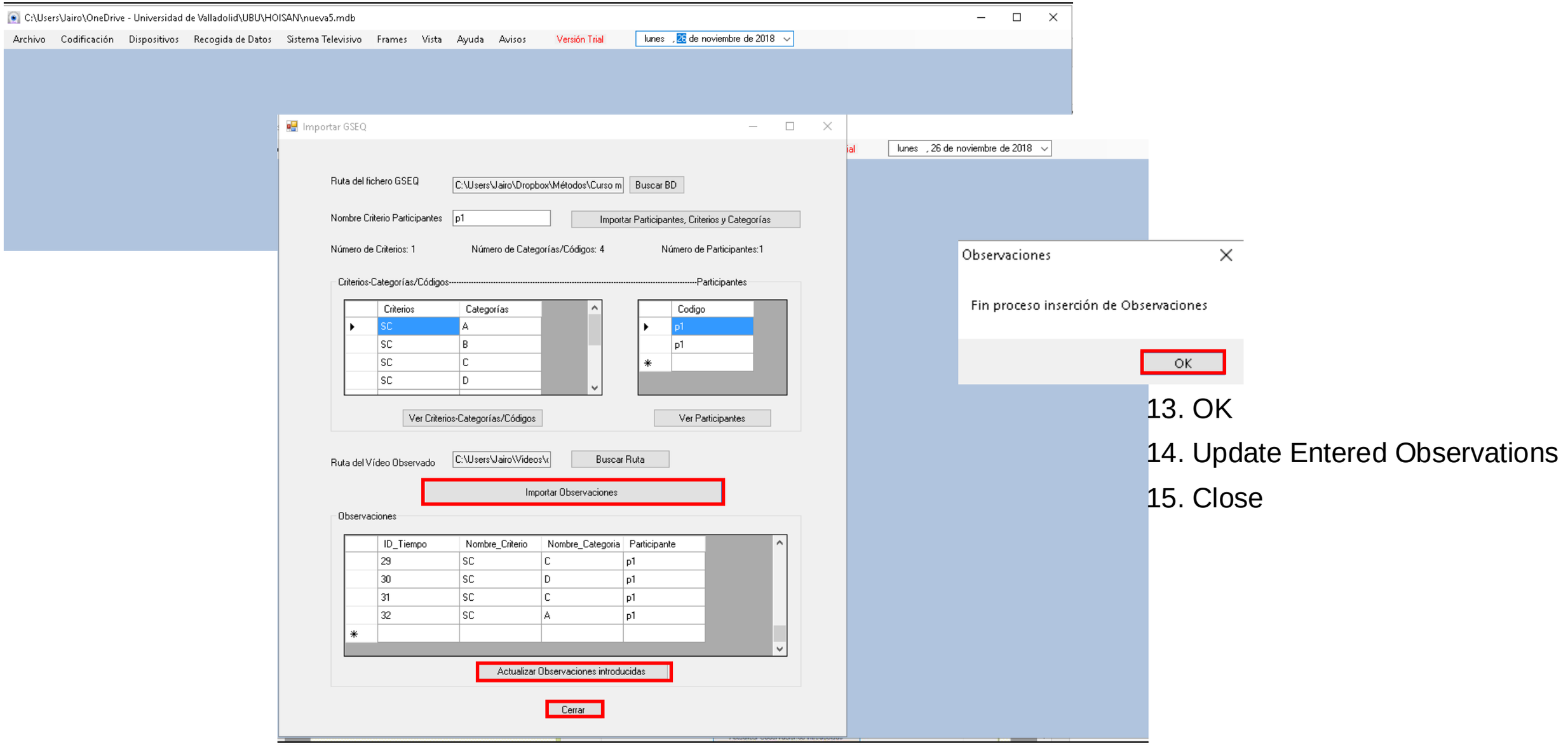
4.3. Polar Coordinate Analysis

RUNNING IN HOISAN, v.2.0



4.3. Polar Coordinate Analysis

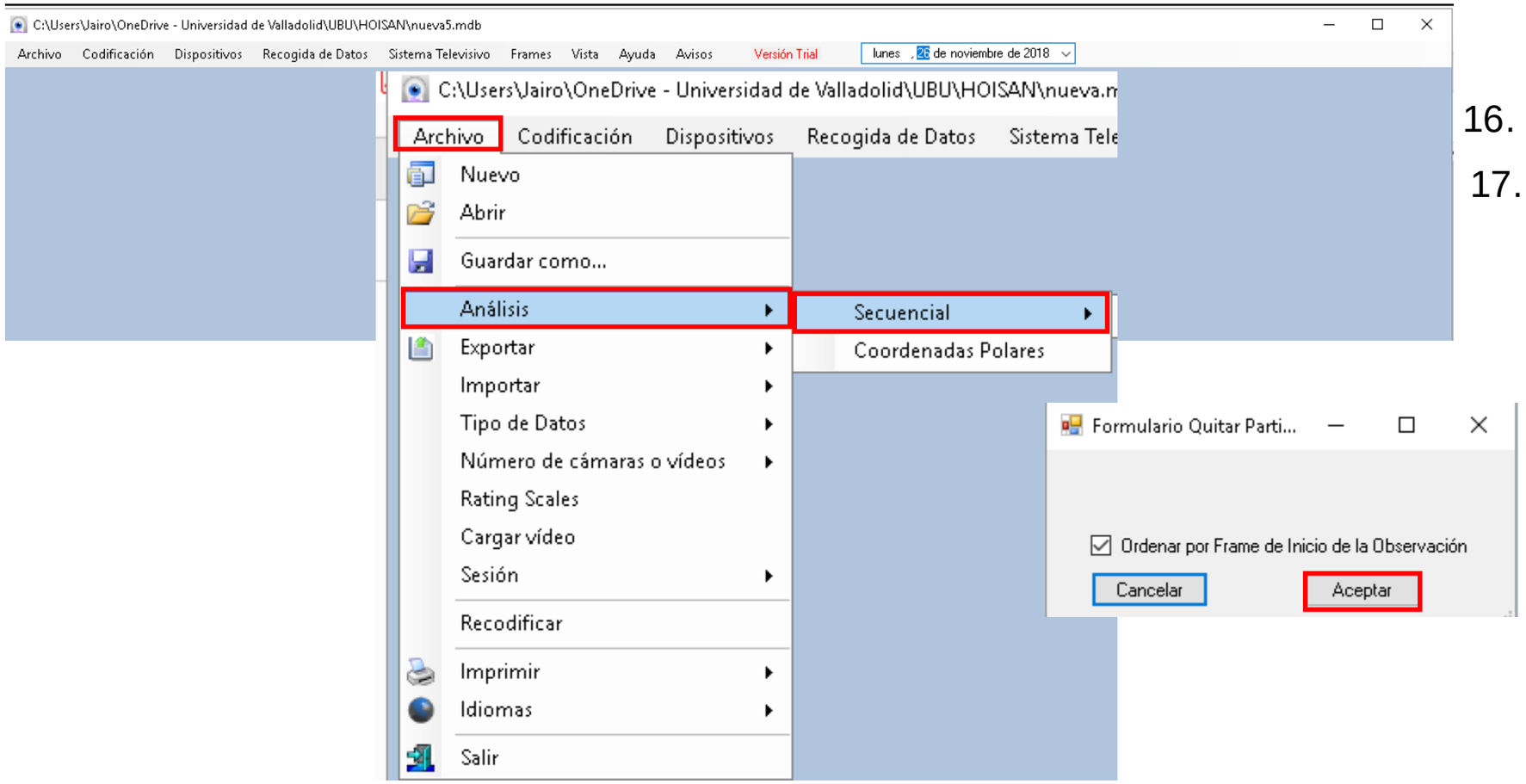
RUNNING IN HOISAN, v.2.0



13. OK
14. Update Entered Observations
15. Close

4.3. Polar Coordinate Analysis

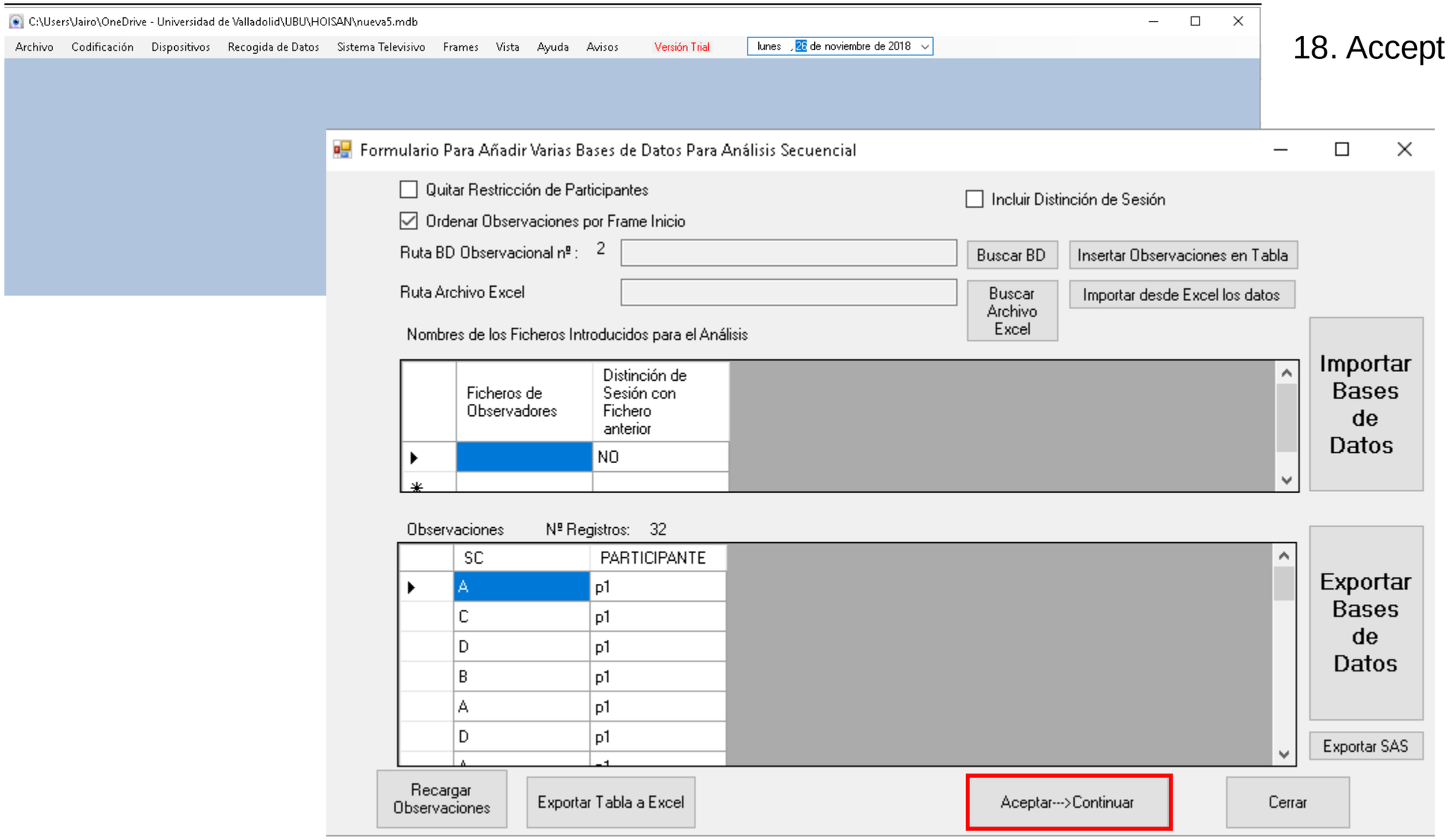
RUNNING IN HOISAN, v.2.0



16. File > Analysis > Sequential
17. Accept

4.3. Polar Coordinate Analysis

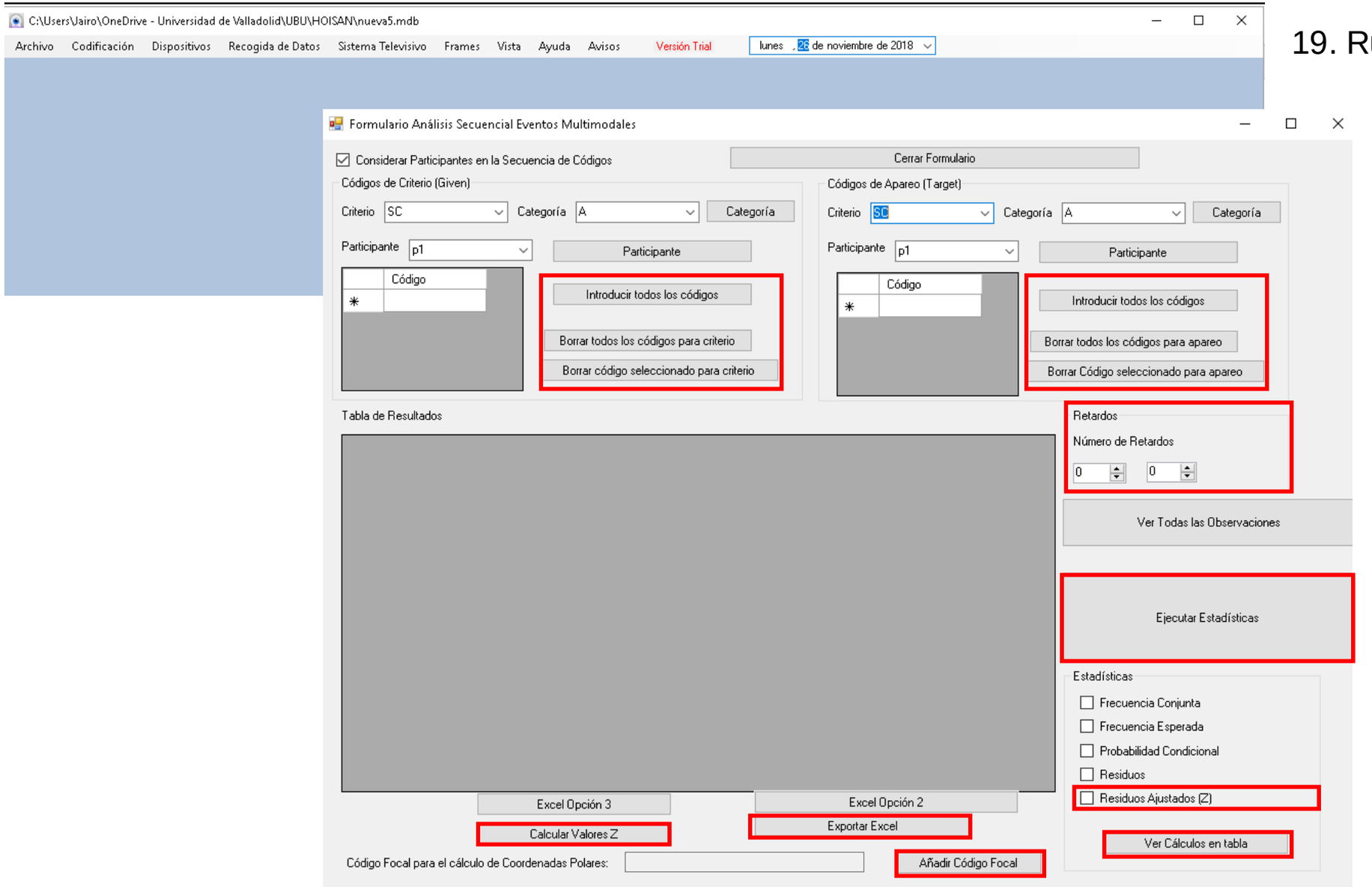
RUNNING IN HOISAN, v.2.0



18. Accept and Continue

4.3. Polar Coordinate Analysis

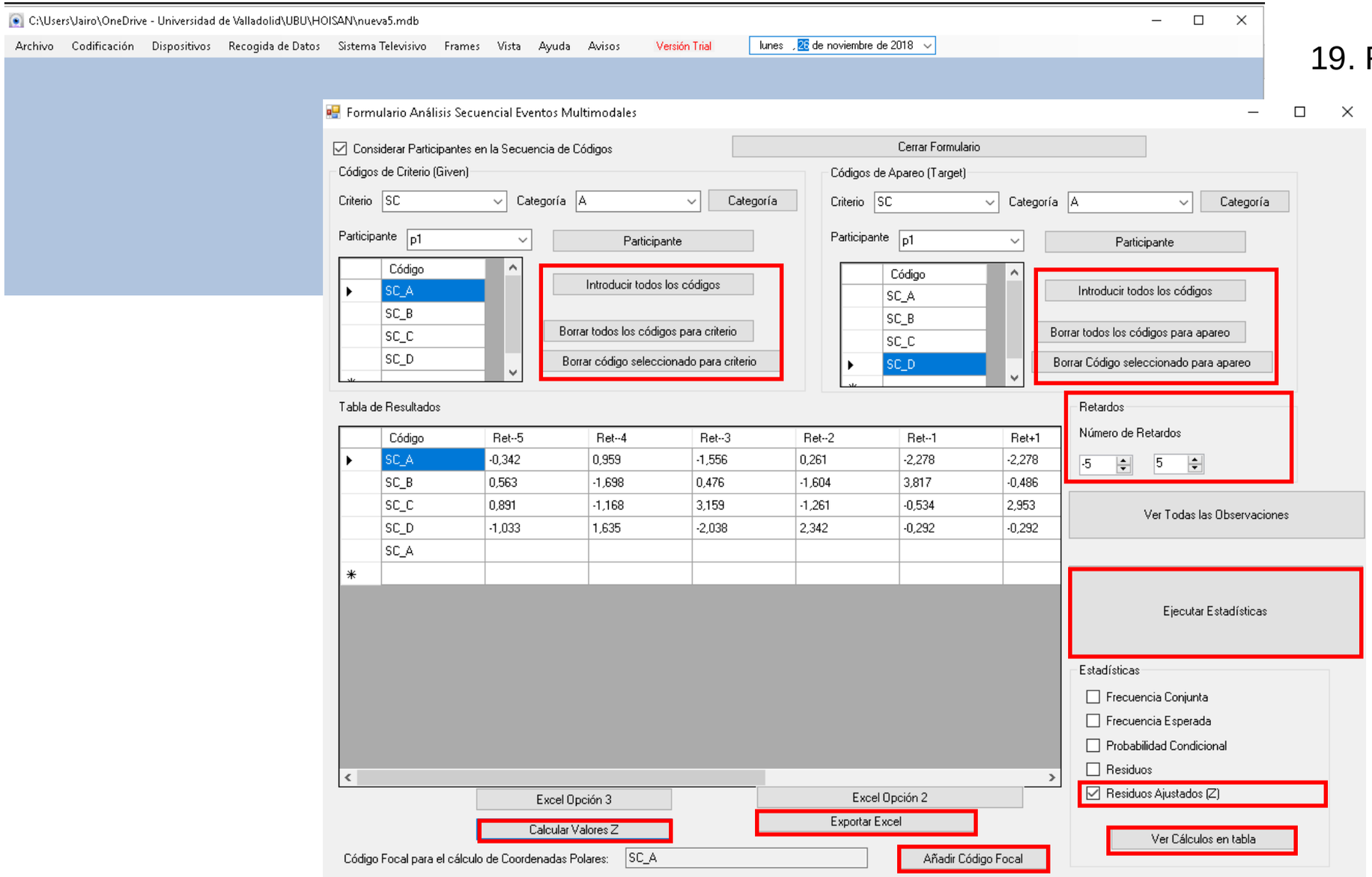
RUNNING IN HOISAN, v.2.0



19. Run Lag Sequential Analysis

4.3. Polar Coordinate Analysis

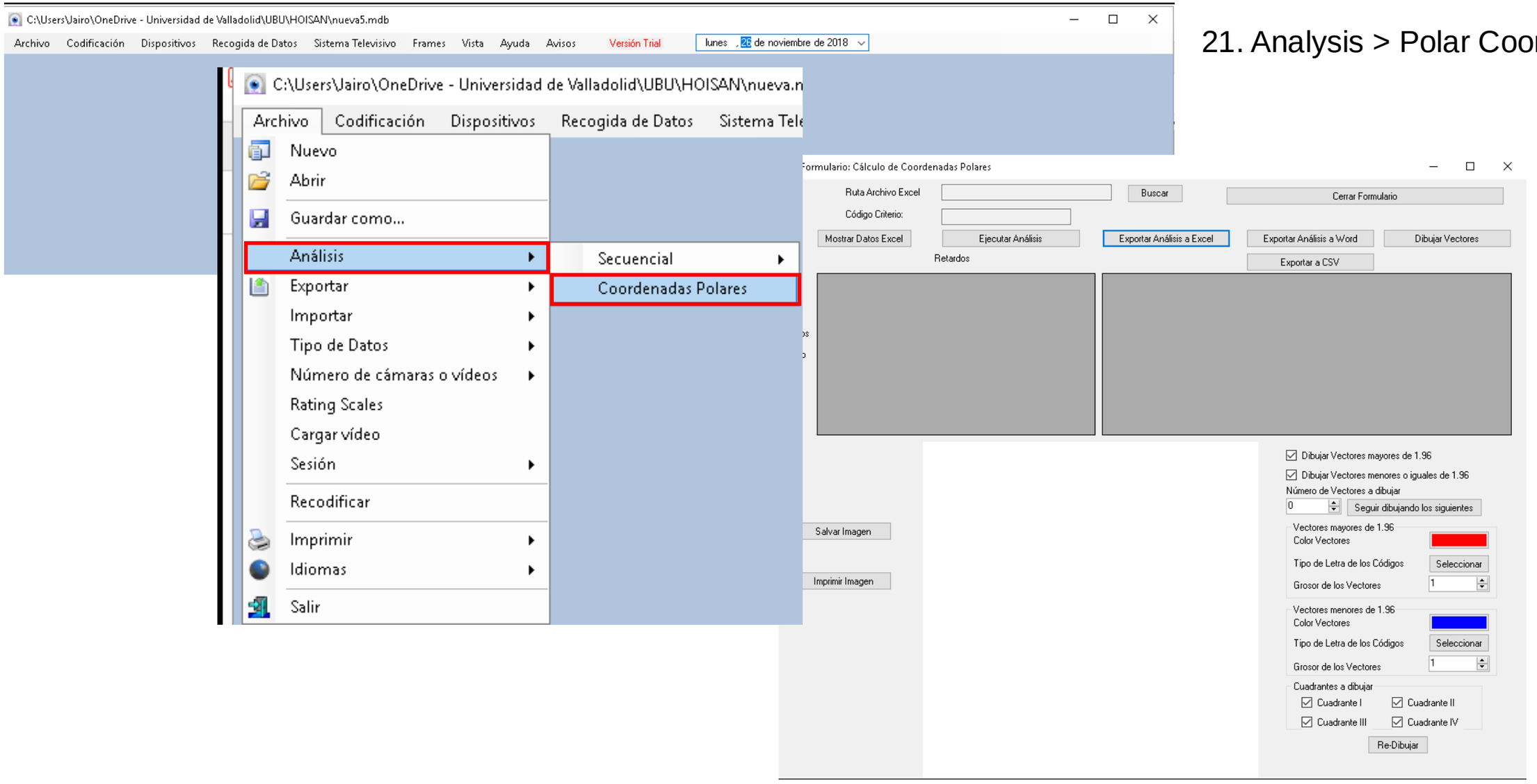
RUNNING IN HOISAN, v.2.0



19. Run Lag Sequential Analysis
20. Close

4.3. Polar Coordinate Analysis

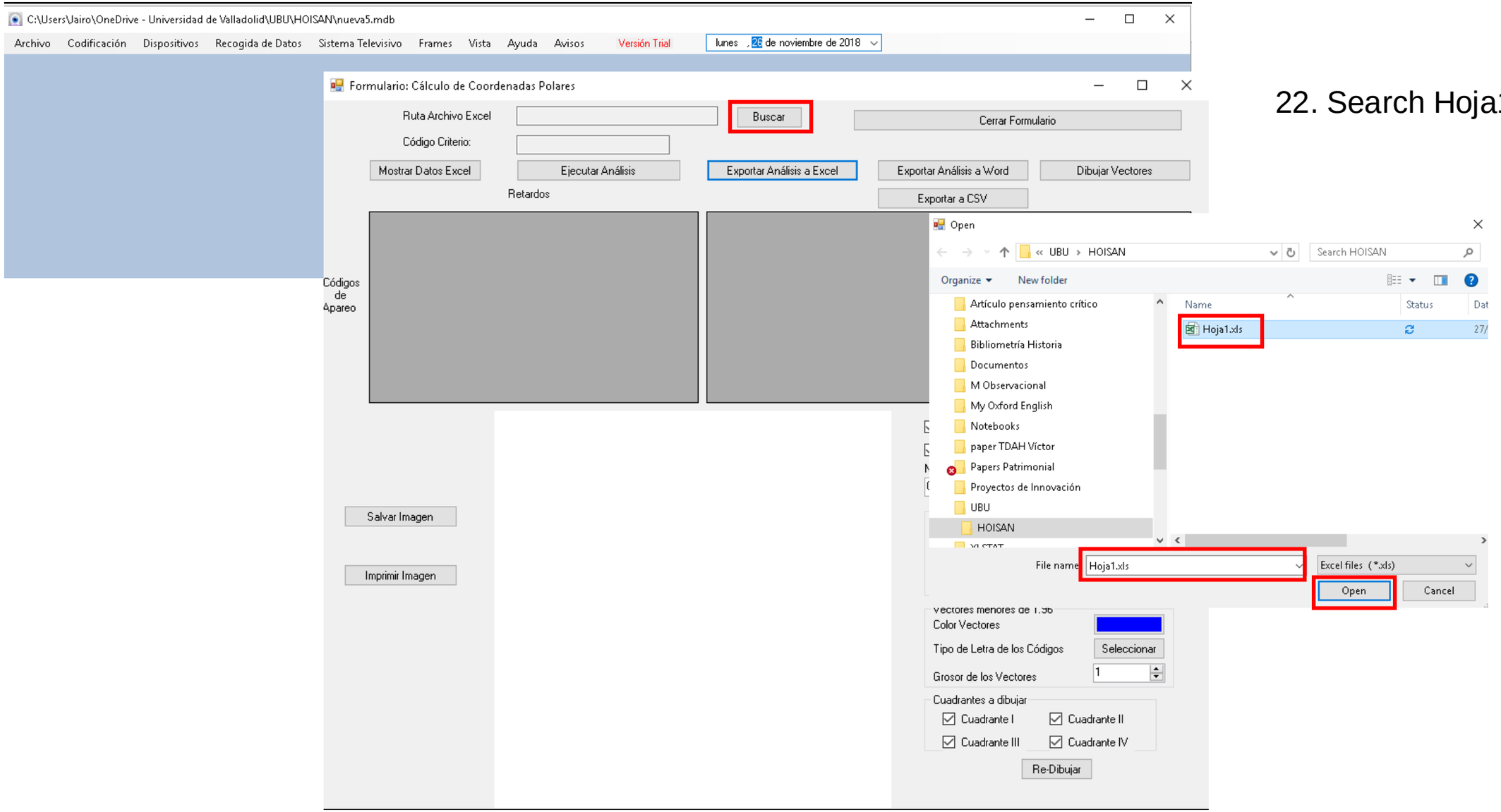
RUNNING IN HOISAN, v.2.0



21. Analysis > Polar Coordinates

4.3. Polar Coordinate Analysis

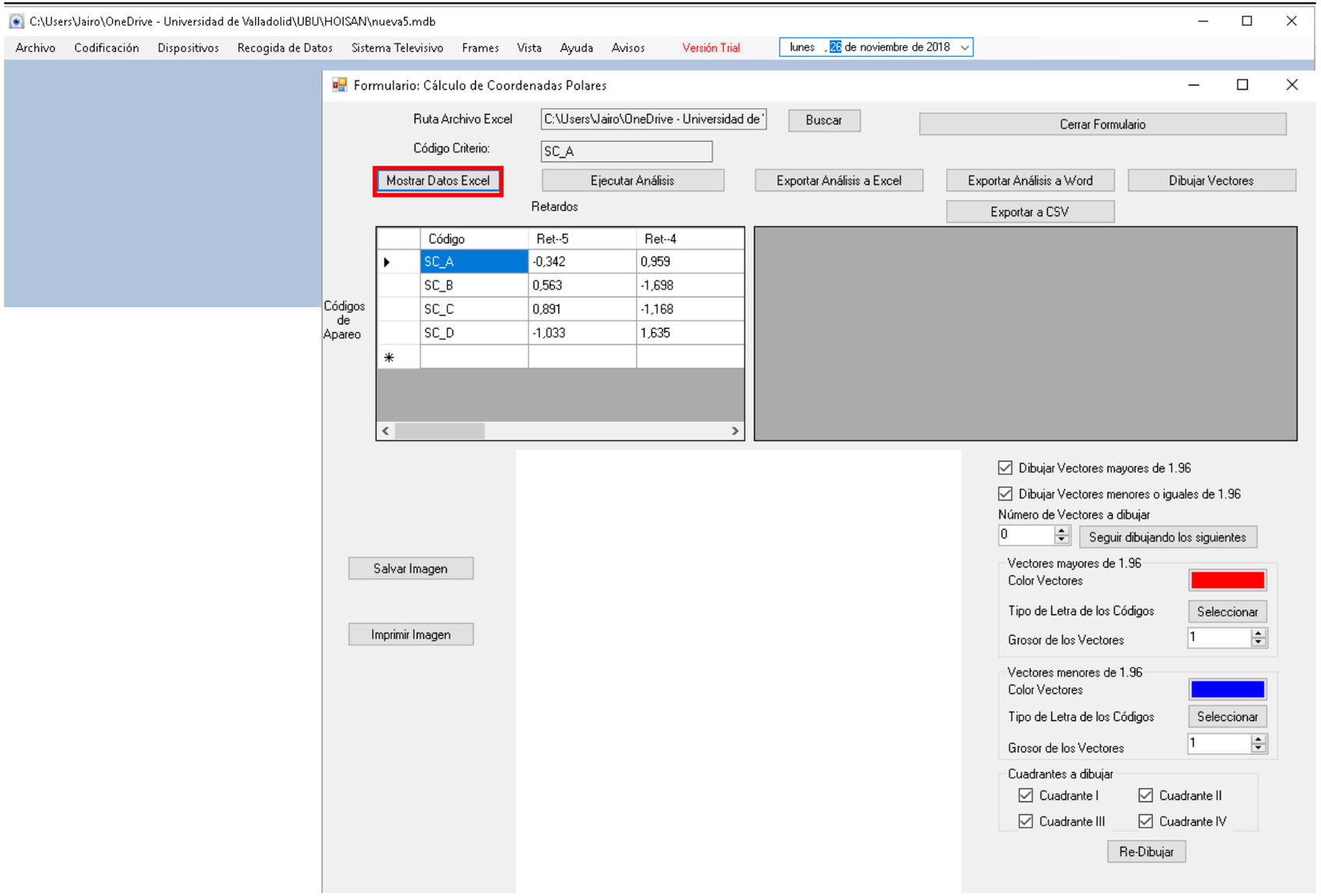
RUNNING IN HOISAN, v.2.0



22. Search Hoja1.xls

4.3. Polar Coordinate Analysis

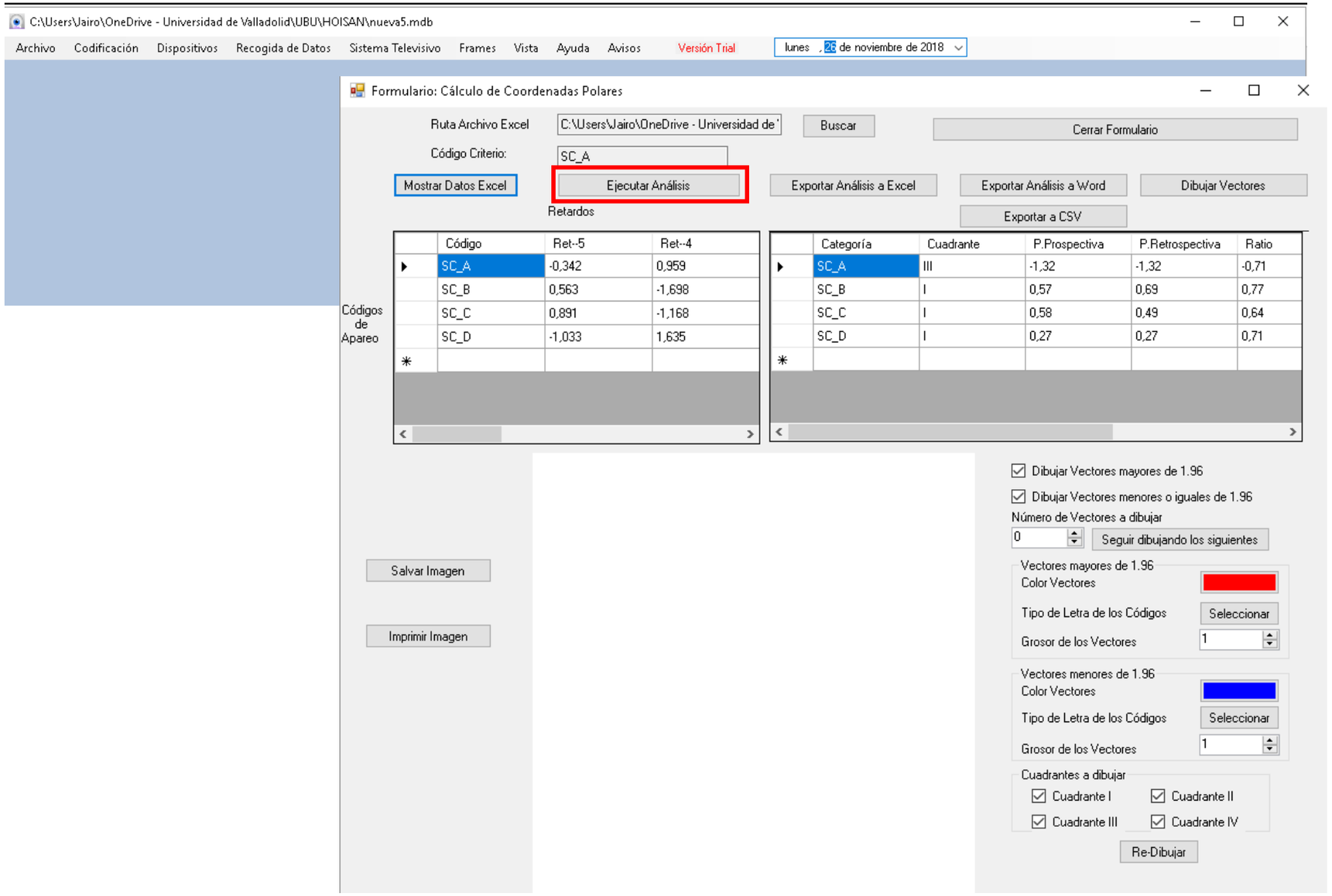
RUNNING IN HOISAN, v.2.0



23. Display Excel Data

4.3. Polar Coordinate Analysis

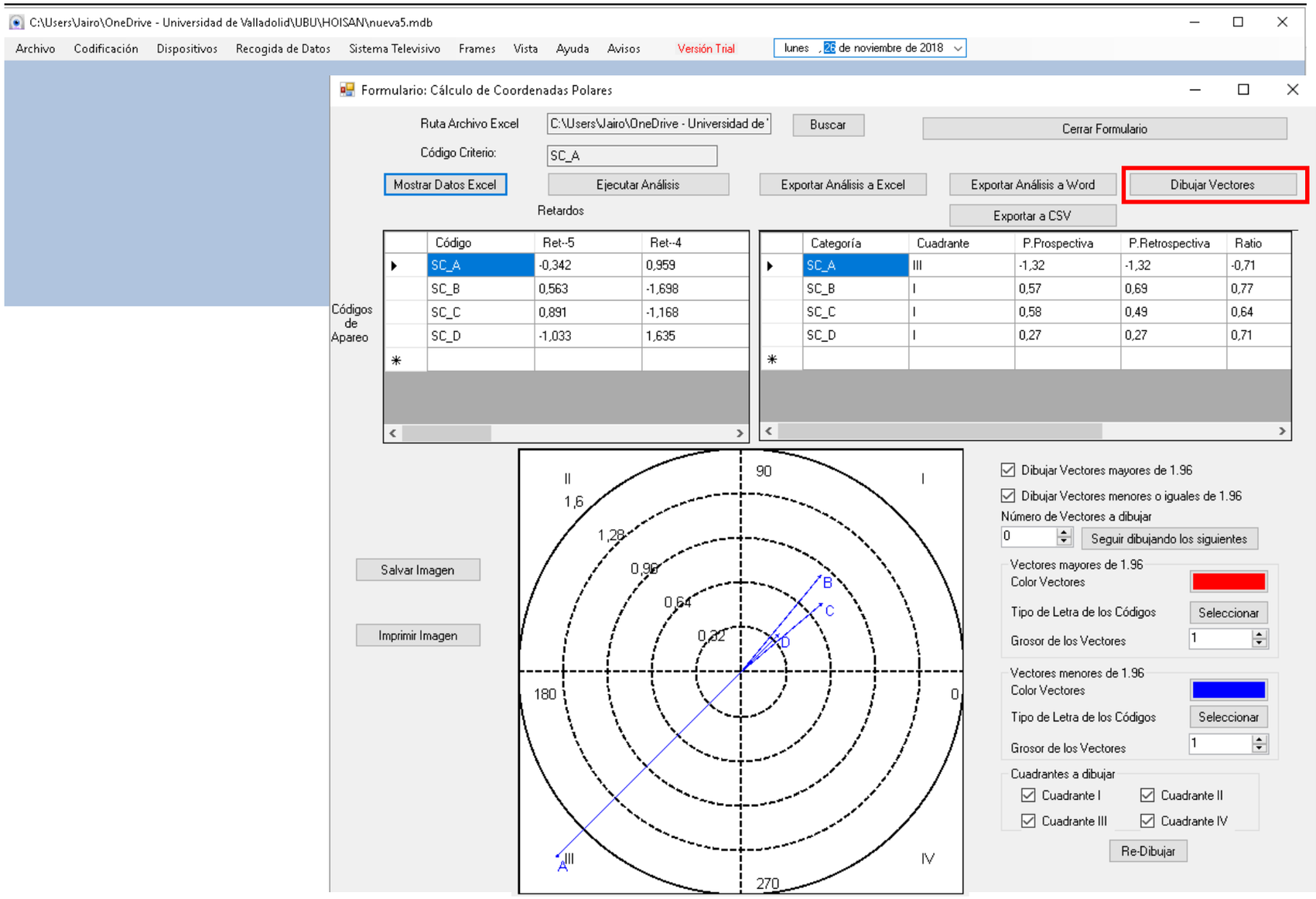
RUNNING IN HOISAN, v.2.0



24. Run Analysis

4.3. Polar Coordinate Analysis

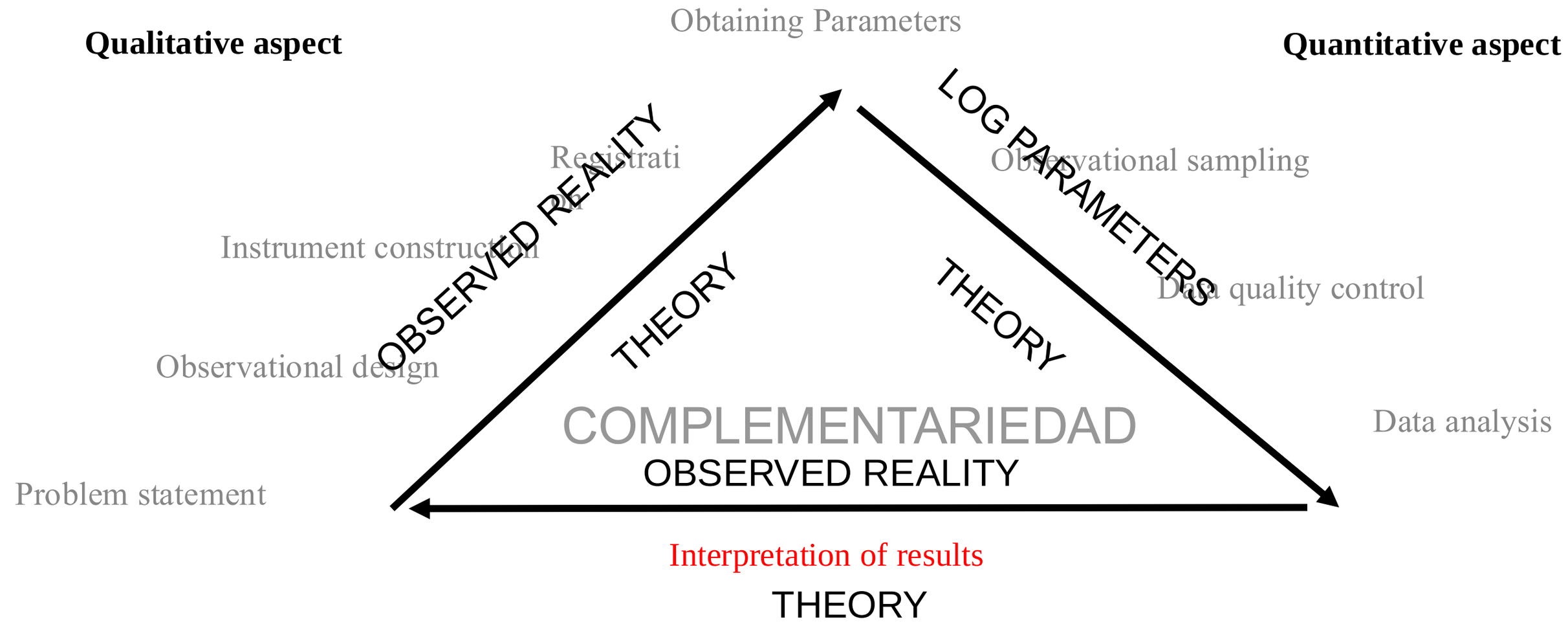
RUNNING IN HOISAN, v.2.0



25. Draw Vectors

4.4. Interpretation of Results

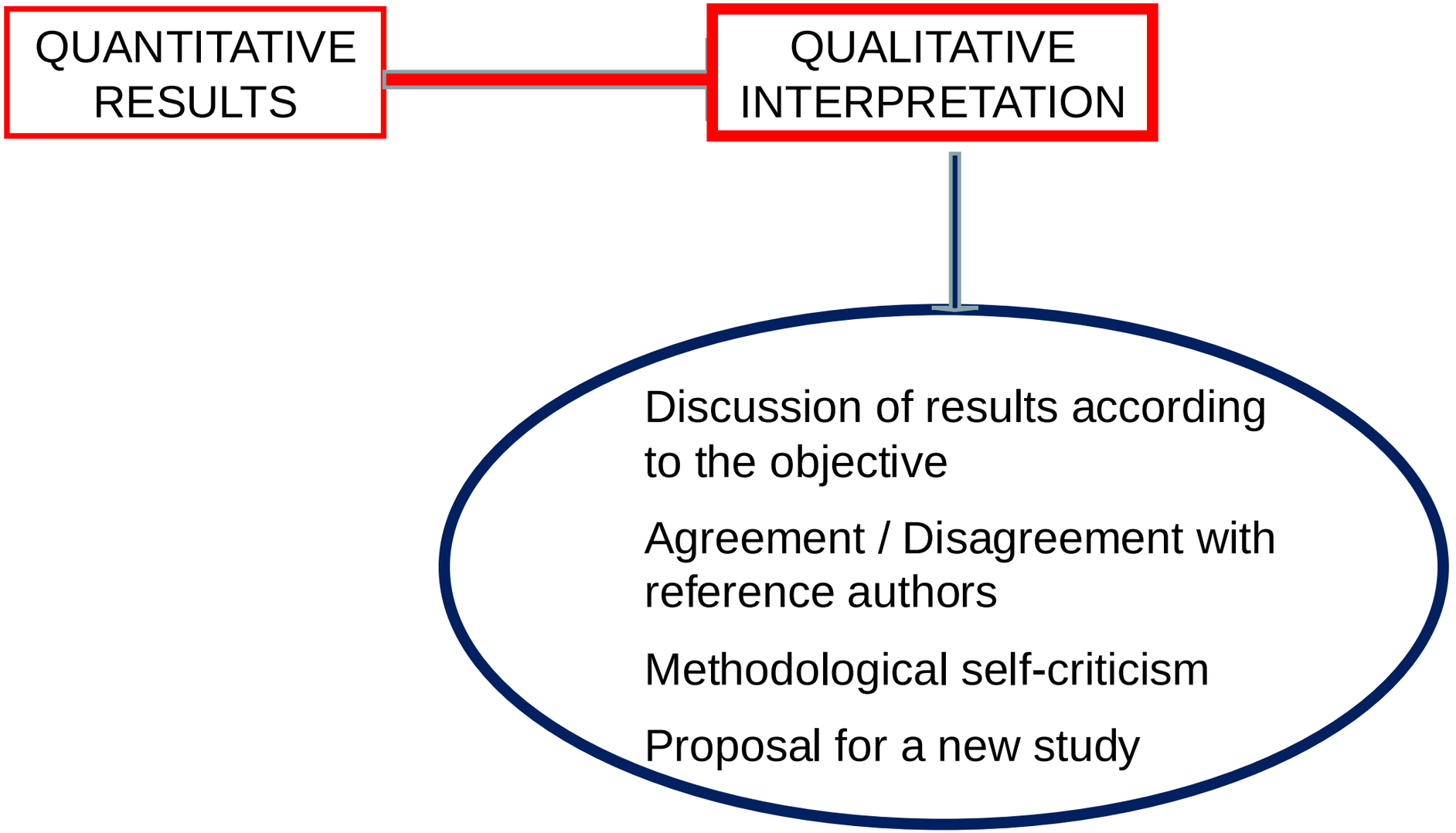
Integration into Mixed Methods



General Process of the Observational Method

Anguera, Blanco-Villaseñor, Losada, & Portell, 2018

4.4. Interpretation of Results

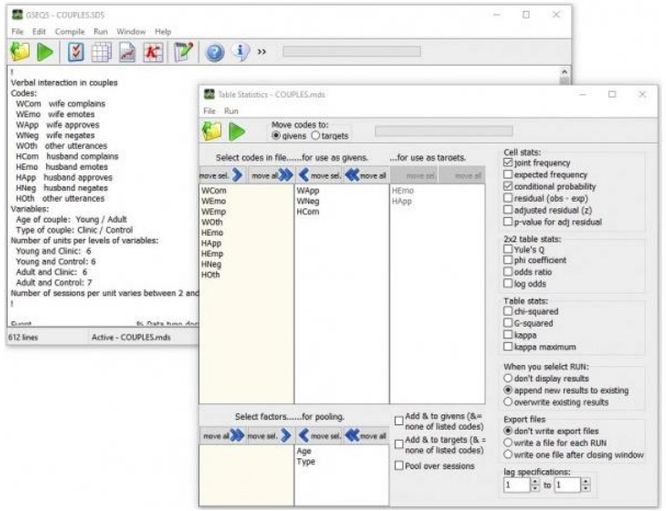


4.5. Software for data analysis

GSEQ
Free Software for the Analysis of Interaction Sequences

GSEQ and SDIS Software

The Generalized Sequential Querier is a computer program for analyzing sequential observational data. It computes a variety of simple and contingency table statistics. Simple statistics include frequencies, rates, durations, and proportions (percentages).



esiduals, chi-squares
cs can be computed
ooled over sessions,

uage for describing
tion of individuals,
r for SDIS-formatted
ed SDS files), which
included in GSEQ.

rted from other data
CT and Noldus' The
one utilities ActSds,
nd ObsTxtSds (The

lities expand analytic possibilities. New codes can be created form existing ones using standard logical and chaining. The window command is especially useful. It lets you define new codes (windows) that are particular, perform time-window sequential analyses.

Exportation: A major use of GSEQ is to produce statistics for export that are then analyzed by standard statistical packages such as SPSS or SAS or by standard

Download GSEQ

Unzip and run the setup to install the program.

Thereafter, to run GSEQ, click Start > Programs > GSEQ5 > GSEQ 5.1, or click on the GSEQ desktop icon.

GSEQ 5

GSEQ Version 5.1 includes new algorithms for computing interobserver agreement, both for event and timed-event sequential data, which are described in:

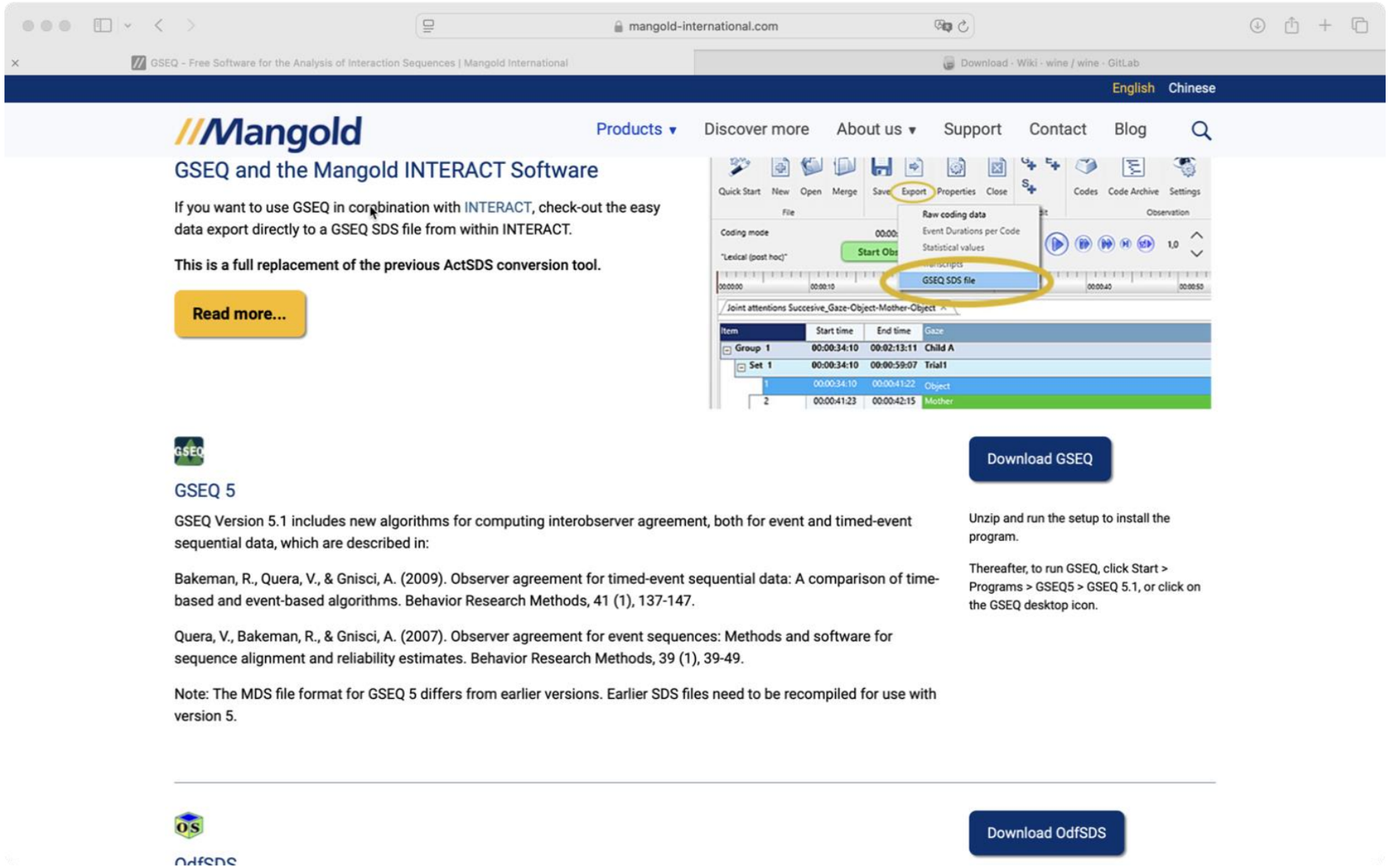
Bakeman, R., Quera, V., & Gnisci, A. (2009). Observer agreement for timed-event sequential data: A comparison of time-based and event-based algorithms. Behavior Research Methods, 41 (1), 137-147.

Quera, V., Bakeman, R., & Gnisci, A. (2007). Observer agreement for event sequences: Methods and software for sequence alignment and reliability estimates. Behavior Research Methods, 39 (1), 39-49.

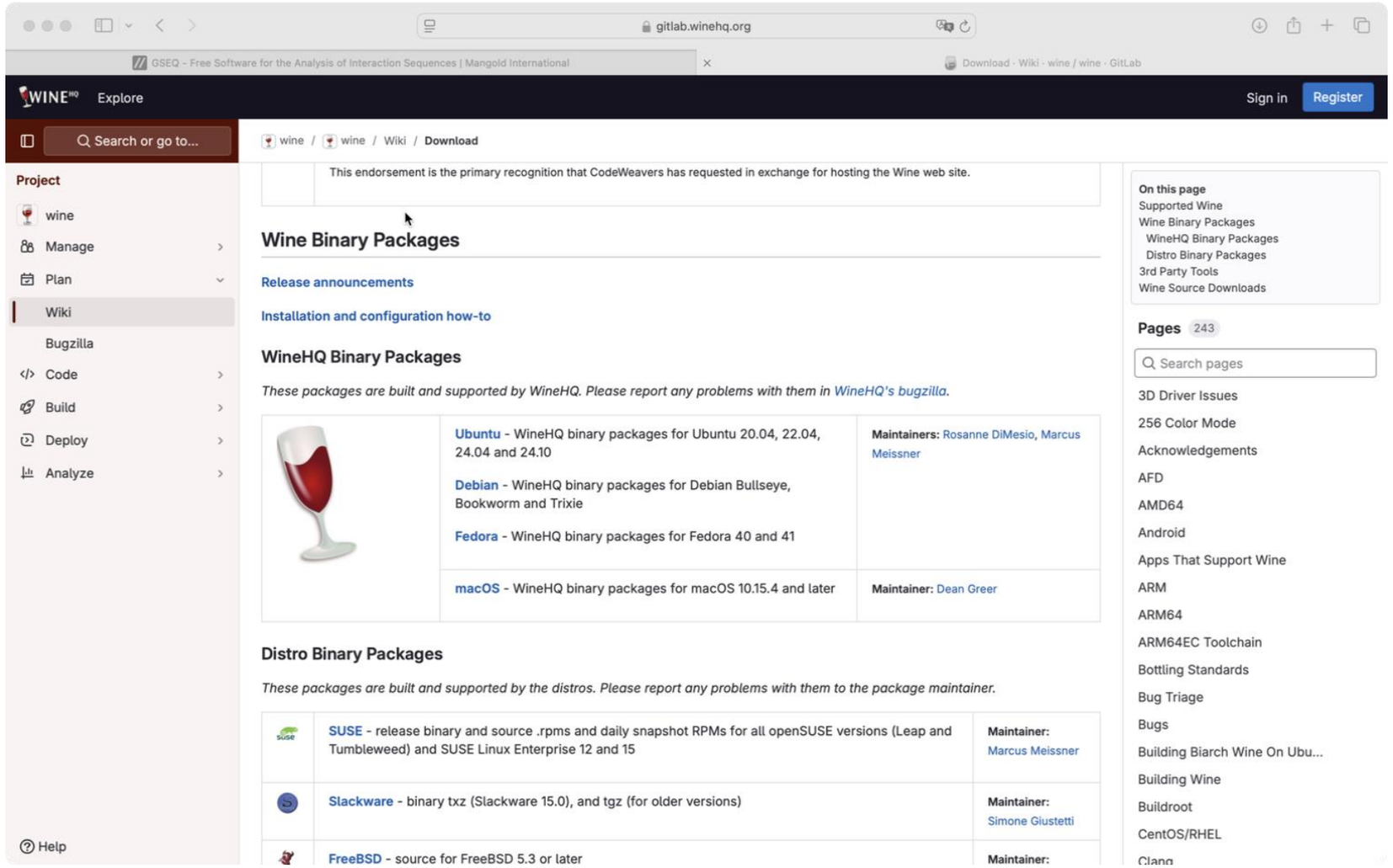
Note: The MDS file format for GSEQ 5 differs from earlier versions. Earlier SDS files need to be recompiled for use with version 5.

https://www.mangold-international.com/en/products/software/gseq.html

Installation of GSEQ in iOS



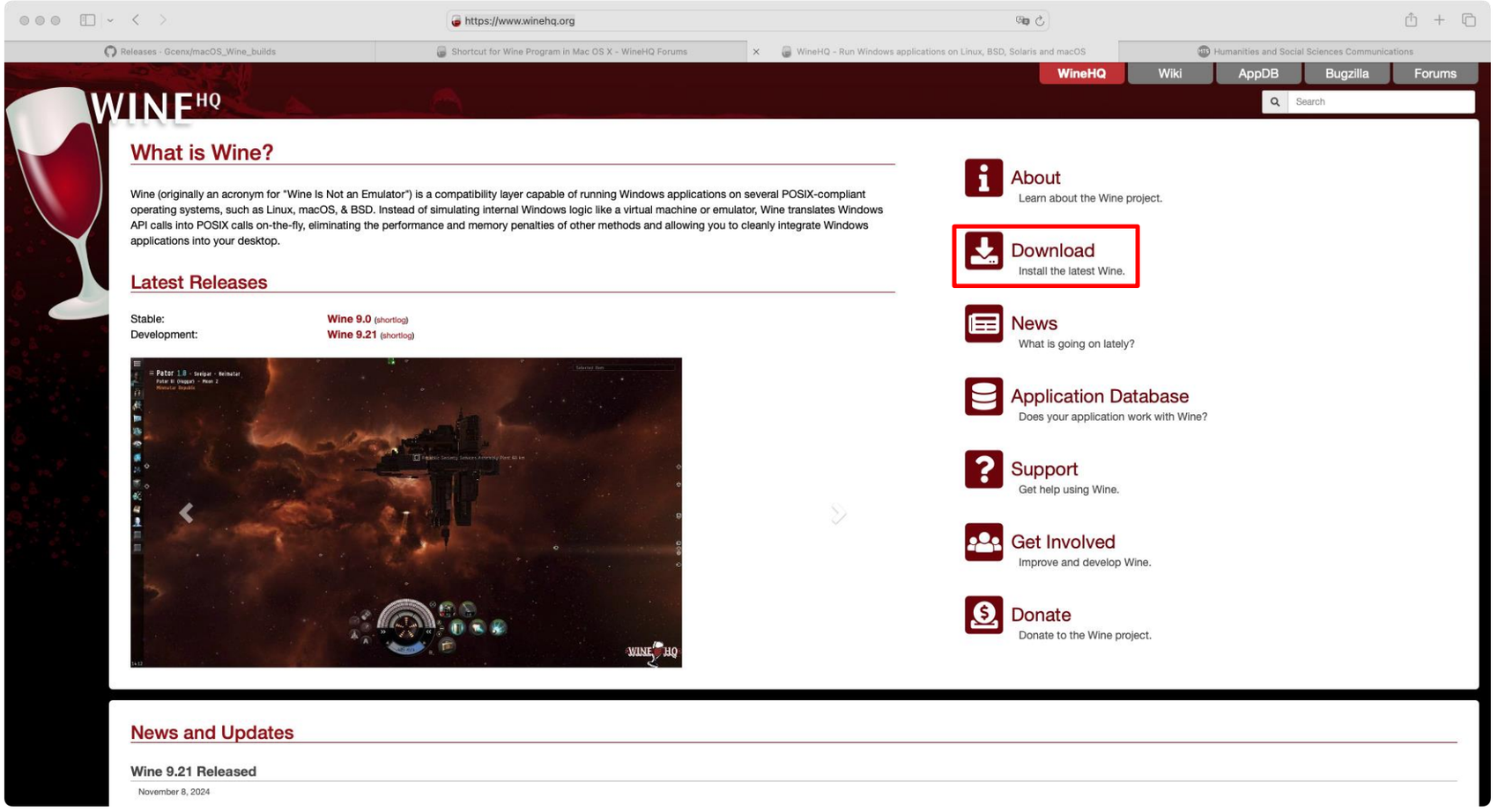
Installation of GSEQ in iOS



Installation of GSEQ in iOS

Install Wine

https://www.winehq.org



Installation of GSEQ in iOS

Install Wine

Homebrew

To install wine the following command can be used;

```
brew install --cask --no-quarantine (selected wine package)
```

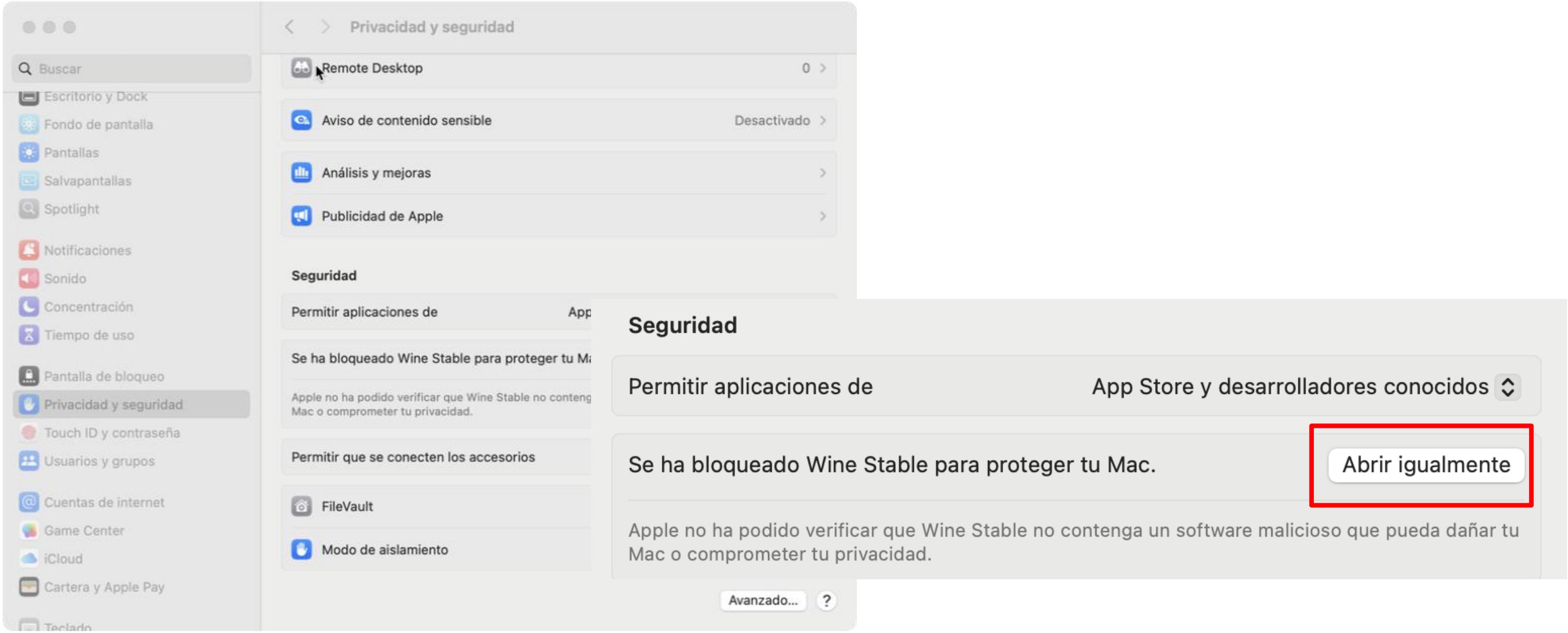
wine-stable, **wine@devel** or **wine@staging** packages can be installed using the above example. The advantage of installing via homebrew means wine is available from a standard terminal session The **--no-quarantine** line is to avoid brew adding the quarantine flag.

brew install --cask --no-quarantine wine-stable

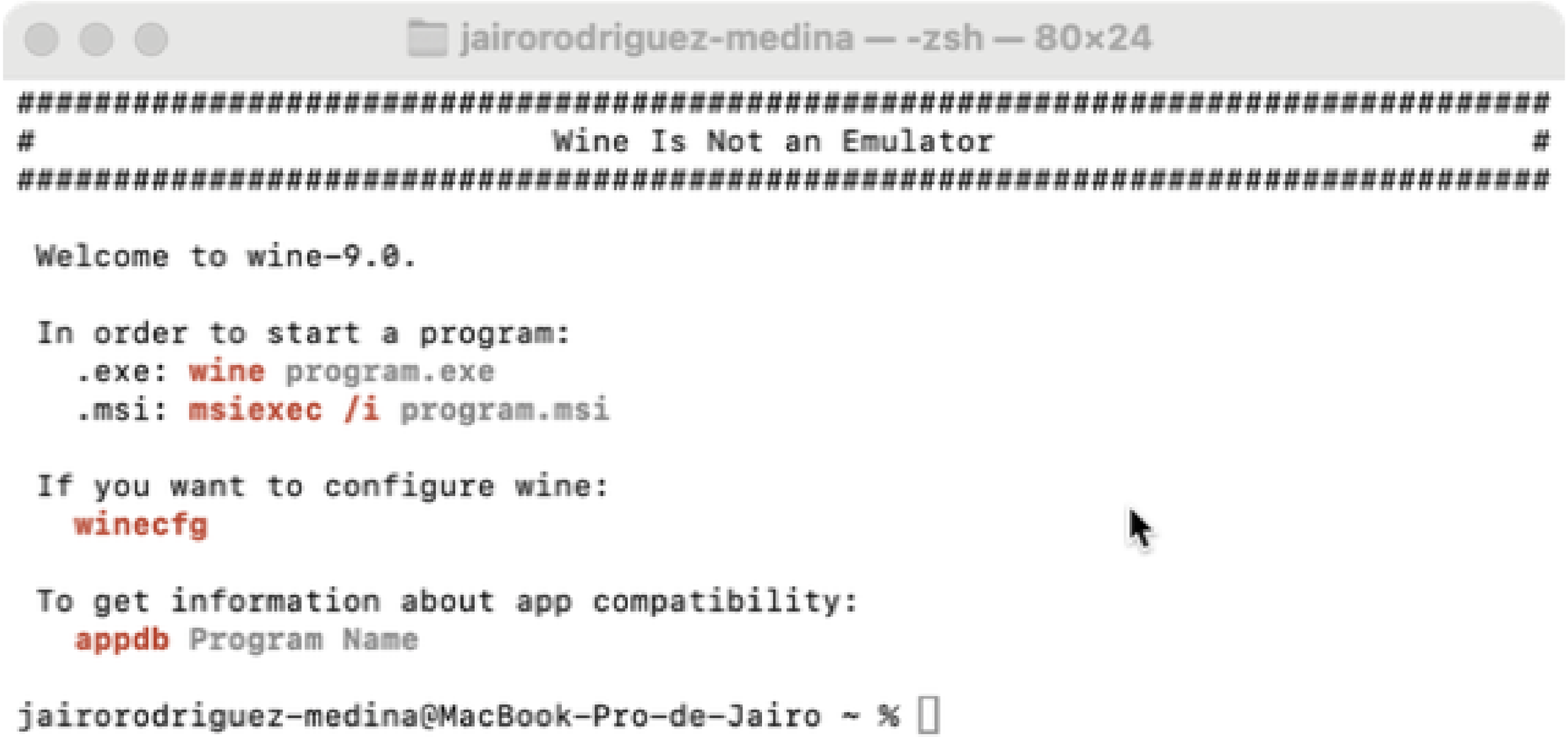
If it fails, install the following:

/bin/bash -c "$(curl -fsSL https://raw.githubusercontent.com/Homebrew/install/HEAD/install.sh)"

Installation of GSEQ in iOS



Installation of GSEQ in iOS

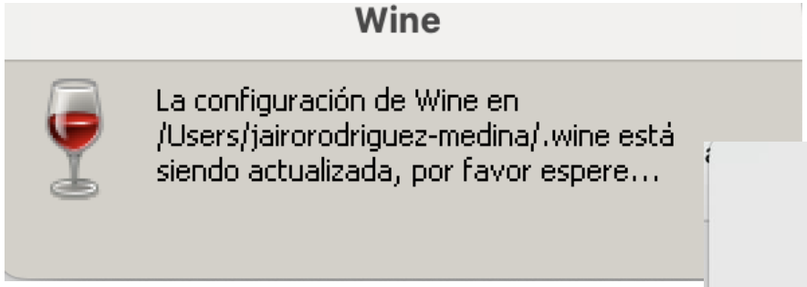


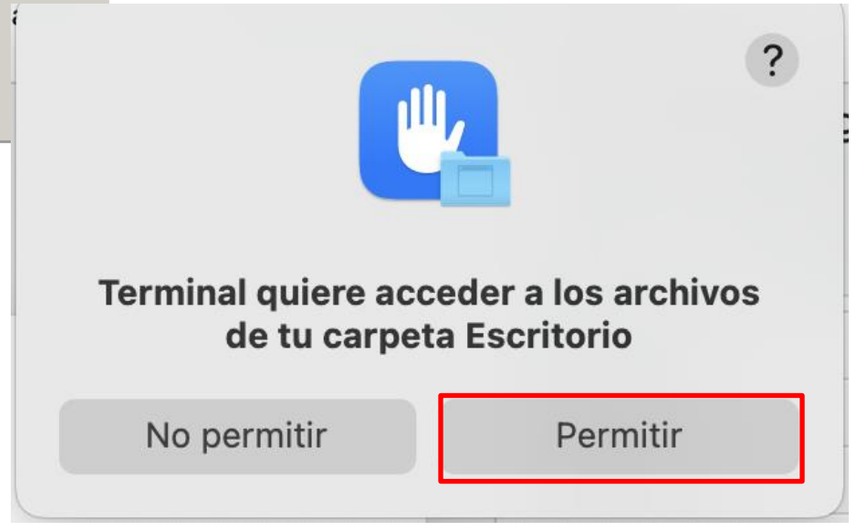
Installation of GSEQ in iOS

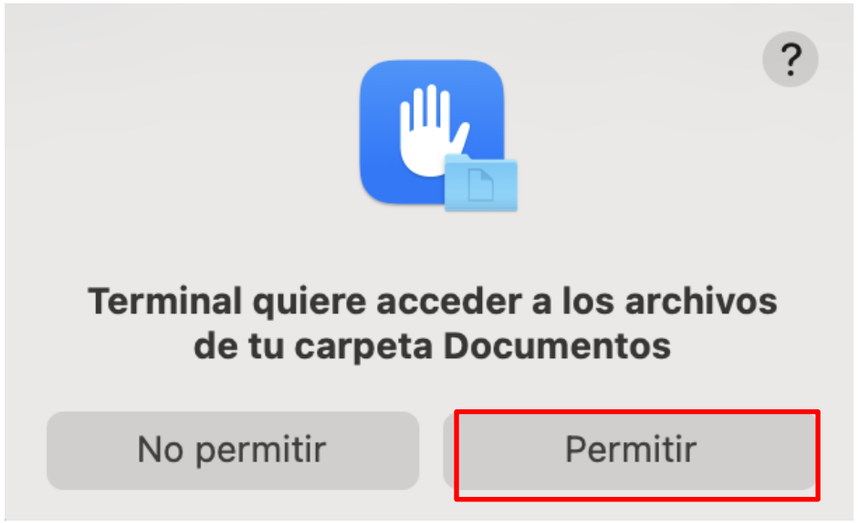
Install GSEQ

jairorodriguez-medina@MacBook-Pro-de-Jairo ~ %

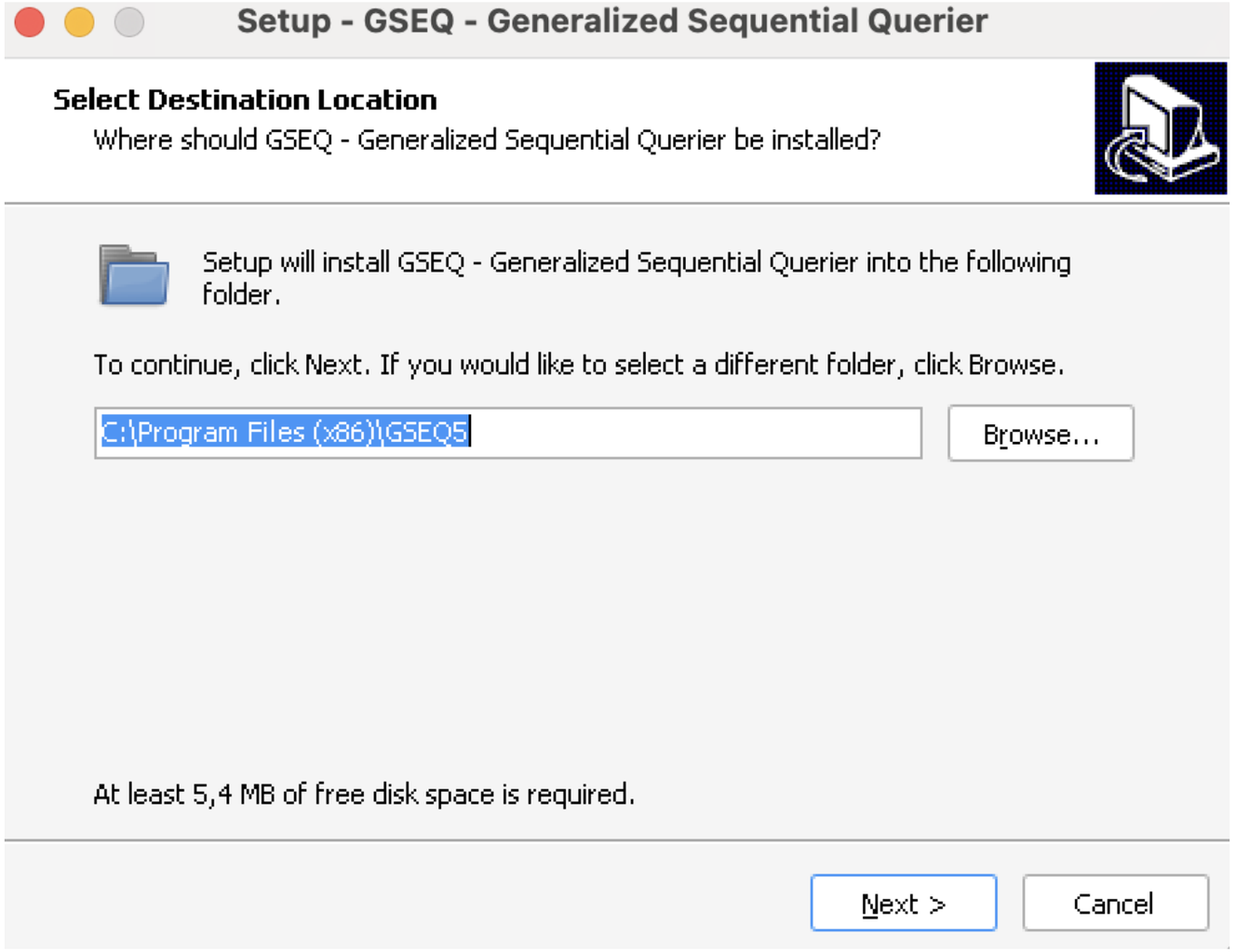
wine /Users/jairorodriguez-medina/Downloads/GSEQ51Setup.exe



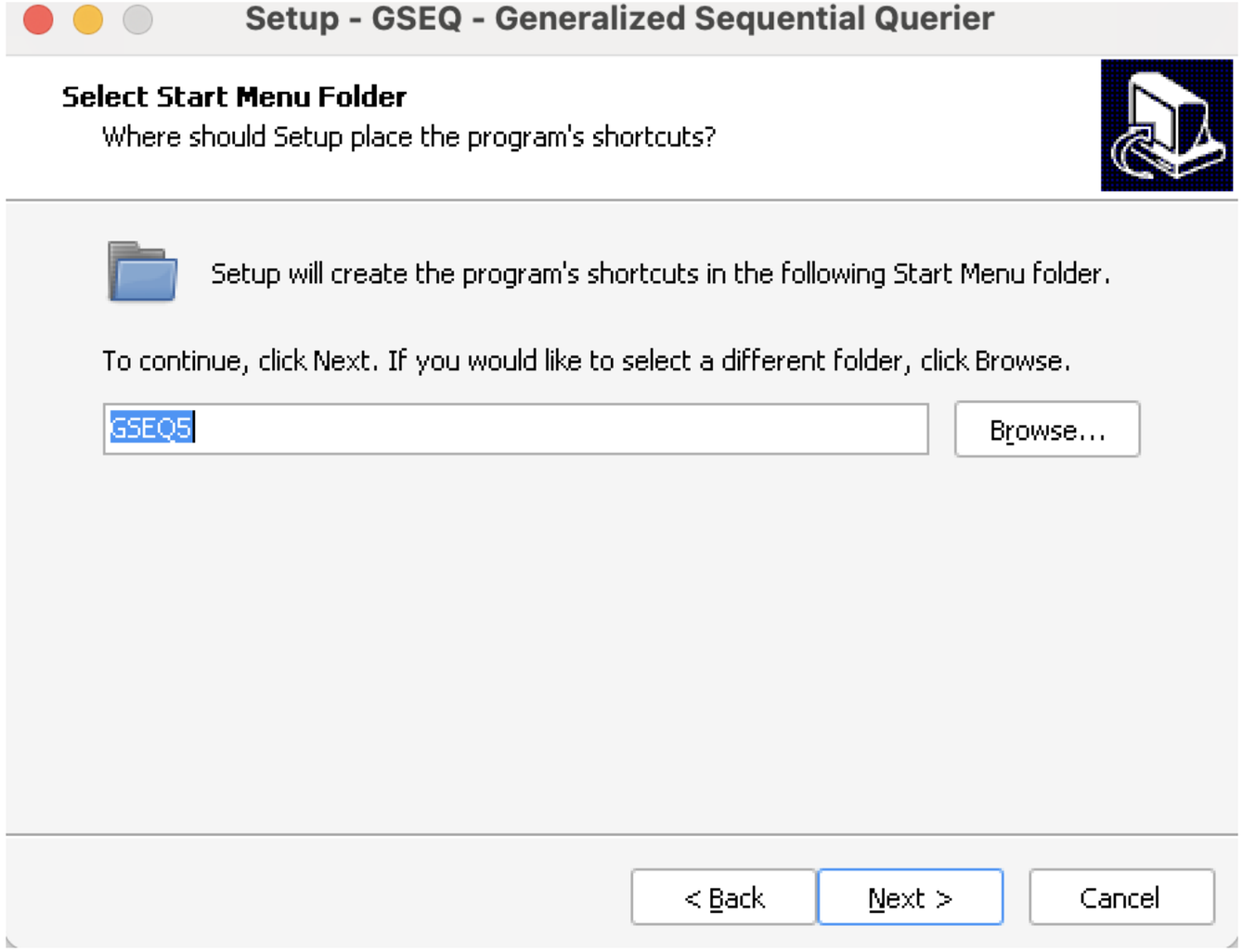




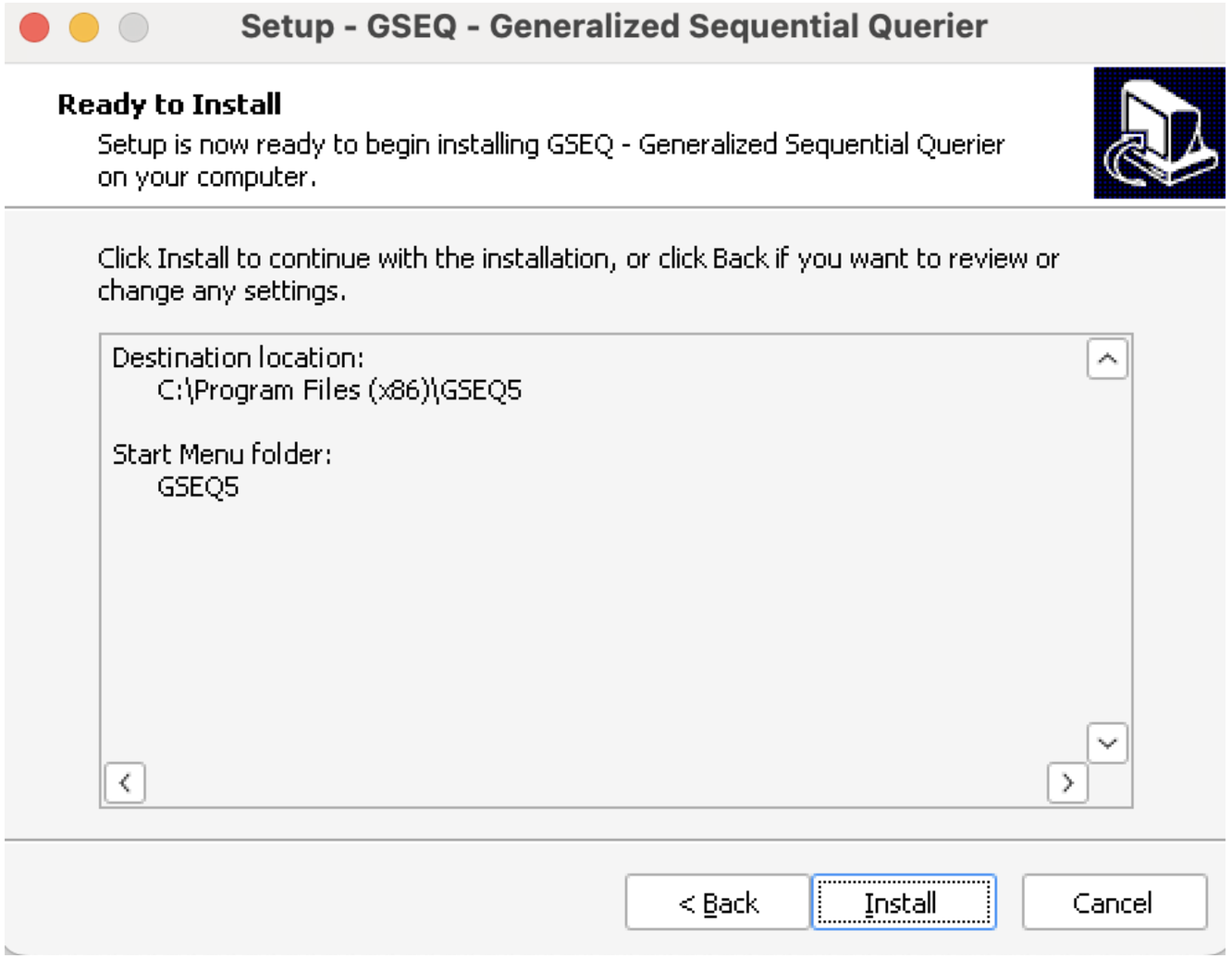
Installation of GSEQ in iOS



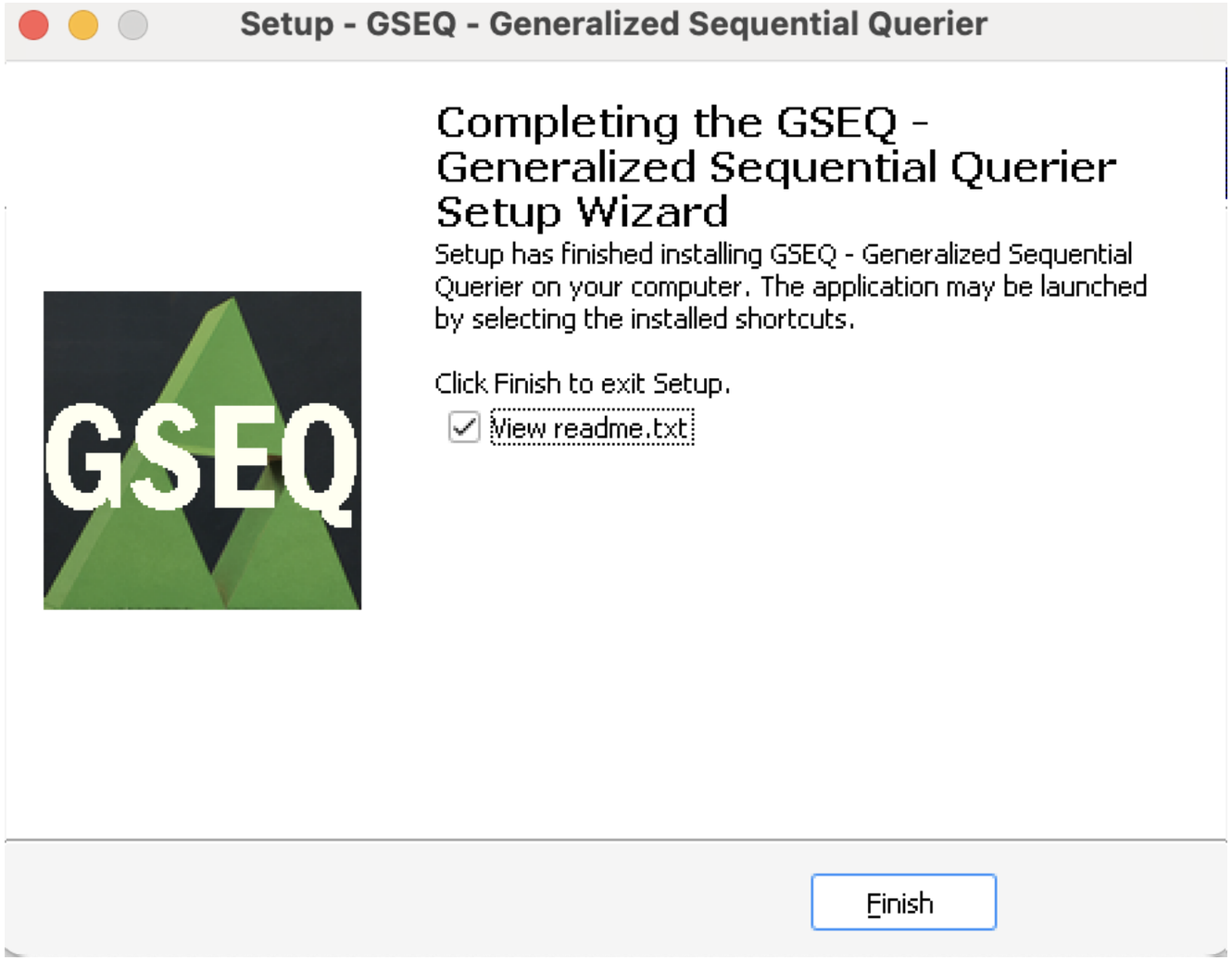
Installation of GSEQ in iOS



Installation of GSEQ in iOS



Installation of GSEQ in iOS



Installation of GSEQ in iOS

wine "C:\Program Files (x86)\GSEQ5\GSEQ5.exe"

CONCLUSIONS

- Systematic observation allows qualitative data to be collected that can be quantified
- Records can take many formats (descriptive, semi-systematized, systematized, and the multiple variants of each)
- It is possible to obtain a matrix of codes from the systematized records
- Quantitative analysis facilitates access to the possible existence of a multiple case from single cases
- The quantitative analyses that allow the detection of regularities are lag-sequential analysis, detection of hidden time patterns, and vectorization of the map of polar coordinates, which always require a qualitative interpretation of the quantitative results
- Qualitative data recorded through systematic observation have significant potential in their potential applications to the field of health, based on an excellent combination of flexibility and rigour

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