



Universidad de Valladolid

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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3. Data Collection and Management

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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

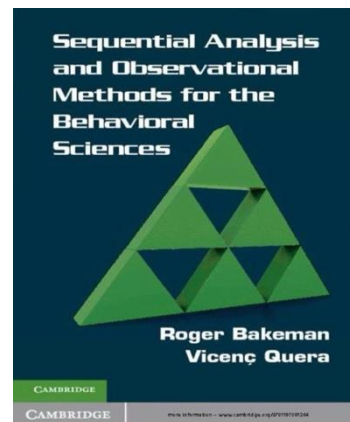
1.4. Applicability

1.5. Why we use systematic observation

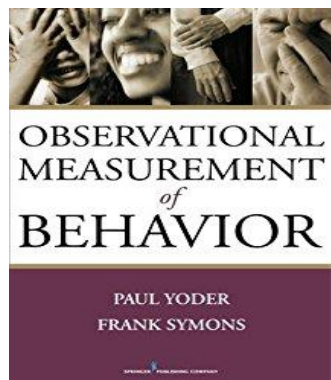
1.1. Definition and purpose of systematic observation (1)



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



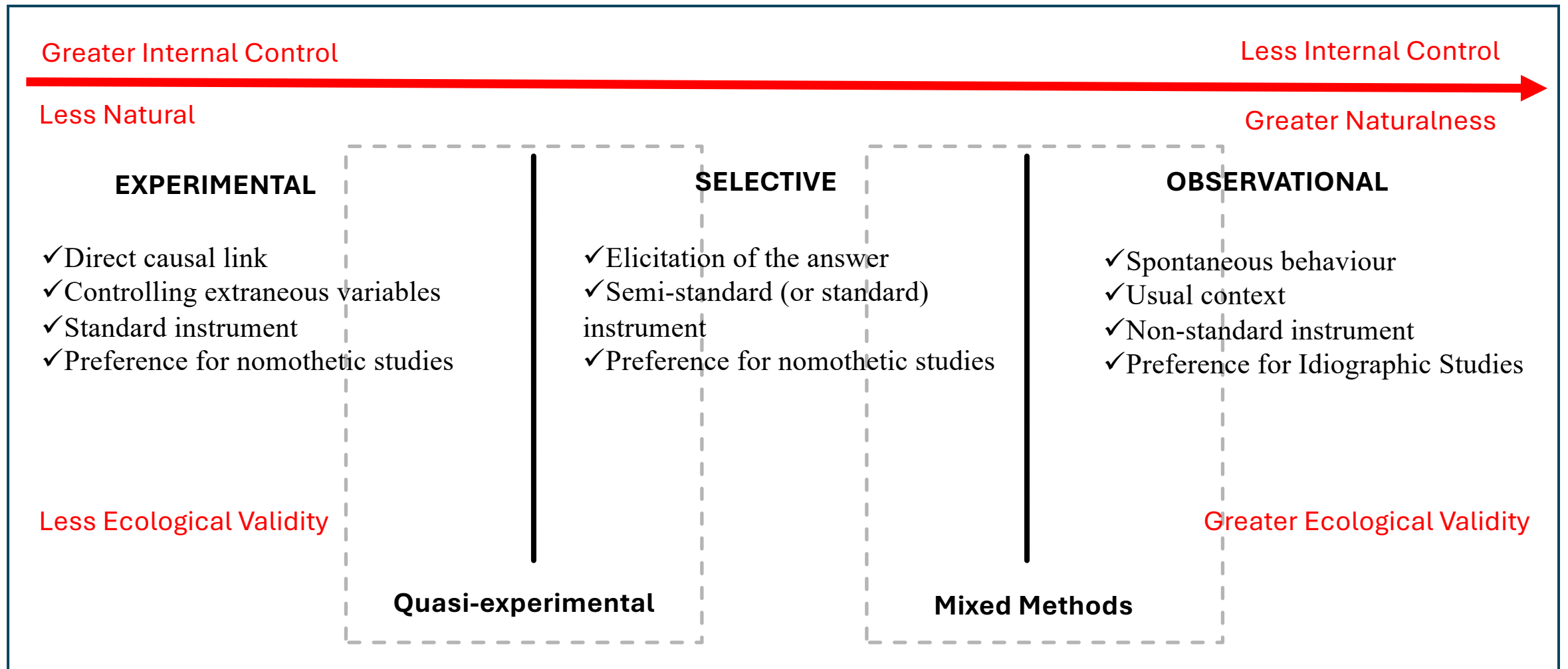
(...) as we understand the term, observational methods are **unabashedly quantitative** (Bakeman y Quera, 2011, p. 2)



The set of measurement principles we address is particularly well suited to falsifying hypotheses **using a quantitative approach** (Yoder y Symons, 2010, p. 2)



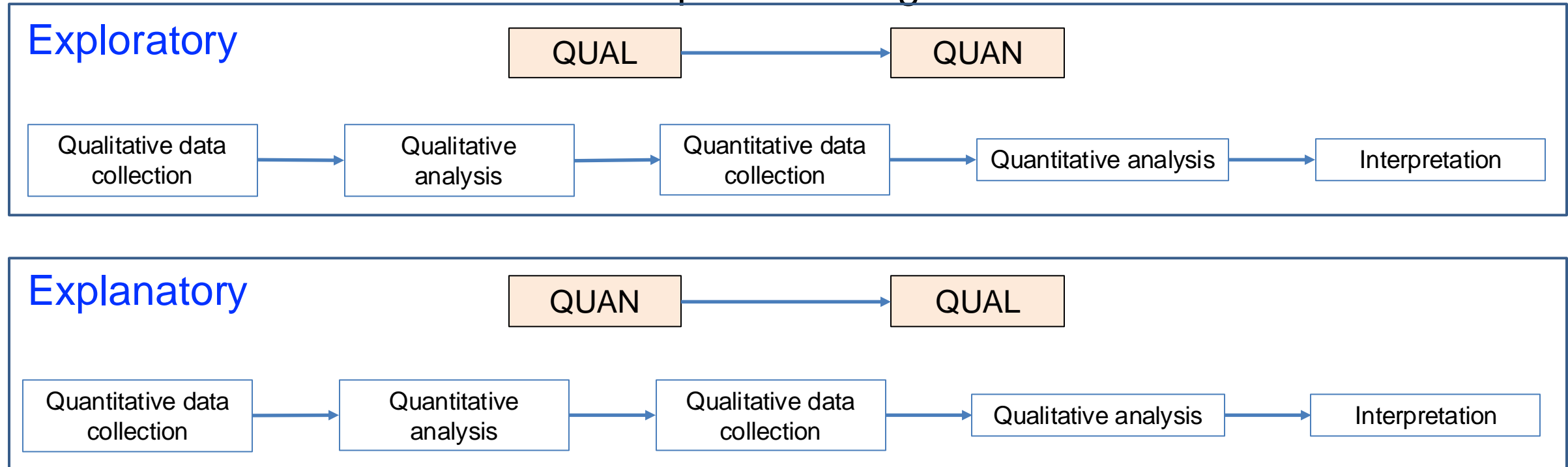
1.2. Systematic Observation as a mixed method (1)



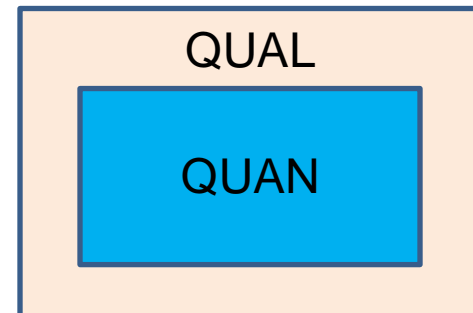
The observer LISTENS to nature while the experimenter INTERROGATES it
(Cuvier, 1817)

1.2. Systematic Observation as a mixed method (2)

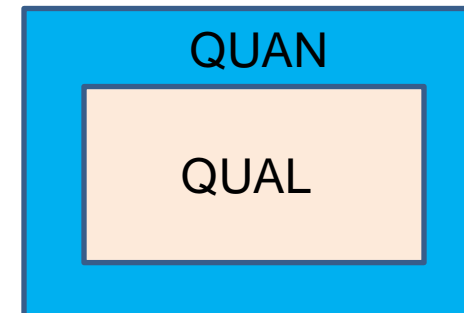
Sequential designs



Concurrent (convergent) designs



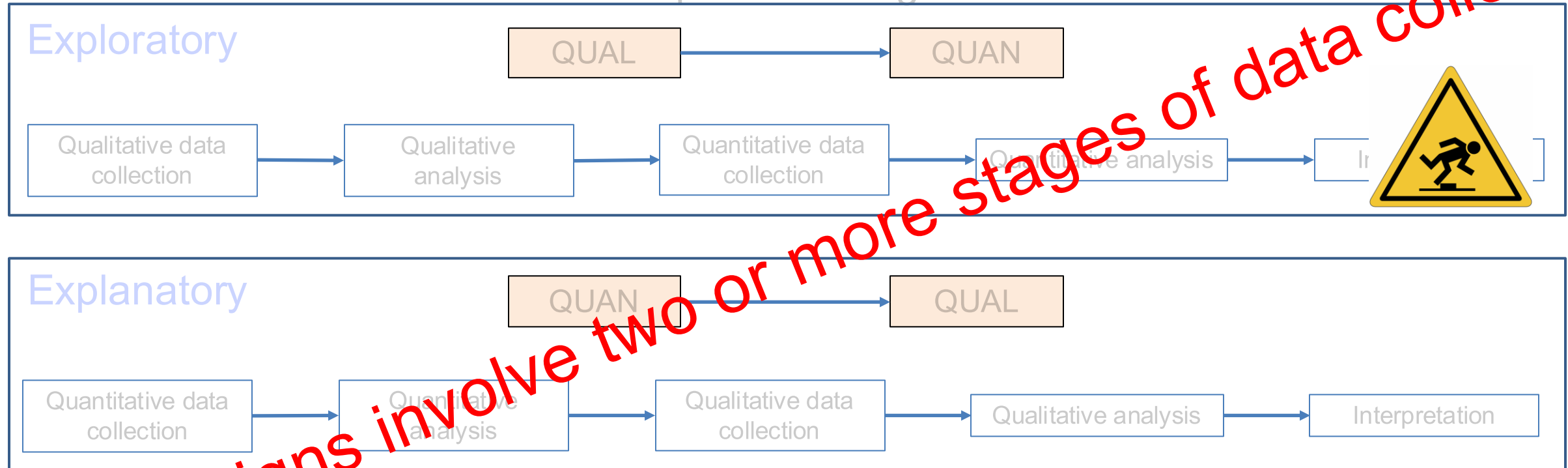
OR



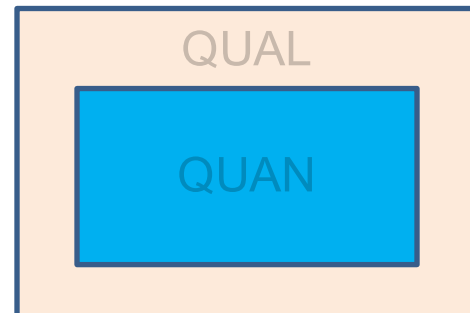
Basic designs in mixed methods

1.2. Systematic Observation as a mixed method (3)

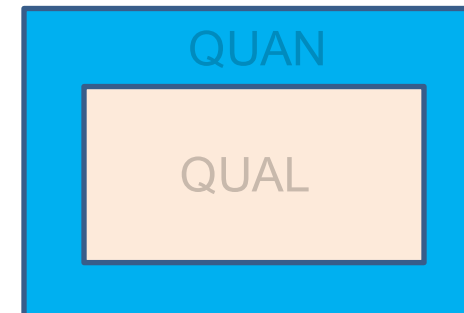
Sequential designs



Concurrent (convergent) designs



OR

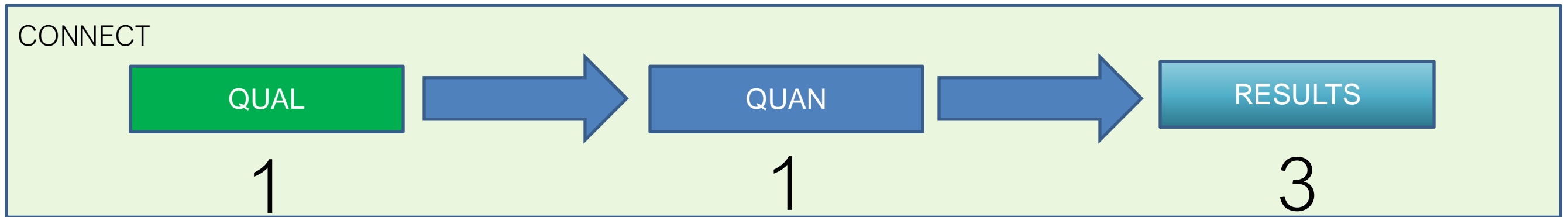


Basic designs in mixed methods

These designs involve two or more stages of data collection

1.2. Systematic Observation as a mixed method (4)

The 1 + 1 = 3 Integration Challenge
(Fetters & Freshwater, 2015)

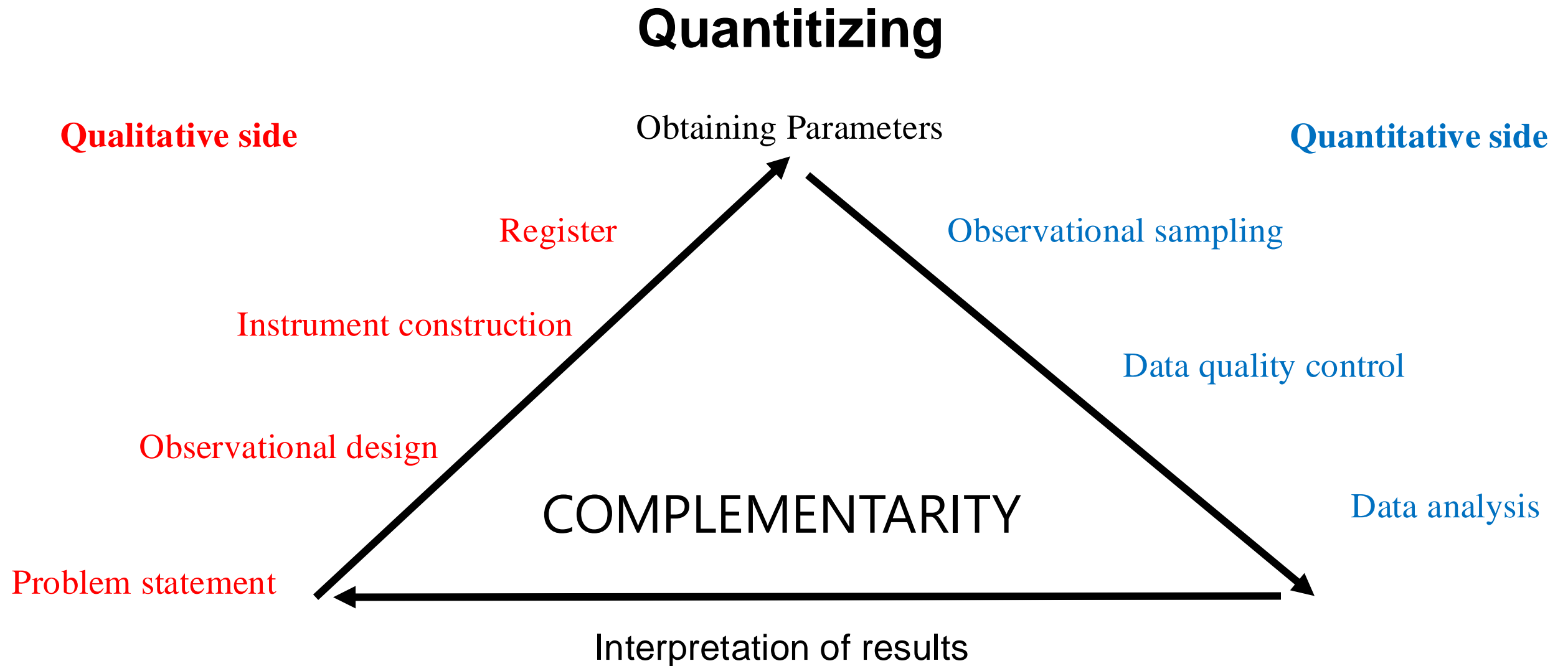


Mixed Methods Approach to Describe Social Interaction During a Group Intervention for Adolescents With Autism Spectrum Disorders

Carlota Alcover^{1,2}, M^a. 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-Medina⁴, M. Teresa Anguera⁵ and Eulàlia Arias-Pujol¹*

Check for updates

1.3. General Process of the Observational Method (1)



1.3. General Process of the Observational Method (2)

Functional equation of observation

$$O = P + I + Pk - \text{Bias}$$

Reactivity

Expectancy

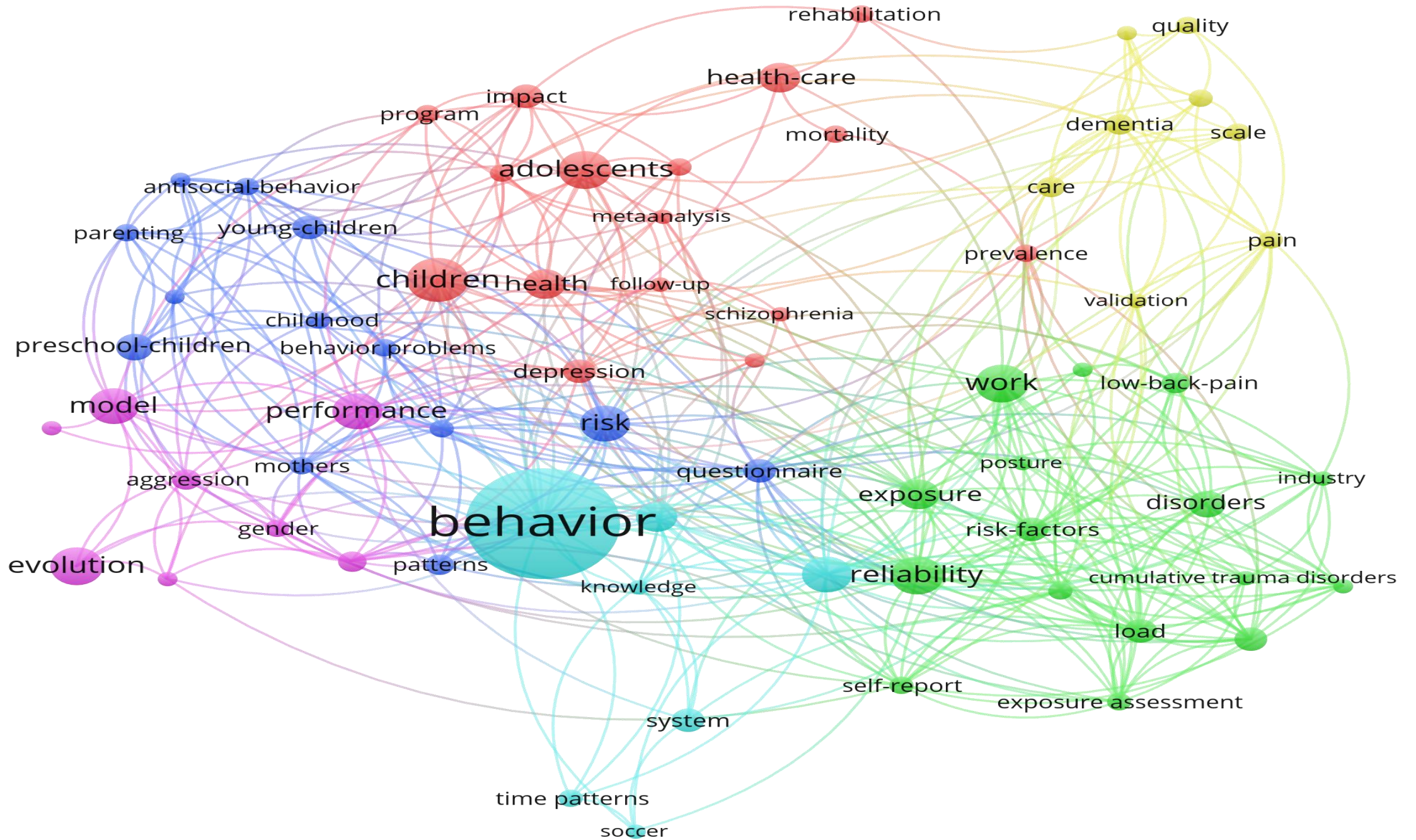
O = Observation

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 Li¹  | Yonghan Peng¹  | Yiting Lu¹  | Yumin Zhang² 

Communicative interaction

Analysis of communicative interaction in autism

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

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-Navarro² · Víctor Arias³ · Benito Arias⁴ · M. Teresa Anguera⁵

Social participation

Social Skills

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

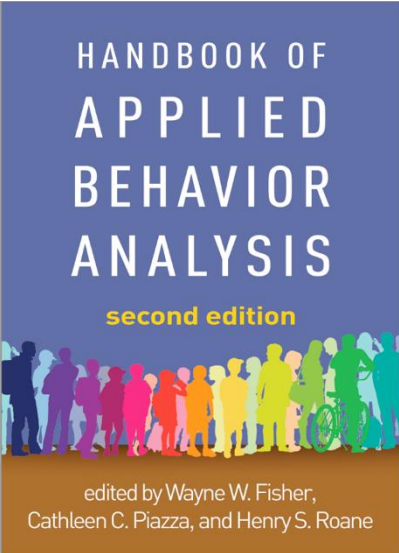
ORIGINAL PAPER



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

Carlota Alcover¹  · M. Ángeles Mairena² · Jairo Rodríguez-Medina³ · Marcela Mezzatesta² · Gemma Balaña² · Neus Elias² · Maria Elias² · Eulàlia Arias-Pujol¹

1.4. Applicability (5)



HANDBOOK OF APPLIED BEHAVIOR ANALYSIS
second edition

edited by Wayne W. Fisher, Cathleen C. Piazza, and Henry S. Roane

CHAPTER 12
Direct Observation

Rachel H. Thompson and John C. Borrero

2021



Second Edition

Functional Analysis in Clinical Treatment

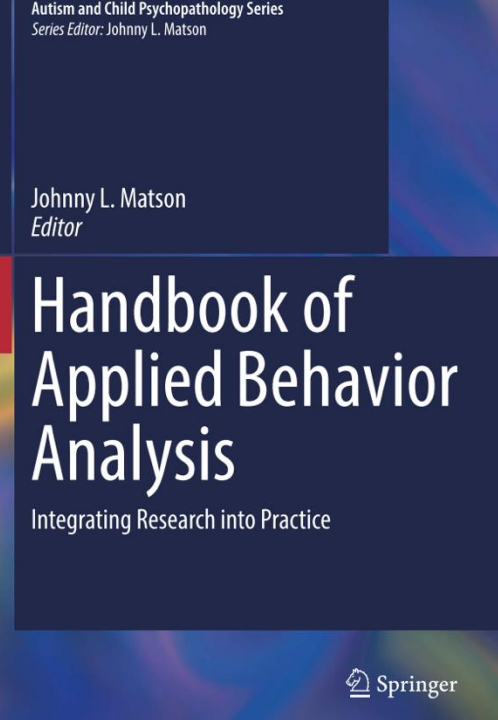
Edited by Peter Sturmey

Chapter 4

Functional analysis methodology in developmental disabilities

Nienke Peters-Scheffer, Robert Didden
Behavioural Science Institute, Radboud University, Nijmegen, the Netherlands

2020



Autism and Child Psychopathology Series
Series Editor: Johnny L. Matson

Johnny L. Matson
Editor

Handbook of Applied Behavior Analysis
Integrating Research into Practice

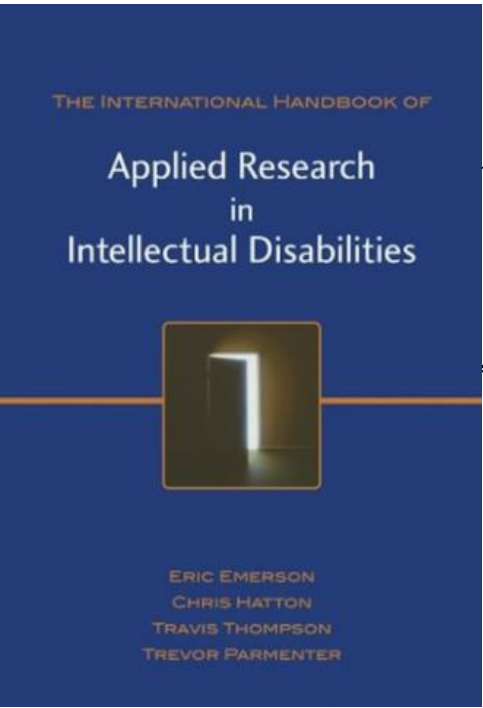
Springer

Precursor Behaviors to Severe Challenging Behaviors

29

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

2023



THE INTERNATIONAL HANDBOOK OF

Applied Research in Intellectual Disabilities

ERIC EMERSON
CHRIS HATTON
TRAVIS THOMPSON
TREVOR PARMENTER

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

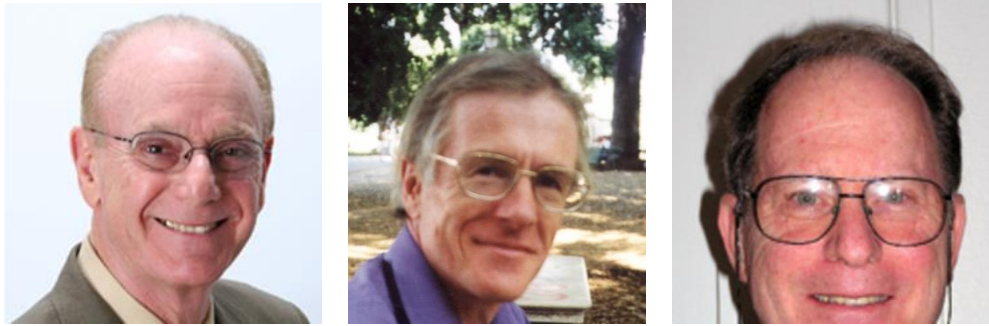
2004

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

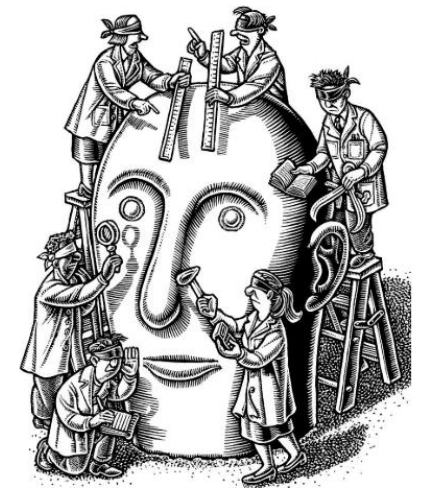
Department of Applied Mathematics and Theoretical Physics, University of Cambridge, Cambridge, England

David Kronenfeld

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

Lee Sailer

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



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

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

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>

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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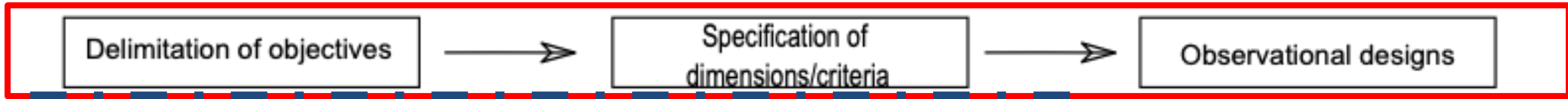
2. Research Design for Systematic Observation Studies

2.1. Stages of Systematic Observation Research

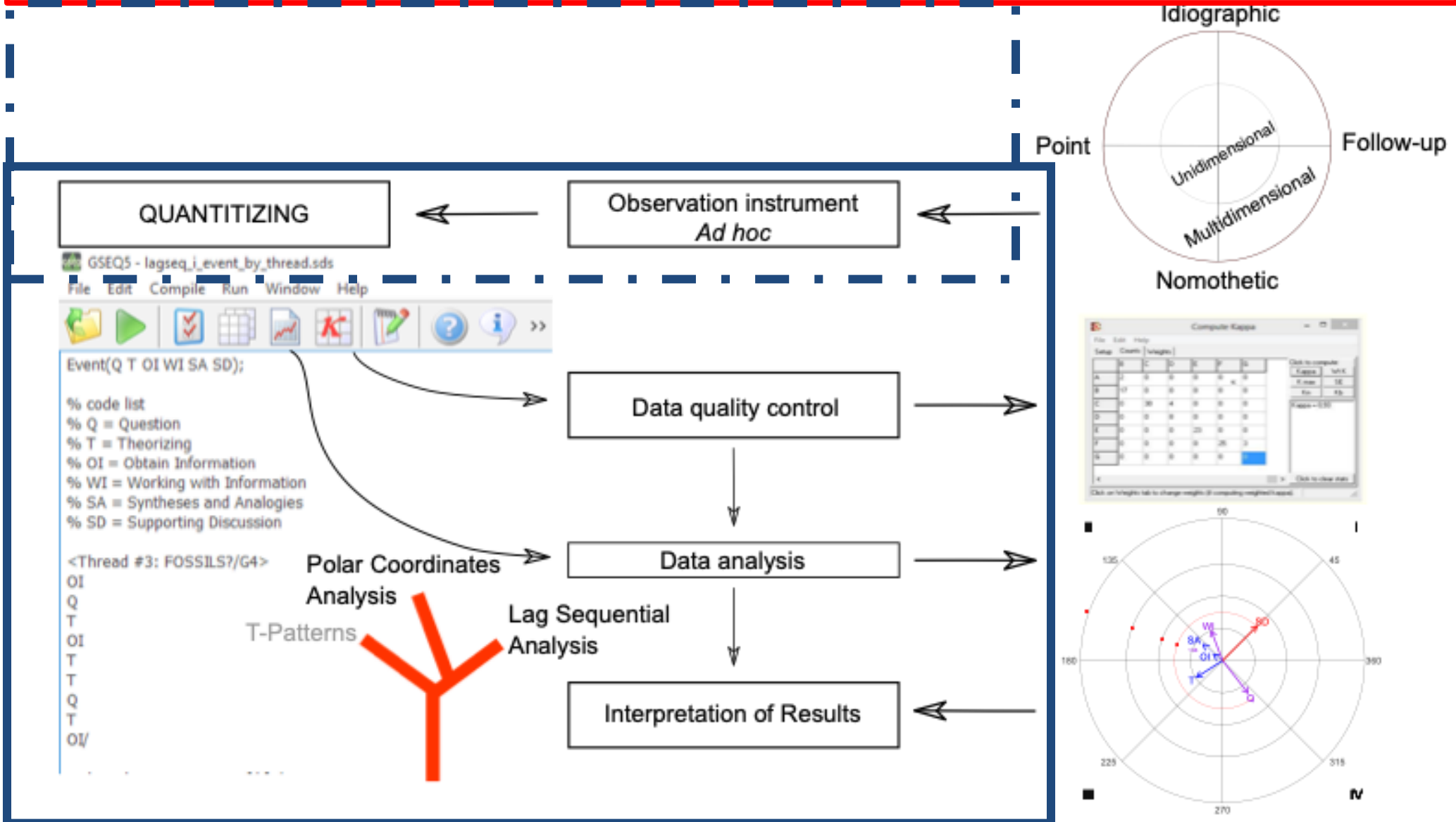
2.2. Types of research design

2.1. Stages of Systematic Observation Research (1)

Passive / Exploratory observation

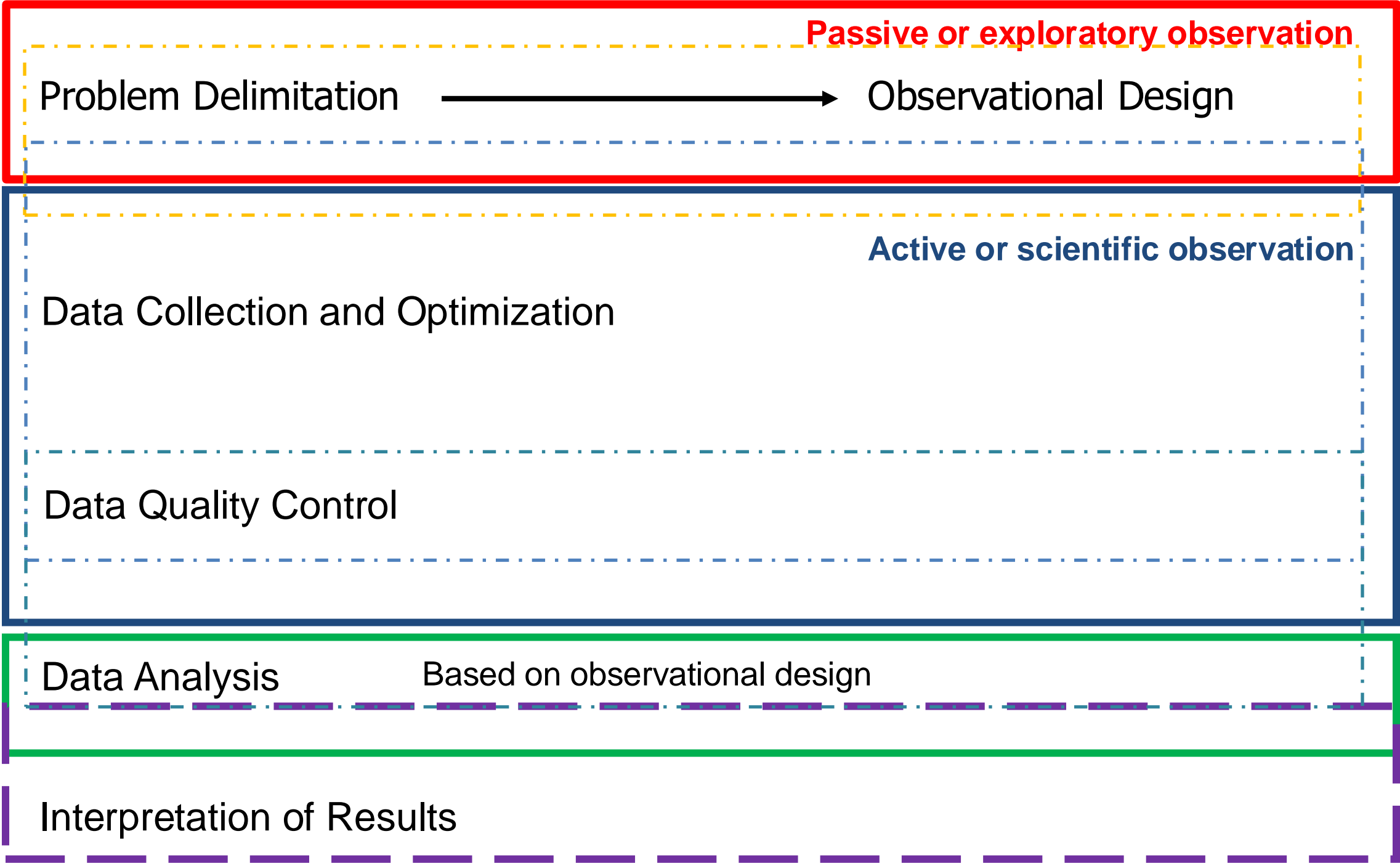


Active / Scientific observation



2.1. Stages of Systematic Observation Research (2)

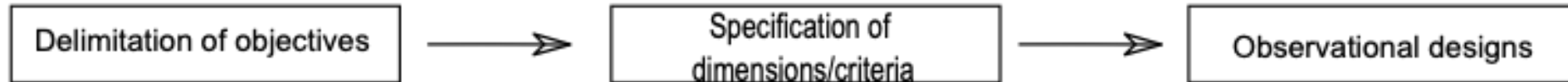
SYSTEMATIC OBSERVATION



2.1. Stages of Systematic Observation Research (3)

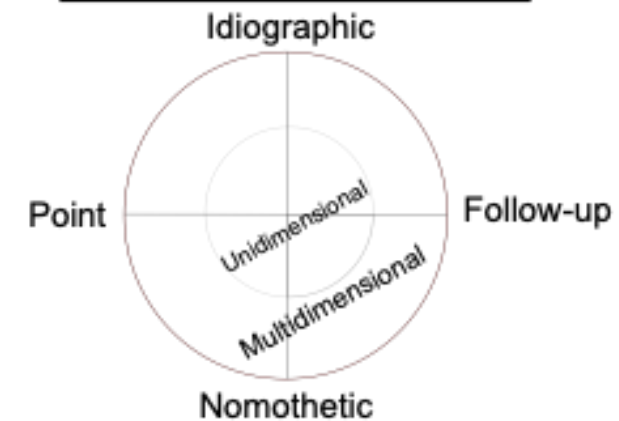
Passive or exploratory observation

Problem Delimitation → Observational Design



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

Specification of
dimensions/criteria

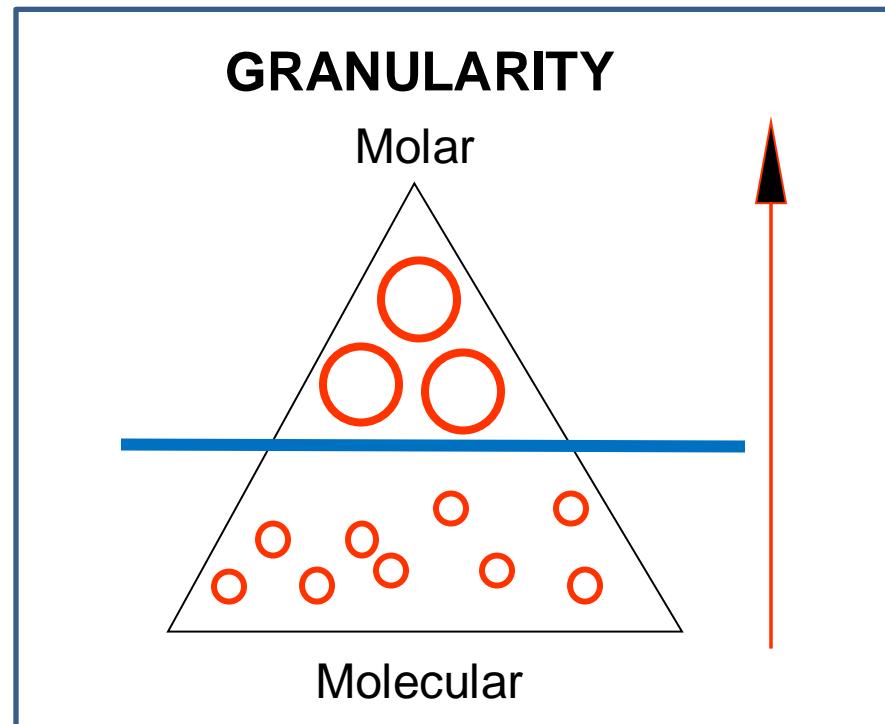
- Each of the facets that are part of the object of study can be understood as levels of response
- Initially there is no limit to the number of dimensions
- They must be considered in each case depending on:
 - the specific objective of the study
 - the theoretical framework considered
- Successive 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

Each behaviour must be able to:

- delimit (clear beginning and end)*
- name (give name to each conduct)*
- define by grasping all its nuances (describe what it consists of)*



Specification of
dimensions/criteria

SOCIAL vs. PHYSICAL CRITERIA



FEAR

- ① Las cejas se elevan y se unen
- ② Los párpados superiores se elevan
- ③ Los párpados inferiores se tensan
- ④ Los labios se estiran horizontalmente hacia atrás

FACS example



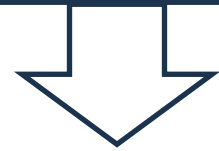
E.g., Action code: 1, 2, 4, 5, 7, 20,

- 1C Inner brow raise
- 2C Outer brow raise
- 4B Brow lower
- 5D Upper lid raise
- 7B Lower lid tighten
- 20B Lip stretch
- 26B Jaw drop

2.1. Stages of Systematic Observation Research (11)

Categories Conditions

Exhaustiveness (E)
Mutual Exclusivity (ME)
Congruence between category name and its content

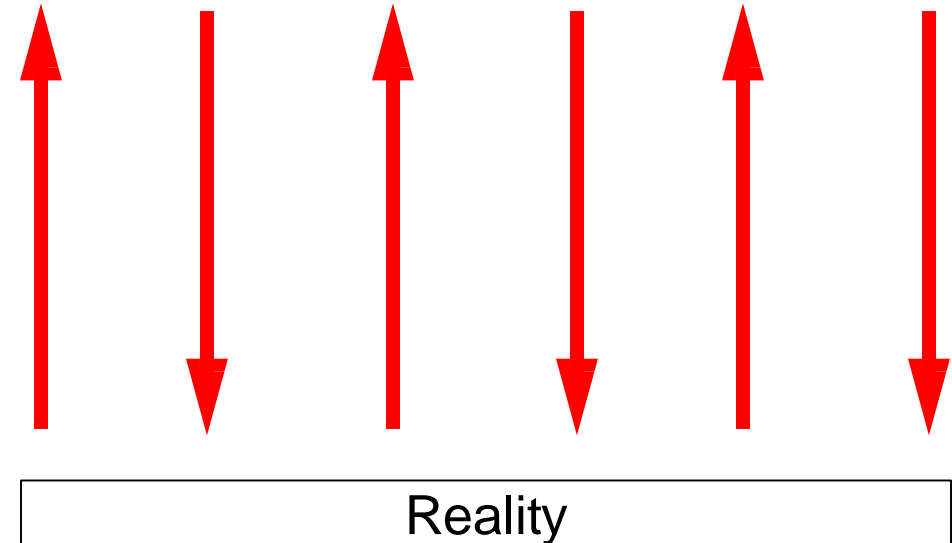


Once the three conditions are met:

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

Specification of
dimensions/criteria

Theoretical framework



Examples

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

Dimensions categories (CODES)	Description	Examples
<i>Interaction type</i>		
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
<i>Social behavior</i>		
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

Examples

Table S2

Coding Definitions and Examples

DIMENSIONS

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	<u>Caregiver</u> talk in which the referent corresponds with the child’s focus of attention, and does not <u>instruct or suggest</u> 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

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<https://doi.org/10.1111/cdev.12848>

Examples

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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

Examples

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

Dimensions	Category systems (<i>codes</i>)	Definition
Interaction states	Adult (<i>A</i>)	The student interacts with teachers or caregivers
	Low-intensity interaction (<i>L</i>)	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 (<i>J</i>)	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 (<i>N</i>)	The student shows hostility or anger toward one or more classmates while participating in an activity
	Solitary (<i>S</i>)	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>i</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 (<i>r</i>)	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 (<i>ch</i>)	The student initiates or responds inappropriately to an interaction with one or more of his classmates
Partners	1–14	Peers with whom target child interacted, including his classmates (1–14) as well as other children with whom he interacts during recess (15–n)
	15–n	

DIMENSIONS

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.

2.2. Observational Designs (1)

Observational designs are developed based on three basic dichotomous criteria

1. Study units

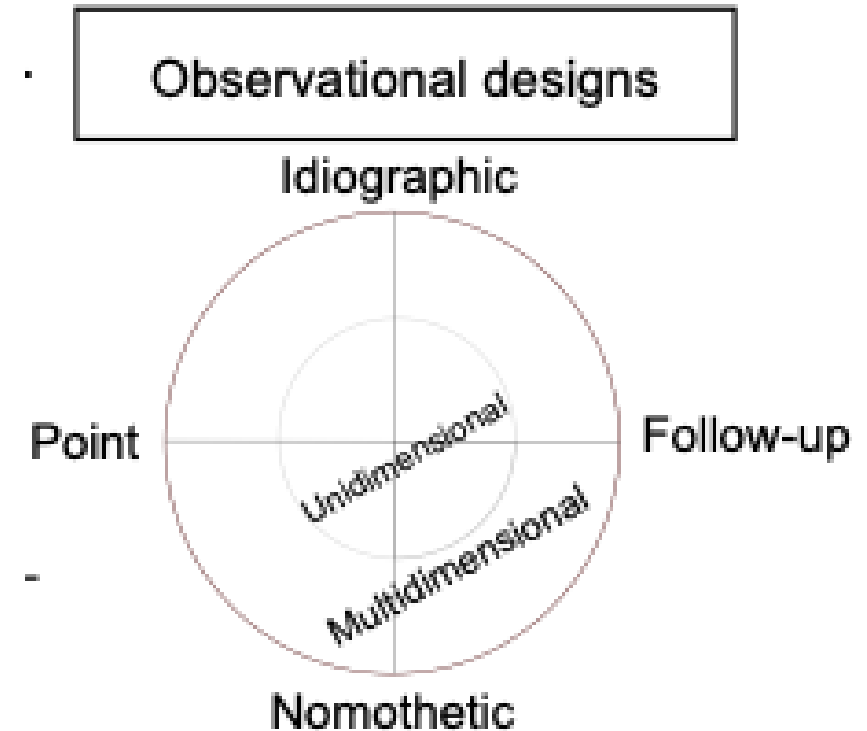
Idiographic/Nomothetic

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

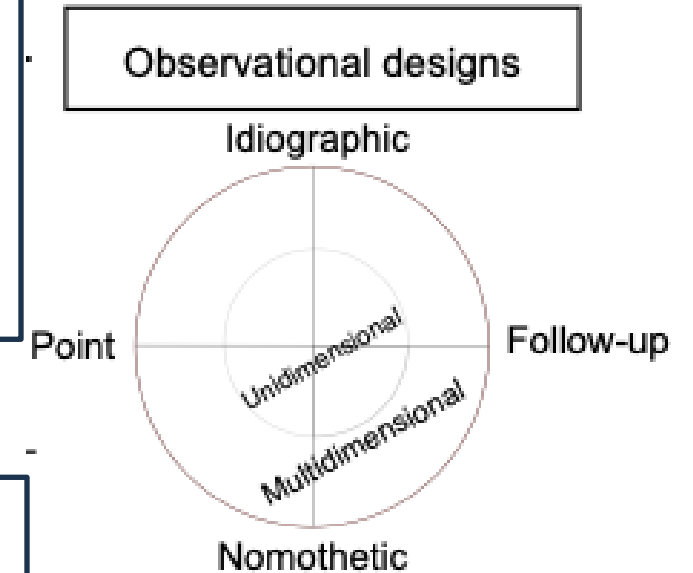
CRITERION 3: DIMENSIONALITY

-UNIDIMENSIONAL

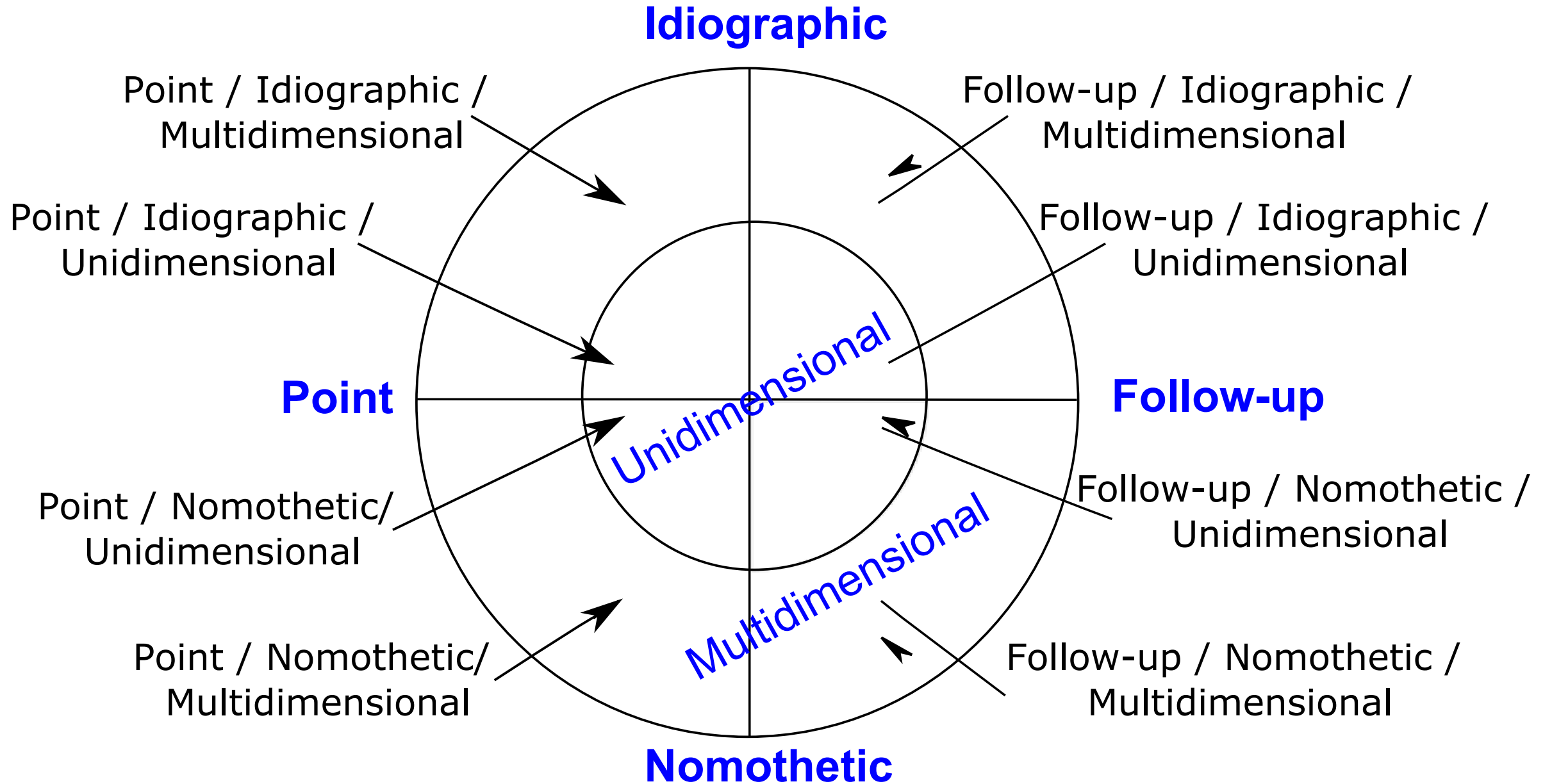
One level of response (one dimension)

-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

TABLE 2

Revised Version of the Conversational Argument Coding Scheme (CACS)

Category System (CS)

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

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

Growing external control

Systematization of the registry

Passive phase

Narrative

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 limpiado y olor a tierra de X por inflar el balón. A pesar de probarlo consigue, y ya respaldado con la fuerza del viento, el balón enfadado consigue correr a sus compañeros para volver a la 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

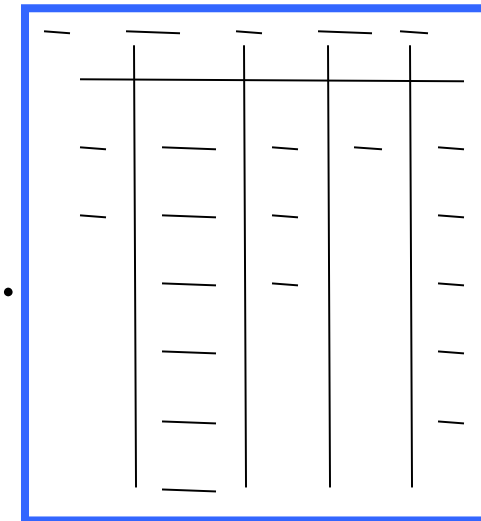
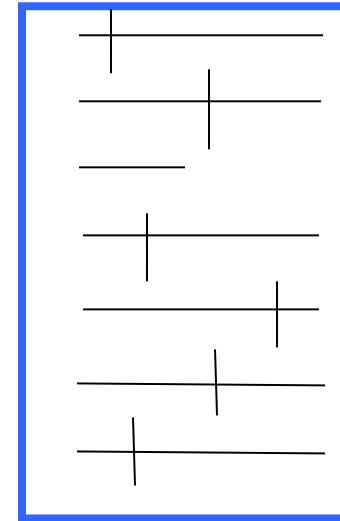
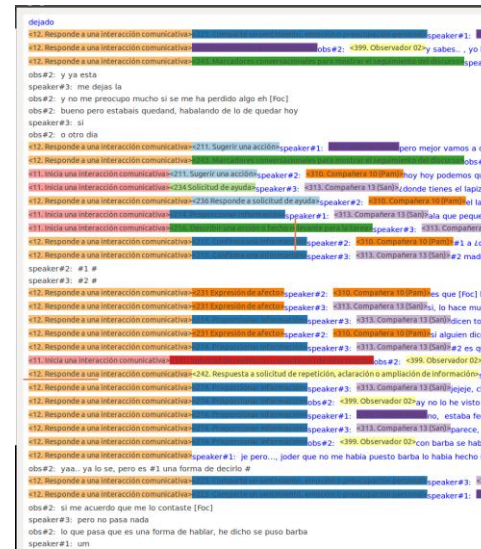
4:05. dos compañeros de Fc (de su grupo) y uno de

Active phase

Descriptive

Semi-systematized

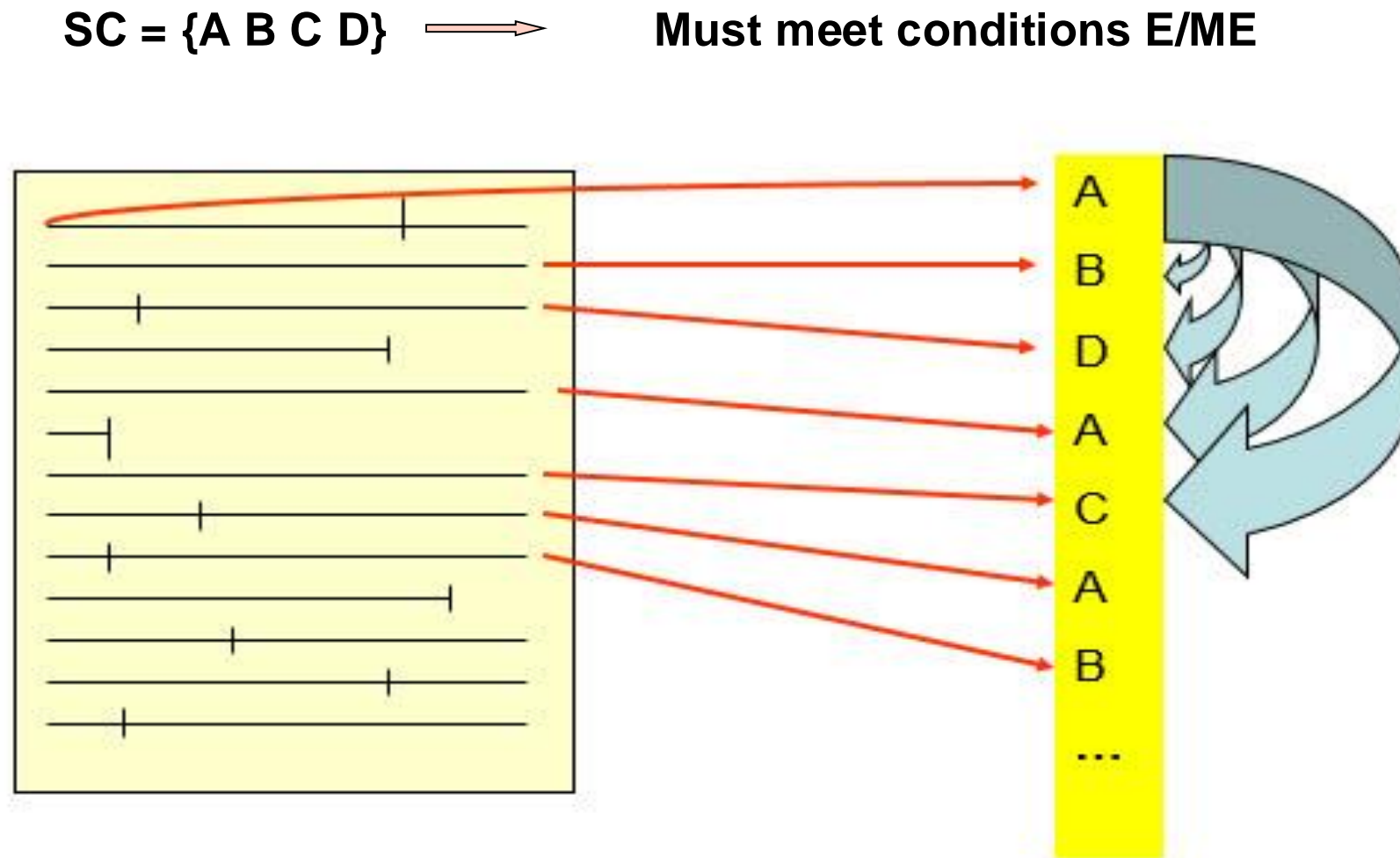
Systematized



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.



3.2. Coding systems (development and use)

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

Dimensions	Category systems (<i>codes</i>)	Definition
Interaction states	Adult (<i>A</i>)	The student interacts with teachers or caregivers
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	Joint engagement (<i>J</i>)	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 (<i>N</i>)	The student shows hostility or anger toward one or more classmates while participating in an activity
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Communicative acts	Initiates an interaction (<i>i</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 (<i>r</i>)	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 (<i>ch</i>)	The student initiates or responds inappropriately to an interaction with one or more of his classmates
Partners	1–14	Peers with whom target child interacted, including his classmates (1–14) as well as other children with whom he interacts during recess (15–n)
	15–n	

3.2. Coding systems (development and use)

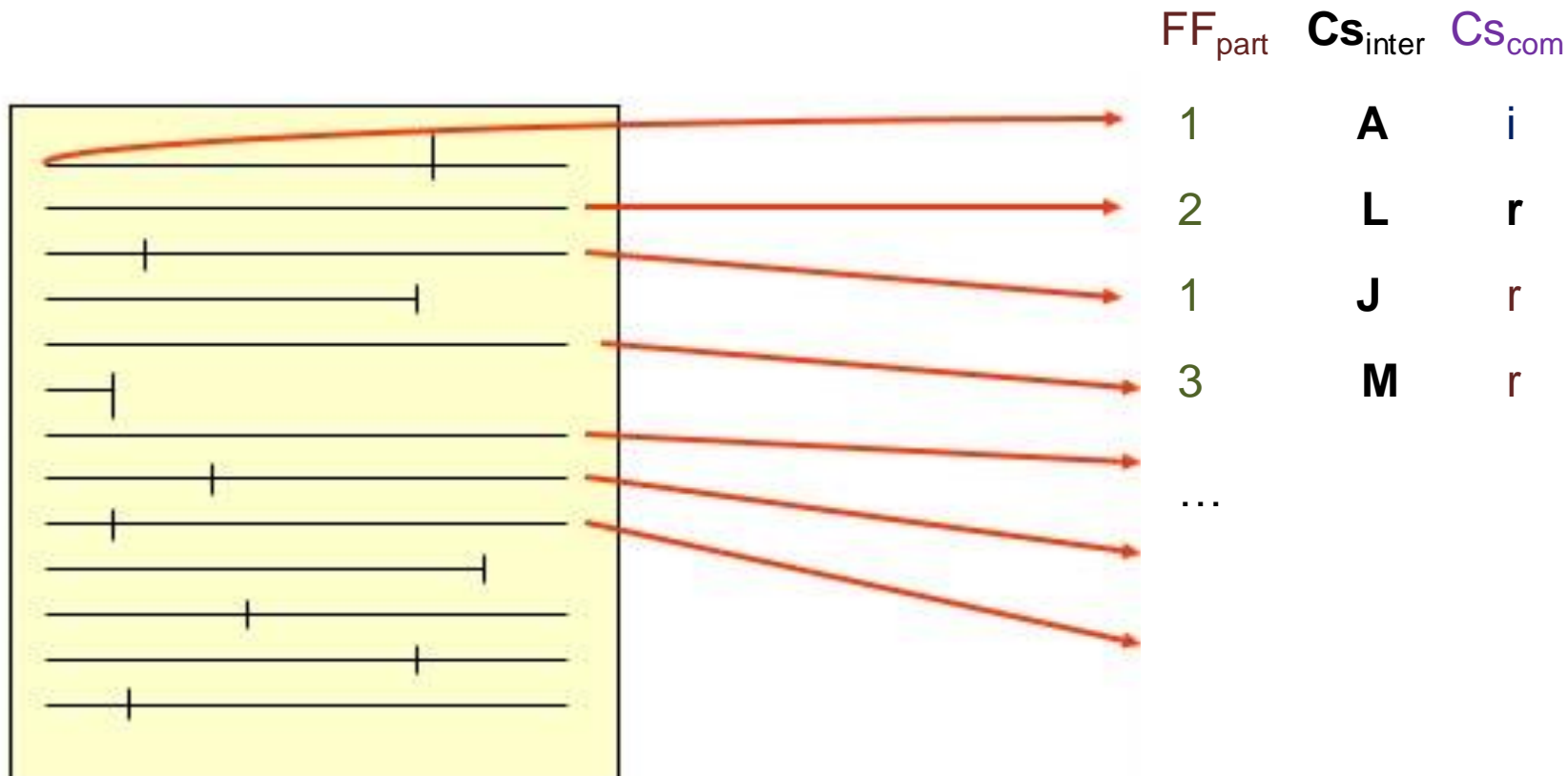
An important advantage is the possibility of using multidimensional instruments

$Cs_{inter} = \{A L J M N S\}$ \implies Must meet ME conditions

$FF_{part} = 1 2 3 4 5 6 7 8 \dots$

$Cs_{com} = \{i r ch\}$ \implies Must meet E/ME conditions

...



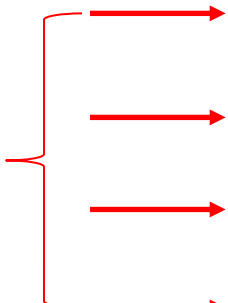
CS = Category System
FF = Field Format

3.3. Data entry and management

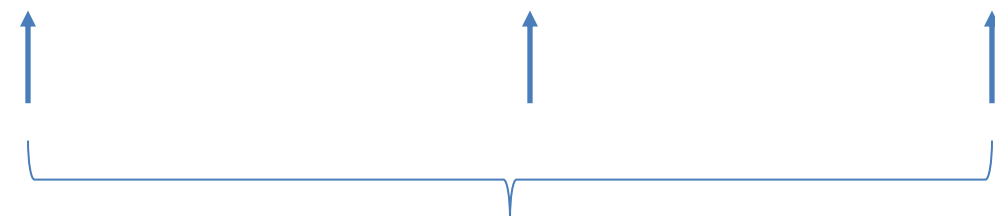
Each textual unit shall be assigned at least one code, and at most as many as the dimensions established in the indirect observation instrument
A code matrix will be obtained

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

Each row corresponds to one unit



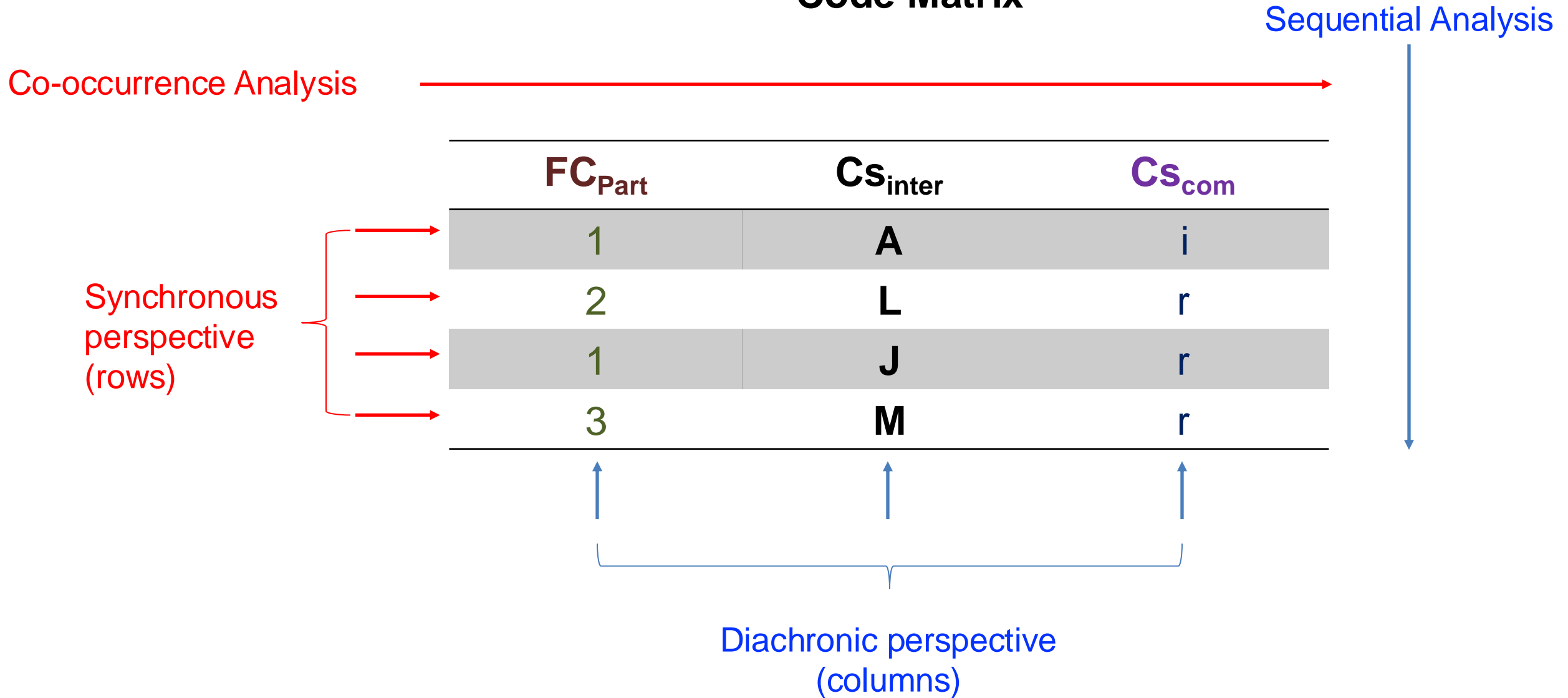
	FC_{Part}	Cs_{inter}	Cs_{com}
1		A	i
2		L	r
1		J	r
3		M	r



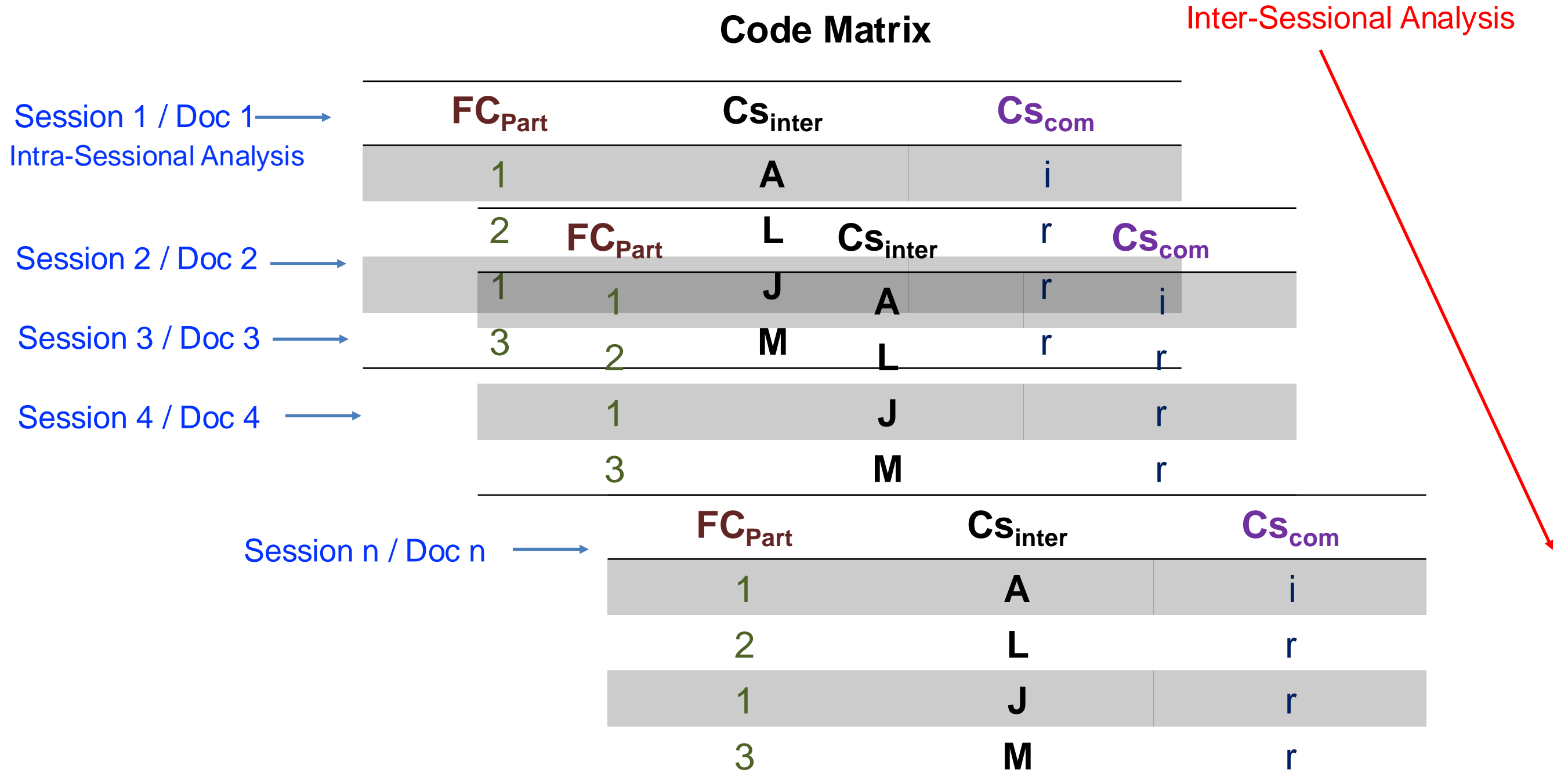
Each column corresponds to a dimension

3.3. Data entry and management

Code Matrix

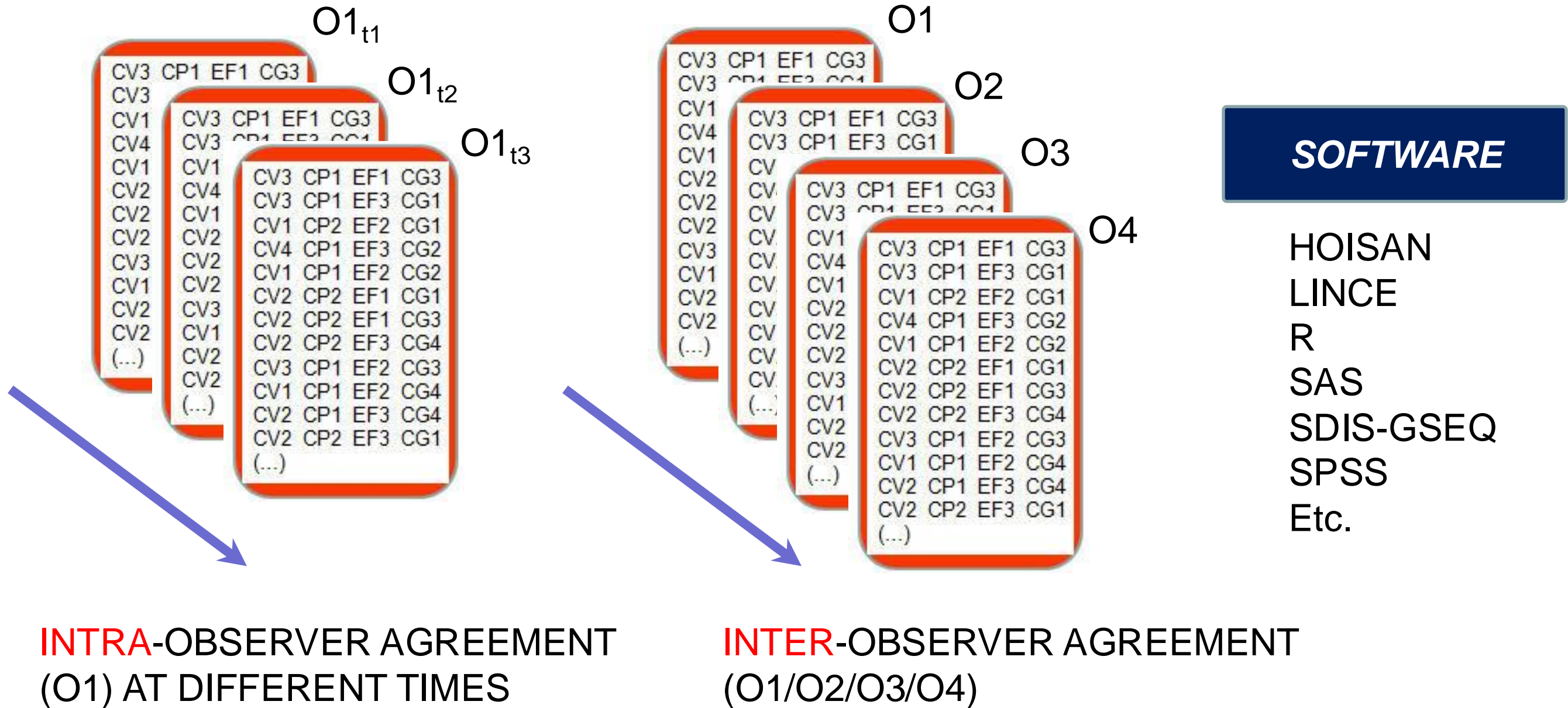


3.3. Data entry and management



3.4. Quality control measures (Inter-rater reliability)

HIGH NUMBER OF COEFFICIENTS OF AGREEMENT + CONSENSUS AGREEMENT



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

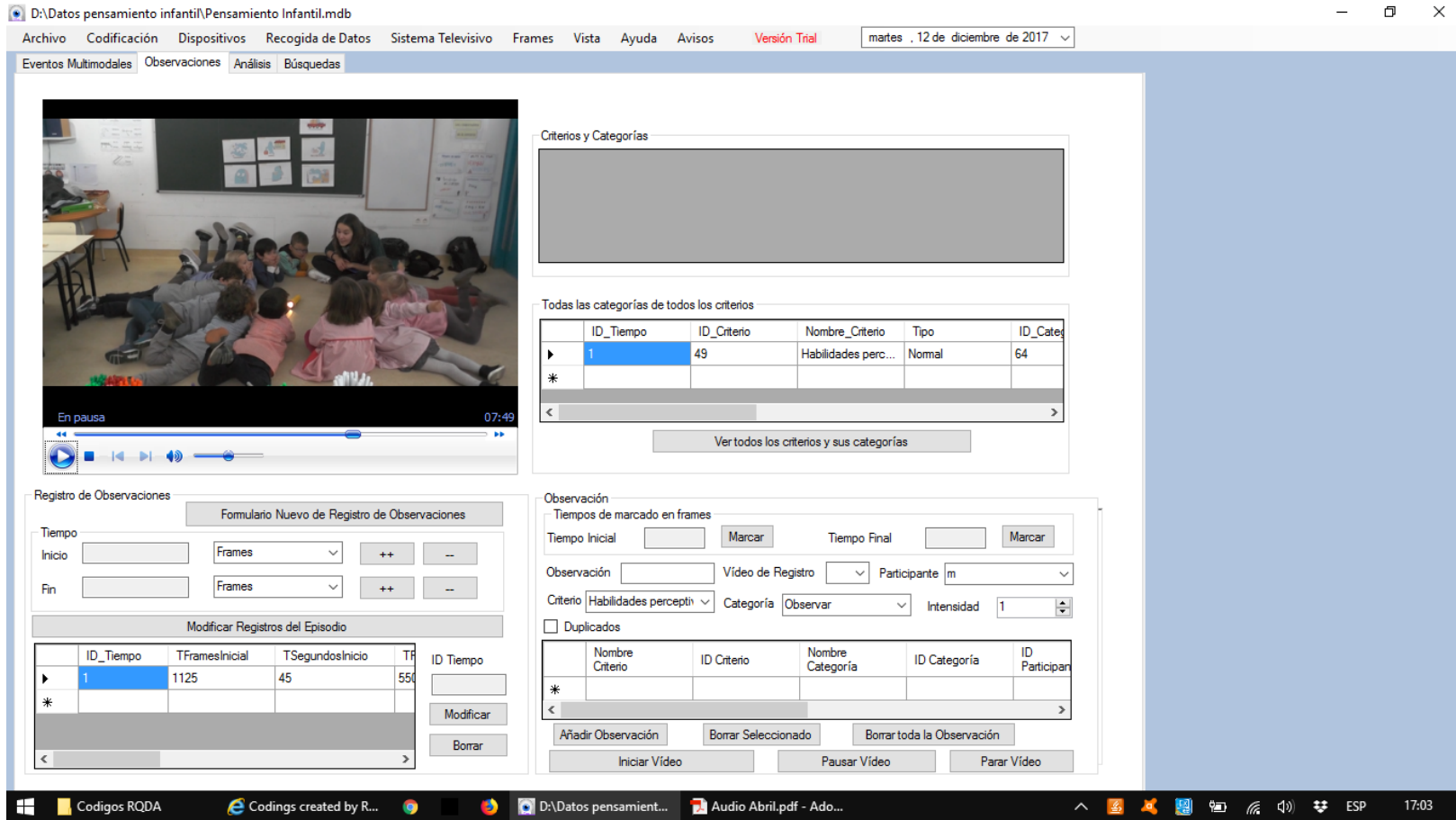
Motion Analysis
Spectral decomposition of the voice
Eye tracking...

...

PAPER AND PENCIL

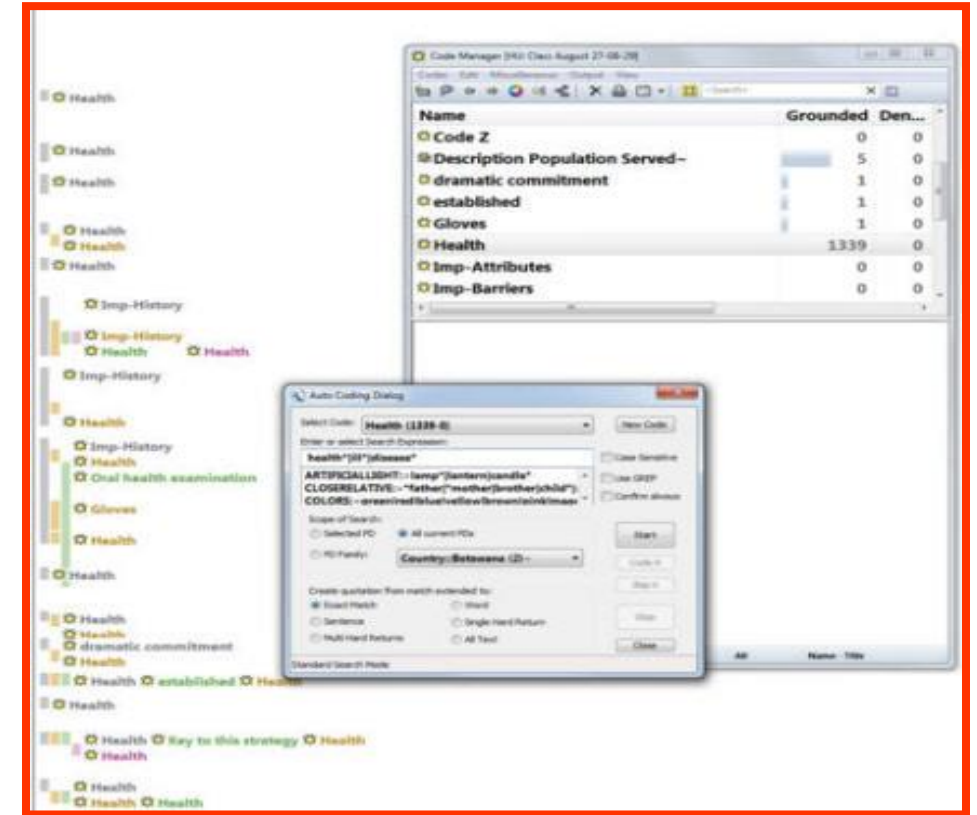
3.5. Software for data collection

COMPUTERIZED CODING



DIRECT OBSERVATION

<p>Hoisan</p> <p>Lince</p> <p>jWatcher</p>	<p>SDIS-GSEQ</p> <p>The Observer</p> <p>ThemeCoder</p>
--	---



INDIRECT OBSERVATION

<p>Aquad</p> <p>ATLAS.ti</p> <p>RQDA</p>	<p>MAXqda2</p> <p>Nvivo</p> <p>Nudist</p>
---	--

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

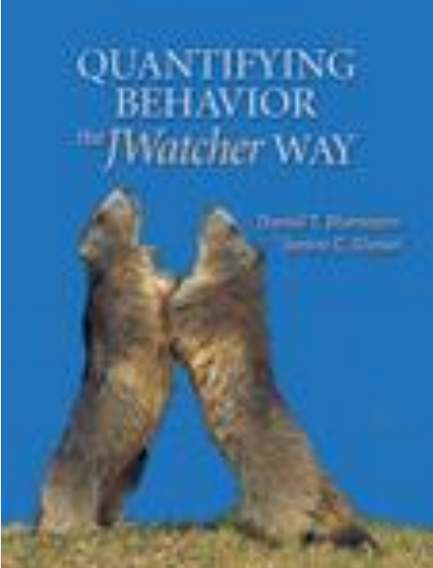

Close

Modifiers

Key Code	Modifier
0	Pm
1	Sn
2	Br
3	Ev
4	An
5	ln
6	Ar
7	LI
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



3.5. Software for data collection

COMPUTERIZED CODING

INDIRECT OBSERVATION

The screenshot displays the ATLAS.ti software interface. The main window shows a transcript of a lesson on athletics, with segments highlighted in yellow and red. The transcript includes the following text:

02:38-P: Saltar vallas pero eso dentro de las carreras ¿no? el equilibrio no, pero estamos hablando del ejercicio que hacemos, de la actividad que hacemos. En el atletismo hacemos carreras, hacemos saltos y hacemos también otra cosa que es parte, una de las habilidades básicas que vimos. Han visto por la televisión pruebas de atletismo, hay una pista ovalada en la que corren, pero dentro de esa pista, en el centro de esa pista hacen otro tipo de cosas ¿Qué hacen?

A: Lanzamientos

03:12-P: ¿Lanzamientos de qué?

A: de jabalina, de peso, de martillo

03:16-P: De martillo ¿pero el martillo es un martillo de esos de meter clavos?

A: No...de jabalina, de salto de longitud...

03:20-P: Bien. De jabalina... ¿qué es una jabalina?

A: una lanza

03:26-P: La lanza. No, ¿la pértiga qué es? ¿Qué es la pértiga?

A: un palo y...

03:35-P: el palo ese largo que nos ayuda a saltar más alto, vale. Bien. Pues esta unidad didáctica que vamos a empezar hoy, que acabaremos antes de navidades, va a tratar de todo eso, vamos a aprender las diferentes disciplinas deportivas que hay dentro del atletismo y vamos a practicar unas cuantas cositas para que cuando nos apetezca hacer atletismo sepamos algo, por ejemplo el año que viene, a lo mejor en el barrio a lo mejor aquí por las tardes. Todo eso lo haremos en la cancha y también vamos a ver si conseguimos ver algunos videos para ver bien las distintas pruebas y a ver si una de las clases hacemos aula TIC y hacemos pues una casa del tesoro de atletismo o una Webquest o alguna cosita de esas para yo practicar un poquito más con todo eso y que ustedes trabajen, ¿de acuerdo? Bien. Vamos a hacer la animación, un buen calentamiento. La clase de hoy va de carreras, carreras de fondo porque las carreras en el atletismo ustedes las han visto. ¿Cuál es la más corta que se hace en atletismo? 50 metros, 100 metros. ¿Y la más larga?

A: quinientos

04:51-P: ¿Quinientos qué?

The right-hand pane shows a list of codes assigned to the segments, including:

- # B3D2E1H1
- # A2D2E1H3
- # A1D2E1H3
- # A3D2E2H3
- # B3D2E2H1
- # A1D2E2H1 # B3D2E1H1
- # B3D2E2H1 # B7D2E1H2
- # A3D2E2H3
- # C1D2E1H1 # B7D2E1H1
- # C5D2E1H3
- # A3D2E2H3
- # B3D2E2H1

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

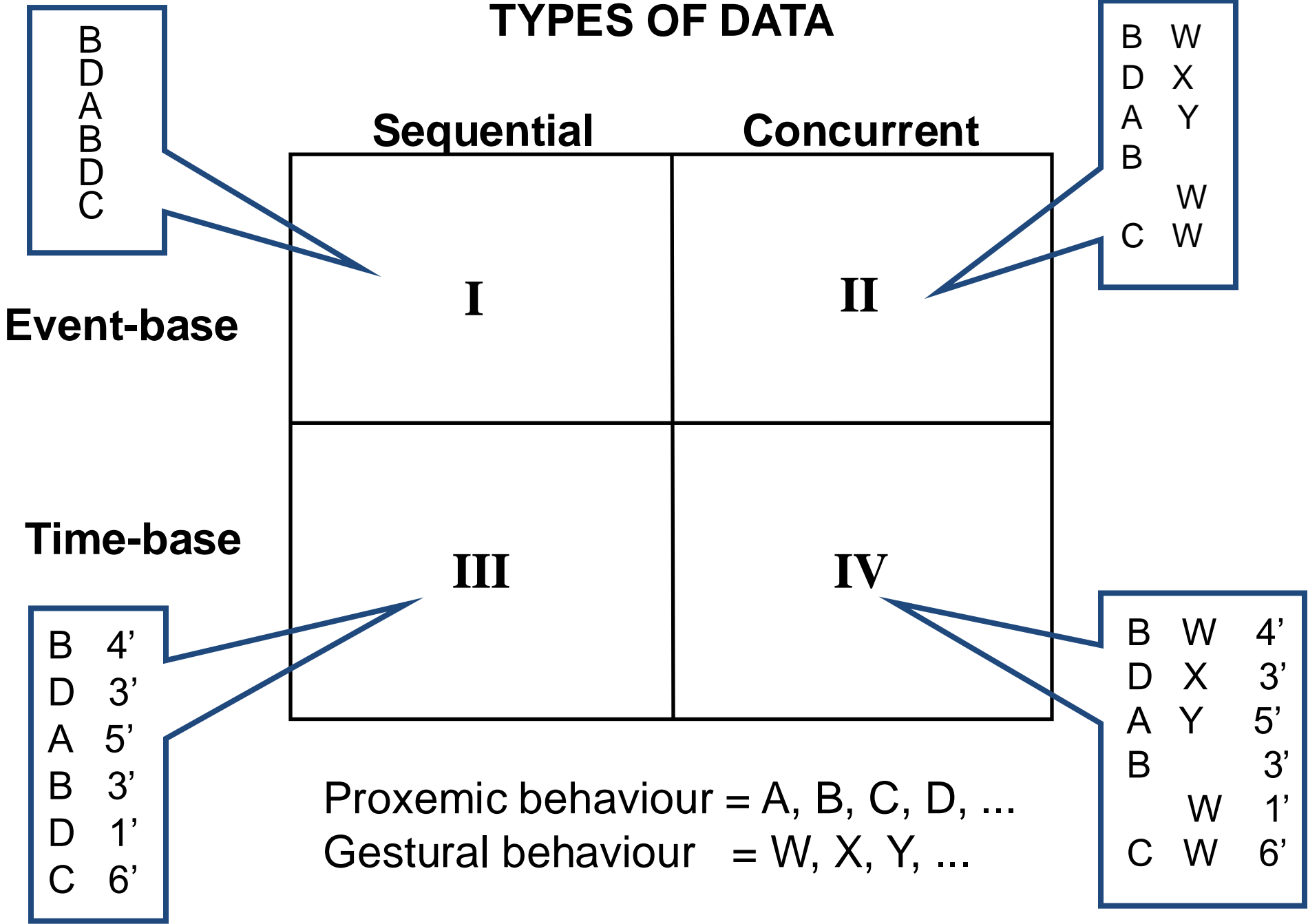
4.3. Polar Coordinates Analysis

4.4. Interpreting results and drawing conclusions

4.5. Software for data analysis

4.1. Introduction

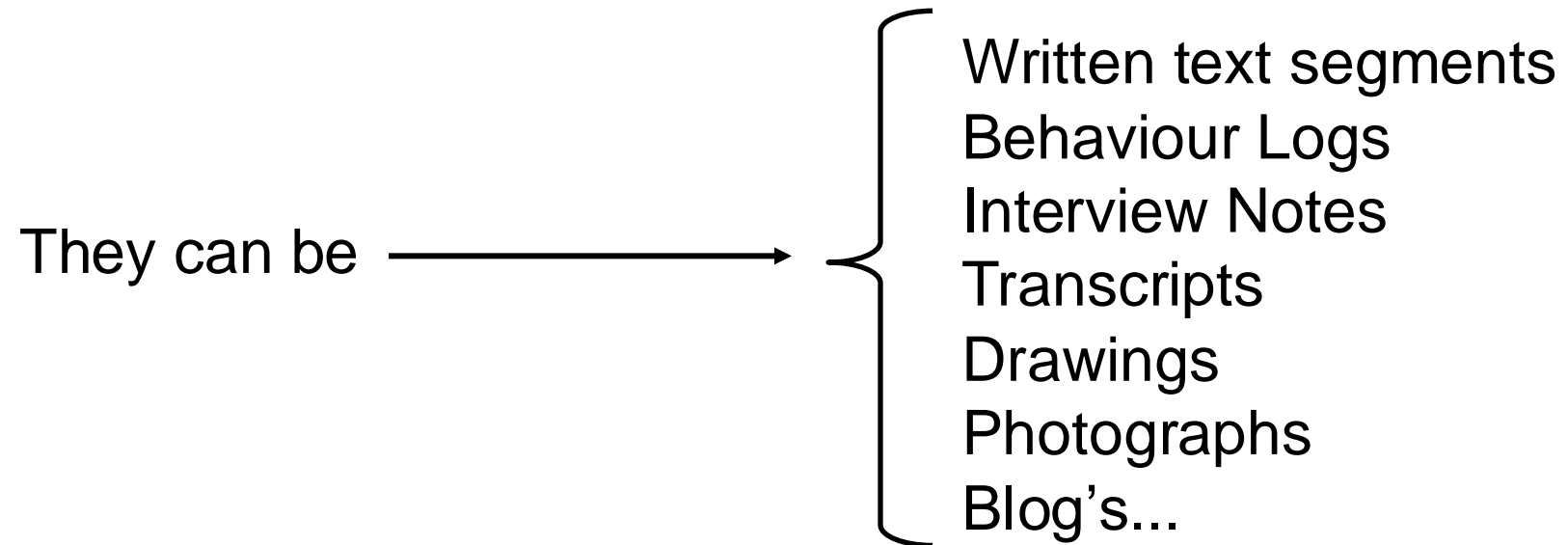
TYPES OF DATA



4.1. Introduction

QUANTITIZING

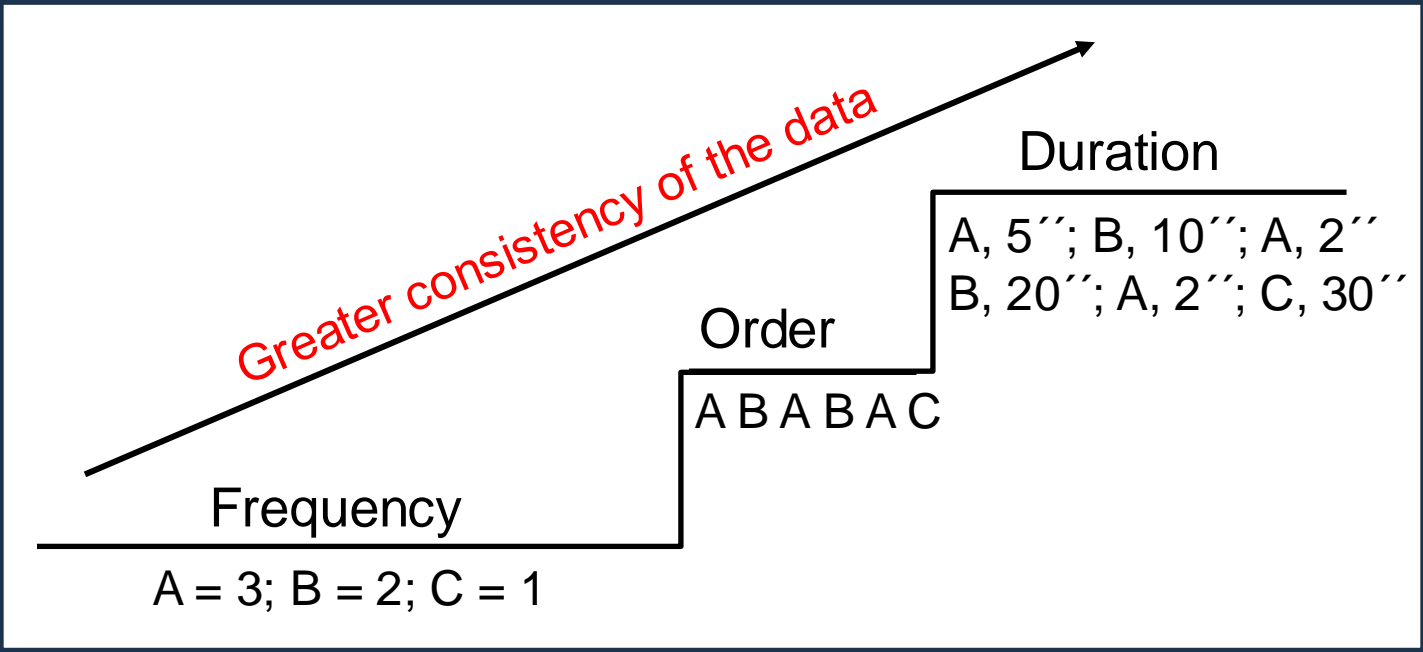
Process of assigning numeric values to data conceived as non-numeric



4.1. Introduction

Obtaining Parameters

Primary Measures



Mixed Measures

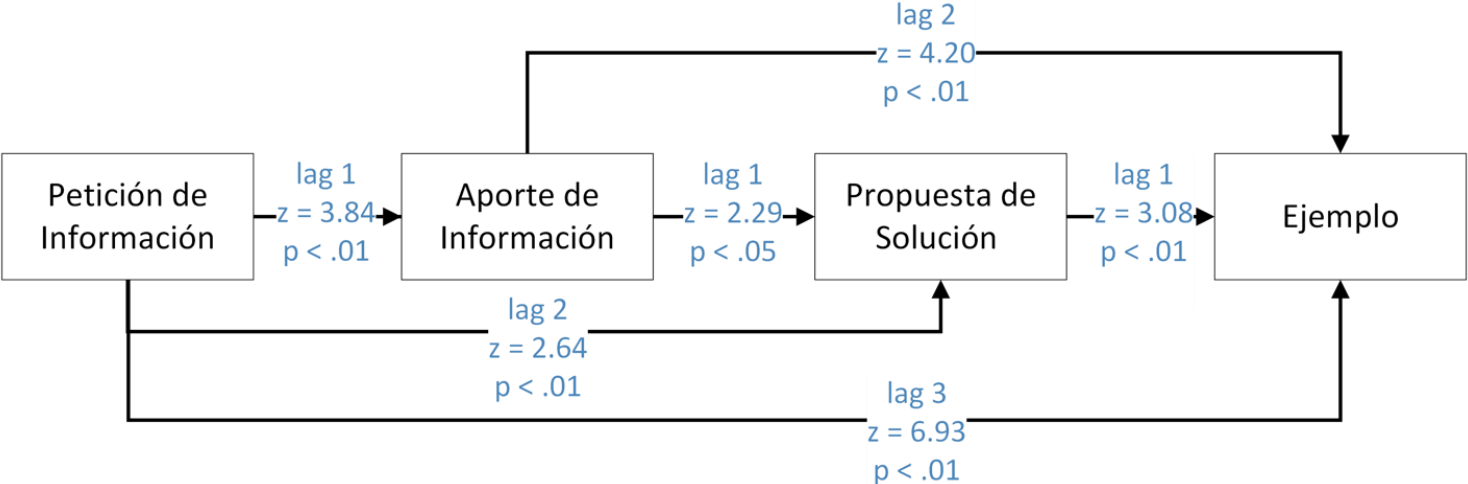
Transition frequency

Secondary measures

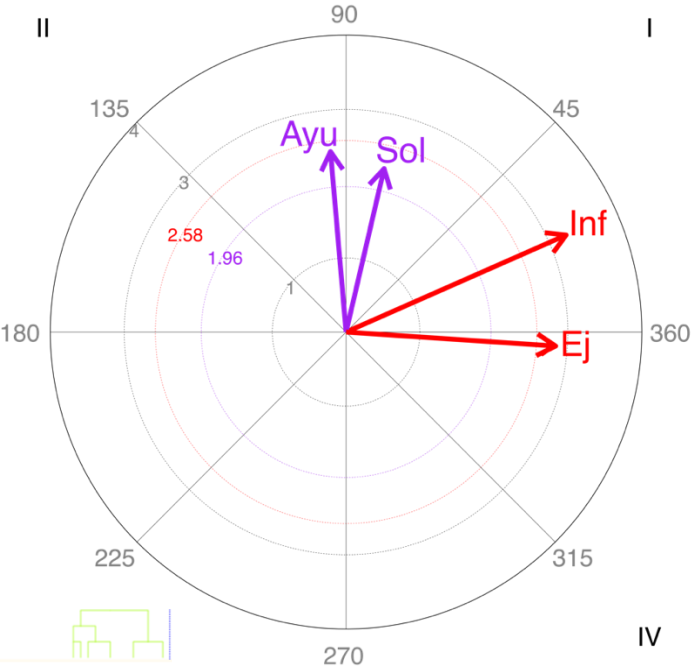
Relative frequency
Relative duration

4.1. Introduction

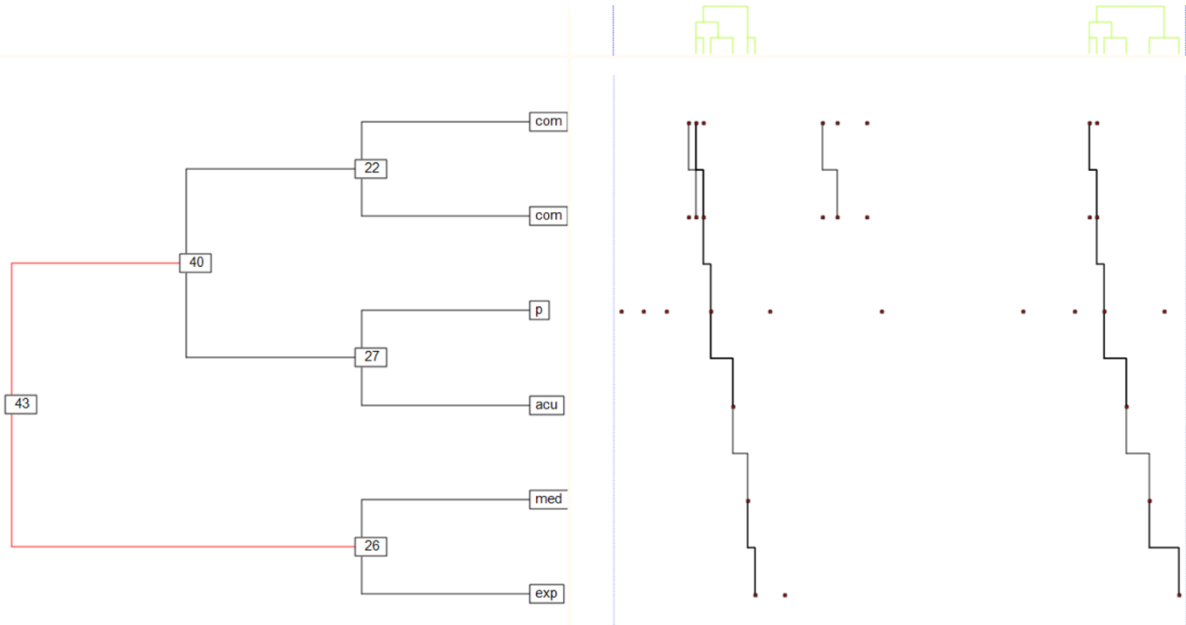
Lag Sequential Analysis



Polar Coordinate Analysis



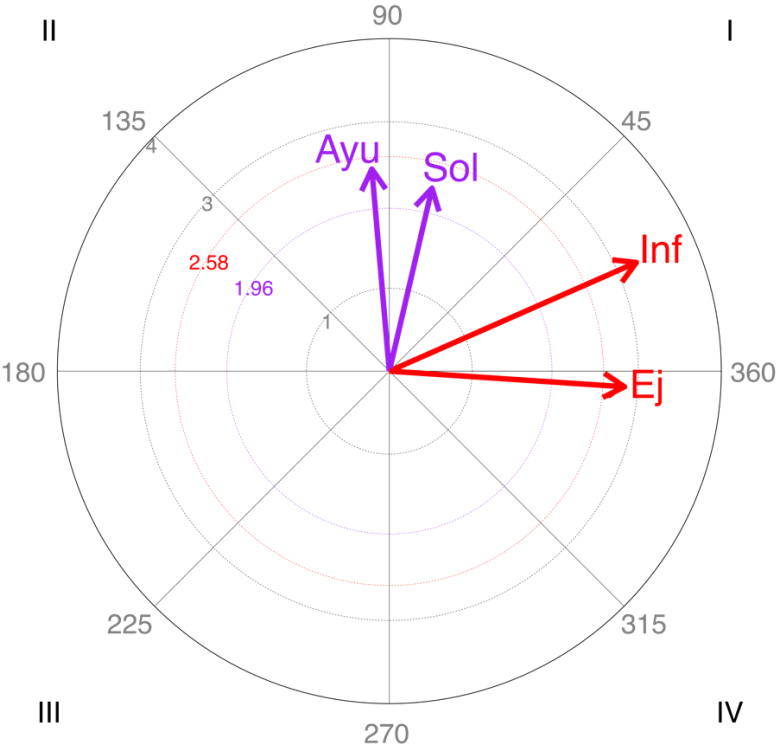
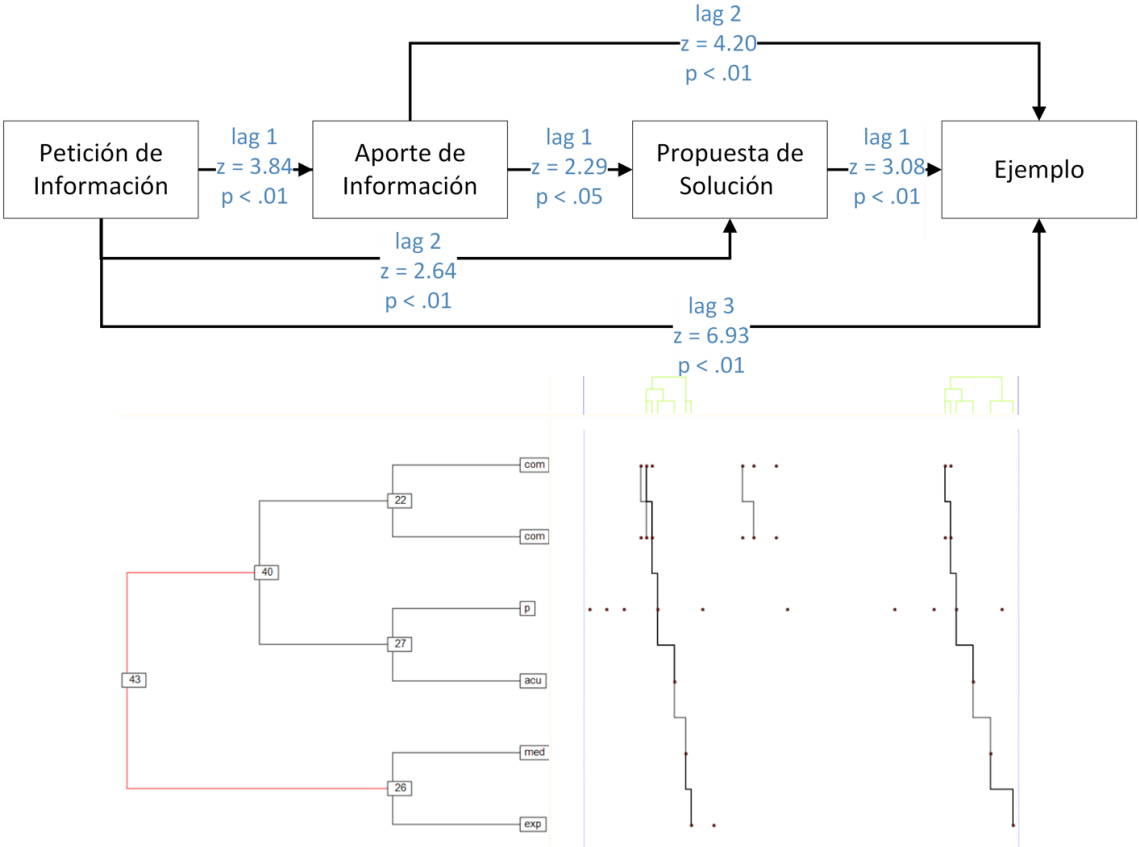
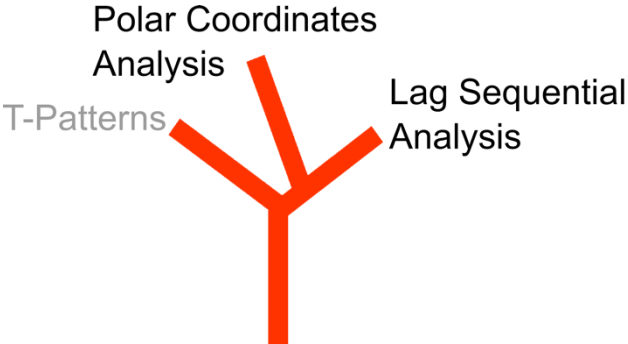
T-Patterns Analysis



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

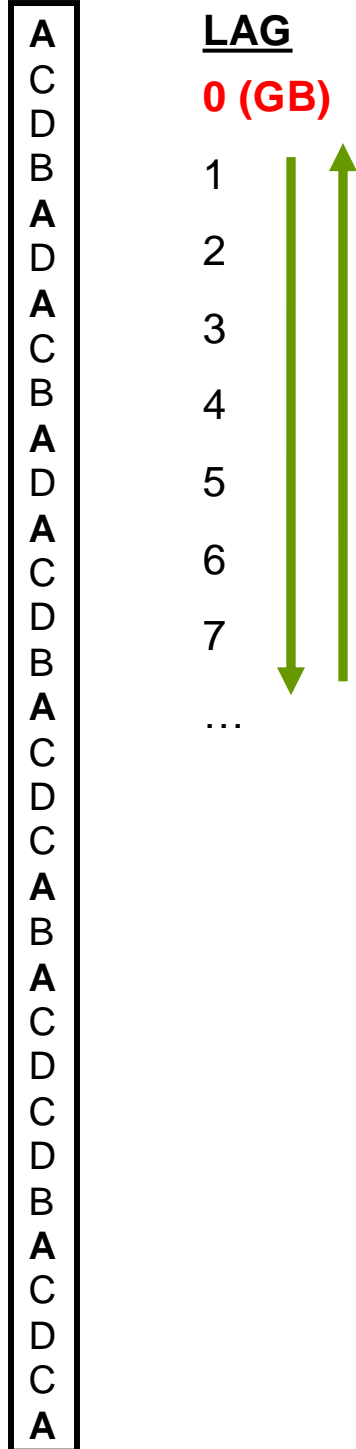
BASICS CONCEPTS

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)

Table S2

Coding Definitions and Examples

DIMENSIONS

Child Play*	Definition	Example	Caregiver Talk**	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.	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.
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.	Follow-in Comment	<u>Caregiver</u> talk in which the referent corresponds with the child's focus of attention, and does not <u>instruct or suggest</u> 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!"
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!"	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
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Blair P. Lloyd
Vanderbilt University

Rebecca Louick
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Linnea Joffe-Nelson
Boston Children's Hospital

Linda R. Watson
University of North Carolina-Chapel Hill

Paul J. Yoder
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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
C
D
B
A
C
D
C
A

CS = { A,B,C,D }

Given behaviour → A

Observed Joint Frequencies

Total Frequencies →

Lags →

Target Behaviours

	A	B	C	D	TOTAL
	10	5	9	8	32
1	<u>0</u>	1	6	<u>2</u>	9
2	<u>3</u>	1	0	<u>5</u>	9
3	<u>1</u>	2	6	<u>0</u>	9
4	<u>4</u>	1	0	<u>4</u>	9
5	<u>2</u>	<u>3</u>	<u>2</u>	<u>1</u>	8

Transition Frequencies (x_{rc})

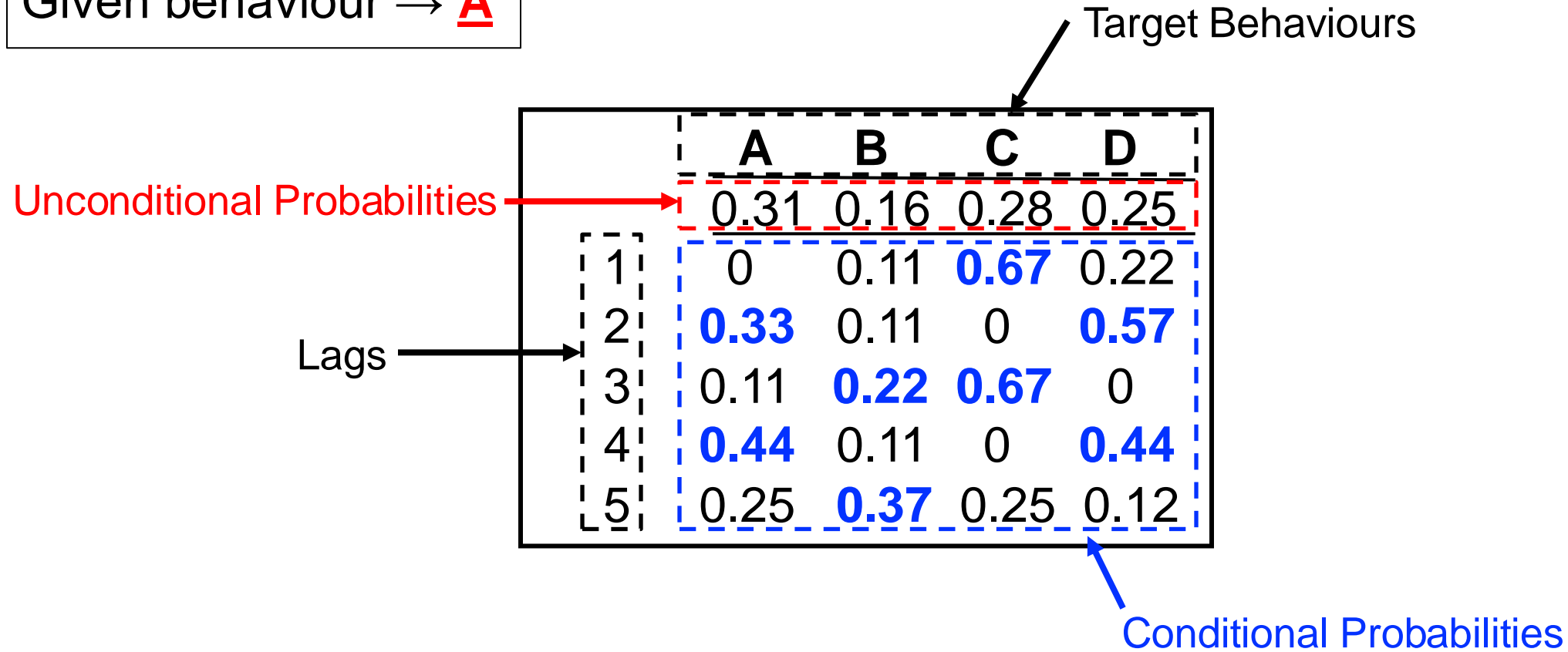
4.2. Lag Sequential Analysis (LSA)

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
B
A
C
D
C
A

CS = { A,B,C,D }

Given behaviour → A

Observed Joint Probabilities



4.2. Lag Sequential Analysis (LSA)

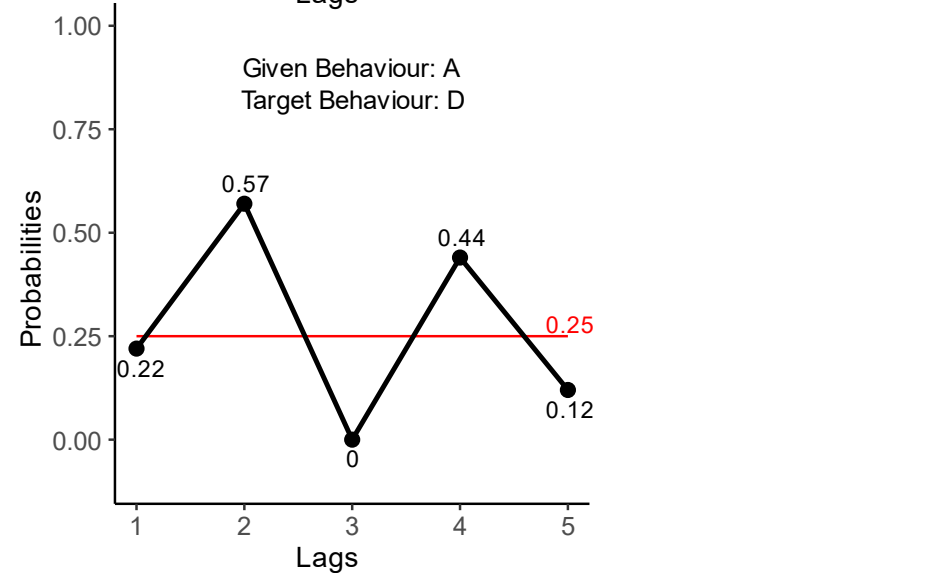
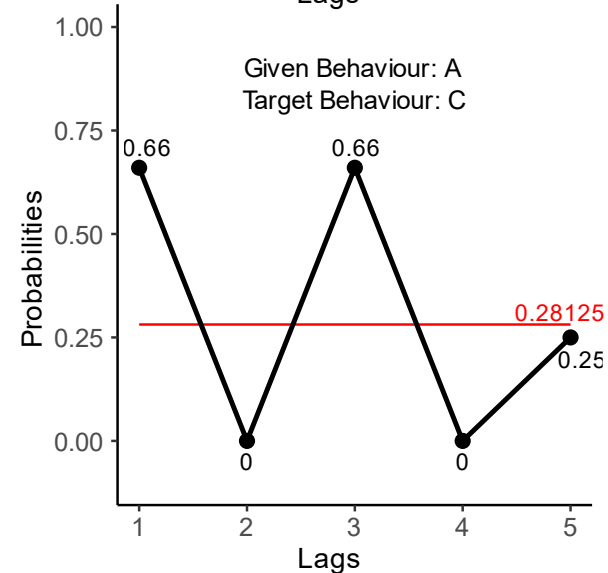
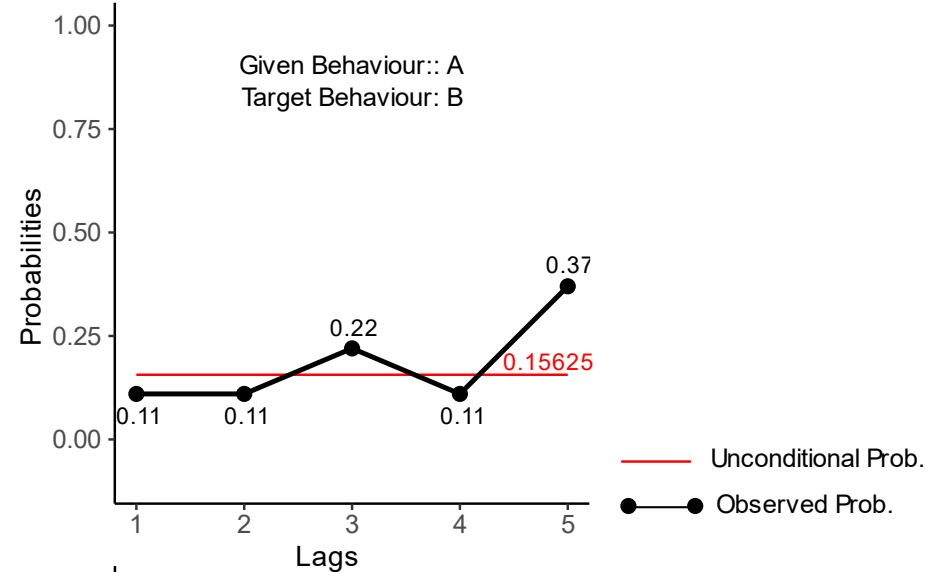
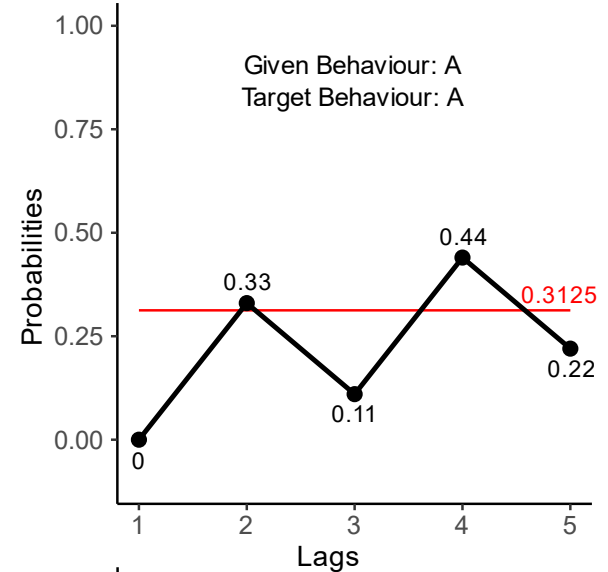
A
C
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A
C
C
D
C
A
B
A
C
C
D
B
A
C
C
D
C
A

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



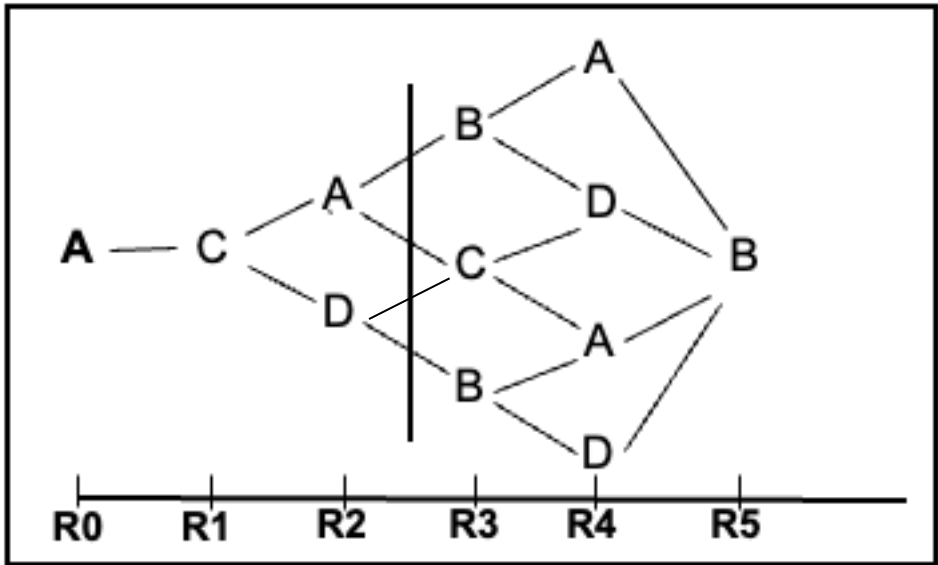
— Unconditional Prob.
●—● Observed Prob.

4.2. Lag Sequential Analysis (LSA)

Identification of the pattern of behaviour

Application of conventional rules

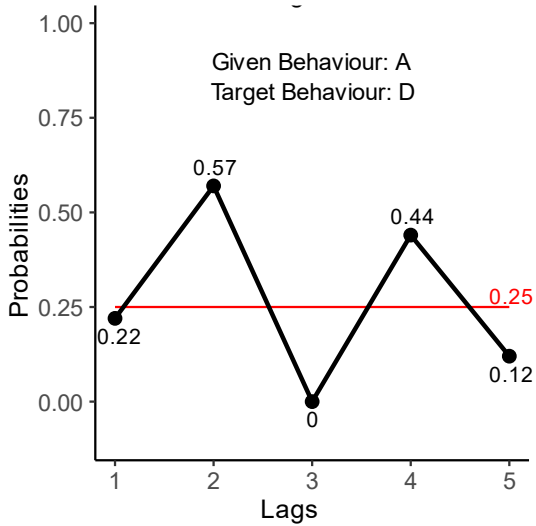
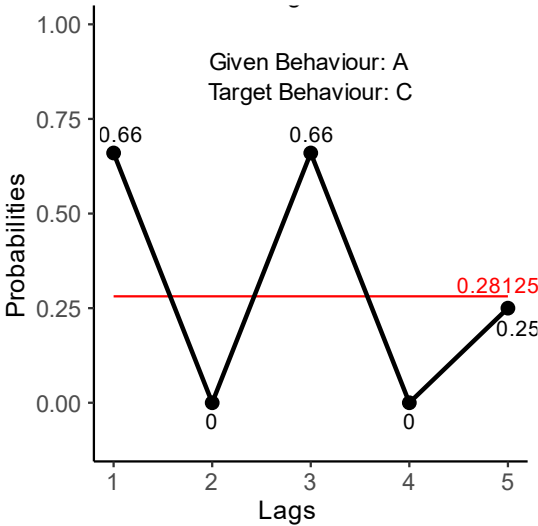
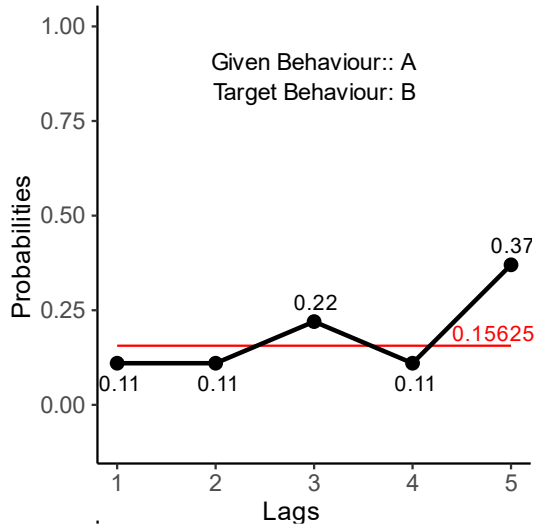
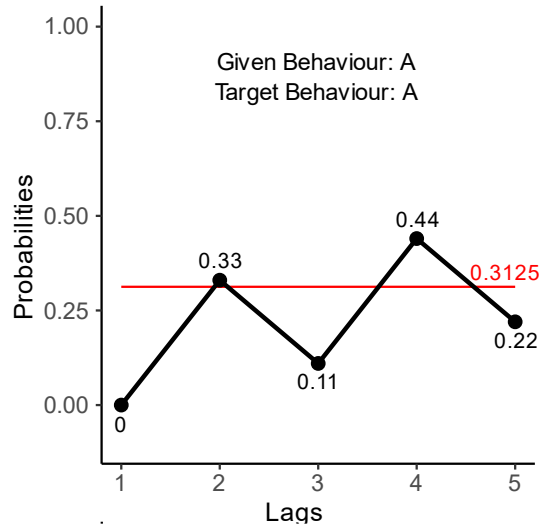
Prospective pattern



Rules of Interpretation

Behaviour patterns:

- A - C - A
- A - C - D



— Unconditional Prob.
● Observed Prob.

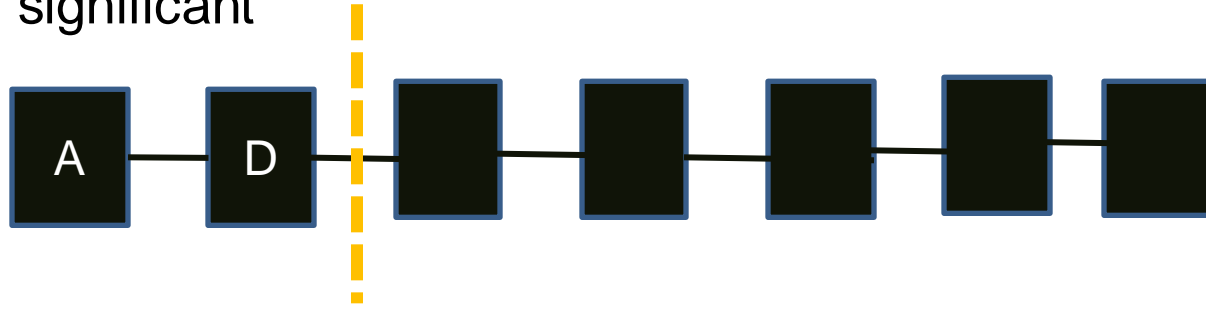
4.2. Lag Sequential Analysis (LSA)

Identification of the pattern of behaviour

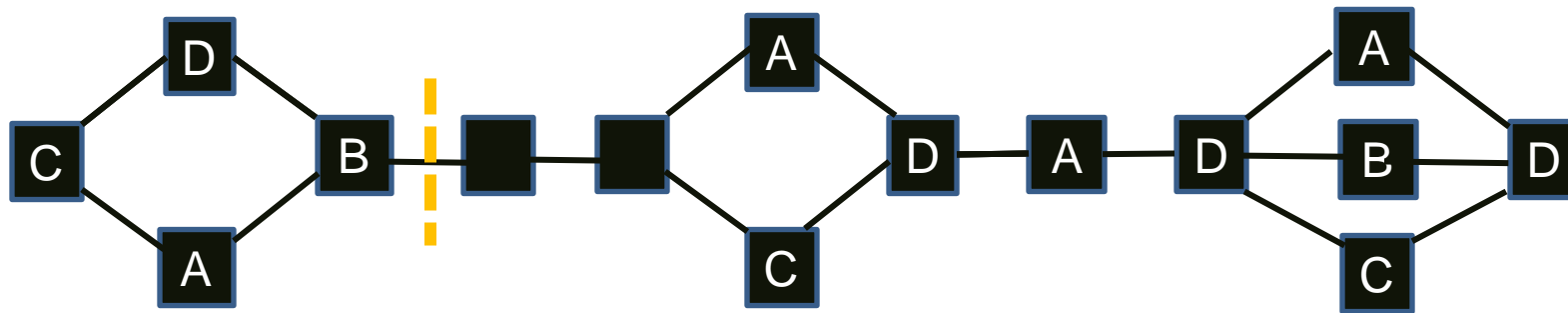
Application of conventional rules

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



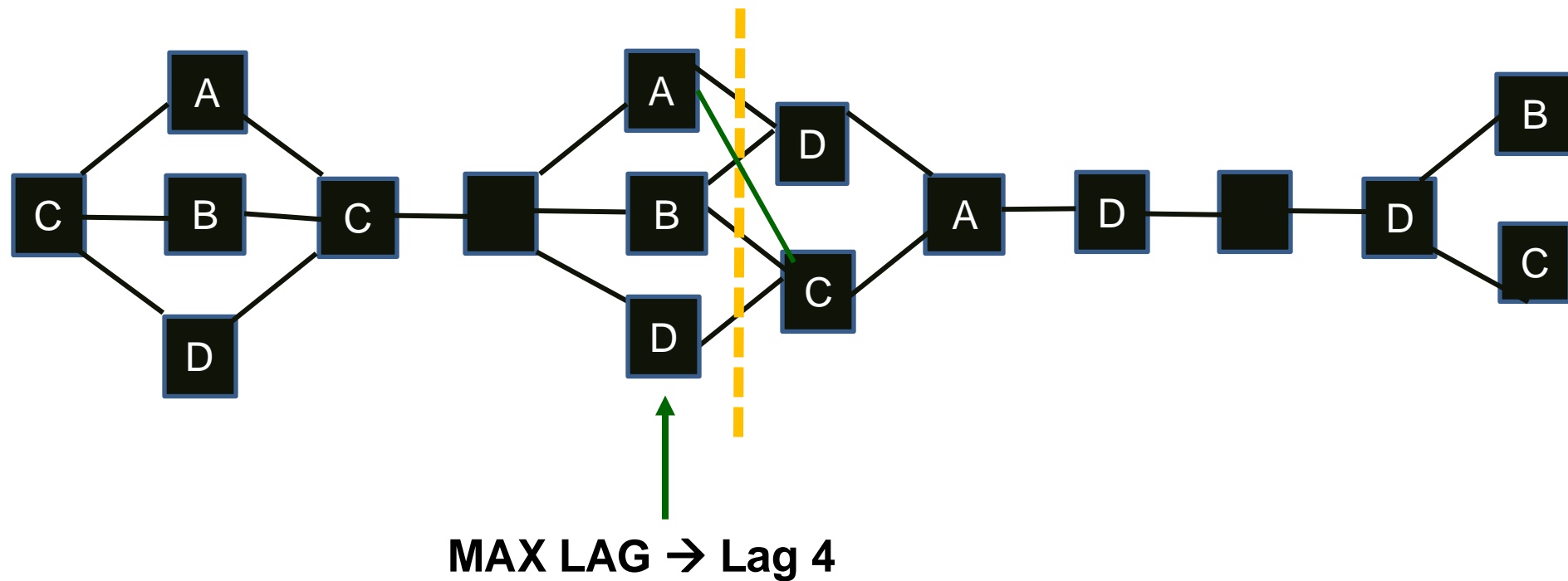
4.2. Lag Sequential Analysis (LSA)

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



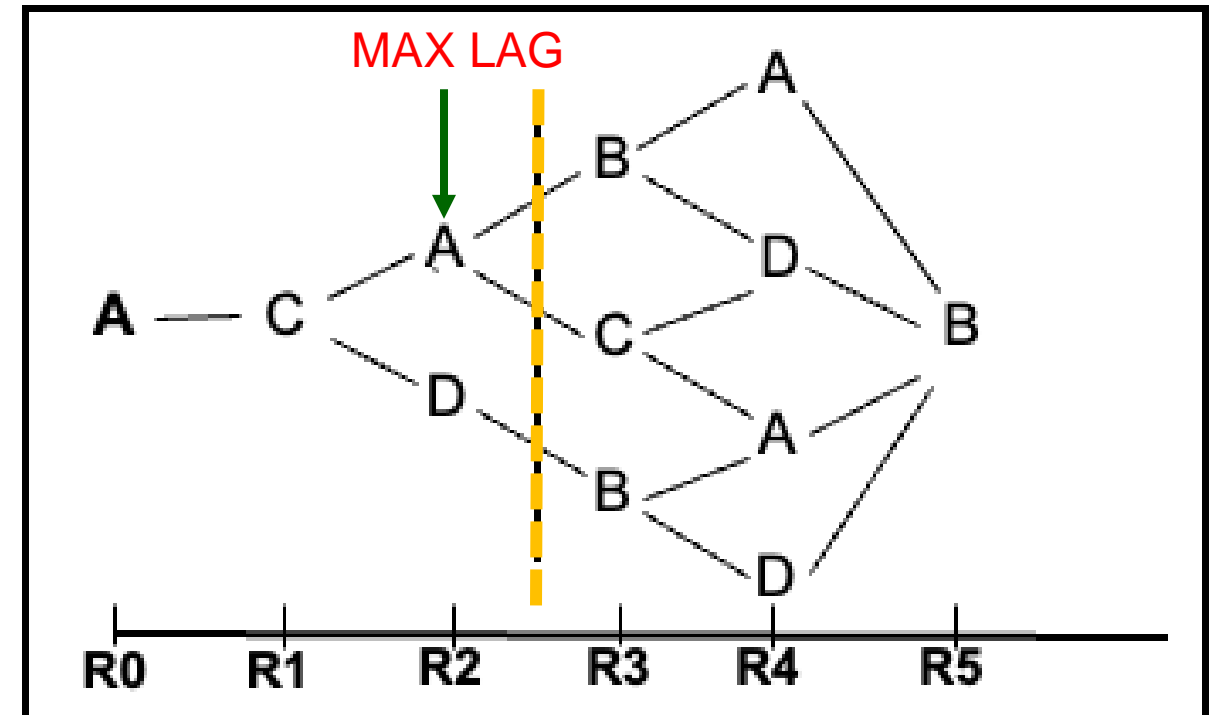
4.2. Lag Sequential Analysis (LSA)

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

Unconditional Prob.
Upper Limit Conf. Interval

	A	B	C	D
	0.31	0.16	0.28	0.25
	0.61	0.39	0.57	0.53
Lag 1	<u>0</u>	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

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

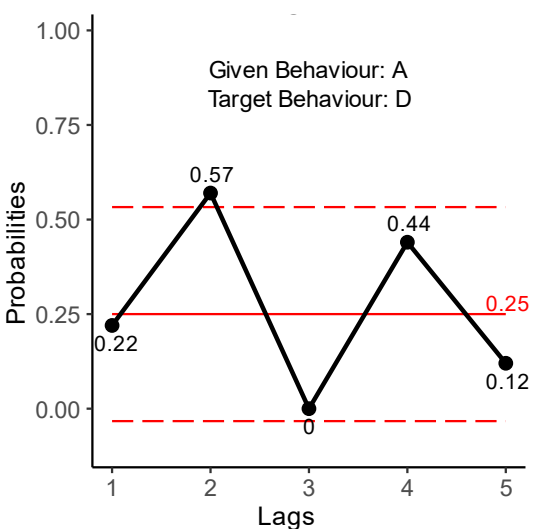
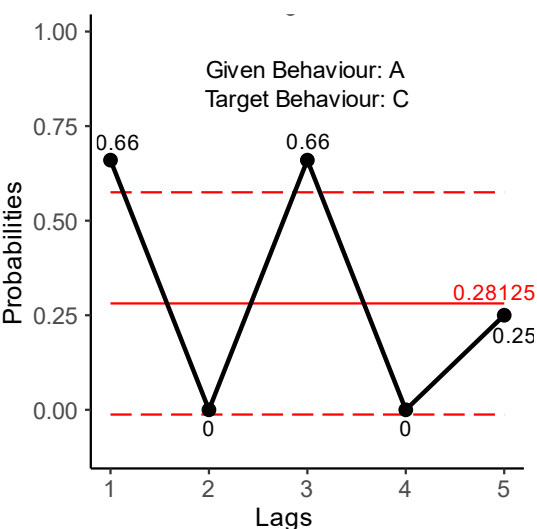
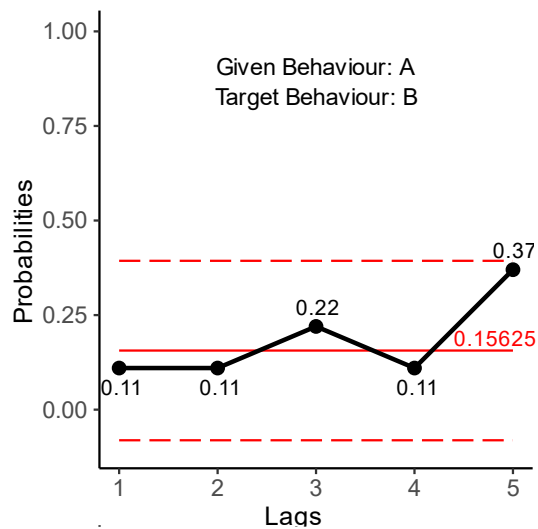
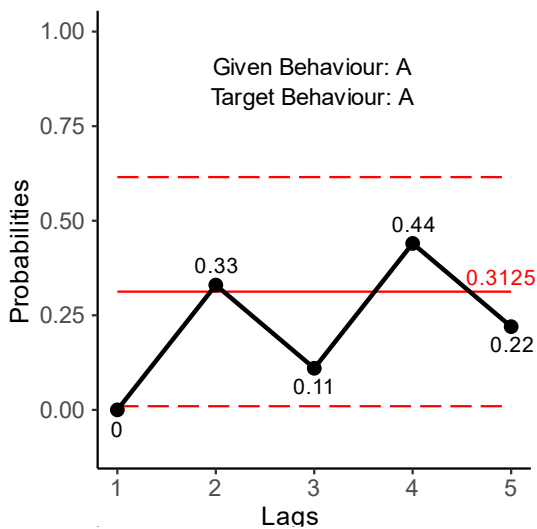
$$p_{\text{esp_corr}} = p_{\text{esp}} + \text{Error}$$

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

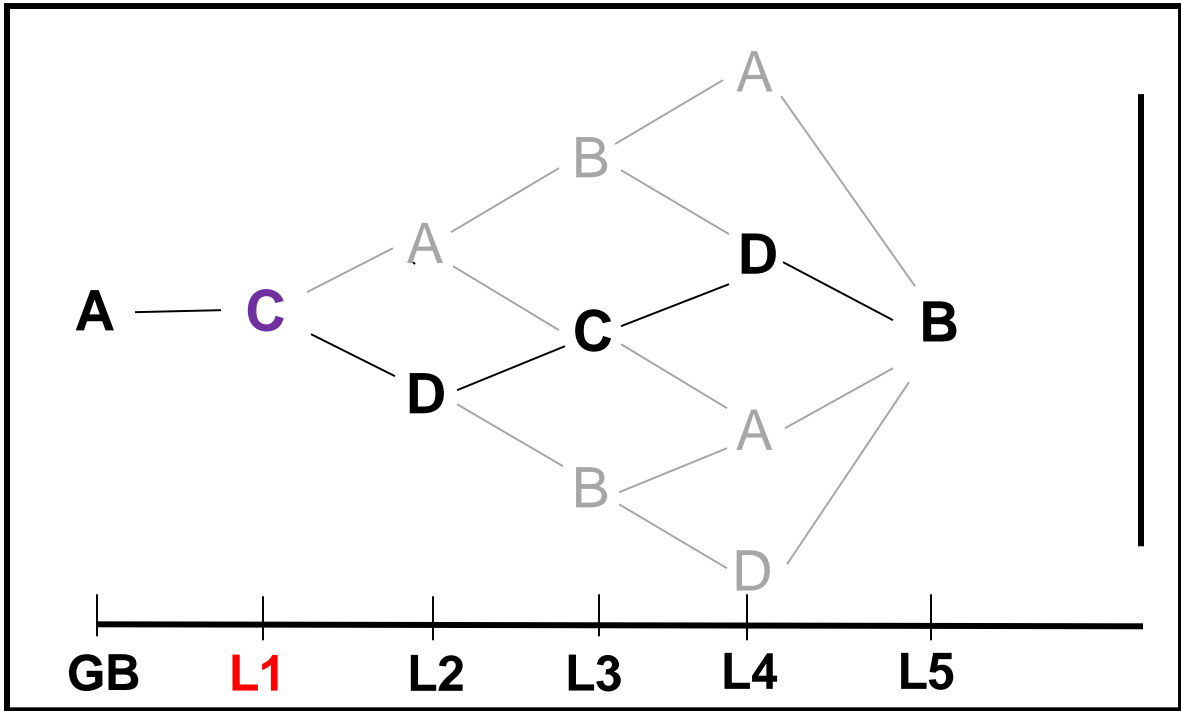
$$\text{Error} = 0.30$$

$$U_{\text{ppr}} = 0.31 + 0.30 = \mathbf{0.61}$$

- A: Caregiver Follow In Utterance
- B: Caregiver Focused Utterance
- C: Child Exploratory Play
- D: Child Functional Play



— Unconditional Prob.
- - Interval Conf. Limits
●—● Observer Prob.

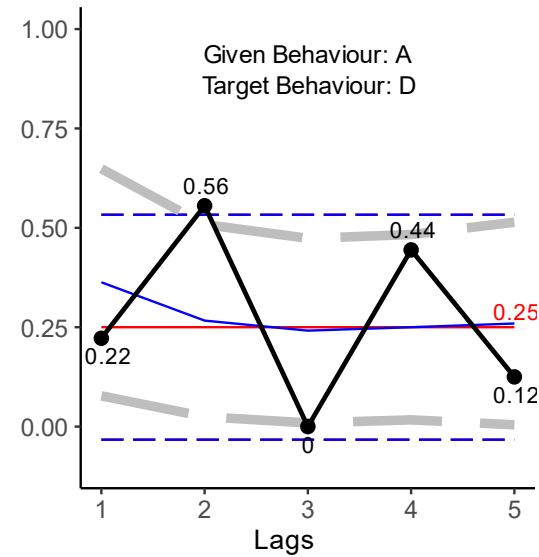
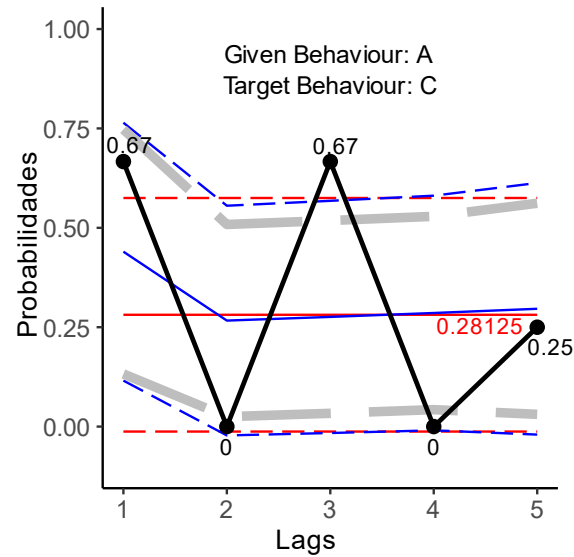
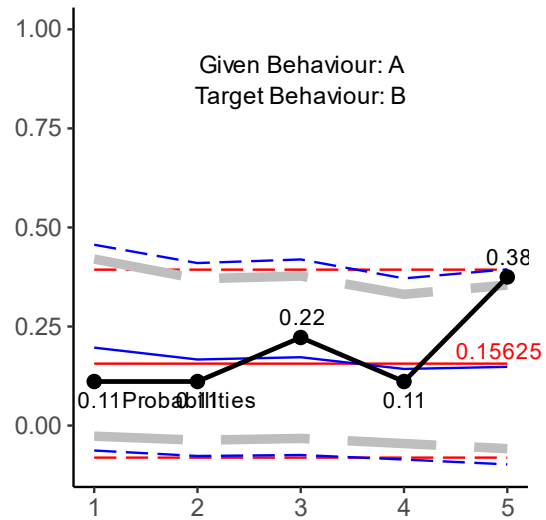
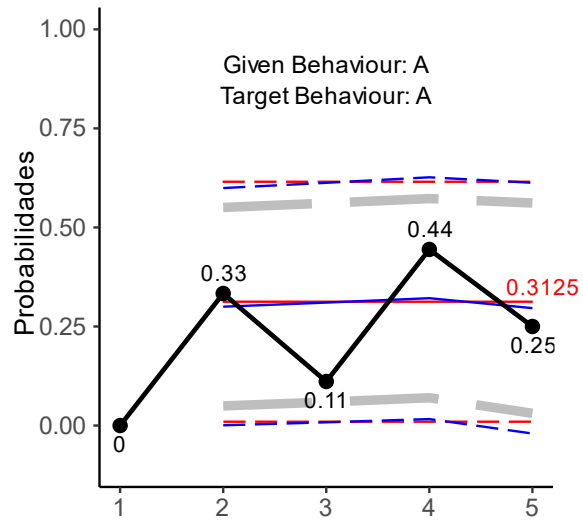


Lag: +1

ADJR 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

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



- Expected Prob.
- - Non Corrected Conf. Limits
- - Sackett Conf. Limits
- - Allison yLiker Conf. Limits
- Observed Prob.

4.2. Lag Sequential Analysis (LSA)

Lag: +2

x_{rc} observed joint frequencies

JNTF Target:	A	B	C	D	Totals
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

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

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

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

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

$$(A|A) e_{rc} = (9/30) * 9 = 2.70$$

$$(B|A) e_{rc} = (5/30) * 9 = 1.50$$

$$(C|A) e_{rc} = (8/30) * 9 = 2.40$$

$$(D|A) e_{rc} = (8/30) * 9 = 2.40$$

Lag: +2

e_{rc} expected frequencies

EXPF Target:	A	B	C	D
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_{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_{r+} Sum of the frequencies of row r

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

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) $p_r = 9 / 30 = 0.3$

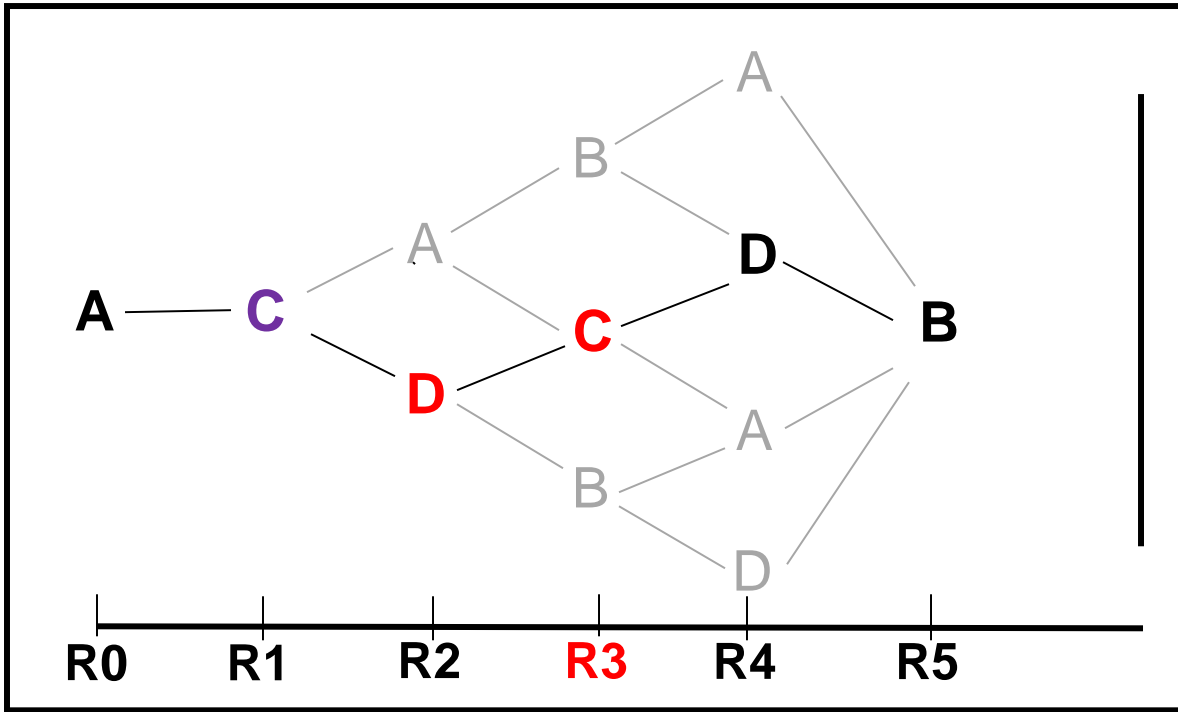
$$z_{rc} = \frac{3 - 2.70}{\sqrt{2.70(1 - 0.3)(1 - 0.3)}} \quad z_{rc} = 0.26$$

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

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

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

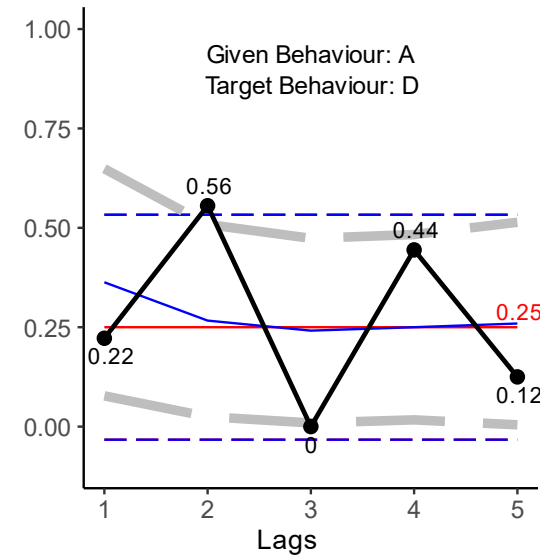
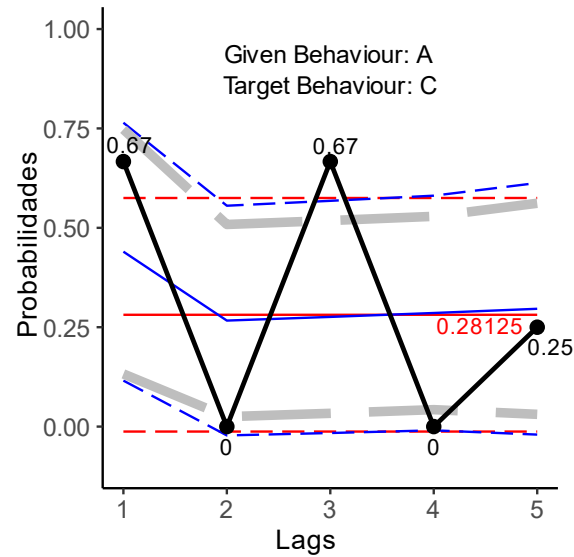
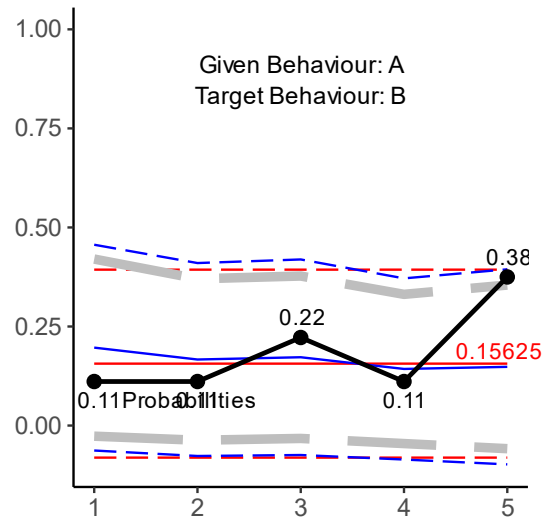
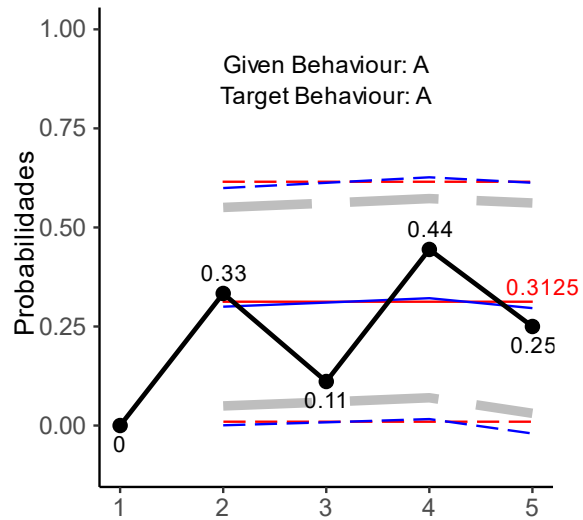


Lag: +3

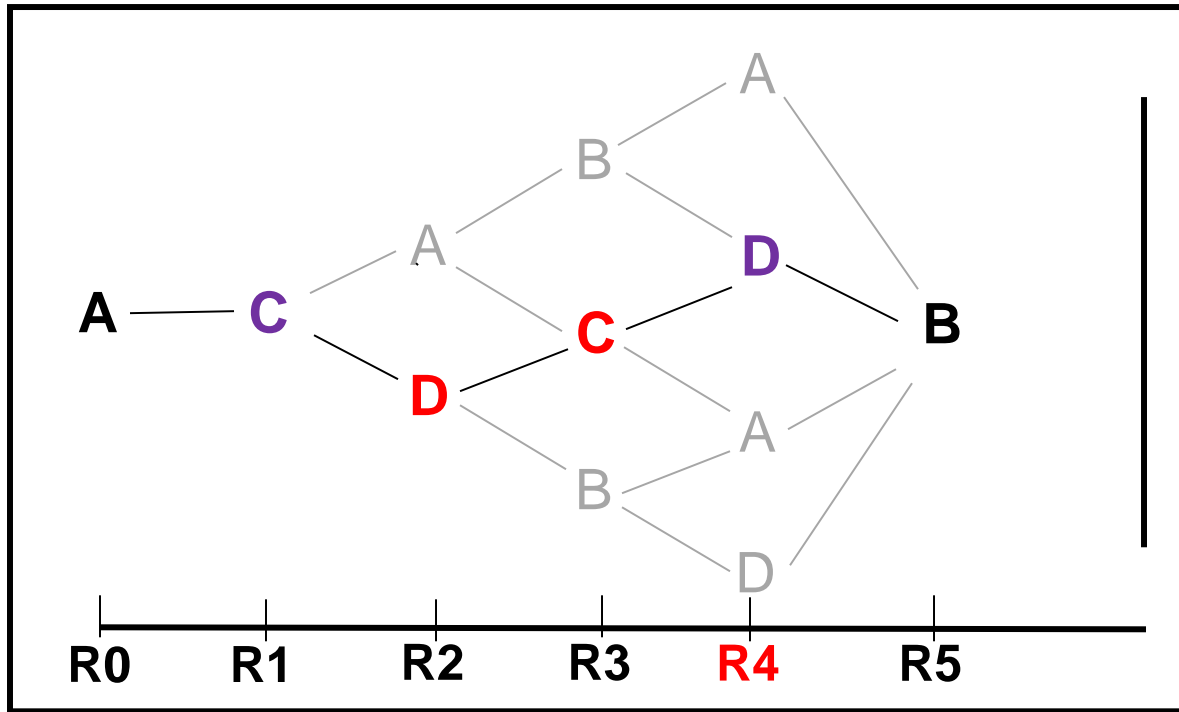
ADJR Target:

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

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



- Expected Prob.
- - Non Corrected Conf. Limits
- - Sackett Conf. Limits
- - Allison yLiker Conf. Limits
- Observed Prob.

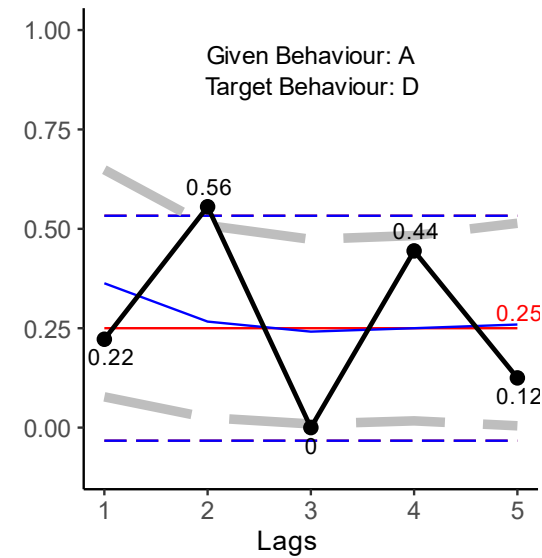
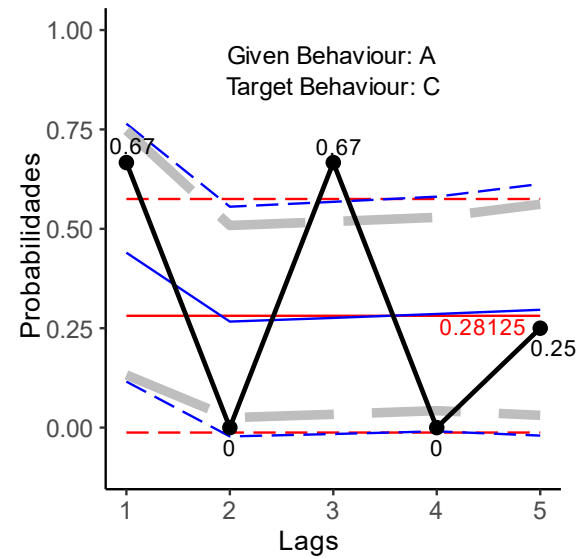
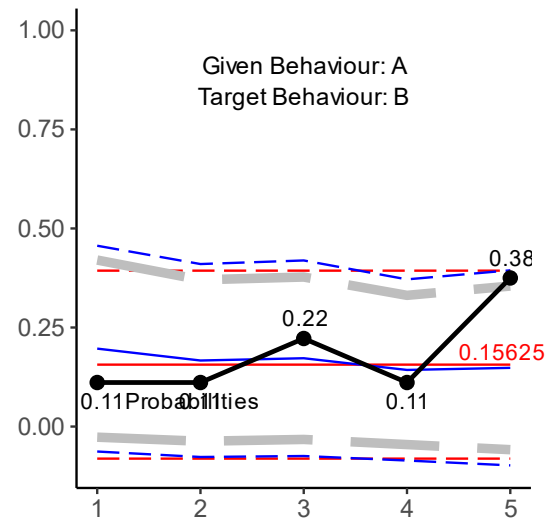
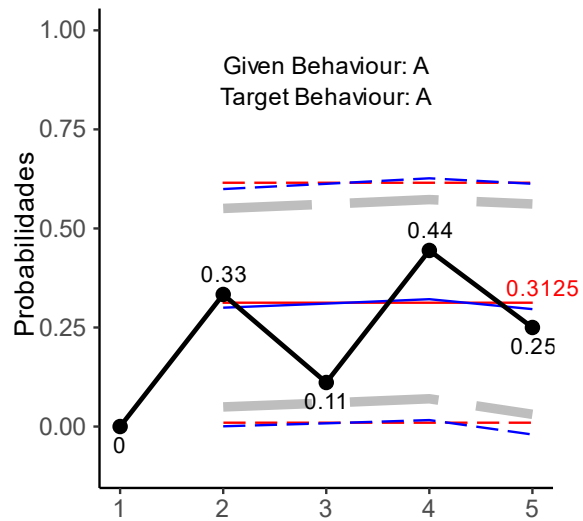


Lag: +4

ADJR Target:

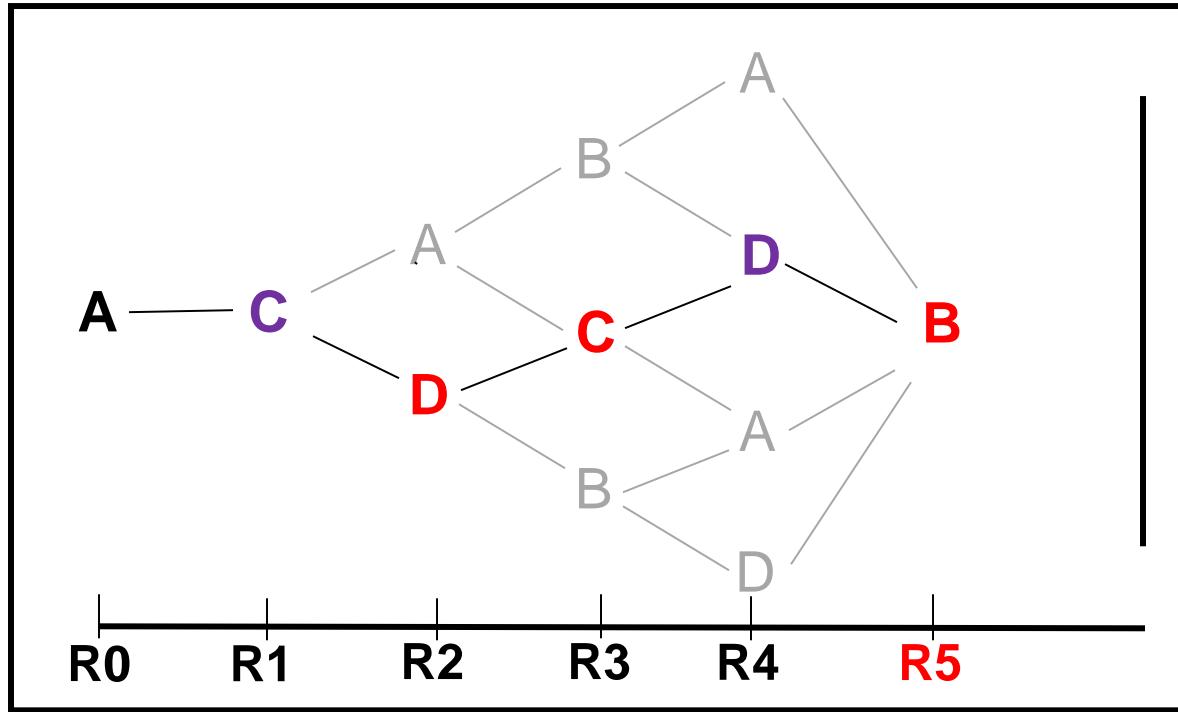
Given:	A	B	C	D
A	0,96	-0,33	-2,30	1,64
B	-1,70	-1,01	3,90	-1,42
C	-1,17	1,25	0,97	-0,76
D	1,64	0,00	-1,93	0,25

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



- Expected Prob.
- - Non Corrected Conf. Limits
- - Sackett Conf. Limits
- - Allison y Liker Conf. Limits
- Observed Prob.

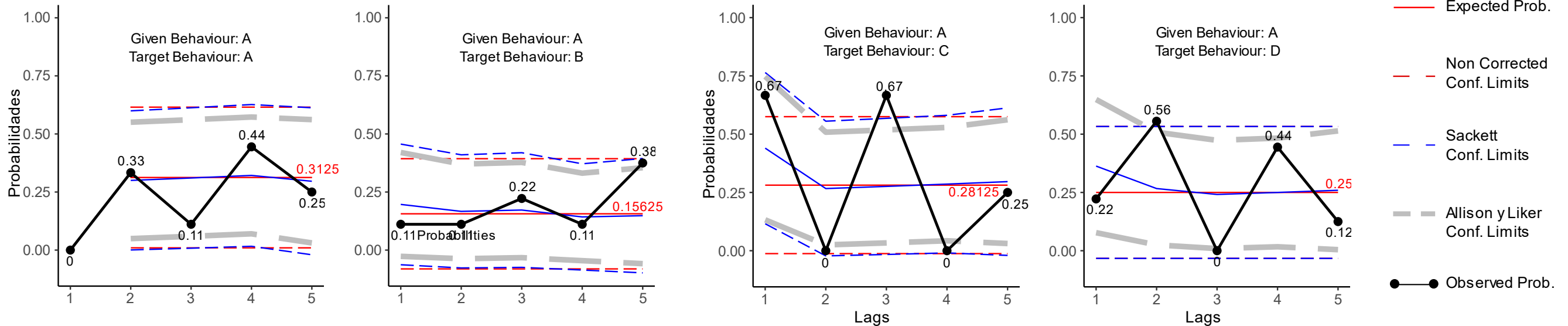
Lag: +5



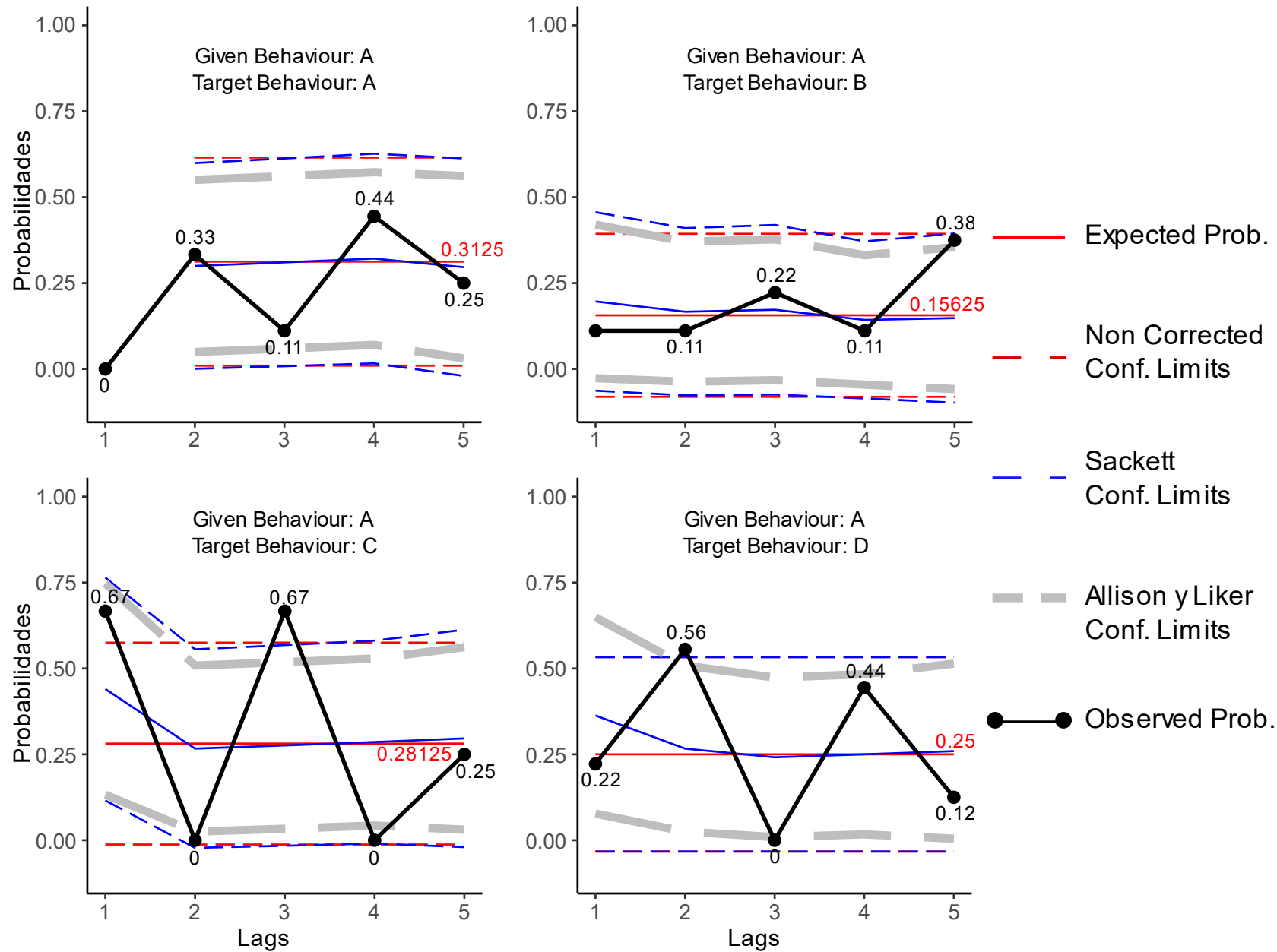
ADJR Target:

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

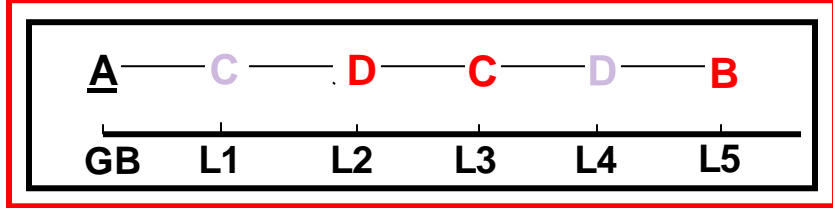
$$z_{rc} \text{ adjusted residuals} = \frac{x_{rc} - e_{rc}}{\sqrt{e_{rc}(1 - p_c)(1 - p_r)}}$$



4.2. Lag Sequential Analysis (LSA)



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

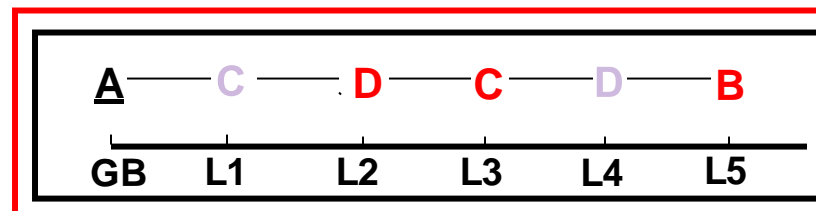
D: Child Functional Play

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

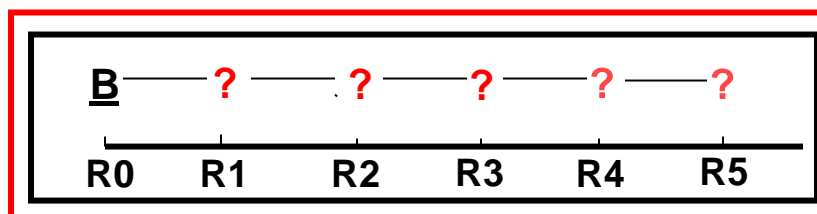
D: Child Functional Play

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	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

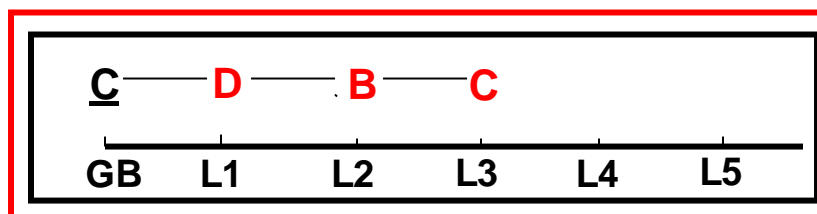
D: Child Functional Play

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

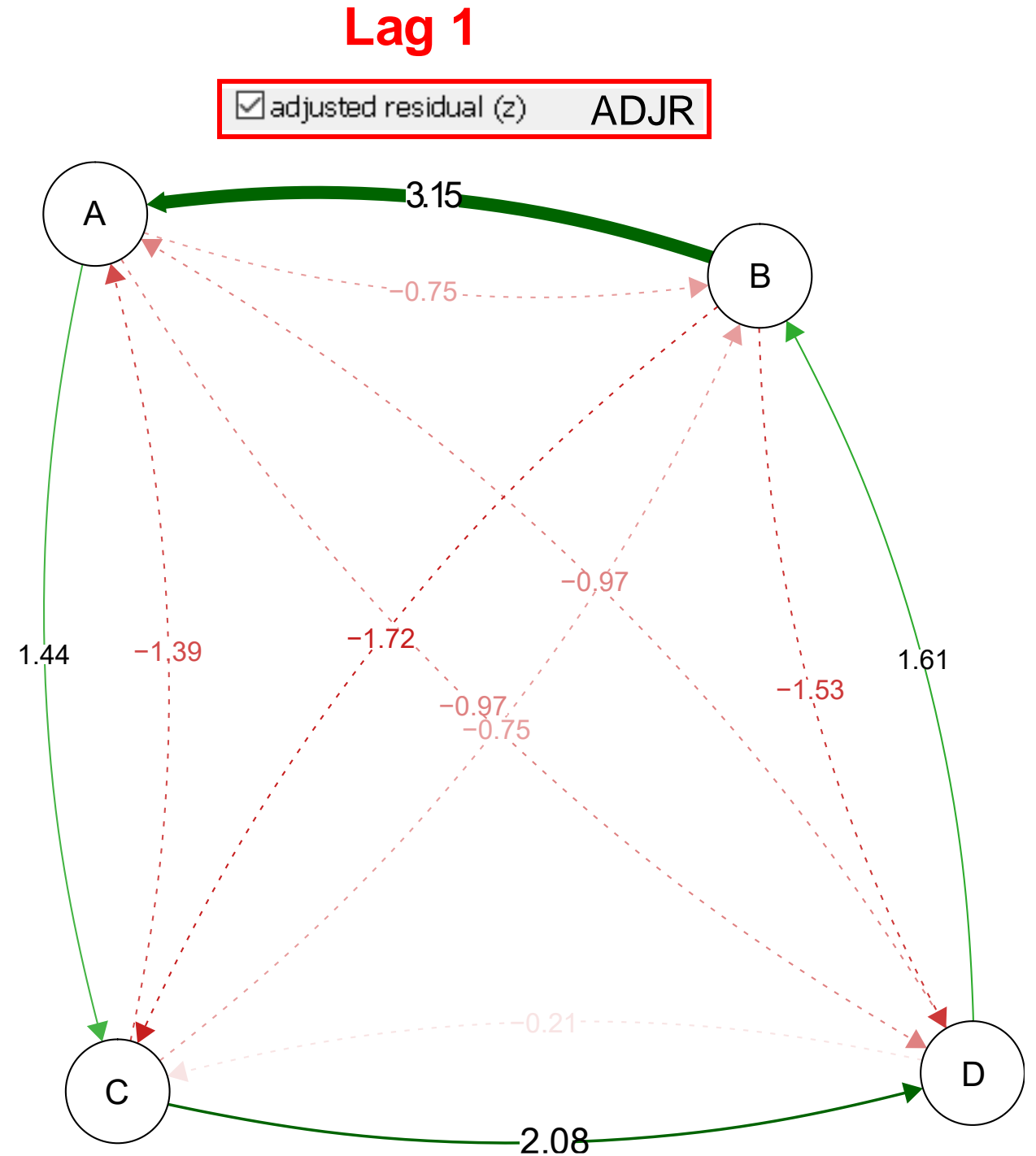


Lag 1	Target:				
Given:	A	B	C	D	
A	0,00	-0,75	1,44	-0,97	
B	3,15	0,00	-1,72	-1,53	
C	-1,39	-0,75	0,00	2,08	
D	-0,97	1,61	-0,21	0,00	

Nodes represent the codes

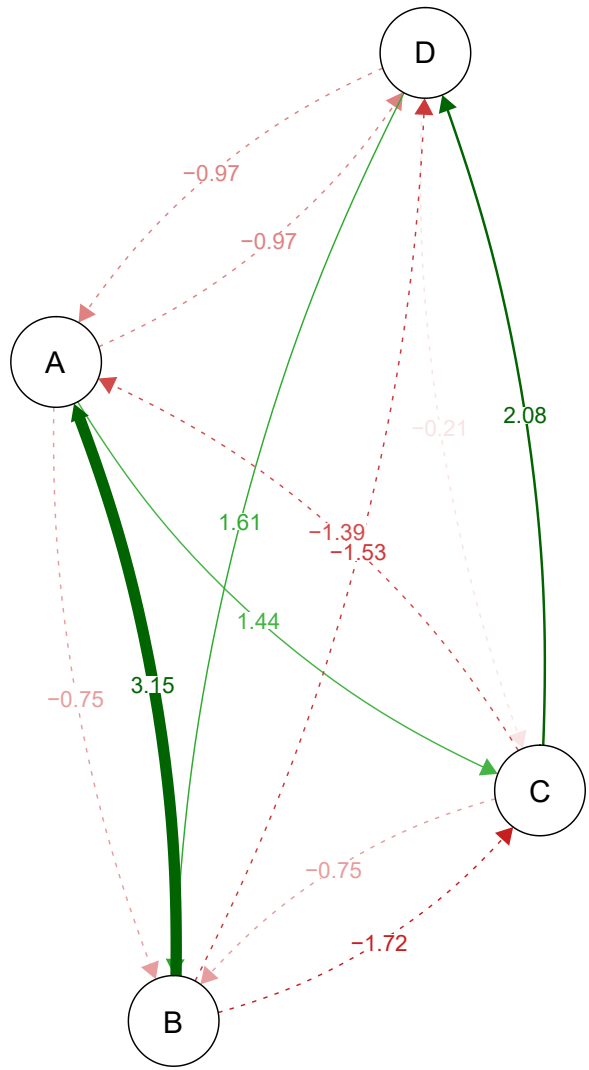
Edge thickness is proportional to adjusted residuals

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

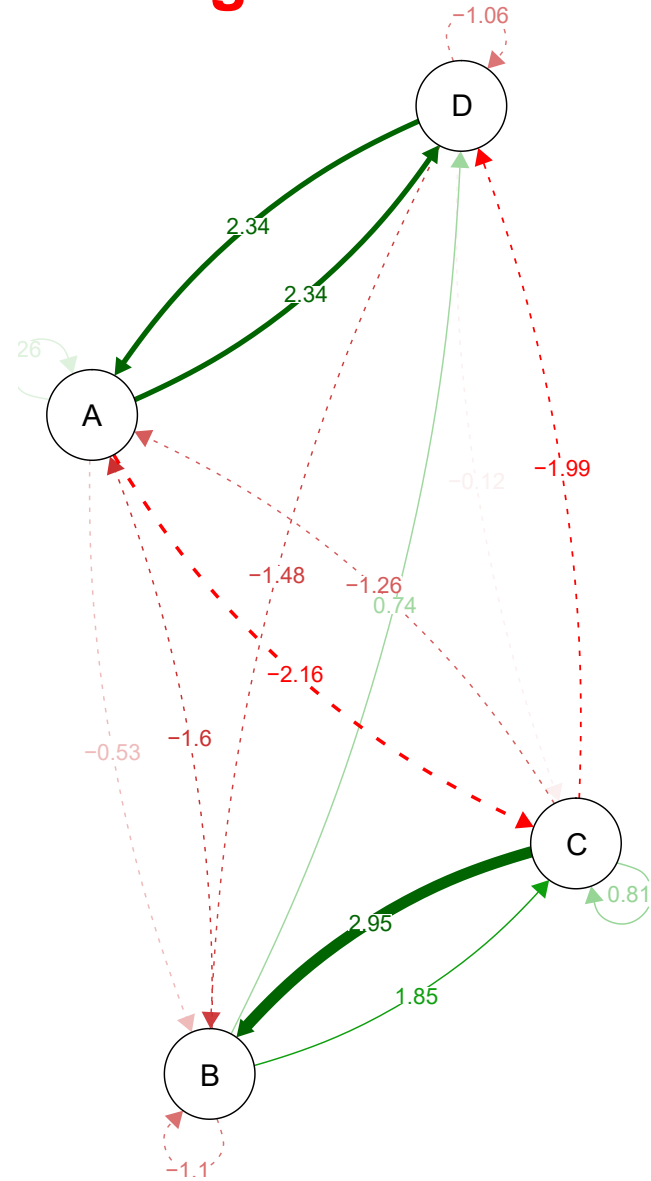


Graphical Representation

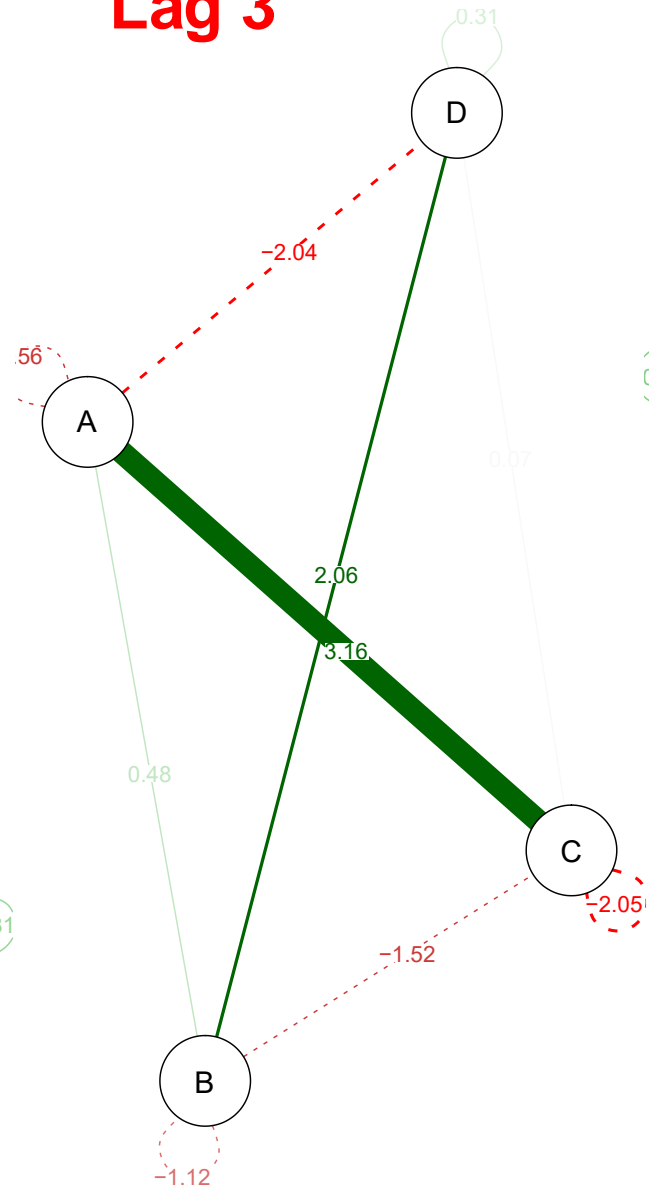
Lag 1



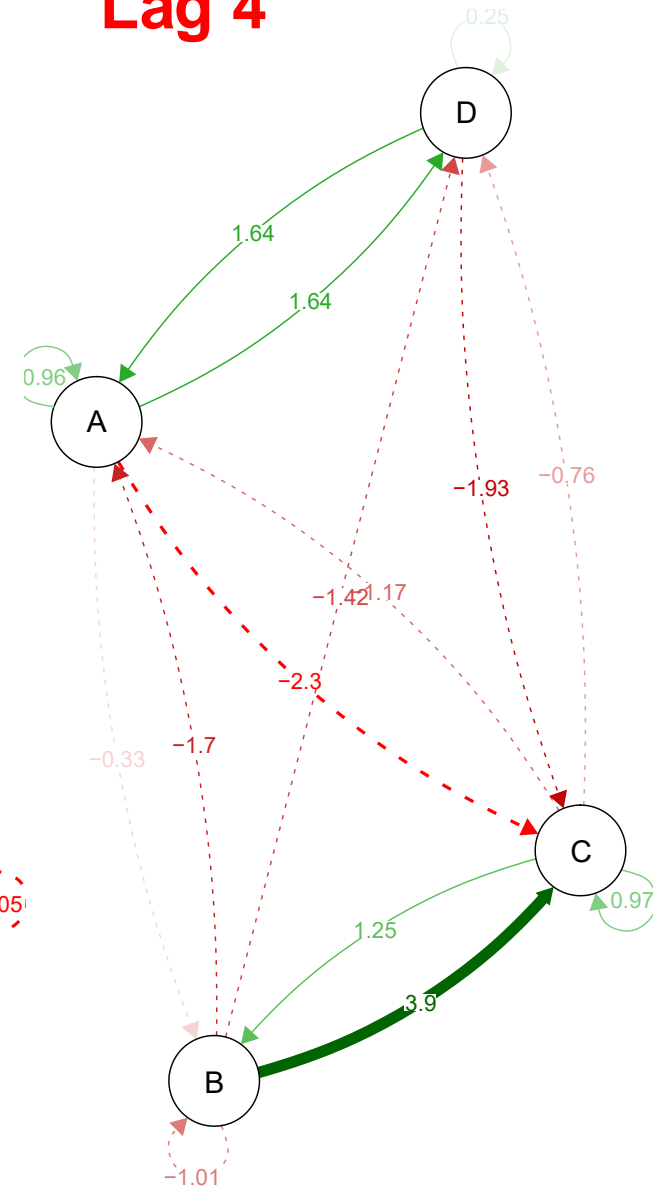
Lag 2



Lag 3

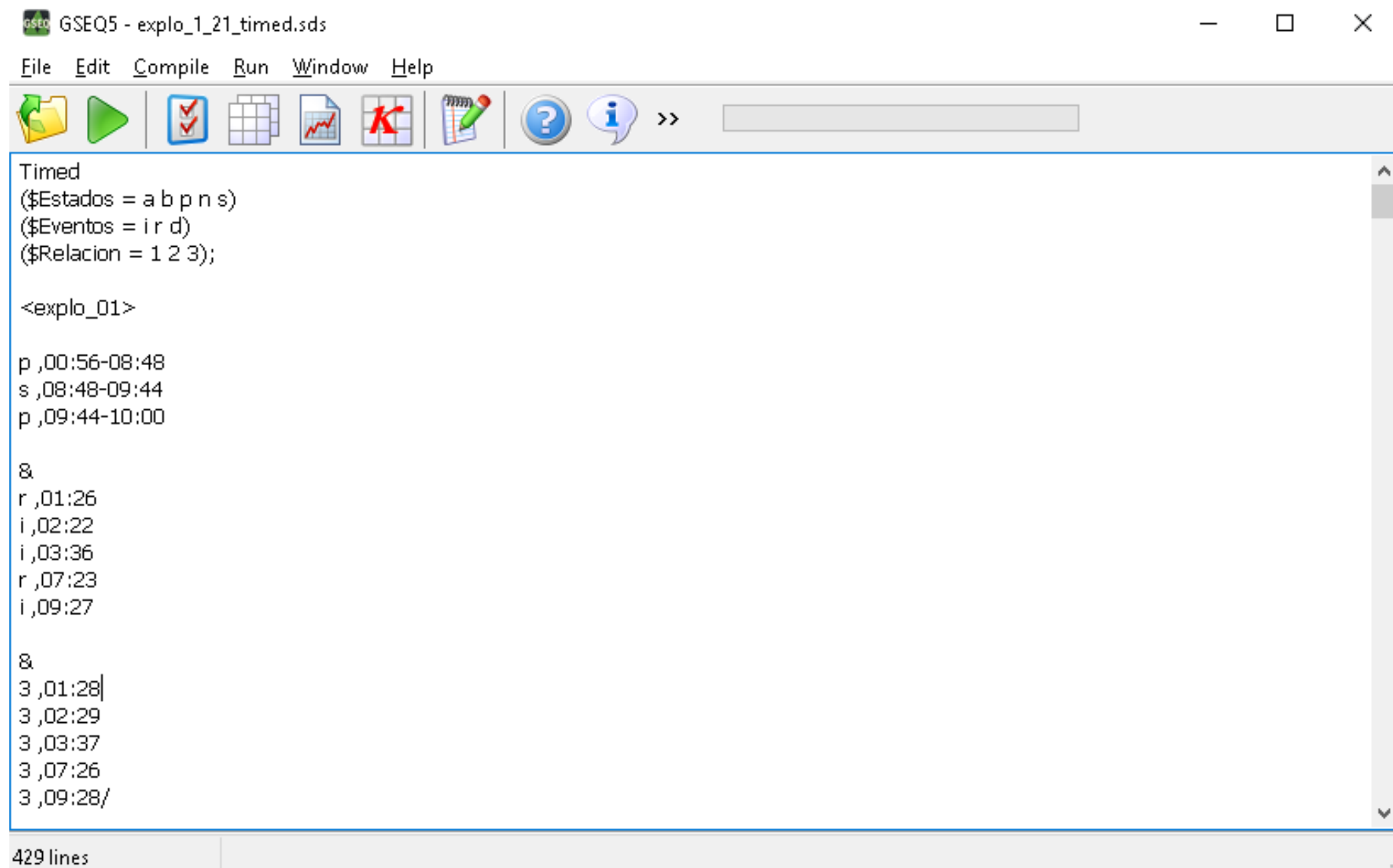


Lag 4



4.2. Lag Sequential Analysis (LSA)

Example with SDIS-GSEQ



```
GSEQ5 - explo_1_21_timed.sds
File Edit Compile Run Window Help
Timed
($Estados = a b p n s)
($Eventos = i r d)
($Relacion = 1 2 3);

<explo_01>

p ,00:56-08:48
s ,08:48-09:44
p ,09:44-10:00

&
r ,01:26
i ,02:22
i ,03:36
r ,07:23
i ,09:27

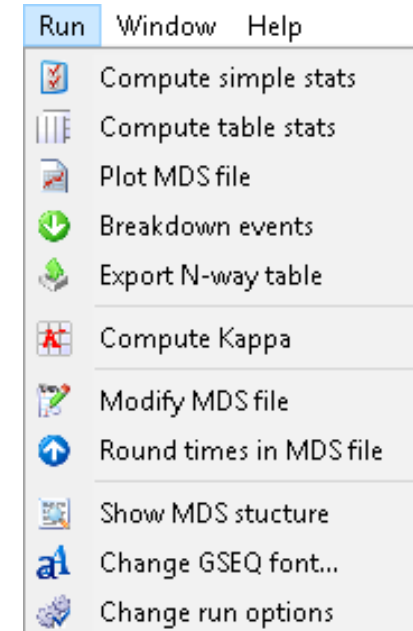
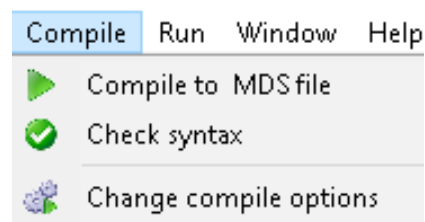
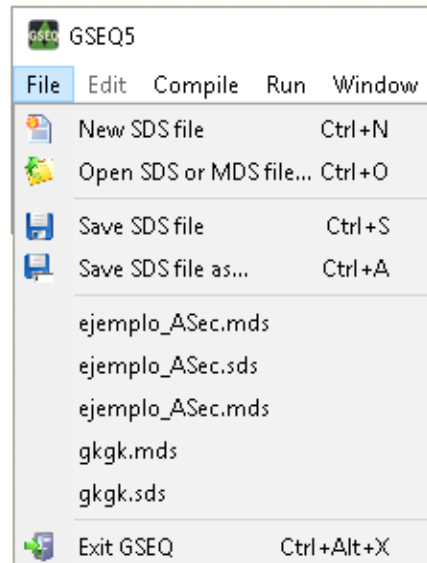
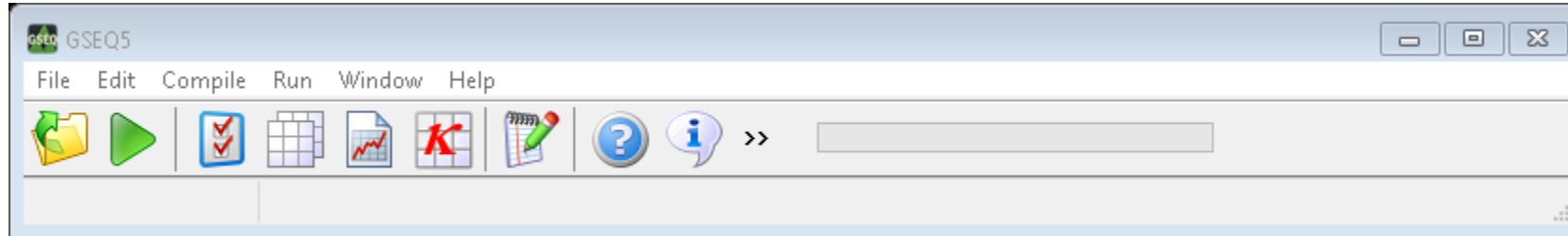
&
3 ,01:28|
3 ,02:29
3 ,03:37
3 ,07:26
3 ,09:28/

429 lines
```


4.2. Lag Sequential Analysis (LSA)

RUNNING IN SDIS-QSEQ v 5.1.23

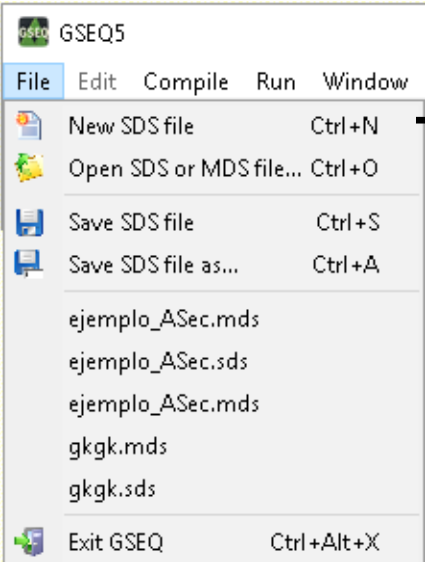
Menú Principal



4.2. Lag Sequential Analysis (LSA)

RUNNING IN SDIS-QSEQ v 5.1.23

SYNTAX



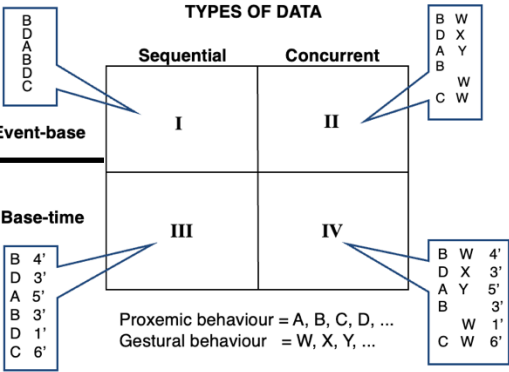
New SDS File

Data Type
Code Statement
Declaration of variables ;

```
<Session 1>
Registered codes
Registered codes/

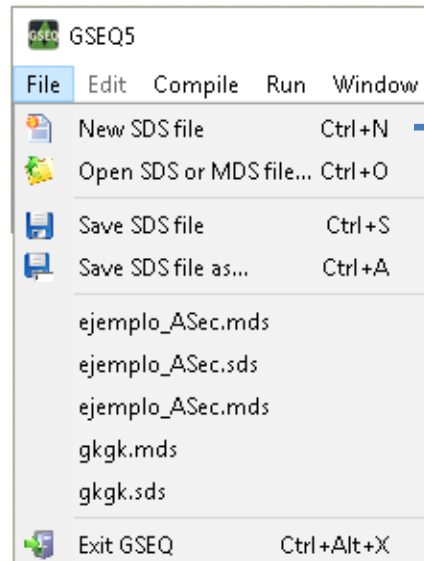
<Session 2>
Registered codes
Registered codes/

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



4.2. Lag Sequential Analysis (LSA)

RUNNING IN SDIS-QSEQ v 5.1.23

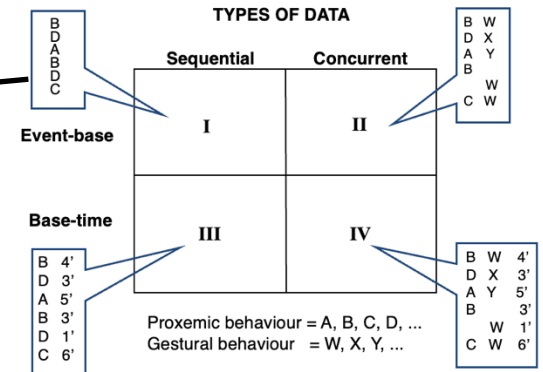


New SDS File

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

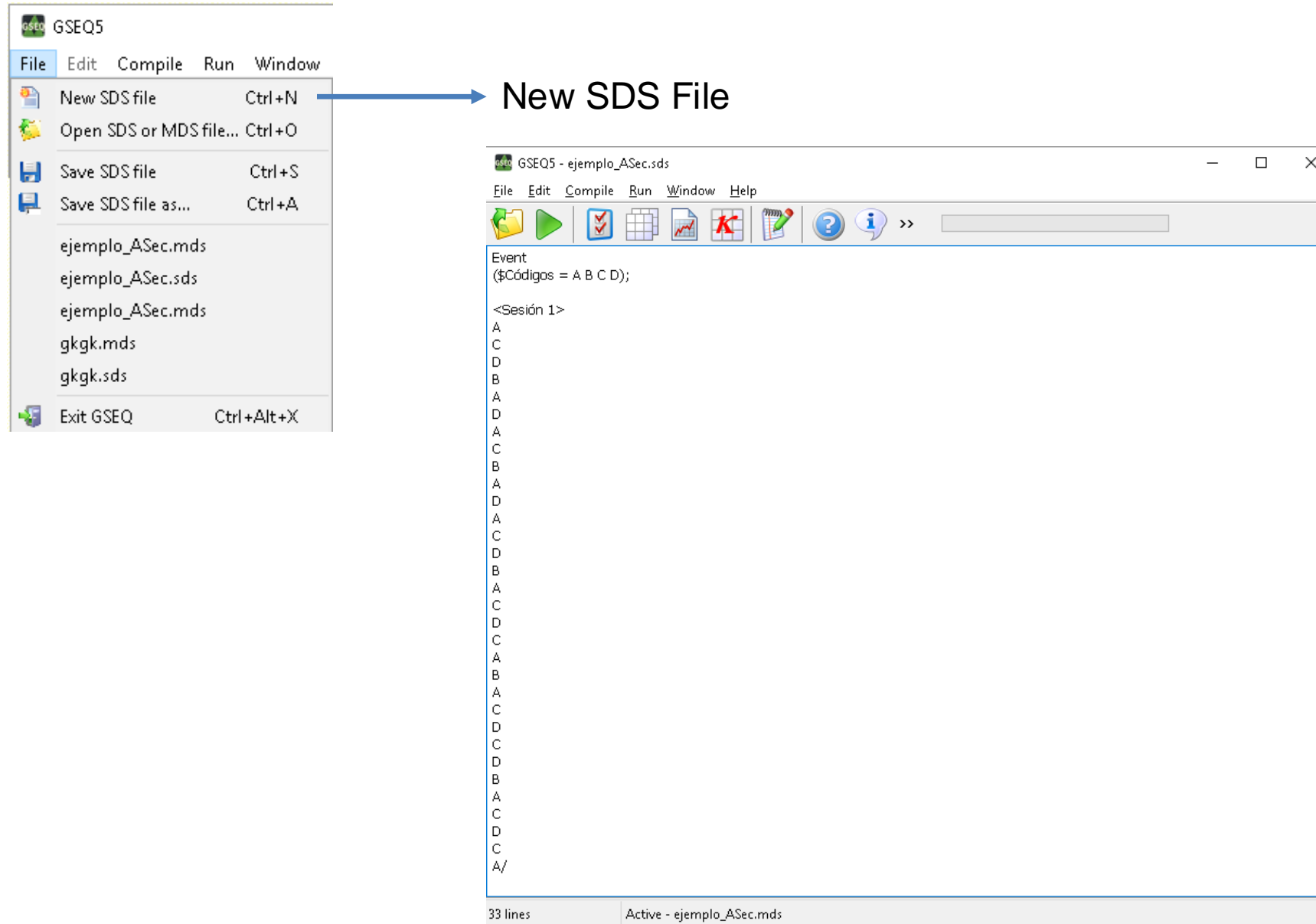
<Session 1>

```
A  
C  
D  
B  
A  
D  
A  
C  
B/
```



4.2. Lag Sequential Analysis (LSA)

RUNNING IN SDIS-QSEQ v 5.1.23



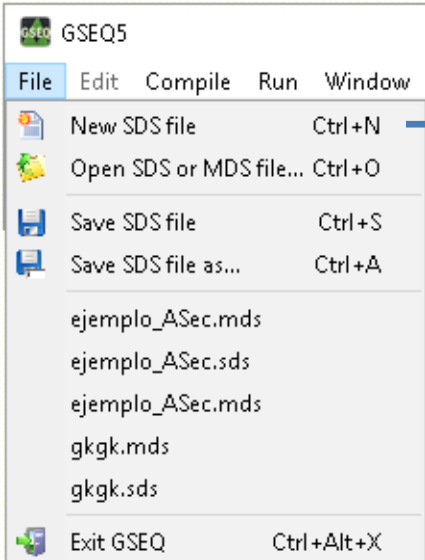
The image shows two screenshots of the GSEQ5 software interface. The left screenshot shows the 'File' menu with the 'New SDS file' option highlighted. A blue arrow points from this option to the text 'New SDS File'. The right screenshot shows the main window of GSEQ5 with a new file named 'ejemplo_ASec.sds' open. The window title is 'GSEQ5 - ejemplo_ASec.sds'. The menu bar includes 'File', 'Edit', 'Compile', 'Run', 'Window', and 'Help'. The toolbar contains icons for file operations and analysis. The main text area displays the following content:

```
Event  
($Códigos = A B C D);  
  
<Sesión 1>  
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/  
A/
```

The status bar at the bottom indicates '33 lines' and 'Active - ejemplo_ASec.sds'.

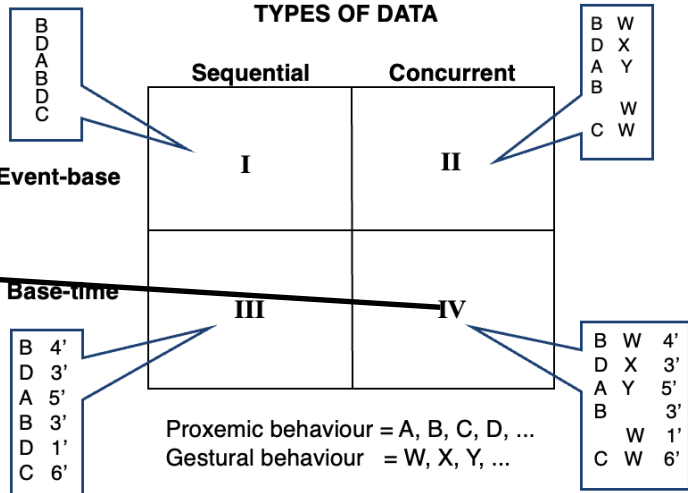
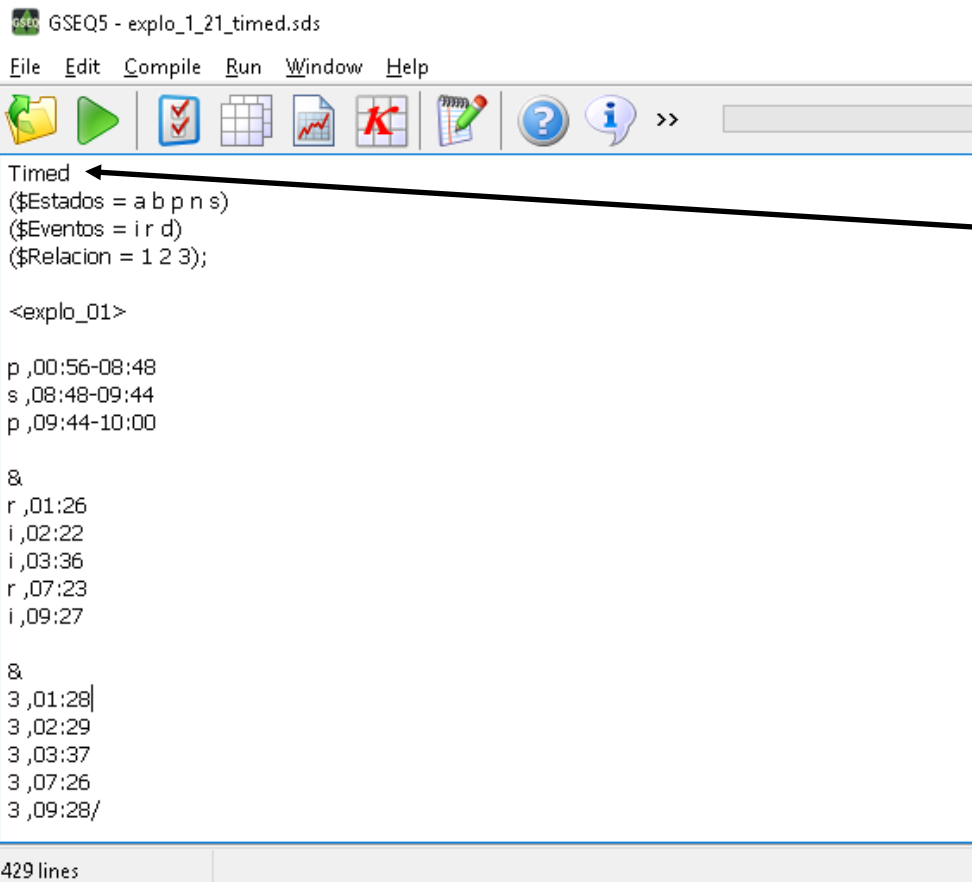
4.2. Lag Sequential Analysis (LSA)

RUNNING IN SDIS-QSEQ v 5.1.23



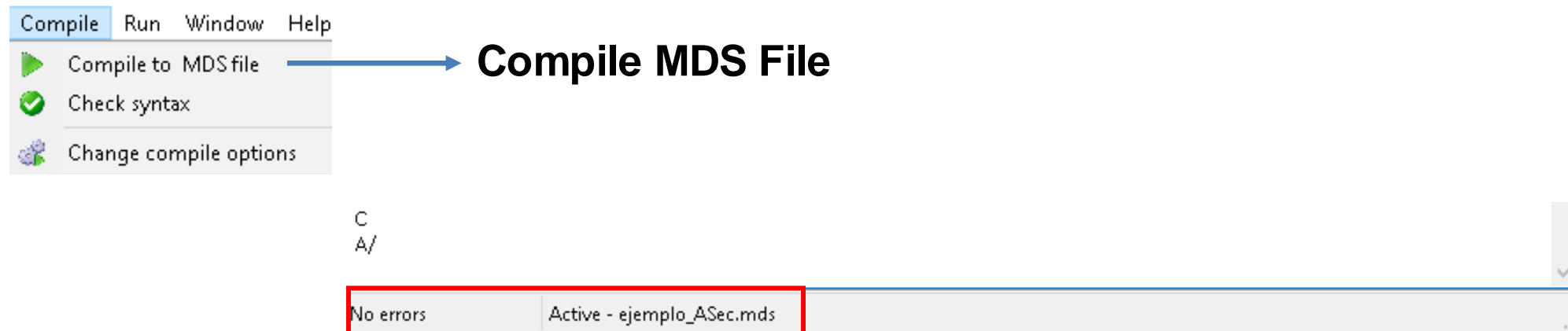
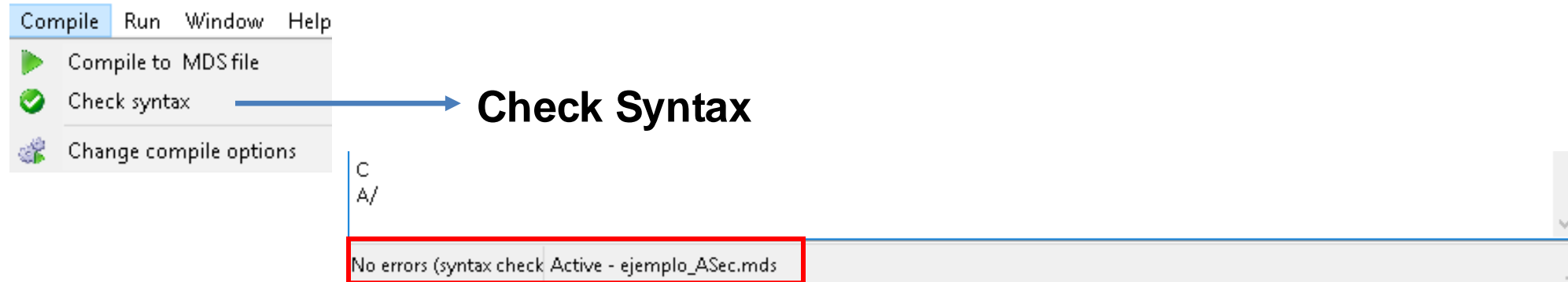
New SDS File

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

The screenshot displays the 'Simple Statistics' dialog box in the SDIS-QSEQ v 5.1.23 software. The 'Run' menu is open on the left, with an arrow pointing to the 'Simple Statistics' option. The dialog box has a title bar 'Simple Statistics - ejemplo_ASec.mds' and a 'File Run' menu. It features a 'Select codes from file.....for simple stats.' section with a list of codes (A, B, C, D) and buttons for 'move all', 'move sel.', and 'move all'. Below this is a 'Select factors.....for pooling.' section with similar buttons. On the right, there are several sections of options: 'Simple stats:' with checkboxes for frequency, relative frequency, rate..., duration, relative duration, and probability; 'for:' with checkboxes for durations, gaps, between onsets, and latencies; 'When you select RUN:' with radio buttons for 'don't display results', 'append new results to existing' (selected), and 'overwrite existing results'; 'Export files:' with radio buttons for 'don't write export files' (selected), 'write a file for each RUN', and 'write one file after closing window'; and a checkbox for 'Pool over sessions'.

Run Window Help

- Compute simple stats
- Compute table stats
- Plot MDS file
- Breakdown events
- Export N-way table
- Compute Kappa
- Modify MDS file
- Round times in MDS file
- Show MDS structure
- Change GSEQ font...
- Change run options

Simple Statistics - ejemplo_ASec.mds

File Run

Select codes from file.....for simple stats.

move all move sel. move sel. move all

A
B
C
D

Select factors.....for pooling.

move all move sel. move sel. move all

Simple stats:

- frequency
- relative frequency
- rate...
- duration
- relative duration
- probability

for:

- durations
 - gaps
 - between onsets
 - latencies

When you select RUN:

- don't display results
- append new results to existing
- overwrite existing results

Export files:

- don't write export files
- write a file for each RUN
- write one file after closing window

Pool over sessions

4.2. Lag Sequential Analysis (LSA)

RUNNING IN SDIS-QSEQ v 5.1.23

The screenshot shows the 'Simple Statistics' dialog box in SDIS-QSEQ v 5.1.23. The 'Run' menu is open, and the 'Simple Statistics' window is active. The window contains two columns of codes (A, B, C, D) and a list of statistical options. A red box highlights the 'Run' button, and another red box highlights the 'Simple stats' options. A blue arrow points from the 'Run' menu to the 'Simple Statistics' window.

1 move all >> move sel. > < move sel. << move all

Select codes from file.....for simple stats.

A B C D

A B C D

2 Simple stats:

- frequency
- relative frequency
- rate... 1=second
- duration
- relative duration
- probability
- average
- minimum
- maximum

for: durations

- gaps
- between onsets
- latencies

When you select RUN:

- don't display results
- append new results to existing
- overwrite existing results

Export files:

- don't write export files
- write a file for each RUN
- write one file after closing window

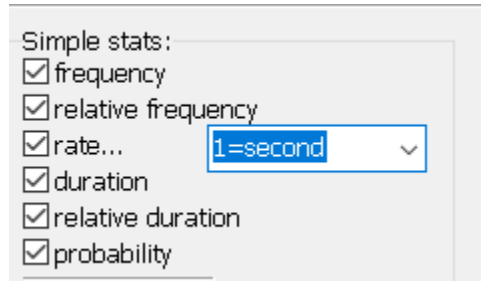
Pool over sessions

Select factors.....for pooling.

move all move sel. move sel. move all

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

relf = relative frequency

rate = rate

dura = duration

reld = relative duration

prob = probability

Number of occurrences of a behavior

Relative Frequency = Frequency / Sum of Frequencies

Rate = Session Frequency / Duration

Duration of each of the registered codes

Relative Duration = Duration / Sum of Durations

Probability = Duration / Total Duration

4.2. Lag Sequential Analysis (LSA)

RUNNING IN SDIS-QSEQ v 5.1.23

The screenshot displays the 'Table Statistics - ejemplo_ASec.mds' dialog box in the SDIS-QSEQ v 5.1.23 software. The interface is annotated with red boxes and arrows indicating key components:

- 1**: The 'Run' button in the top toolbar.
- 2**: The 'move all' button in the 'Select codes in file...' section.
- 3**: The 'Cell stats' section, which includes checked options for joint frequency, expected frequency, conditional probability, residual (obs - exp), adjusted residual (z), and p-value for adj residual.
- 4**: The 'lag specifications' section, showing '1' in the input fields.

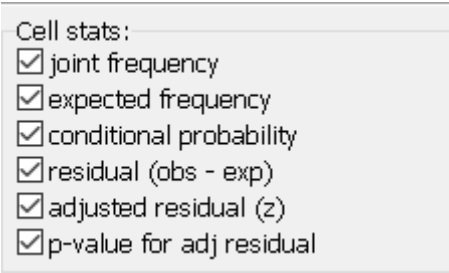
The main window also shows a 'Move codes to:' section with radio buttons for 'givens' and 'targets', and a table for selecting codes for use as givens or targets. The table lists codes A, B, C, and D, with arrows indicating their selection.

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)
$P(t_c g_r)$	Conditional probability = x_{rc} / x_{r+}
y_{rc}	Residuals, difference between frequencies Observed and expected = $x_{rc} - e_{rc}$
z_{rc}	Adjusted residuals = $\frac{x_{rc} - e_{rc}}{\sqrt{e_{rc}(1 - p_c)(1 - p_r)}}$



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	<u>0</u>	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	Target:			
Given:	A	B	C	D
A	0	1	6	2
B	5	0	0	0
C	2	1	0	6
D	2	3	3	0
Totals	9	5	9	8

X_{+c}

Totals

9
5
9
8
31

X_{r+}

$N = X_{++}$

Xrc observed transition frequencies

4.2. Lag Sequential Analysis (LSA)

RUNNING IN SDIS-QSEQ v 5.1.23

Lag: +2

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

joint frequency **JNTF**

JNTF	Target:				Totals
Given:	A	B	C	D	
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

$N = x_{++}$

x_{+c}

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 = $p_c \times x_{r+}$
 p_c = probability of column c = x_{+c} / N

4.2. Lag Sequential Analysis (LSA)

RUNNING IN SDIS-QSEQ v 5.1.23

- 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:				Totals
Given:	A	B	C	D	
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

$N = x_{++}$

x_{rc} observed transition frequencies

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

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} Frecuencias Esperadas = $p_c \times x_r$

residual (obs - exp) **RSDL**

RSDL	Target:			
Given:	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

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	Target:				Totals
Given:	A	B	C	D	
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

$N = X_{++}$

residual (obs - exp) **RSDL** $X_{rc} - e_{rc}$

RSDL	Target:			
Given:	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

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 Frequencies = $p_c \times X_r$

adjusted residual (z) **ADJR**

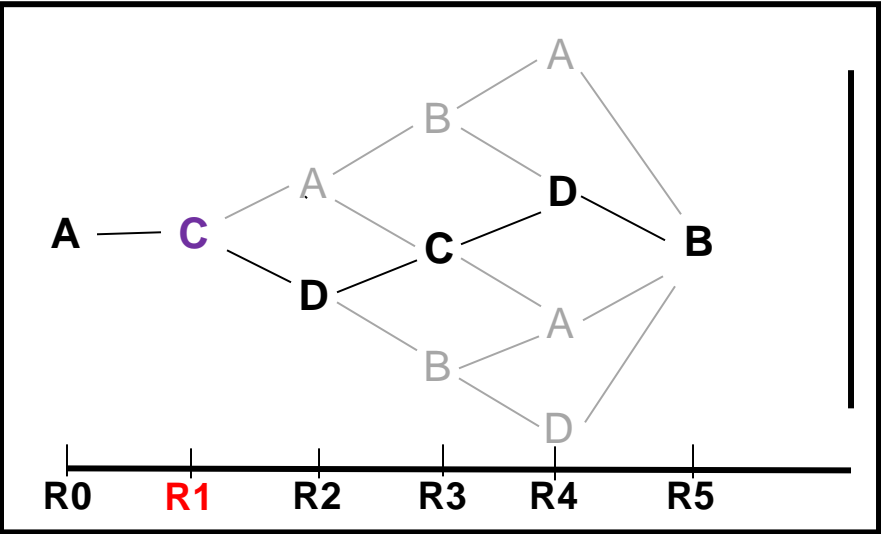
ADJR	Target:			
Given:	A	B	C	D
A	0,26	-0,53	-2,16	2,34
B	-1,60	-1,10	1,85	0,74
C	-1,26	2,95	0,81	-1,99
D	2,34	-1,48	-0,12	-1,06

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

4.2. Lag Sequential Analysis (LSA)

RUNNING IN SDIS-QSEQ v 5.1.23

Lag: +1



adjusted residual (z) ADJR

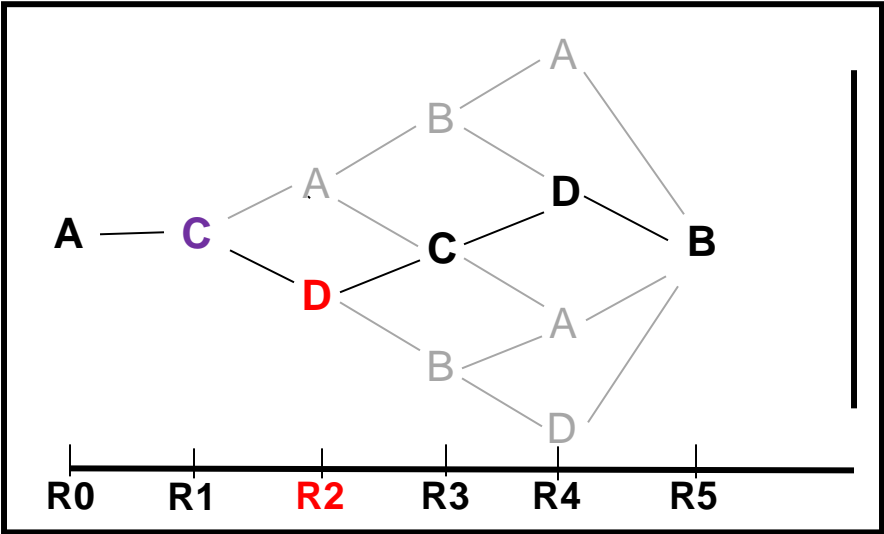
ADJR	Target:	A	B	C	D
Given:	A	0,00	-0,75	1,44	-0,97
A	B	3,15	0,00	-1,72	-1,53
B	C	-1,39	-0,75	0,00	2,08
C	D	-0,97	1,61	-0,21	0,00
D					

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

4.2. Lag Sequential Analysis (LSA)

RUNNING IN SDIS-QSEQ v 5.1.23

Lag: +2



adjusted residual (z) ADJR

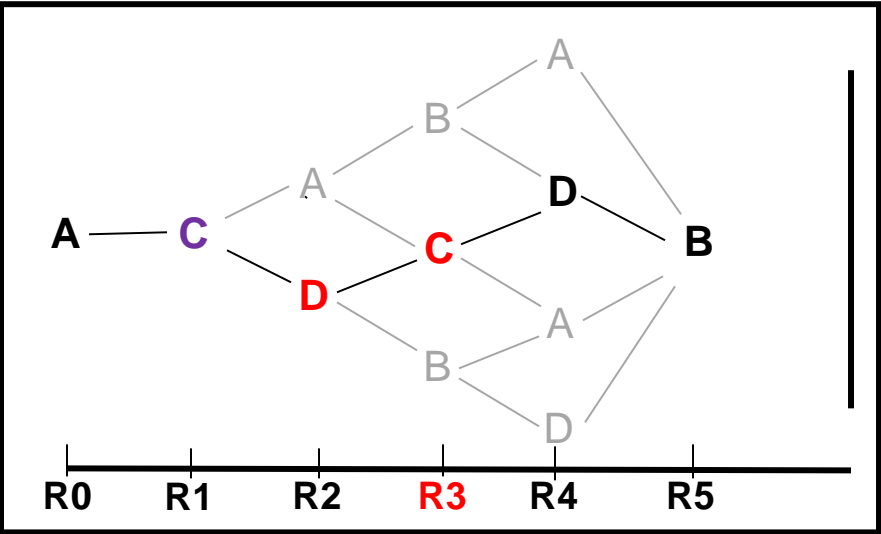
ADJR	Target:	A	B	C	D
Given:	A	0,26	-0,53	-2,16	2,34
	B	-1,60	-1,10	1,85	0,74
	C	-1,26	2,95	0,81	-1,99
	D	2,34	-1,48	-0,12	-1,06

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

4.2. Lag Sequential Analysis (LSA)

RUNNING IN SDIS-QSEQ v 5.1.23

Lag: +3



adjusted residual (z) ADJR

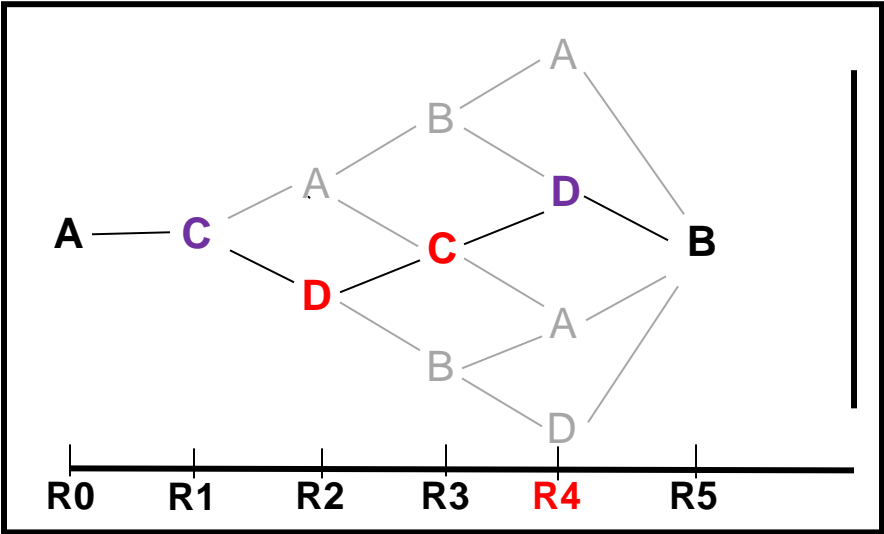
ADJR	Target:				
Given:	A	B	C	D	
A	-1,56	0,48	3,16	-2,04	
B	0,48	-1,12	-1,52	2,06	
C	3,16	-1,52	-2,05	0,07	
D	-2,04	2,06	0,07	0,31	

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

4.2. Lag Sequential Analysis (LSA)

RUNNING IN SDIS-QSEQ v 5.1.23

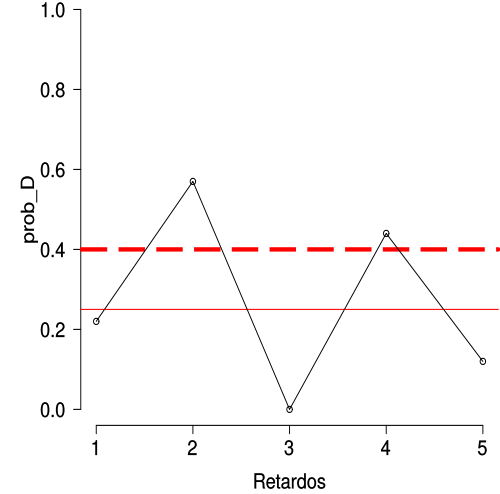
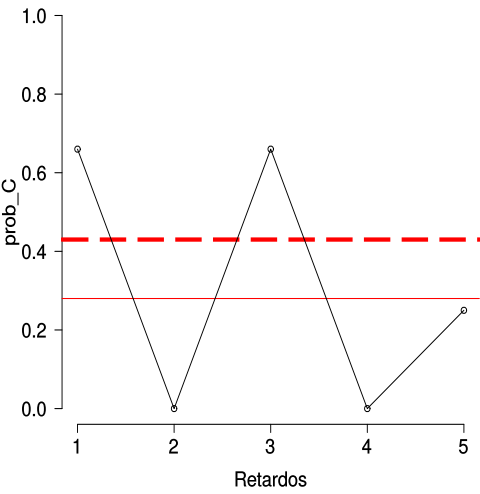
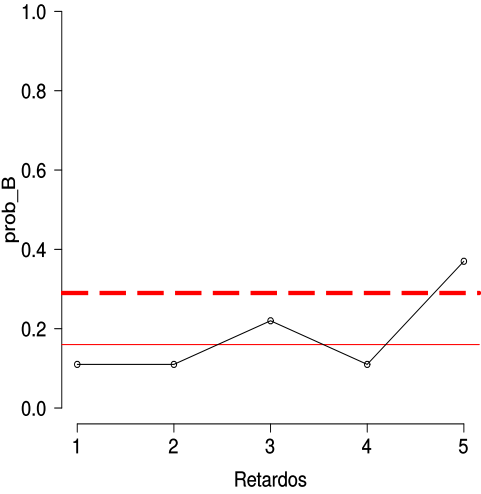
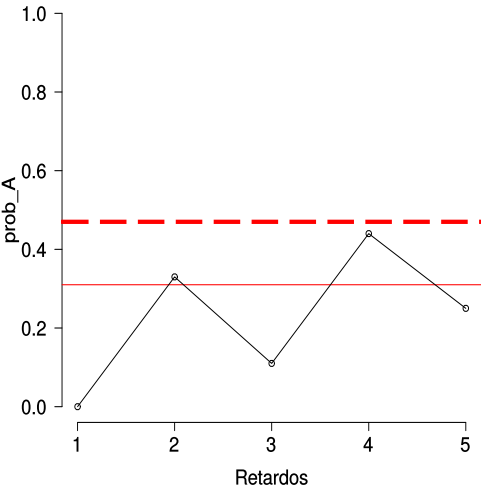
Lag: +4



adjusted residual (z) ADJR

ADJR	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

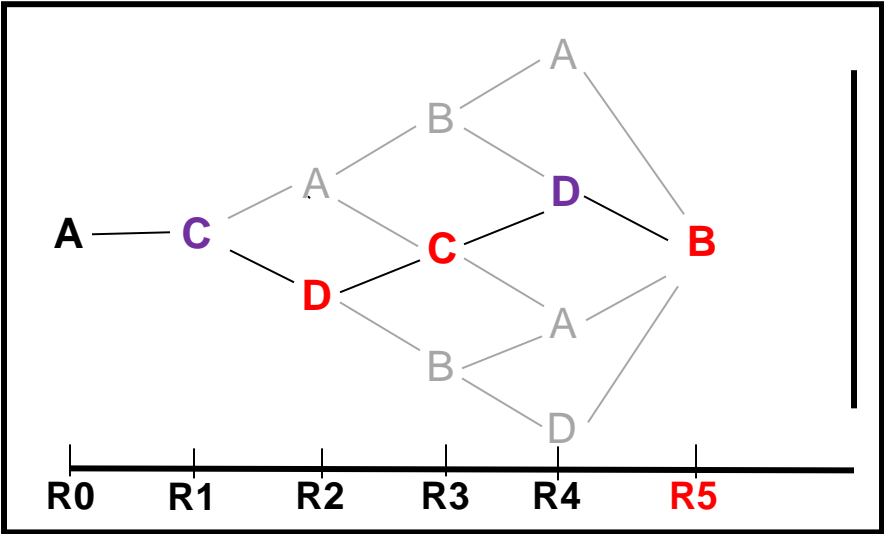
$$z_{rc} \text{ Adjusted Residuals} = \frac{x_{rc} - e_{rc}}{\sqrt{e_{rc}(1 - p_c)(1 - p_r)}}$$



4.2. Lag Sequential Analysis (LSA)

RUNNING IN SDIS-QSEQ v 5.1.23

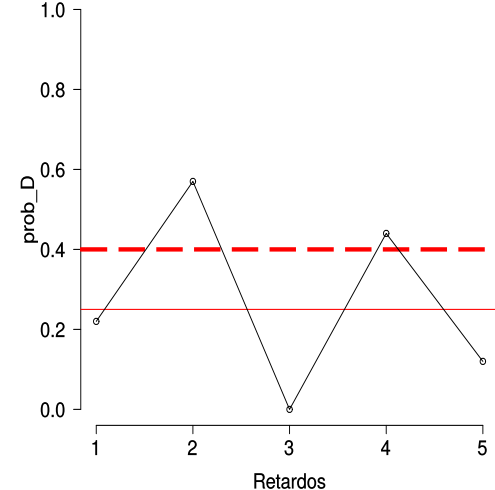
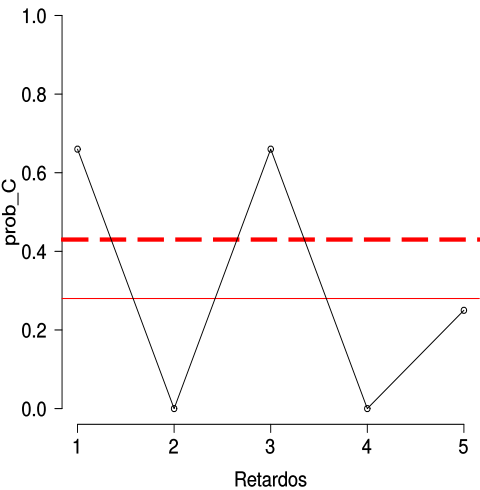
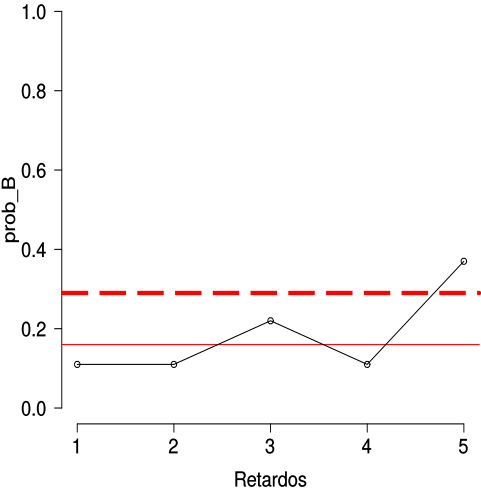
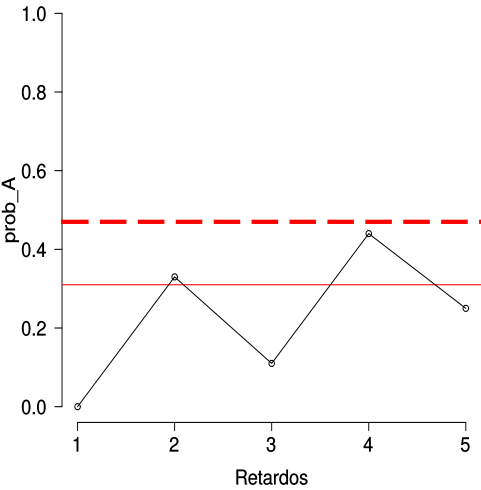
Lag: +5



adjusted residual (z) ADJR

ADJR	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

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



4.2. Lag Sequential Analysis (LSA)

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	

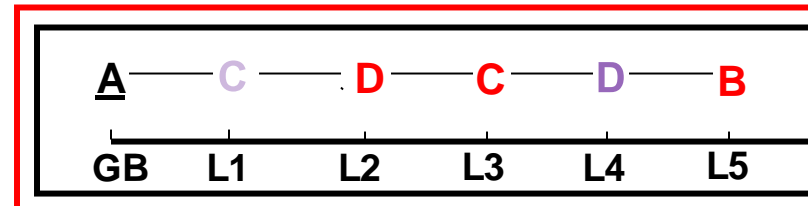
Lag 2	Target:				
Given:	A	B	C	D	
A	0,26	-0,53	-2,16	2,34	
B	-1,60	-1,10	1,85	0,74	
C	-1,26	2,95	0,81	-1,99	
D	2,34	-1,48	-0,12	-1,06	

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

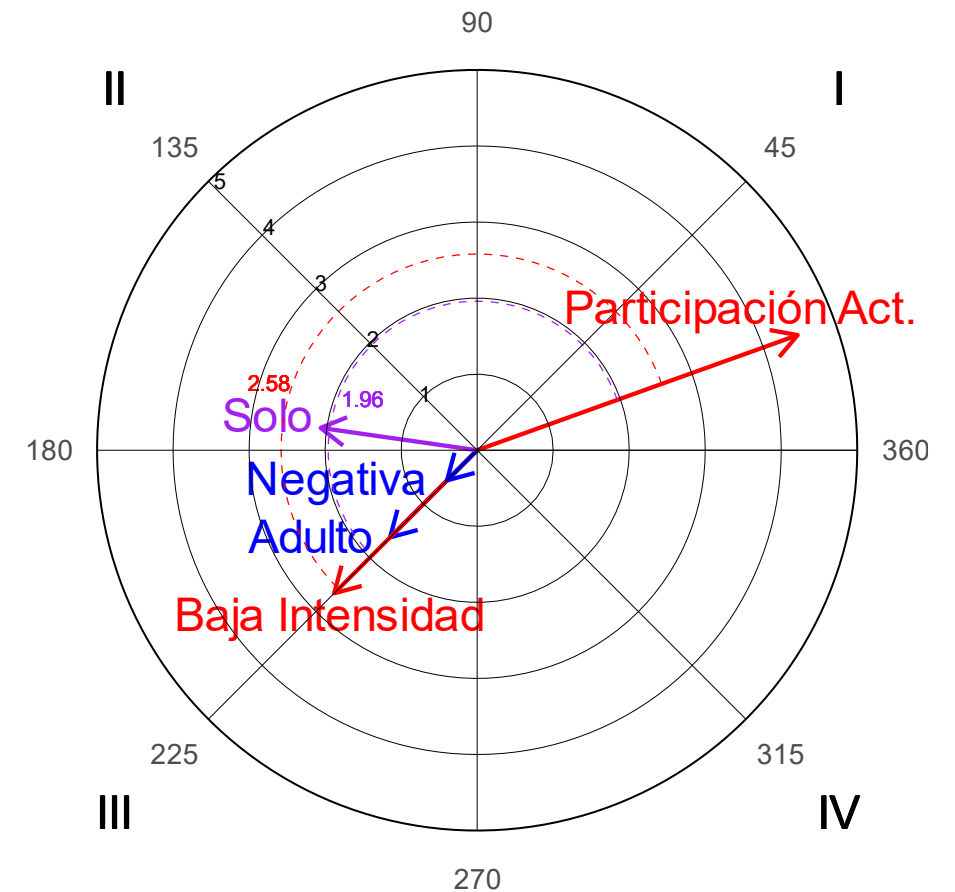
(Bakeman, 1978)

Objectives

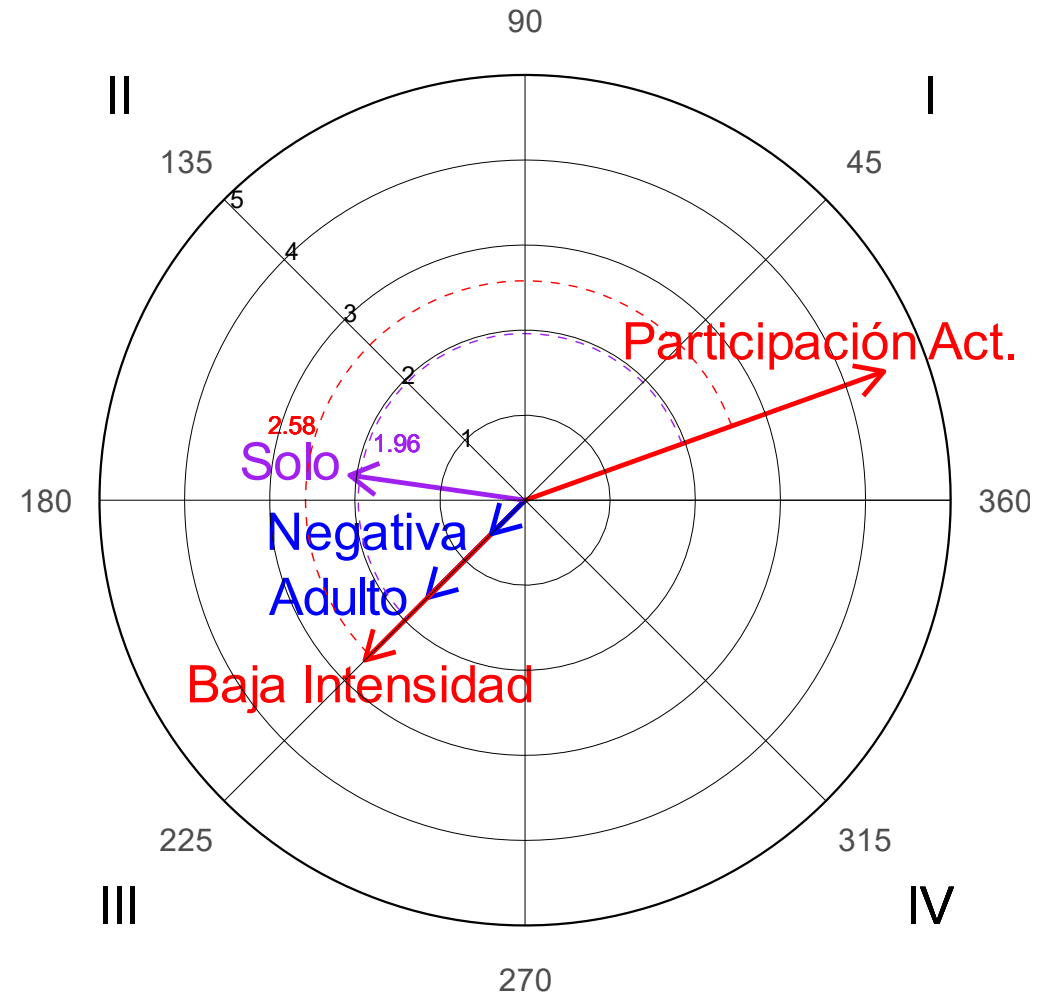
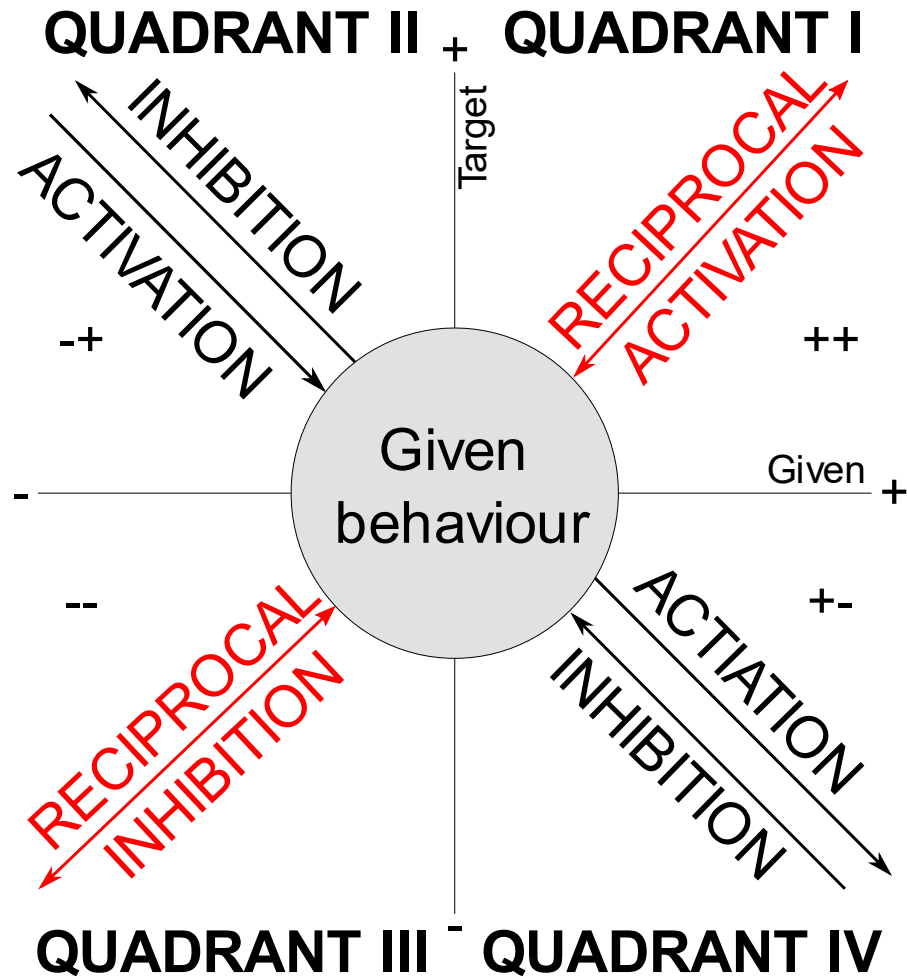
Develop a visual representation of how behaviours are interconnected

Vectorialization of behaviour

Data reduction



4.3. Polar Coordinate Analysis



Radius or Length \longrightarrow

Intensity

Angle \longrightarrow

Nature of the interactive relationship

4.3. Polar Coordinate Analysis

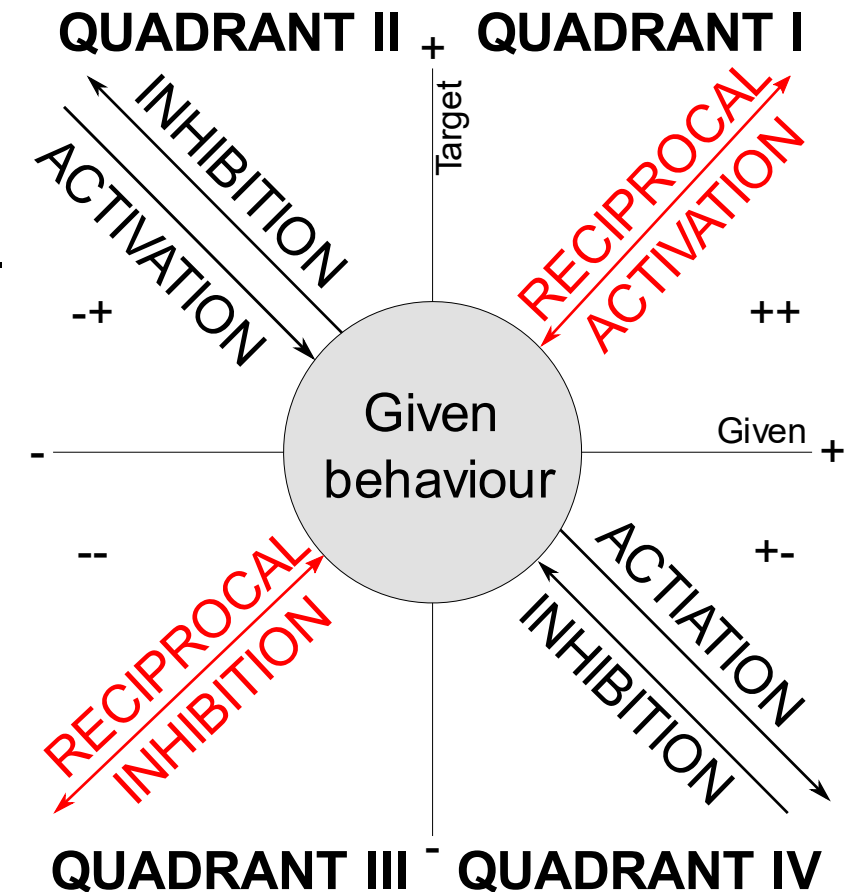
Interpretation

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).

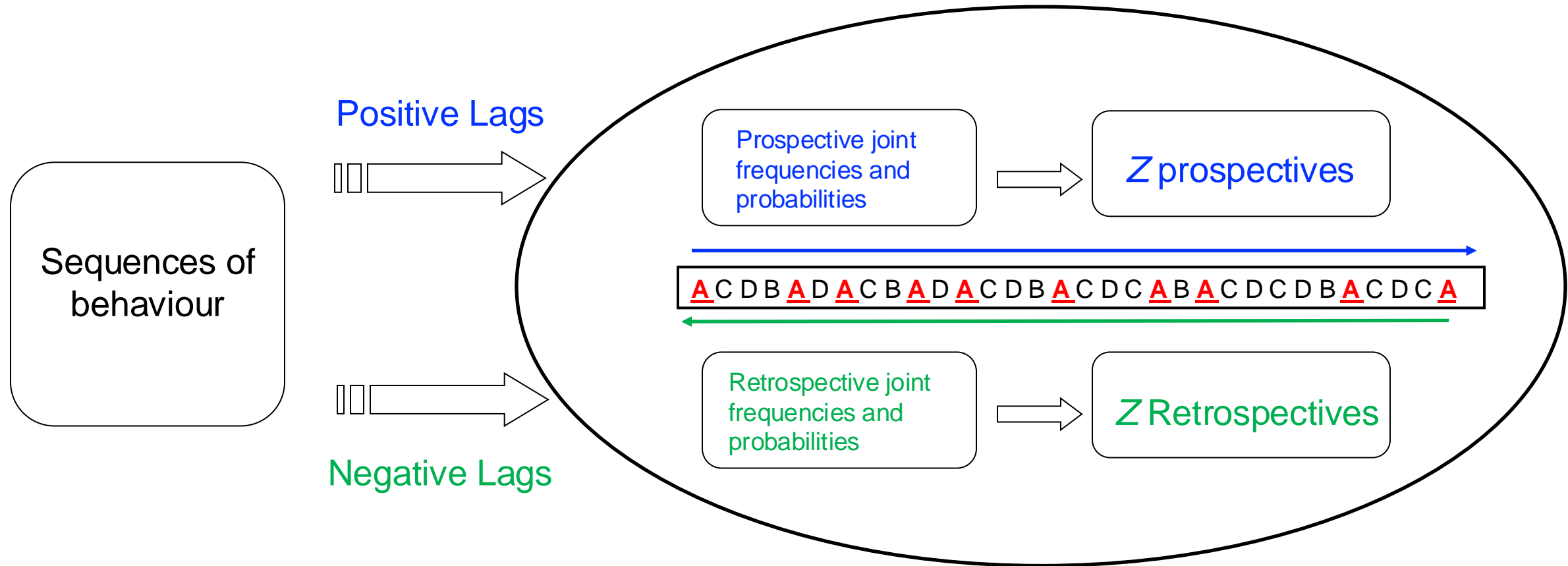
Quadrant IV. Activation-inhibition. Given behaviour activates target behaviour.
Target behaviour inhibits criterion behaviour
(A activates B and B inhibits A)



4.3. Polar Coordinate Analysis

Development of the technique

Integration of prospective and retrospective perspectives



4.3. Polar Coordinate Analysis

Development of the technique

Zsum Parameter

SOME METHODS FOR STRENGTHENING
THE COMMON χ^2 TESTS*

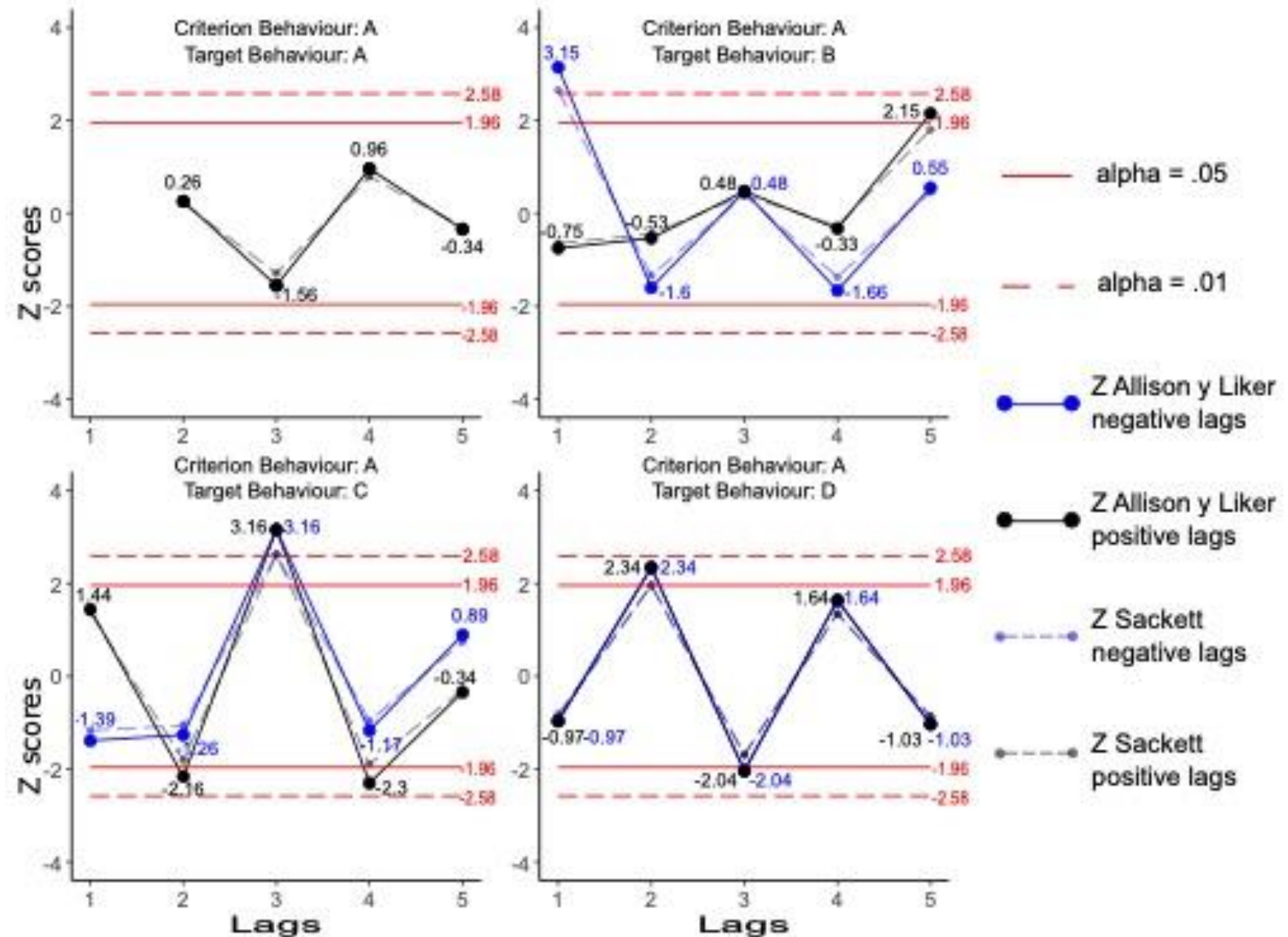
WILLIAM G. COCHRAN
The Johns Hopkins University

Cochran, 1954

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

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

n = lag number

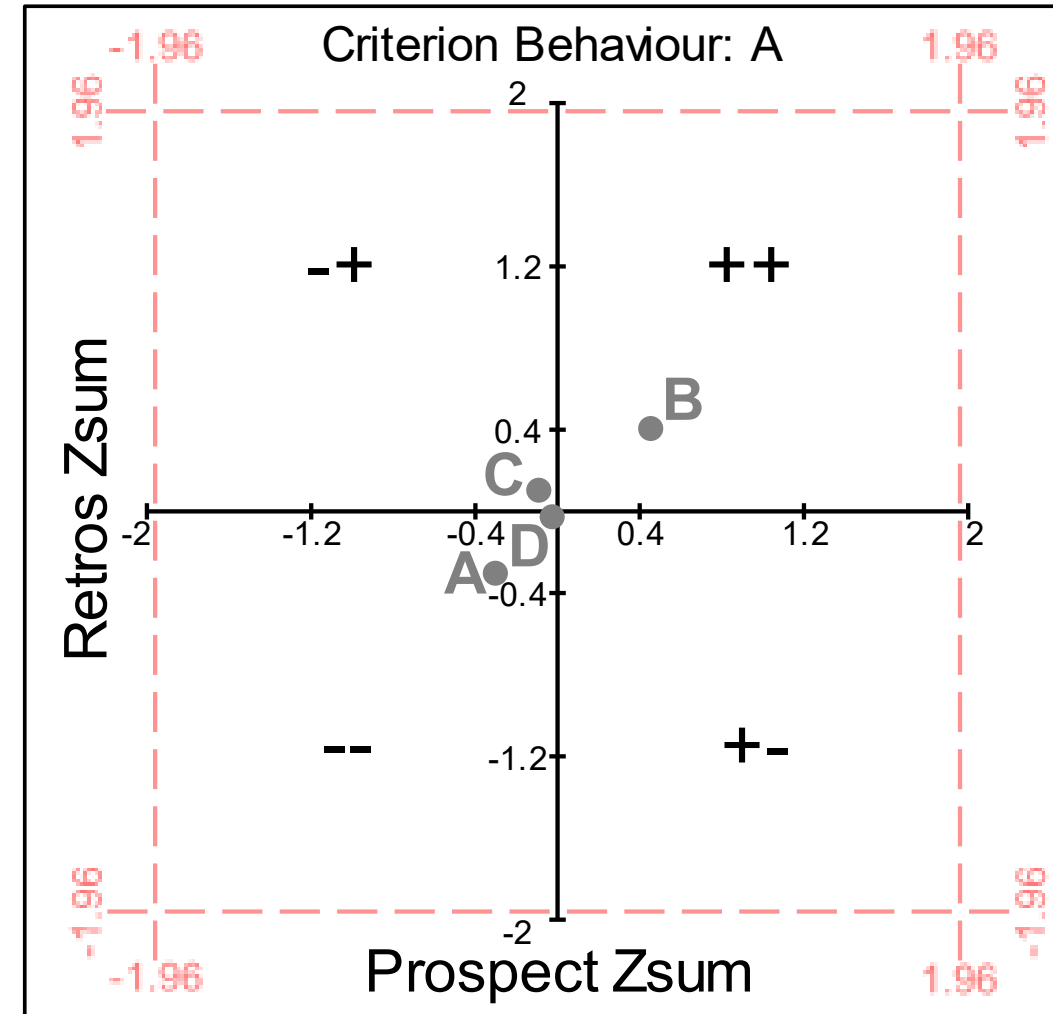
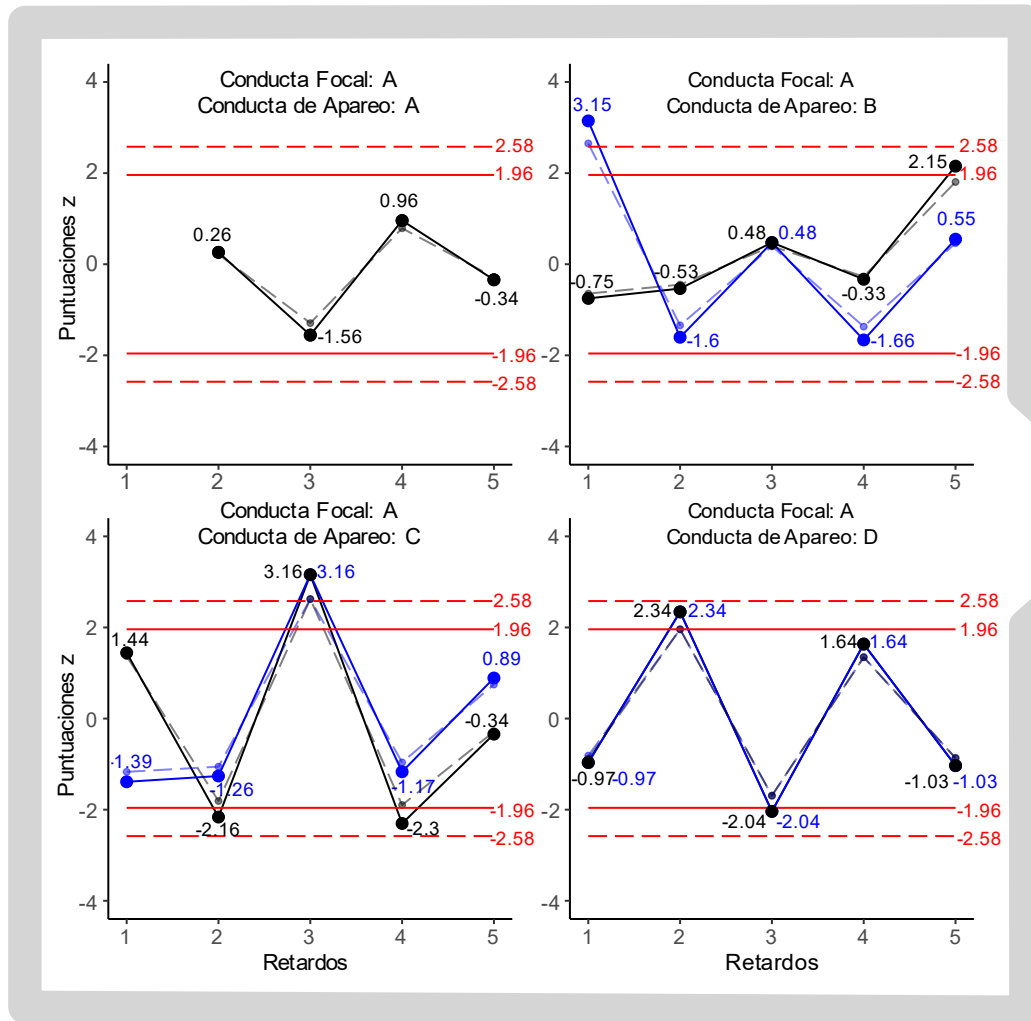


4.3. Polar Coordinate Analysis

Development of the technique

Zsum Parameter

$$Z_{sum} = \frac{\sum z}{\sqrt{n}}$$



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	$\sum z$	$\sum z$	$\sum z / \sqrt{n}$	$\sum z / \sqrt{n}$
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	$\sum z$	$\sum z$	$\sum z / \sqrt{n}$	$\sum z / \sqrt{n}$
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

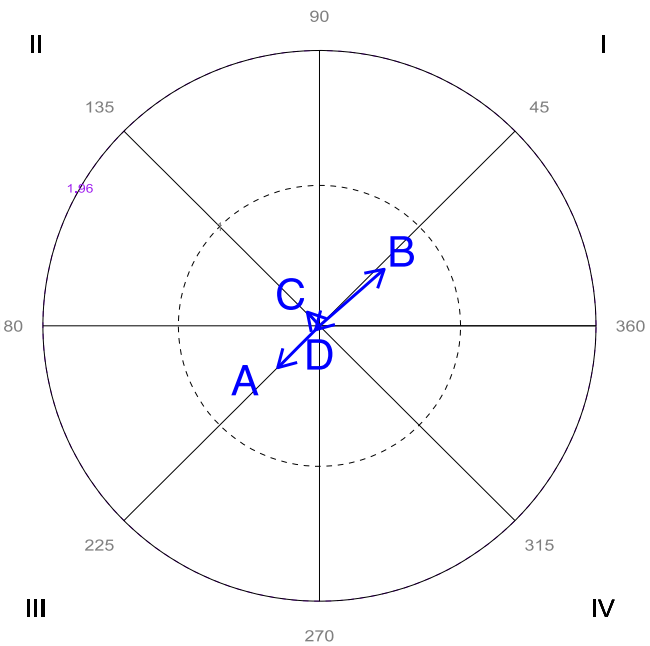
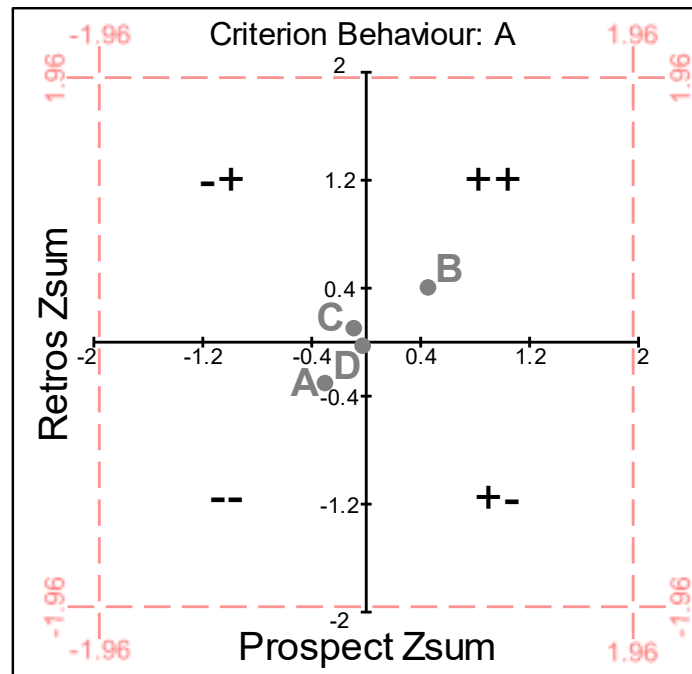
Lag -4	Target:			
Given:	A	B	C	D
A	0.96	-1.70	-1.17	1.64
B	-0.33	-1.01	1.25	0.00
C	-2.30	3.90	0.97	-1.93
D	1.64	-1.42	-0.76	0.25

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

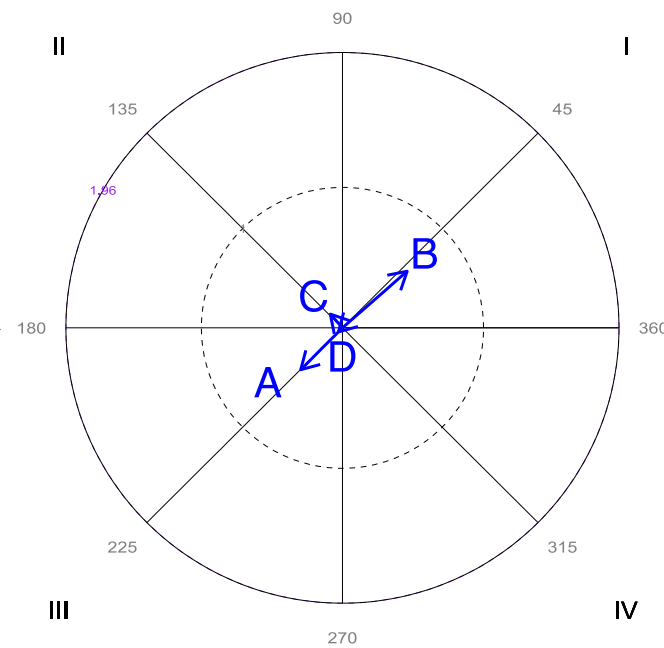
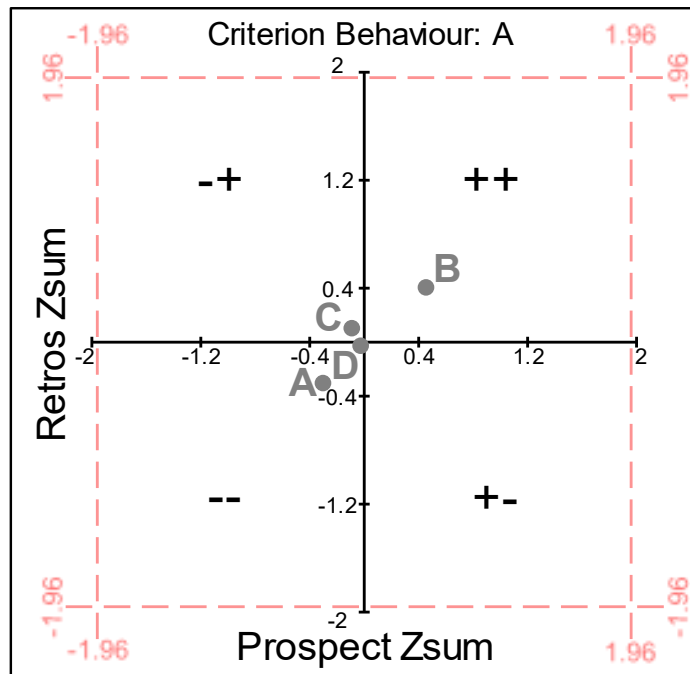
	Retardos										Pros.	Retros.	Zsum	Zsum
	-1	-2	-3	-4	-5	1	2	3	4	5	$\sum z$	$\sum z$	$\sum z / \sqrt{n}$	$\sum z / \sqrt{n}$
A	0	0.26	-1.56	0.96	-0.34	0	0.26	-1.56	0.96	-0.34	-0.68	-0.68	-0.30	-0.30
B	3.15	-1.6	0.48	-1.7	0.56	-0.75	-0.53	0.48	-0.33	2.15	1.02	0.89	0.46	0.40
C	-1.39	-1.26	3.16	-1.17	0.89	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



4.3. Polar Coordinate Analysis

Development of the technique

Transforming Zsum into polar coordinates

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

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

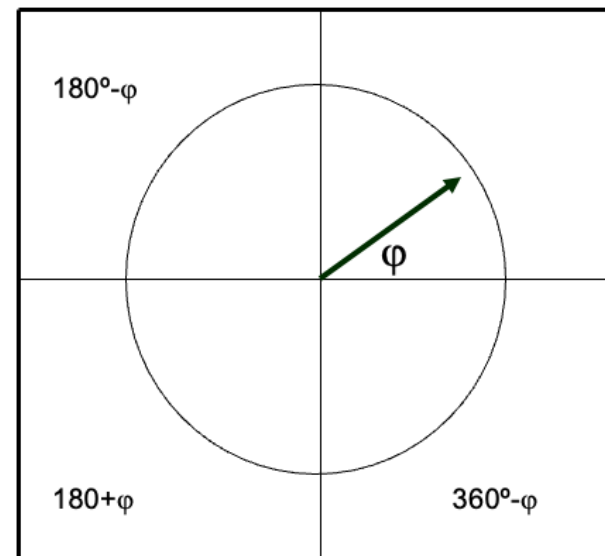
Zsum _{Pros}	Zsum _{Retr}	QUADRANT	Radio	Ratio	Angle	Transformed Angle
		Signos Z _{Pros} Z _{Retr}	$\sqrt{Z_{Pros}^2 + Z_{Retr}^2}$	Z _{Retr} /Radio		
-0.30	-0.30	III (-) +180°	0.42	-0.71	45.23	45.23 + 180 = 225.23
0.46	0.40	I (++) =	0.61	0.66	41.3	41.3
-0.09	0.10	II (-+) -180	0.13	0.74	48.6	48.6 -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

ObseRtools

Welcome Data ▾ Lag Sequential Analysis ▾ **Polar Coordinates Analysis ▾** Register ▾ Observers Agreement ▾ Quit ▾

ObseRtools: The shiny app for observational methodology

ObseRtools: An R-tool for observational data analysis

Rodríguez-Medina, J., Hernández-Mendo, A., & Anguera, M. T. (2021). De HOISAN a R: Una aplicación web interactiva para la representación gráfica de coordenadas polares.

Features

ObseRtools is an open-source tool for executing a comprehensive observational data analysis.

It was programmed in R language to be flexible and facilitate integration with other statistical and graphical packages. Indeed, ObseRtools has the flexibility to be quickly upgraded and integrated. Its development can address a large and active community of developers formed by prominent researchers.

ObseRtools provides various routines for importing data from HOISAN, Lince, and SDIS-QSEQ, performing data analysis and building data matrices for descriptive, lag sequential and polar coordinates analysis.

For an introduction and live examples, visit the [ObseRtools website](#).

Example

Step 1 - Download an example at the following [link](#).

Step 2 - In the Load menu, select 'HOISAN' as database and 'xlsx' as file format.

Step 3 - Choose and load the file canal_riviere_madre_inicia_juego_x_normotípico.xls using the browse button.

Step 4 - **Then, enjoy working with the app!**

4.3. Polar Coordinate Analysis

Development of the technique

Graphical Representation

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

ObseRtools Welcome Data Lag Sequential Analysis Polar Coordinates Analysis

Select HOISAN Polar Coordinates Analysis output file

Browse... No file selected

Data format
 xls csv

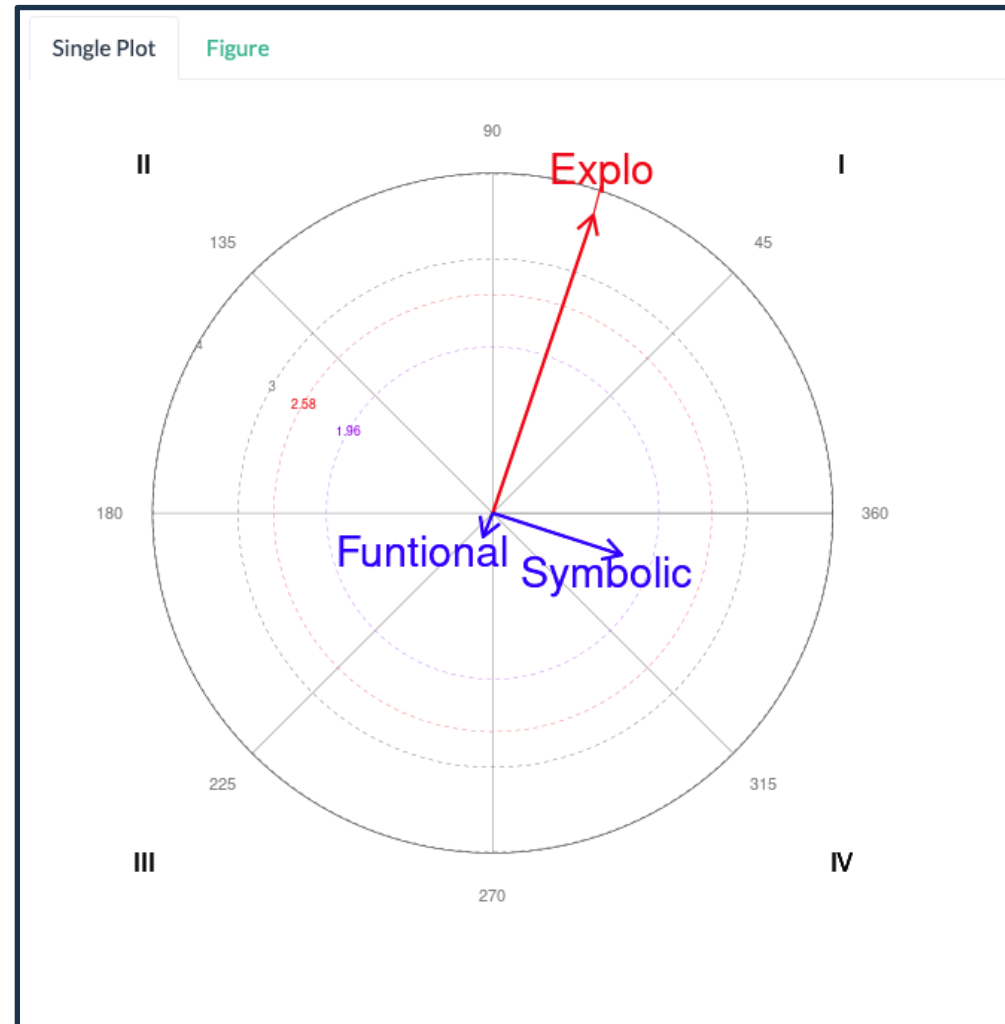
Reset

Scale
0 100

Ticks Location
0 135 — 150 360

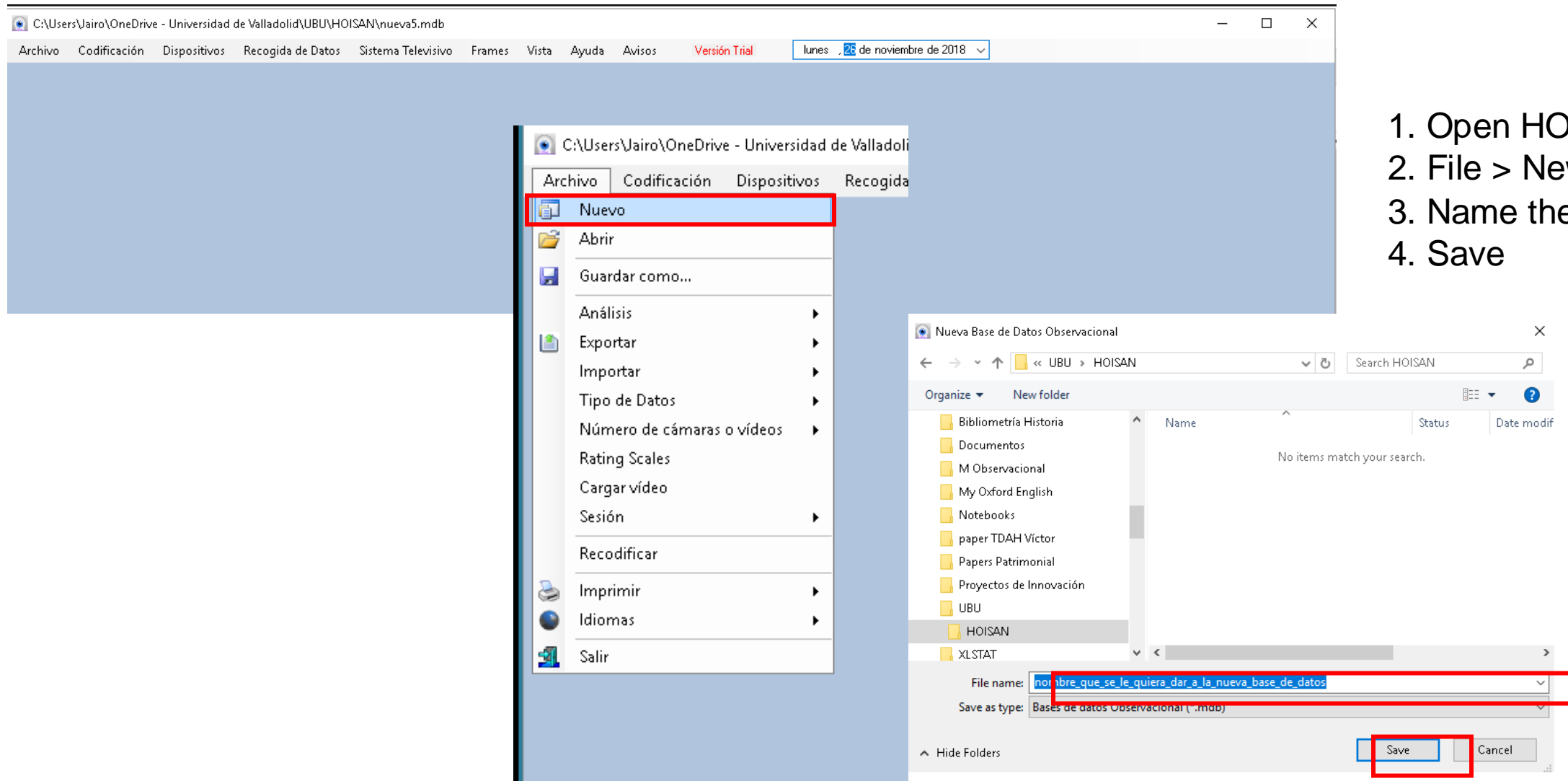
Multiple plots?
 yes no

Multiple plots?
 yes no



4.3. Polar Coordinate Analysis

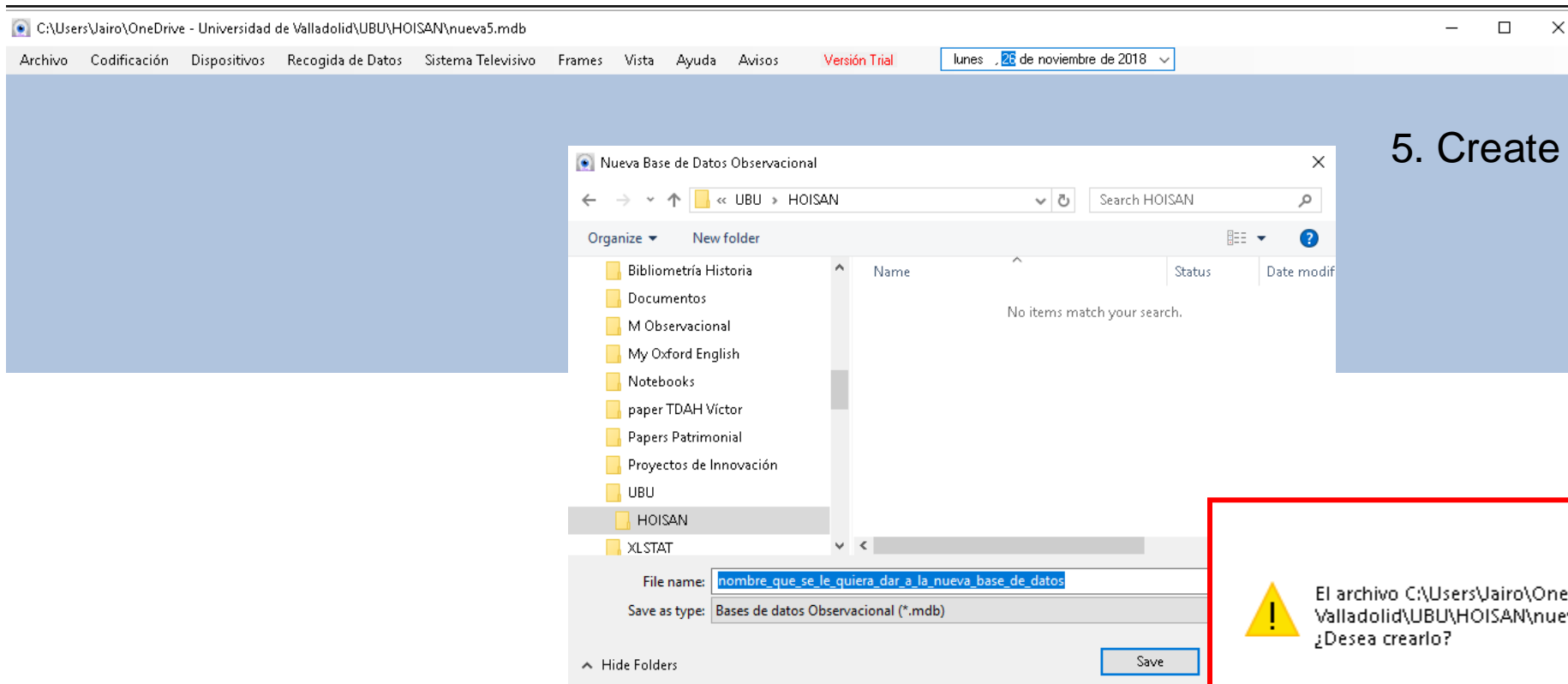
RUNNING IN HOISAN, v.2.0



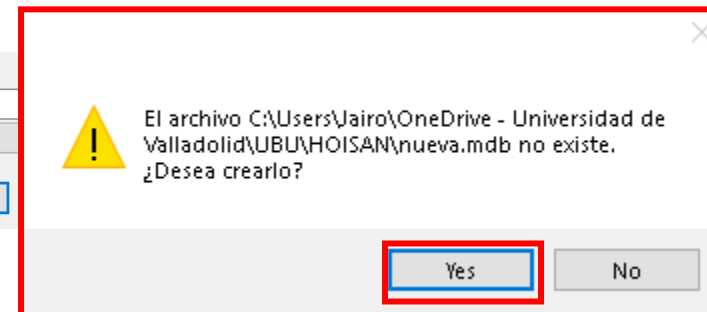
1. Open HOISAN
2. File > New
3. Name the observational database
4. Save

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

The screenshot shows the HOISAN v.2.0 software interface. The main window title is "C:\Users\Jairo\OneDrive - Universidad de Valladolid\UBU\HOISAN\nueva5.mdb". The menu bar includes "Archivo", "Codificación", "Dispositivos", "Recogida de Datos", "Sistema Televisivo", "Frames", "Vista", "Ayuda", "Avisos", "Versión Trial", and a date selector "lunes, 26 de noviembre de 2018". A dialog box titled "Datos de la Investigación" is open, containing the following fields:

- Título: Coordenadas Polares Máster Ubu
- Descripción: Coordenadas Polares paso a paso Máster Investigación en Ciencias de la Salud Universidad de Burgos
- Autores: Jairo Rodríguez-Medina
- Lugar: Burgos
- Fecha: viernes, 30 de noviembre de 2018

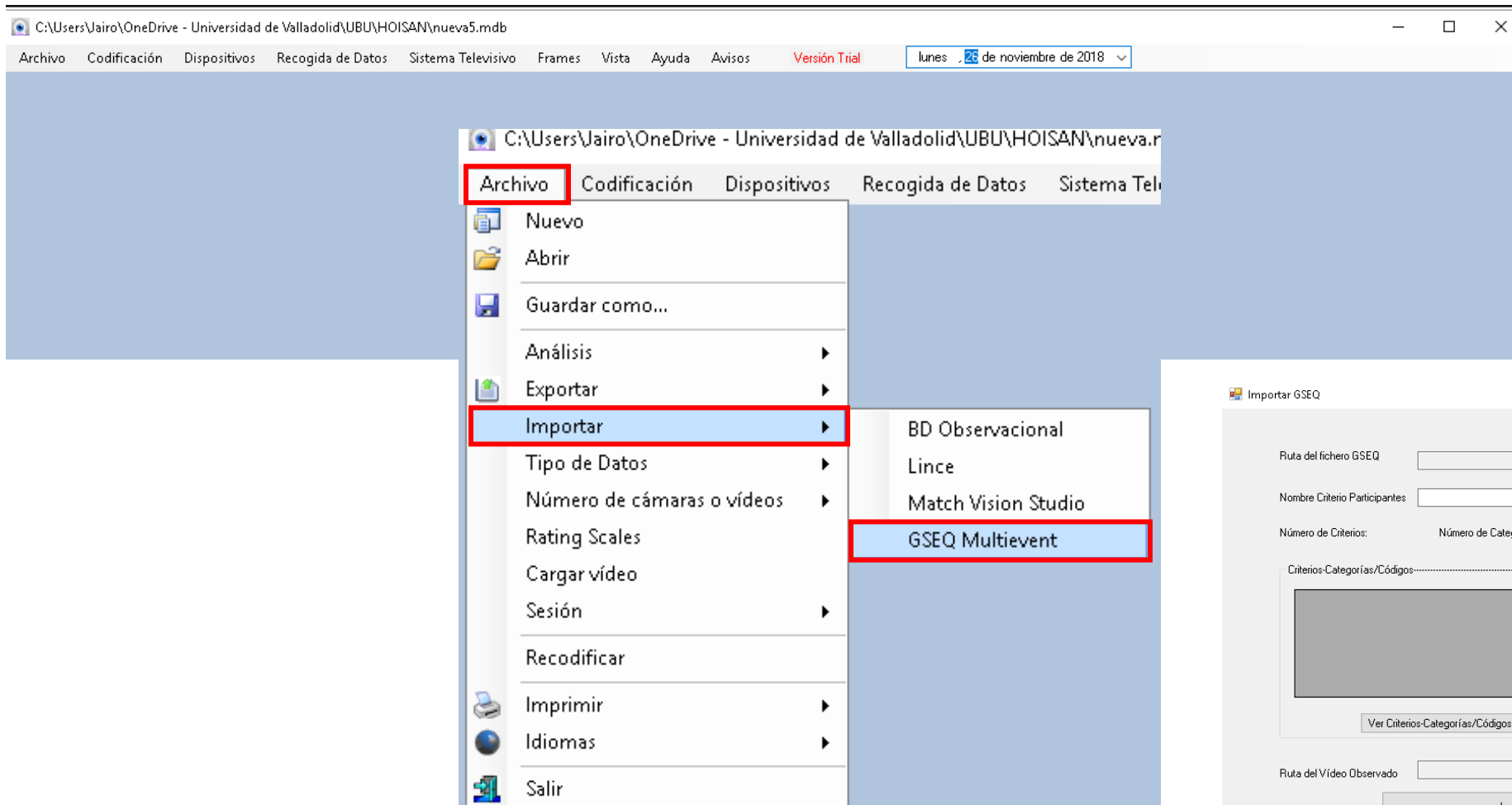
At the bottom of the dialog box are two buttons: "Aceptar" and "Modificar".

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

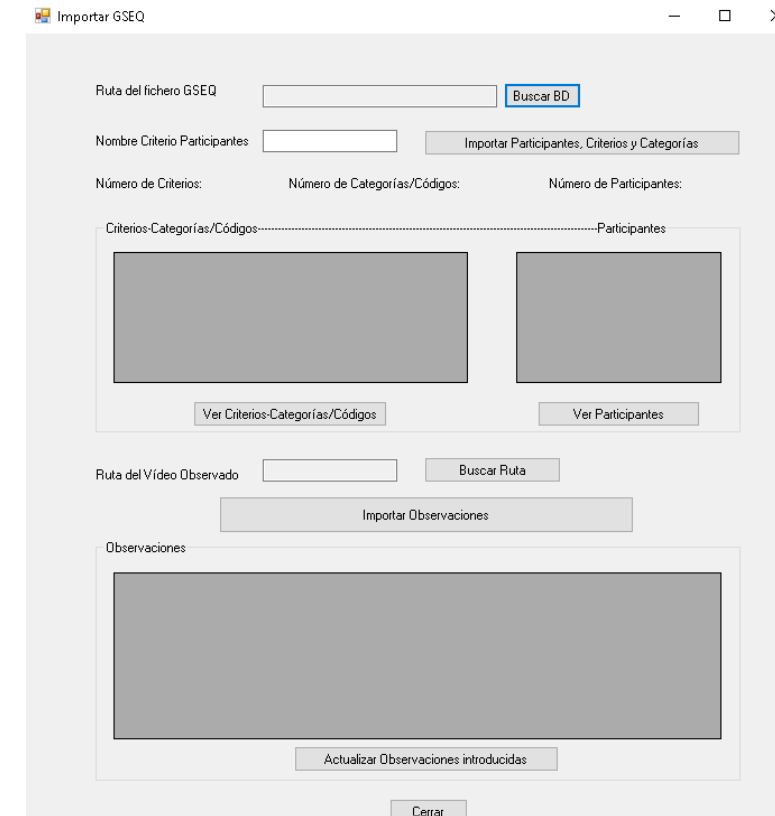
The screenshot shows a dialog box titled "Crear Base de Datos". The text inside reads "Creada la Base de Datos Observacional correcta". At the bottom right of the dialog box is an "OK" button.

4.3. Polar Coordinate Analysis

RUNNING IN HOISAN, v.2.0

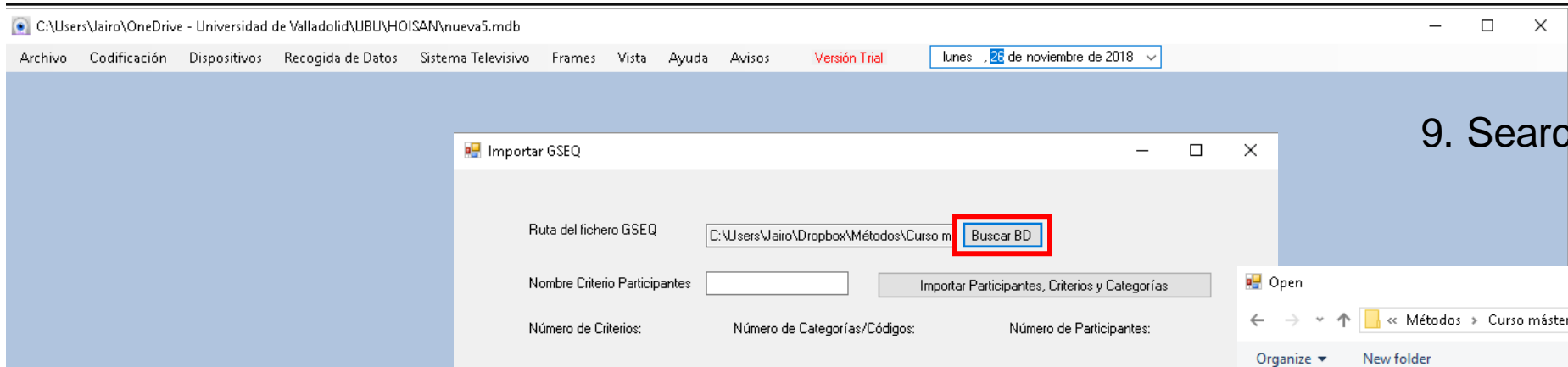


8. File > Import > GSEQ Multievent

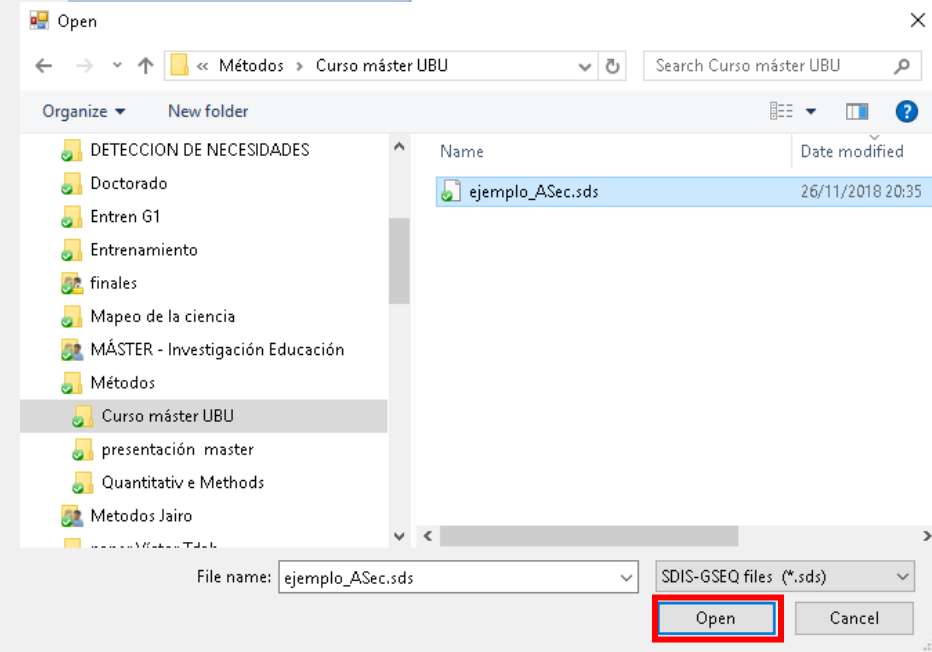
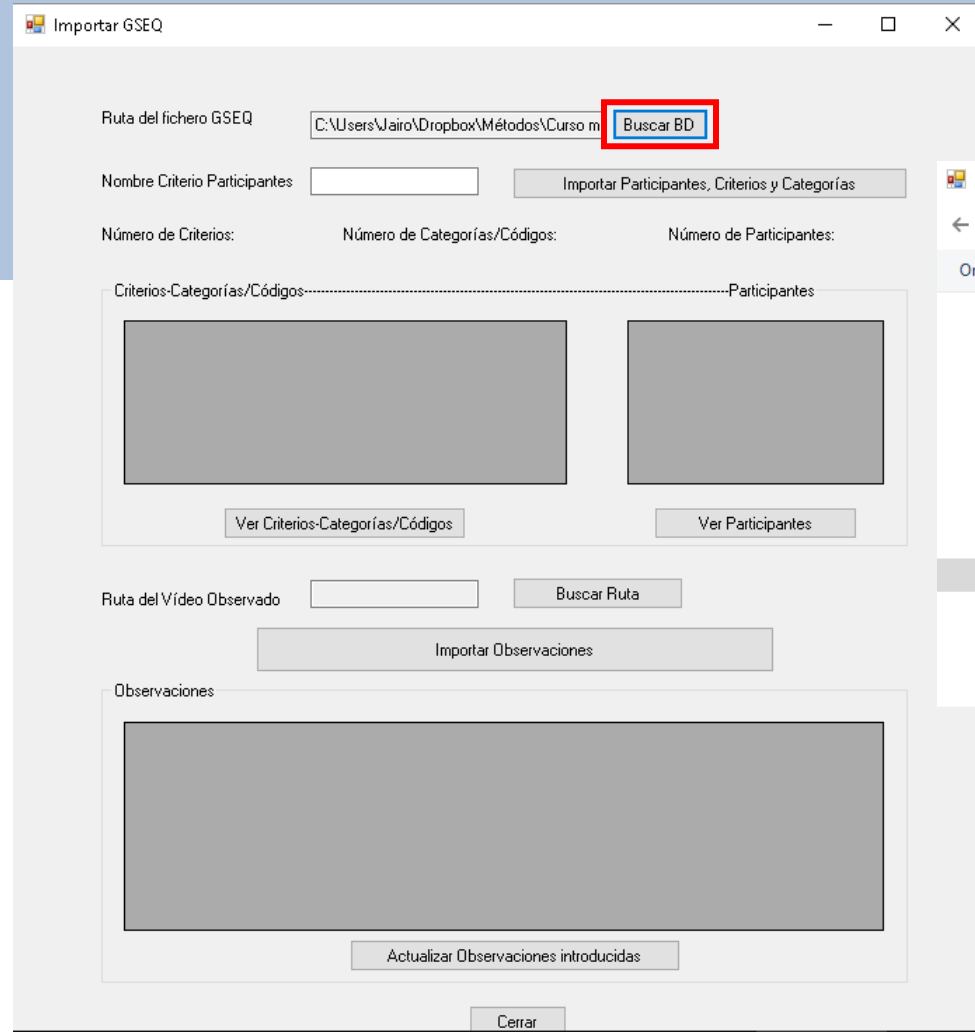


4.3. Polar Coordinate Analysis

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

Importar GSEQ

Ruta del fichero GSEQ: C:\Users\Jairo\Dropbox\Métodos\Curso m [Buscar BD]

Nombre Criterio Participantes: p1 [Importar Participantes, Criterios y Categorías]

Número de Criterios: 1 Número de Categorías/Códigos: 4 Número de Participantes: 1

Criterios	Categorías
SC	A
SC	B
SC	C
SC	D

Ver Criterios-Categorías/Códigos

Codigo
p1
*

Ver Participantes

Ruta del Video Observado: [Buscar Ruta]

[Importar Observaciones]

Observaciones: [Text Area]

Actualizar Observaciones introducidas

Cerrar

10. Import participants (p1), criteria and categories

Abrir Video

This PC > Videos

descriptives_proof.fmp4

File name: descriptives_proof.mp4 [Open] [Cancel]

11. Select Video File

12. Importar Observaciones

4.3. Polar Coordinate Analysis

RUNNING IN HOISAN, v.2.0

The screenshot shows the HOISAN v.2.0 software interface. The main window is titled 'C:\Users\Jairo\OneDrive - Universidad de Valladolid\UBU\HOISAN\nueva5.mdb'. The menu bar includes 'Archivo', 'Codificación', 'Dispositivos', 'Recogida de Datos', 'Sistema Televisivo', 'Frames', 'Vista', 'Ayuda', 'Avisos', 'Versión Trial', and a date dropdown set to 'lunes, 26 de noviembre de 2018'. The 'Importar GSEQ' dialog box is open, showing the following fields and tables:

- Ruta del fichero GSEQ: C:\Users\Jairo\Dropbox\Métodos\Curso m
- Nombre Criterio Participantes: p1
- Número de Criterios: 1, Número de Categorías/Códigos: 4, Número de Participantes: 1
- Table 'Criterios-Categorías/Códigos':

Criterios	Categorías
SC	A
SC	B
SC	C
SC	D
- Table 'Participantes':

Código
p1
p1
*
- Ruta del Vídeo Observado: C:\Users\Jairo\Videos\
- Table 'Observaciones':

ID_Tiempo	Nombre_Criterio	Nombre_Categoria	Participante
29	SC	C	p1
30	SC	D	p1
31	SC	C	p1
32	SC	A	p1
*			

The 'Importar Observaciones' button is highlighted with a red box. A confirmation dialog box titled 'Observaciones' is shown with the text 'Fin proceso inserción de Observaciones' and an 'OK' button highlighted with a red box. An arrow points from the 'OK' button to the text '13. OK'.

Wait for it to complete
The process of inserting remarks

Observaciones
Inicio proceso inserción de Observaciones

4.3. Polar Coordinate Analysis

RUNNING IN HOISAN, v.2.0

The screenshot displays the HOISAN v.2.0 software interface. The main window is titled 'C:\Users\Jairo\OneDrive - Universidad de Valladolid\UBU\HOISAN\nueva5.mdb'. The menu bar includes 'Archivo', 'Codificación', 'Dispositivos', 'Recogida de Datos', 'Sistema Televisivo', 'Frames', 'Vista', 'Ayuda', 'Avisos', 'Versión Trial', and a date dropdown set to 'lunes, 26 de noviembre de 2018'.

The 'Importar GSEQ' dialog box is open, showing the following fields and controls:

- Ruta del fichero GSEQ: C:\Users\Jairo\Dropbox\Métodos\Curso m (with 'Buscar BD' button)
- Nombre Criterio Participantes: p1 (with 'Importar Participantes, Criterios y Categorías' button)
- Número de Criterios: 1, Número de Categorías/Códigos: 4, Número de Participantes: 1
- Two tables for selection: 'Criterios-Categorías/Códigos' and 'Participantes'.
- 'Ruta del Vídeo Observado': C:\Users\Jairo\Videos\ (with 'Buscar Ruta' button)
- 'Importar Observaciones' button (highlighted with a red box)
- 'Actualizar Observaciones introducidas' button (highlighted with a red box)
- 'Cerrar' button (highlighted with a red box)

The 'Observaciones' message box is also visible, displaying the text 'Fin proceso inserción de Observaciones' and an 'OK' button (highlighted with a red box).

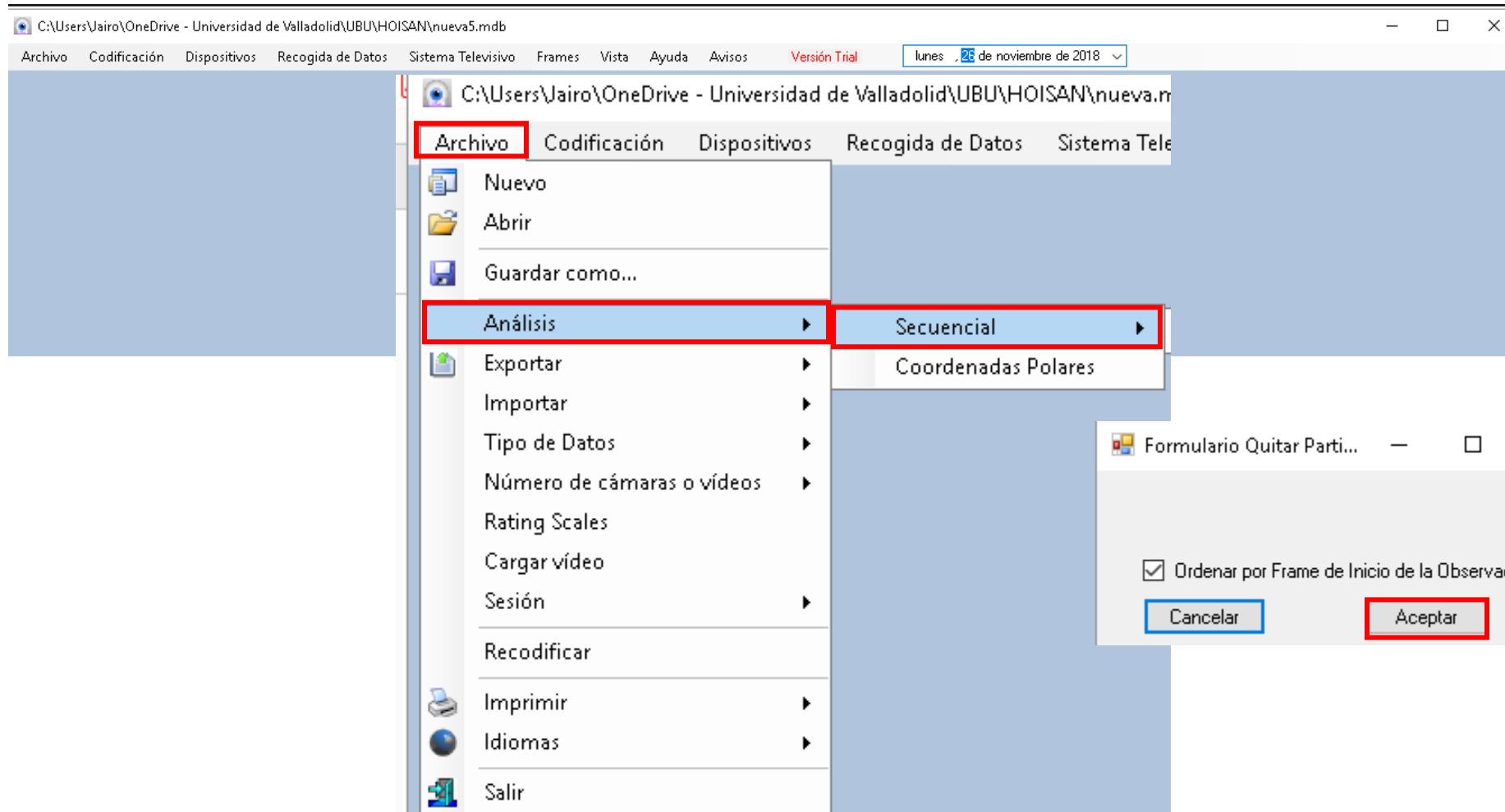
13. OK

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

The screenshot shows the HOISAN v.2.0 software interface. The main window is titled 'C:\Users\Jairo\OneDrive - Universidad de Valladolid\UBU\HOISAN\nueva5.mdb'. The menu bar includes 'Archivo', 'Codificación', 'Dispositivos', 'Recogida de Datos', 'Sistema Televisivo', 'Frames', 'Vista', 'Ayuda', and 'Avisos'. The date is set to 'lunes, 22 de noviembre de 2018'. The 'Versión Trial' is indicated.

The dialog box 'Formulario Para Añadir Varias Bases de Datos Para Análisis Secuencial' is open. It contains the following options:

- Quitar Restricción de Participantes
- Ordenar Observaciones por Frame Inicio
- Incluir Distinción de Sesión

Input fields and buttons:

- Ruta BD Observacional nº: 2 [input field] [Buscar BD] [Insertar Observaciones en Tabla]
- Ruta Archivo Excel [input field] [Buscar Archivo Excel] [Importar desde Excel los datos]

Table: Nombres de los Ficheros Introducidos para el Análisis

	Ficheros de Observadores	Distinción de Sesión con Fichero anterior
▶	[redacted]	NO
*		

Table: Observaciones (Nº Registros: 32)

	SC	PARTICIPANTE
▶	A	p1
	C	p1
	D	p1
	B	p1
	A	p1
	D	p1
	A	p1

Buttons: Recargar Observaciones, Exportar Tabla a Excel, **Aceptar-->Continuar**, Cerrar, Exportar SAS, Importar Bases de Datos, Exportar Bases de Datos.

18. Accept and Continue

4.3. Polar Coordinate Analysis

RUNNING IN HOISAN, v.2.0

19. Run Lag Sequential Analysis

C:\Users\Jairo\OneDrive - Universidad de Valladolid\UBU\HOISAN\nueva5.mdb

Archivo Codificación Dispositivos Recogida de Datos Sistema Televisivo Frames Vista Ayuda Avisos Versión Trial lunes 28 de noviembre de 2018

Formulario Análisis Secuencial Eventos Multimodales

Considerar Participantes en la Secuencia de Códigos

Cerrar Formulario

Códigos de Criterio (Given)

Criterio SC Categoría A Categoría

Participante p1 Participante

Código
*

Introducir todos los códigos

Borrar todos los códigos para criterio

Borrar código seleccionado para criterio

Códigos de Apareo (Target)

Criterio SC Categoría A Categoría

Participante p1 Participante

Código
*

Introducir todos los códigos

Borrar todos los códigos para apareo

Borrar Código seleccionado para apareo

Tabla de Resultados

Retardos

Número de Retardos

0 0

Ver Todas las Observaciones

Ejecutar Estadísticas

Estadísticas

Frecuencia Conjunta

Frecuencia Esperada

Probabilidad Condicional

Residuos

Residuos Ajustados (Z)

Excel Opción 3

Excel Opción 2

Calcular Valores Z

Exportar Excel

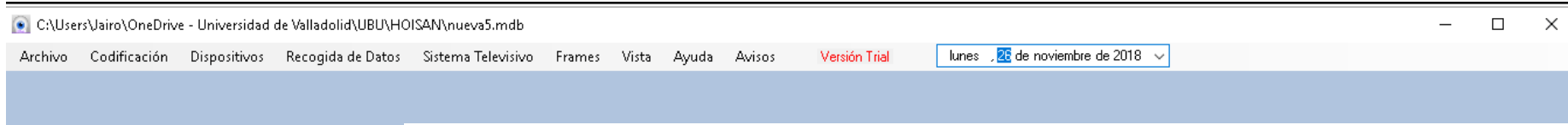
Código Focal para el cálculo de Coordenadas Polares:

Añadir Código Focal

Ver Cálculos en tabla

4.3. Polar Coordinate Analysis

RUNNING IN HOISAN, v.2.0



19. Run Lag Sequential Analysis

Formulario Análisis Secuencial Eventos Multimodales

Considerar Participantes en la Secuencia de Códigos

Cerrar Formulario

Códigos de Criterio (Given)

Criterio: SC Categoría: A

Participante: p1

Introducir todos los códigos

Borrar todos los códigos para criterio

Borrar código seleccionado para criterio

Códigos de Apareo (Target)

Criterio: SC Categoría: A

Participante: p1

Introducir todos los códigos

Borrar todos los códigos para apareo

Borrar Código seleccionado para apareo

Tabla de Resultados

Código	Ret-5	Ret-4	Ret-3	Ret-2	Ret-1	Ret+1
SC_A	-0,342	0,959	-1,556	0,261	-2,278	-2,278
SC_B	0,563	-1,698	0,476	-1,604	3,817	-0,486
SC_C	0,891	-1,168	3,159	-1,261	-0,534	2,953
SC_D	-1,033	1,635	-2,038	2,342	-0,292	-0,292
SC_A						
*						

Retardos: Número de Retardos: -5 5

Ver Todas las Observaciones

Ejecutar Estadísticas

Estadísticas:

- Frecuencia Conjunta
- Frecuencia Esperada
- Probabilidad Condicional
- Residuos
- Residuos Ajustados (Z)

Excel Opción 3

Excel Opción 2

Calcular Valores Z

Exportar Excel

Código Focal para el cálculo de Coordenadas Polares: SC_A

Añadir Código Focal

Ver Cálculos en tabla

20. Close

4.3. Polar Coordinate Analysis

RUNNING IN HOISAN, v.2.0

21. Analysis > Polar Coordinates

The screenshot displays the HOISAN v.2.0 software interface. The main window title is "C:\Users\Jairo\OneDrive - Universidad de Valladolid\UBU\HOISAN\nueva5.mdb". The menu bar includes "Archivo", "Codificación", "Dispositivos", "Recogida de Datos", and "Sistema Televisivo". The "Archivo" menu is open, showing options like "Nuevo", "Abrir", "Guardar como...", "Análisis", "Exportar", "Importar", "Tipo de Datos", "Número de cámaras o vídeos", "Rating Scales", "Cargar vídeo", "Sesión", "Recodificar", "Imprimir", "Idiomas", and "Salir". The "Análisis" menu item is highlighted with a red box, and its sub-menu is open, showing "Secuencial" and "Coordenadas Polares", with "Coordenadas Polares" also highlighted by a red box.

The "Formulario: Cálculo de Coordenadas Polares" dialog box is open, featuring the following fields and controls:

- Ruta Archivo Excel:** A text input field with a "Buscar" button.
- Código Criterio:** A text input field.
- Buttons:** "Mostrar Datos Excel", "Ejecutar Análisis", "Exportar Análisis a Excel" (highlighted), "Exportar Análisis a Word", "Dibujar Vectores", "Exportar a CSV", and "Cerrar Formulario".
- Retardos:** Two large empty rectangular areas.
- Options (bottom right):**
 - Dibujar Vectores mayores de 1.96
 - Dibujar Vectores menores o iguales de 1.96
 - Número de Vectores a dibujar:** A dropdown menu set to "0" and a "Seguir dibujando los siguientes" button.
 - Vectores mayores de 1.96:** "Color Vectores" (red color swatch), "Tipo de Letra de los Códigos" (Seleccionar), "Grosor de los Vectores" (1).
 - Vectores menores de 1.96:** "Color Vectores" (blue color swatch), "Tipo de Letra de los Códigos" (Seleccionar), "Grosor de los Vectores" (1).
 - Cuadrantes a dibujar:** Cuadrante I, Cuadrante II, Cuadrante III, Cuadrante IV.
 - Re-Dibujar:** A button.

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

Formulario: Cálculo de Coordenadas Polares

Ruta Archivo Excel: C:\Users\Jairo\OneDrive - Universidad de...
Código Criterio: SC_A

Mostrar Datos Excel

	Código	Ret--5	Ret--4
▶	SC_A	-0,342	0,959
	SC_B	0,563	-1,698
	SC_C	0,891	-1,168
	SC_D	-1,033	1,635
*			

Códigos de Apareo

Retardos

Salvar Imagen

Imprimir Imagen

Dibujar Vectores mayores de 1.96
 Dibujar Vectores menores o iguales de 1.96
Número de Vectores a dibujar: 0
Vectores mayores de 1.96: Color Vectores (Red), Tipo de Letra de los Códigos (Seleccionar), Grosor de los Vectores (1)
Vectores menores de 1.96: Color Vectores (Blue), Tipo de Letra de los Códigos (Seleccionar), Grosor de los Vectores (1)
Cuadrantes a dibujar: Cuadrante I, Cuadrante II, Cuadrante III, Cuadrante IV
Re-Dibujar

23. Display Excel Data

4.3. Polar Coordinate Analysis

RUNNING IN HOISAN, v.2.0

Formulario: Cálculo de Coordenadas Polares

Ruta Archivo Excel: C:\Users\Jairo\OneDrive - Universidad de Valladolid\UBU\HOISAN\nueva5.mdb

Código Criterio: SC_A

Mostrar Datos Excel

Ejecutar Análisis

Exportar Análisis a Excel

Exportar Análisis a Word

Dibujar Vectores

Exportar a CSV

	Código	Ret-5	Ret--4
▶	SC_A	-0,342	0,959
	SC_B	0,563	-1,698
	SC_C	0,891	-1,168
	SC_D	-1,033	1,635
*			

	Categoría	Cuadrante	P.Prospectiva	P.Retrospectiva	Ratio
▶	SC_A	III	-1,32	-1,32	-0,71
	SC_B	I	0,57	0,69	0,77
	SC_C	I	0,58	0,49	0,64
	SC_D	I	0,27	0,27	0,71
*					

Salvar Imagen

Imprimir Imagen

Dibujar Vectores mayores de 1.96

Dibujar Vectores menores o iguales de 1.96

Número de Vectores a dibujar: 0

Vectores mayores de 1.96: Color Vectores (Red)

Vectores menores de 1.96: Color Vectores (Blue)

Cuadrantes a dibujar: Cuadrante I, Cuadrante II, Cuadrante III, Cuadrante IV

Re-Dibujar

24. Run Analysis

4.3. Polar Coordinate Analysis

RUNNING IN HOISAN, v.2.0

25. Draw Vectors

Formulario: Cálculo de Coordenadas Polares

Ruta Archivo Excel: C:\Users\Jairo\OneDrive - Universidad de Valladolid\UBU\HOISAN\nueva5.mdb

Código Criterio: SC_A

Mostrar Datos Excel Ejecutar Análisis Exportar Análisis a Excel Exportar Análisis a Word **Dibujar Vectores** Exportar a CSV

Código	Ret-5	Ret-4
SC_A	-0,342	0,959
SC_B	0,563	-1,698
SC_C	0,891	-1,168
SC_D	-1,033	1,635

Categoría	Cuadrante	P.Prospectiva	P.Retrospectiva	Ratio
SC_A	III	-1,32	-1,32	-0,71
SC_B	I	0,57	0,69	0,77
SC_C	I	0,58	0,49	0,64
SC_D	I	0,27	0,27	0,71

Salvar Imagen Imprimir Imagen

Dibujar Vectores mayores de 1.96
 Dibujar Vectores menores o iguales de 1.96
Número de Vectores a dibujar: 0 Seguir dibujando los siguientes

Vectores mayores de 1.96
Color Vectores:
Tipo de Letra de los Códigos: Seleccionar
Grosor de los Vectores: 1

Vectores menores de 1.96
Color Vectores:
Tipo de Letra de los Códigos: Seleccionar
Grosor de los Vectores: 1

Cuadrantes a dibujar
 Cuadrante I Cuadrante II
 Cuadrante III Cuadrante IV

Re-Dibujar

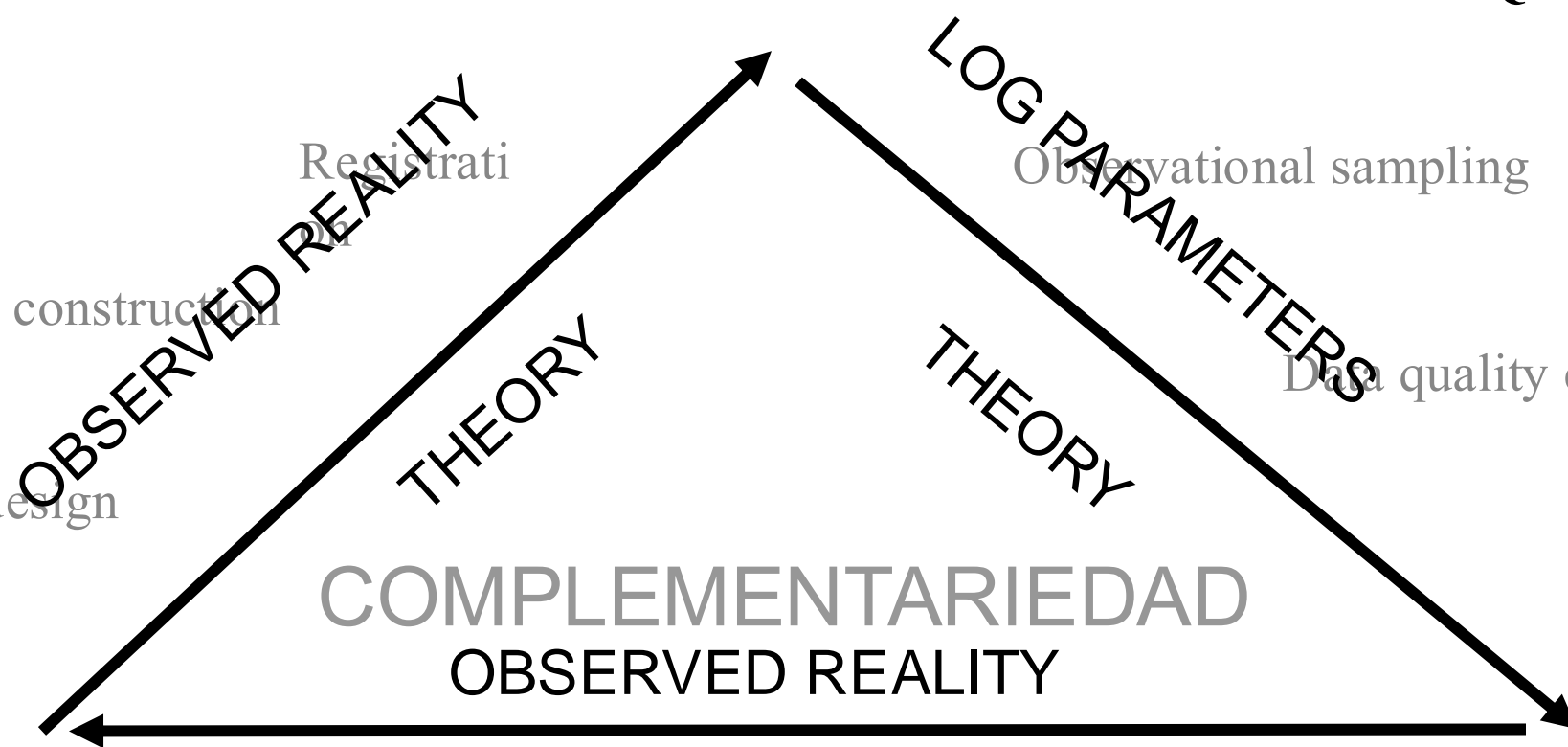
4.4. Interpretation of Results

Integration into Mixed Methods

Qualitative aspect

Quantitative aspect

Obtaining Parameters



Registrati

Observational sampling

Instrument construction

Data quality control

Observational design

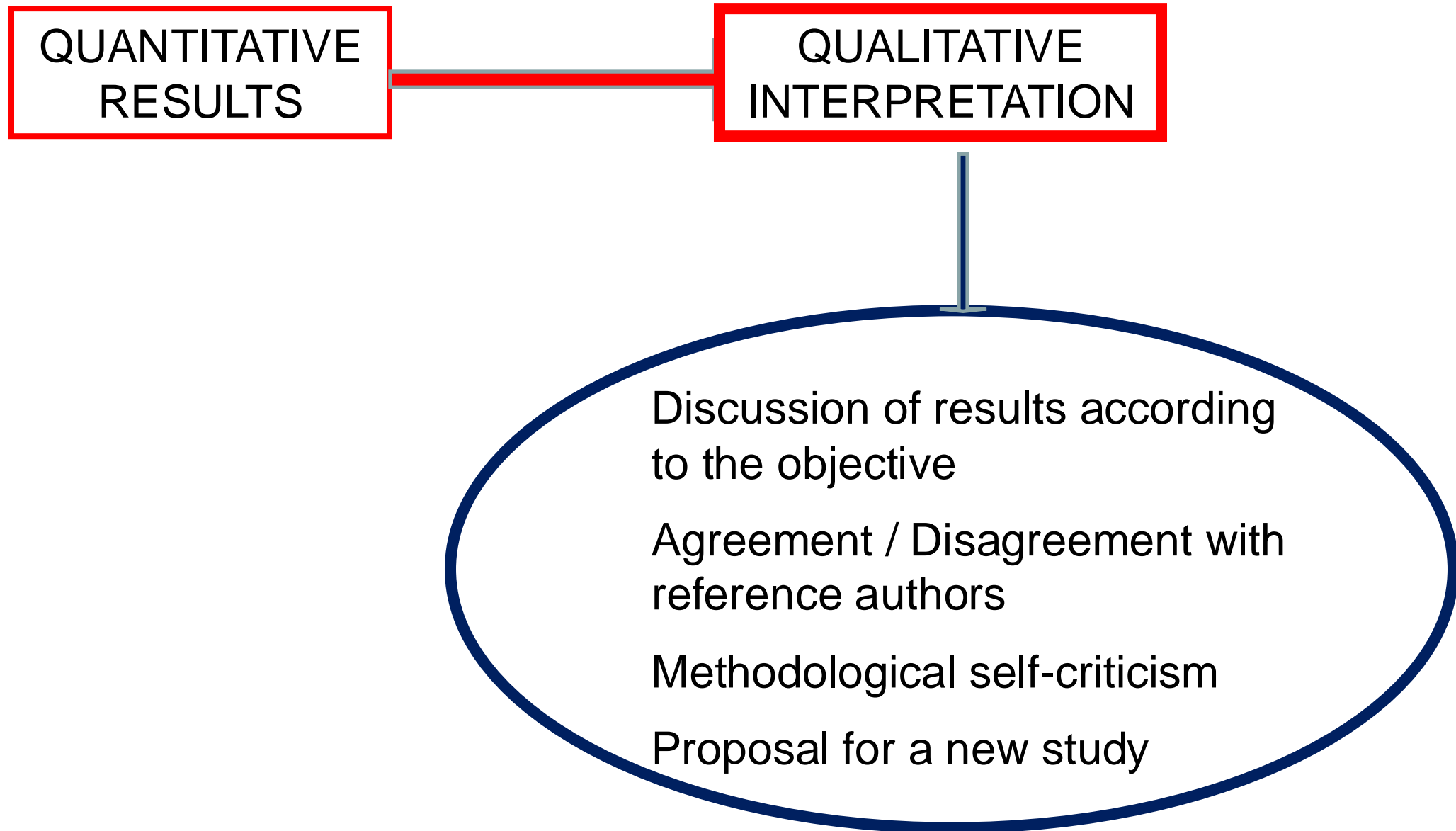
Data analysis

Interpretation of results

THEORY

General Process of the Observational Method

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).



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.

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.

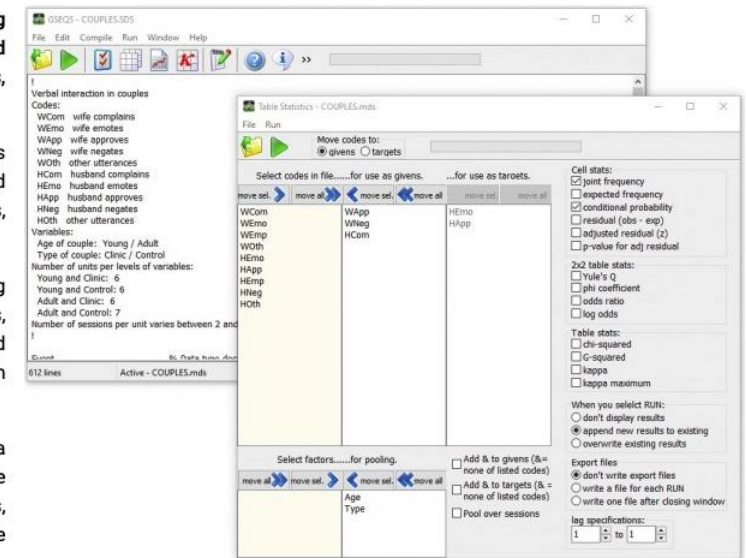
Individuals, chi-squares can be computed pooled over sessions,

Language for describing interaction of individuals, for SDIS-formatted ed SDS files, which is included in GSEQ.

Imported from other data (ACT and Noldus' The one utilities ActSDs, and ObsTxtSds (The

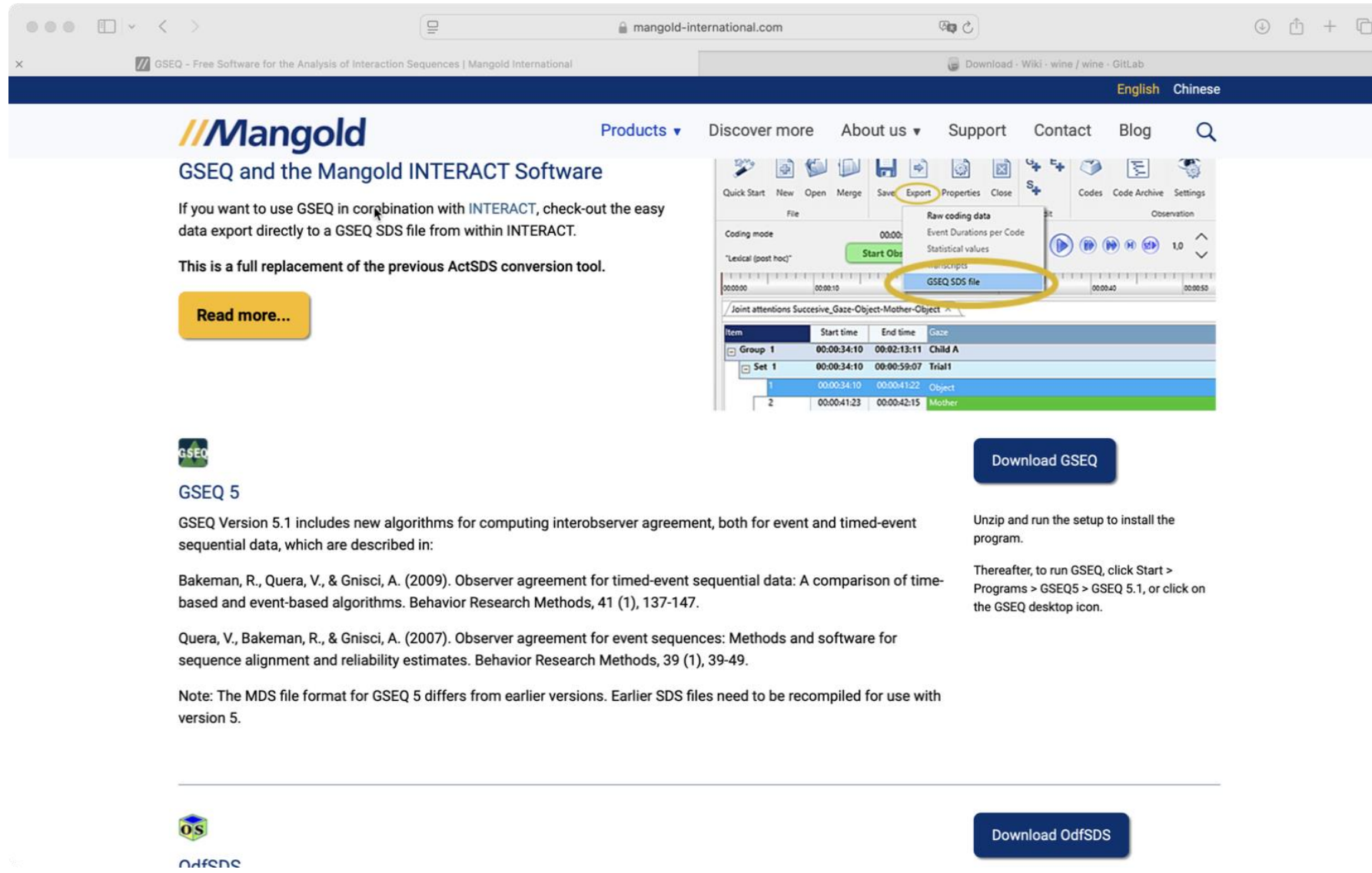
utilities expand analytic possibilities. New codes can be created from existing ones using standard logical and chaining. The window command is especially useful. It lets you define new codes (windows) that are particular, perform time-window sequential analyses.

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



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

Installation of GSEQ in iOS



The screenshot shows the Mangold website with the following content:

Mangold
GSEQ and the Mangold INTERACT Software

If you want to use GSEQ in combination with INTERACT, check-out the easy data export directly to a GSEQ SDS file from within INTERACT.

This is a full replacement of the previous ActSDS conversion tool.

[Read more...](#)

GSEQ
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.

[Download GSEQ](#)

Unzip and run the setup to install the program.

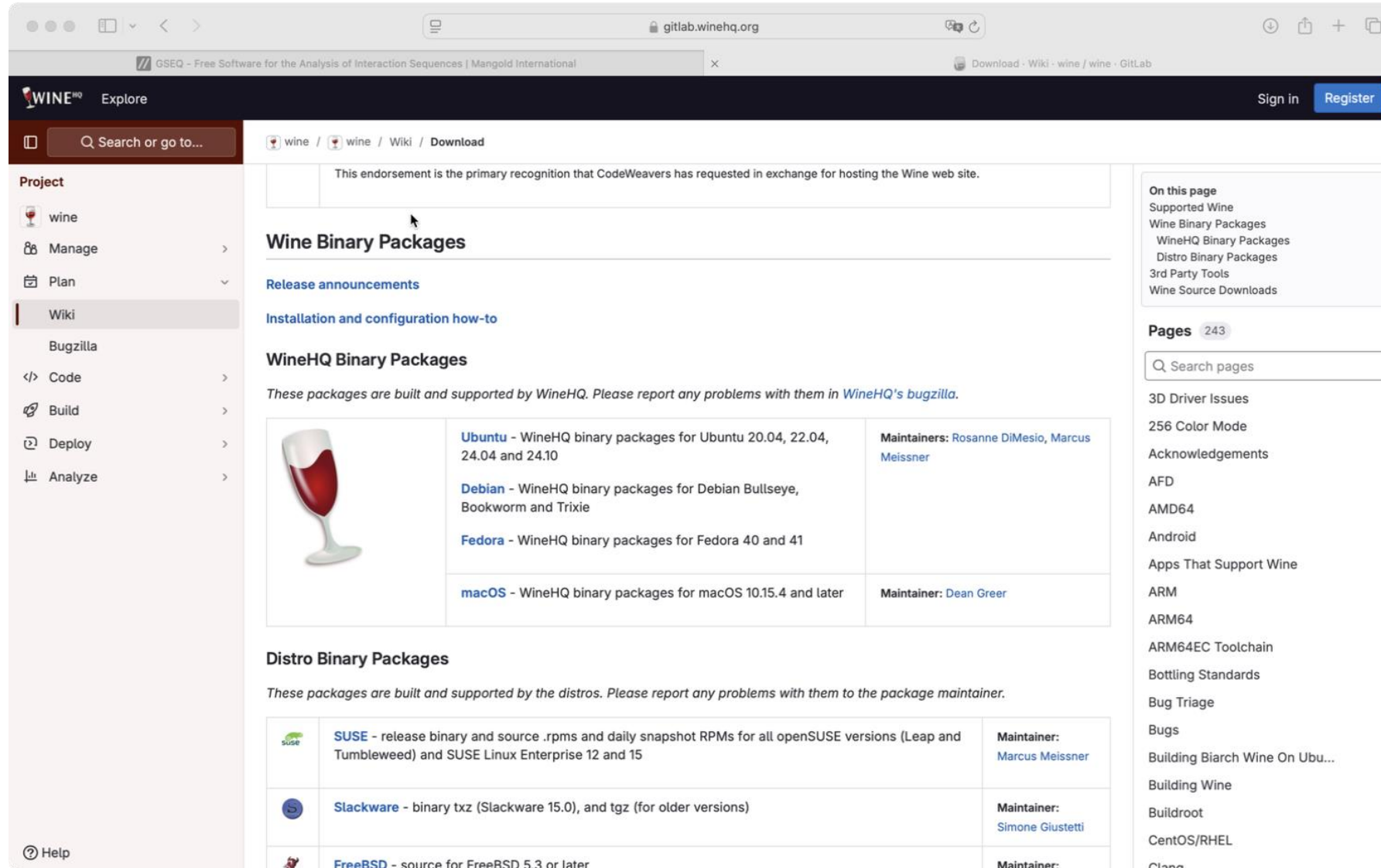
Thereafter, to run GSEQ, click Start > Programs > GSEQ5 > GSEQ 5.1, or click on the GSEQ desktop icon.

[Download OdfSDS](#)

The screenshot also includes a view of the INTERACT software interface, showing a menu with 'Export' and 'GSEQ SDS file' options highlighted, and a data table below:

Item	Start time	End time	Gaze
Group 1	00:00:34:10	00:02:13:11	Child A
Set 1	00:00:34:10	00:00:59:07	Trial1
1	00:00:34:10	00:00:41:22	Object
2	00:00:41:23	00:00:42:15	Mother


Installation of GSEQ in iOS






The screenshot shows the WineHQ Wiki page for the 'Download' section. The page is viewed in a browser window with the URL 'gitlab.winehq.org'. The page content includes a navigation sidebar on the left, a main content area with sections for 'Wine Binary Packages', 'WineHQ Binary Packages', and 'Distro Binary Packages', and a right sidebar with a 'Pages' list.

Wine Binary Packages

WineHQ Binary Packages

	Ubuntu - WineHQ binary packages for Ubuntu 20.04, 22.04, 24.04 and 24.10	Maintainers: Rosanne DiMesio , Marcus Meissner
	Debian - WineHQ binary packages for Debian Bullseye, Bookworm and Trixie	
	Fedora - WineHQ binary packages for Fedora 40 and 41	
	macOS - WineHQ binary packages for macOS 10.15.4 and later	Maintainer: Dean Greer

Distro Binary Packages

	SUSE - release binary and source .rpms and daily snapshot RPMs for all openSUSE versions (Leap and Tumbleweed) and SUSE Linux Enterprise 12 and 15	Maintainer: Marcus Meissner
	Slackware - binary txz (Slackware 15.0), and tgz (for older versions)	Maintainer: Simone Giustetti
	FreeBSD - source for FreeBSD 5.3 or later	Maintainer:

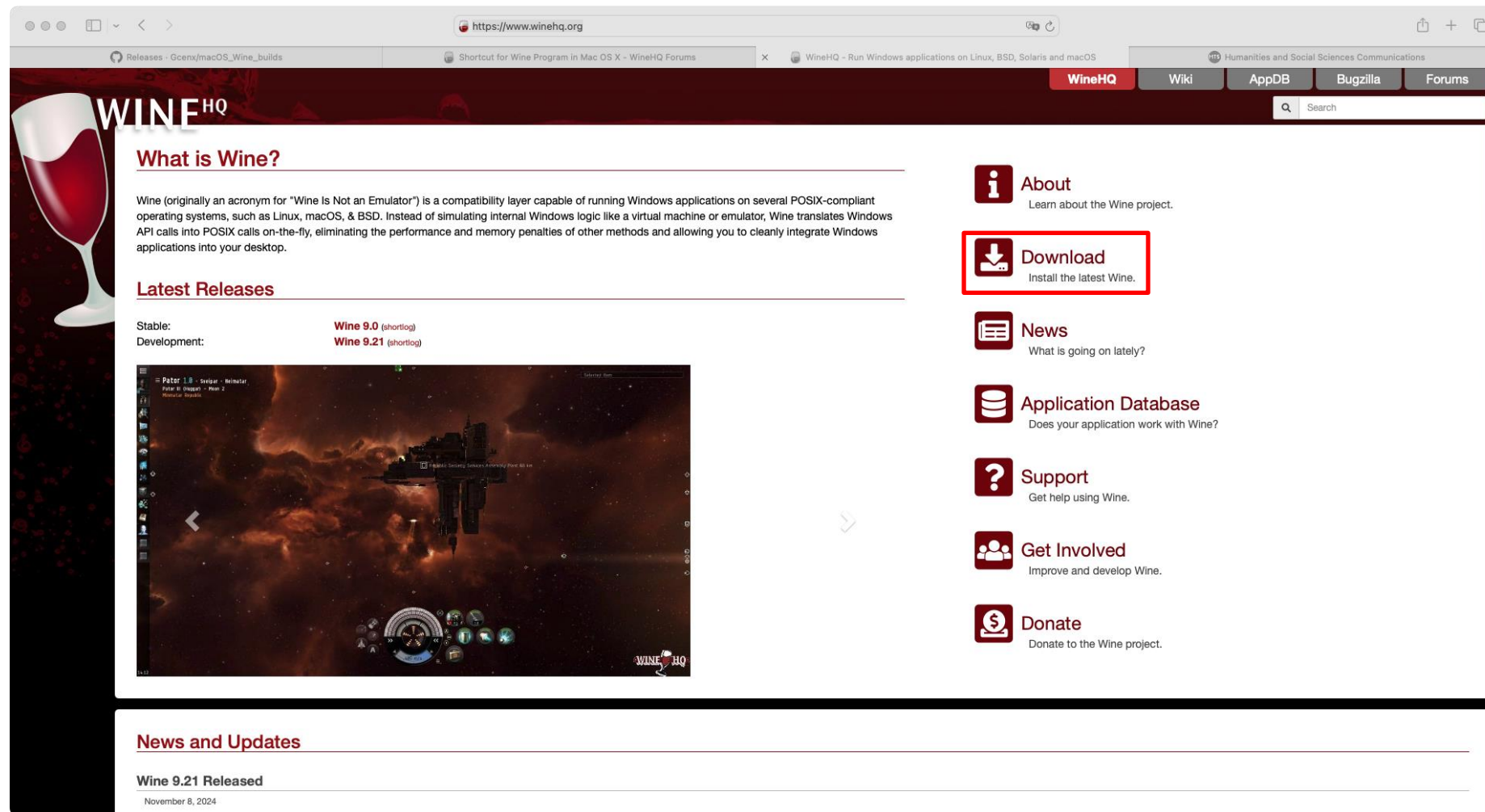
Pages 243

- 3D Driver Issues
- 256 Color Mode
- Acknowledgements
- AFD
- AMD64
- Android
- Apps That Support Wine
- ARM
- ARM64
- ARM64EC Toolchain
- Bottling Standards
- Bug Triage
- Bugs
- Building Biarch Wine On Ubu...
- Building Wine
- Buildroot
- CentOS/RHEL
- Clann

Installation of GSEQ in iOS

Install Wine

<https://www.winehq.org>



The screenshot shows the WineHQ website homepage. The browser address bar displays <https://www.winehq.org>. The website features a dark red header with the WineHQ logo on the left and navigation links for WineHQ, Wiki, AppDB, Bugzilla, and Forums on the right. A search bar is also present. The main content area is divided into several sections:

- What is Wine?**: A section explaining that Wine is a compatibility layer for running Windows applications on POSIX-compliant systems like Linux, macOS, and BSD.
- Latest Releases**: A section listing the current stable release as **Wine 9.0** and the development version as **Wine 9.21**.
- Download**: A prominent button with a download icon and the text "Download" and "Install the latest Wine." is highlighted with a red box.
- Navigation Menu**: A vertical list of links with icons: About, News, Application Database, Support, Get Involved, and Donate.
- News and Updates**: A section at the bottom with the heading "Wine 9.21 Released" and the date "November 8, 2024".

In the background, a window titled "Pater 1.8" is visible, showing a space-themed game interface with a large ship and a control panel.

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)
```

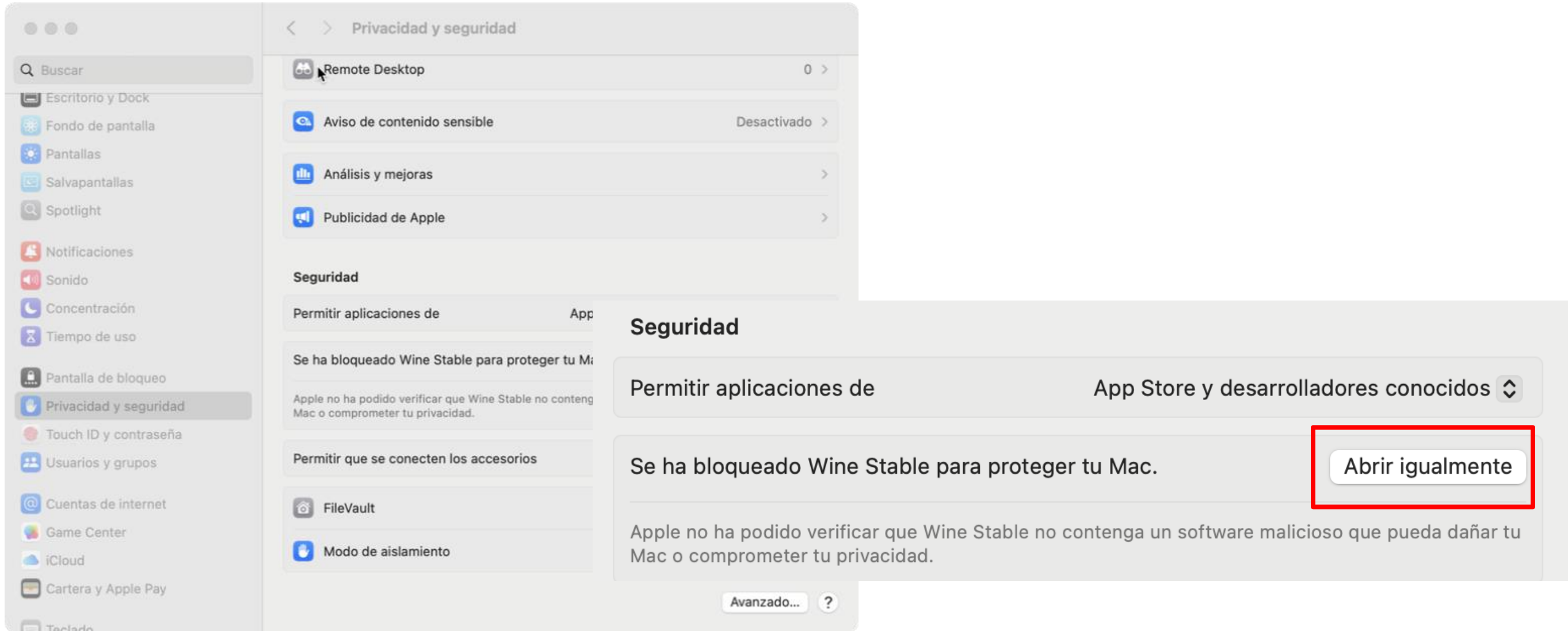
wine-stable, **wine@devel** or **wine@staging** packages can be installed using the above example. The advantage of installing via homebrew means wine is available from a standard terminal session The **--no-quarantine** line is to avoid brew adding the quarantine flag.

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

```
jairorodriguez-medina — -zsh — 80x24
#####
#                               Wine Is Not an Emulator                               #
#####

Welcome to wine-9.0.

In order to start a program:
.exe: wine program.exe
.msi: msiexec /i program.msi

If you want to configure wine:
winecfg

To get information about app compatibility:
appdb Program Name

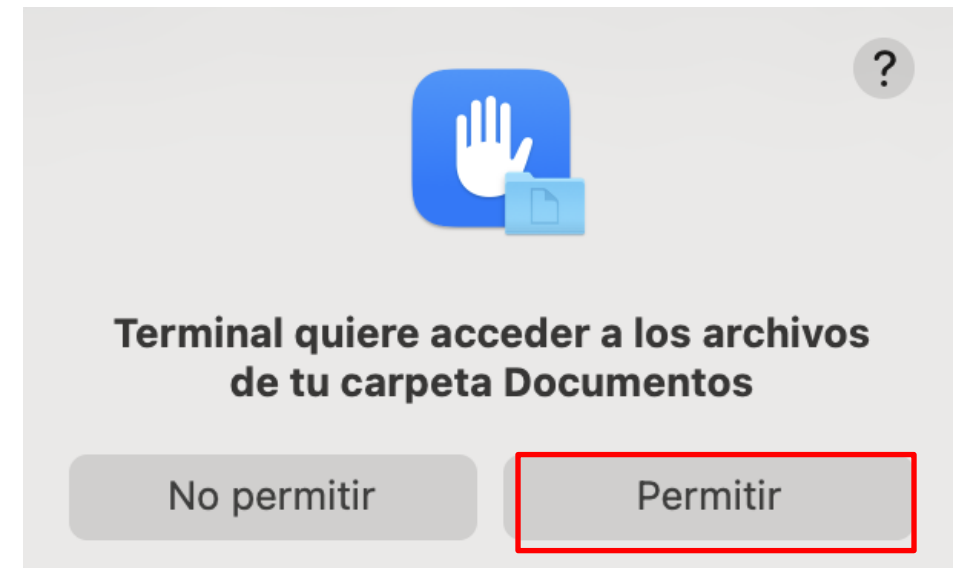
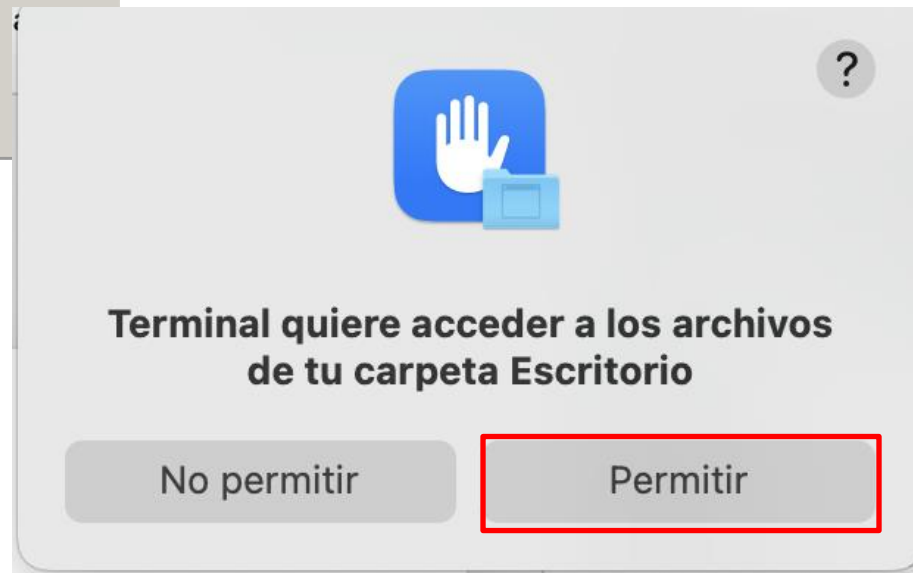
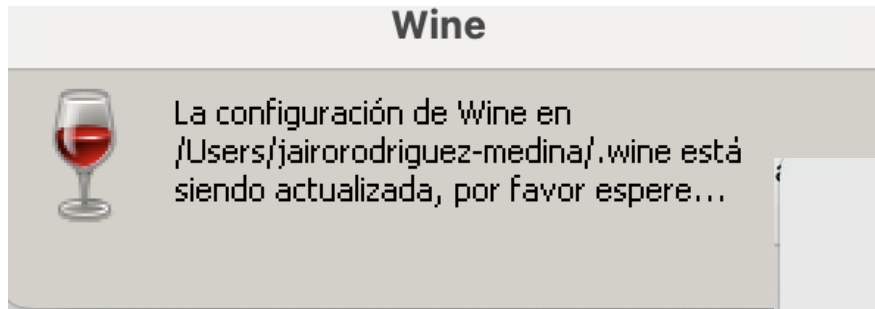
jairorodriguez-medina@MacBook-Pro-de-Jairo ~ %
```

Installation of GSEQ in iOS

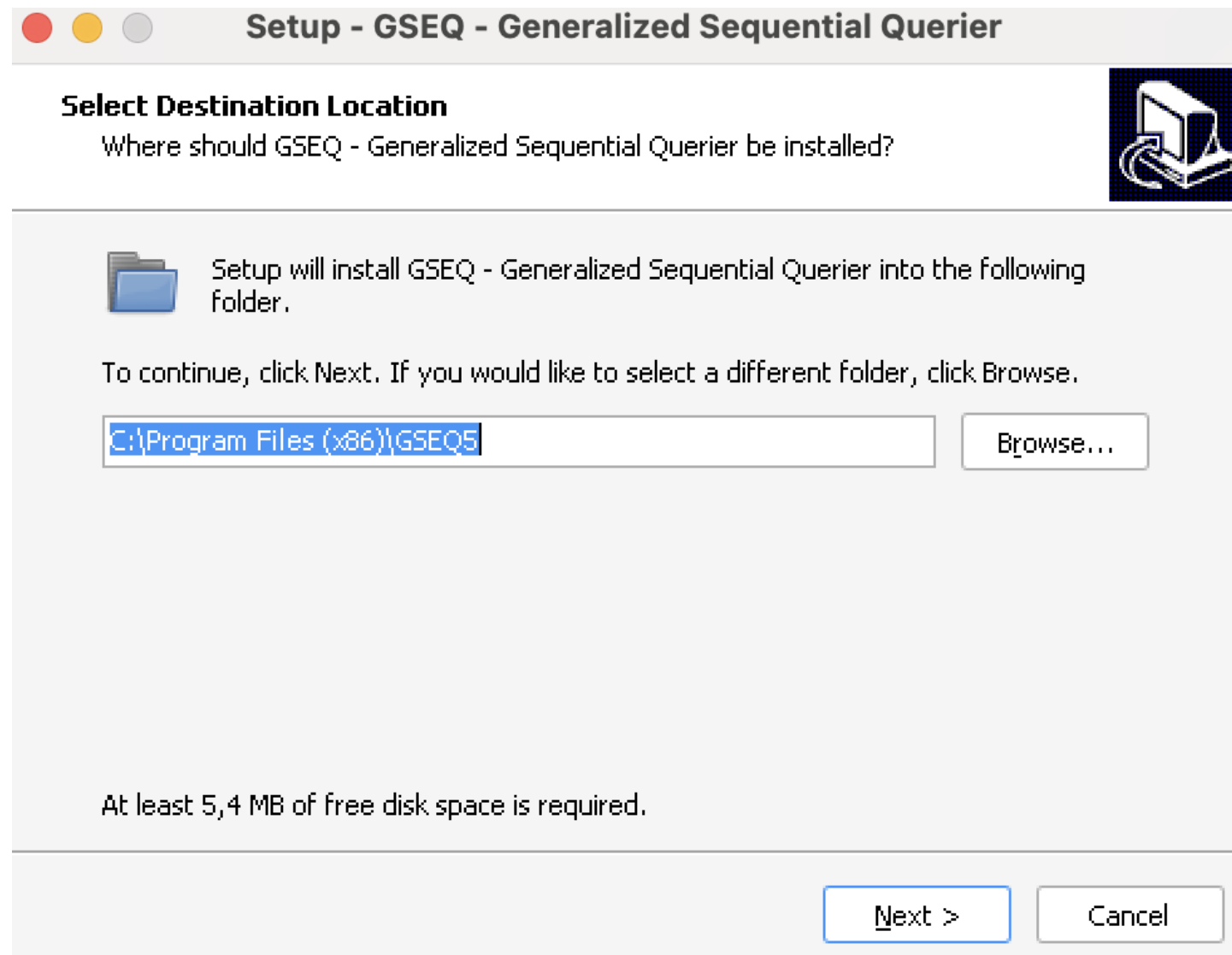
Install GSEQ

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

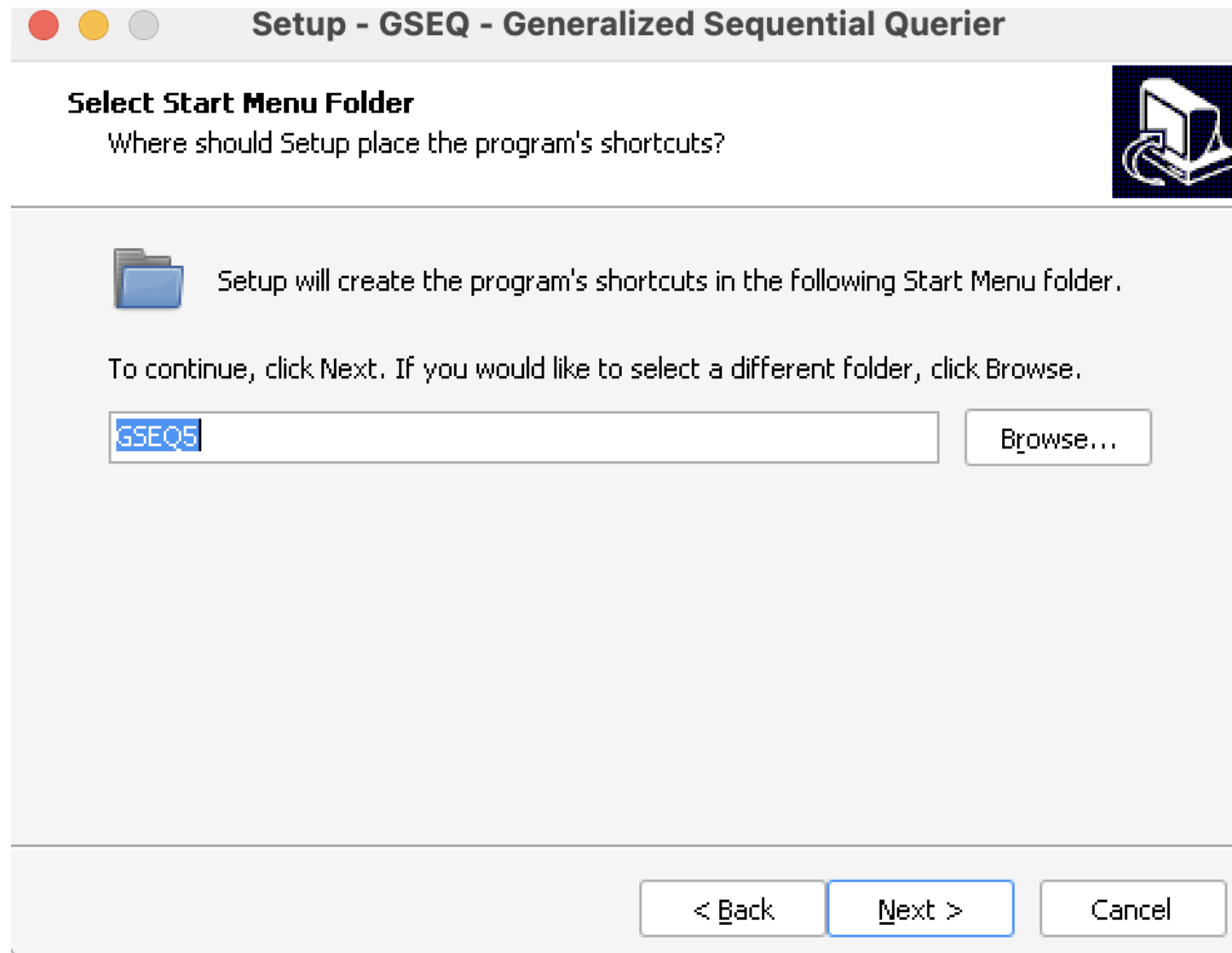
wine /Users/jairorodriguez-medina/Downloads/GSEQ51Setup.exe



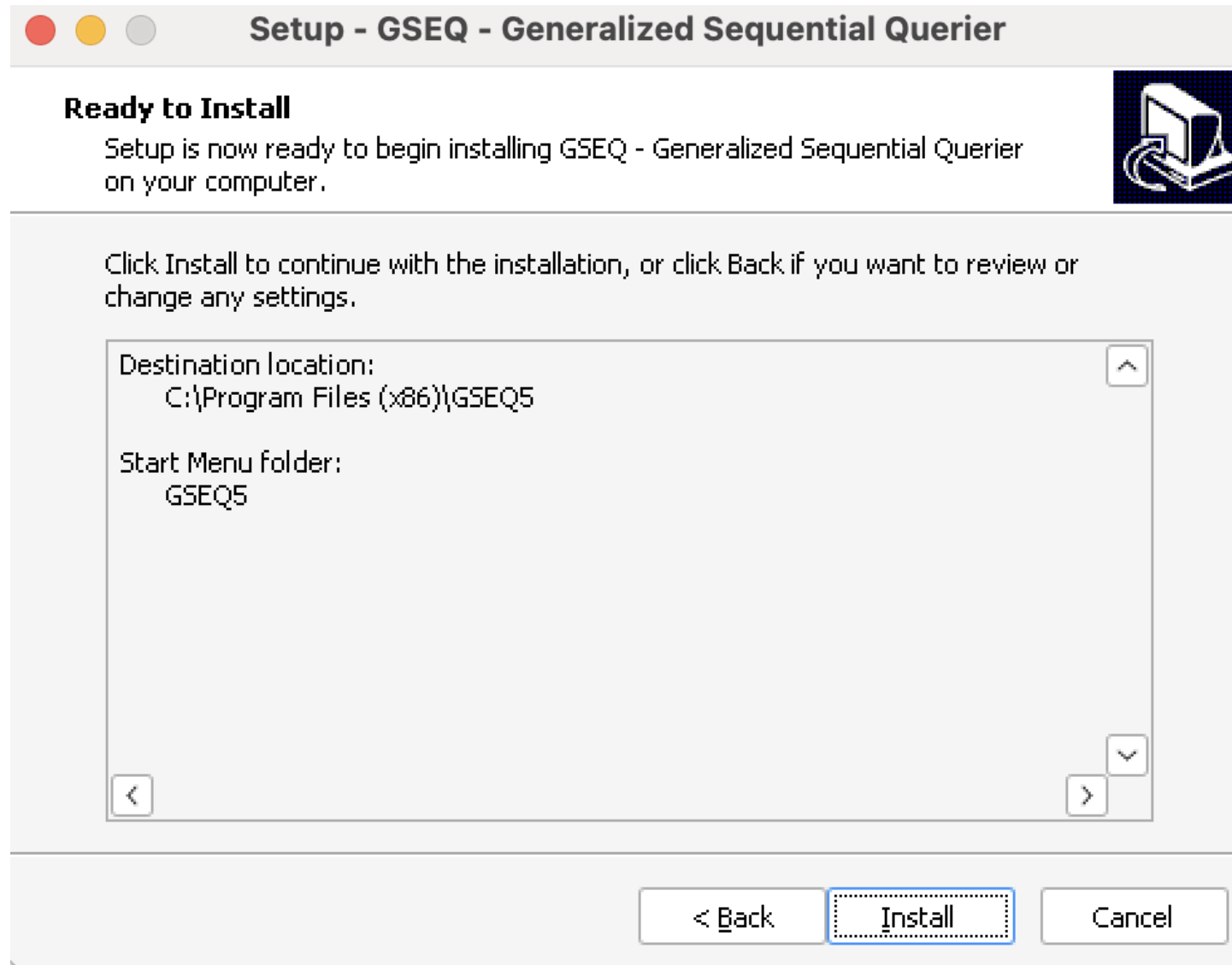
Installation of GSEQ in iOS



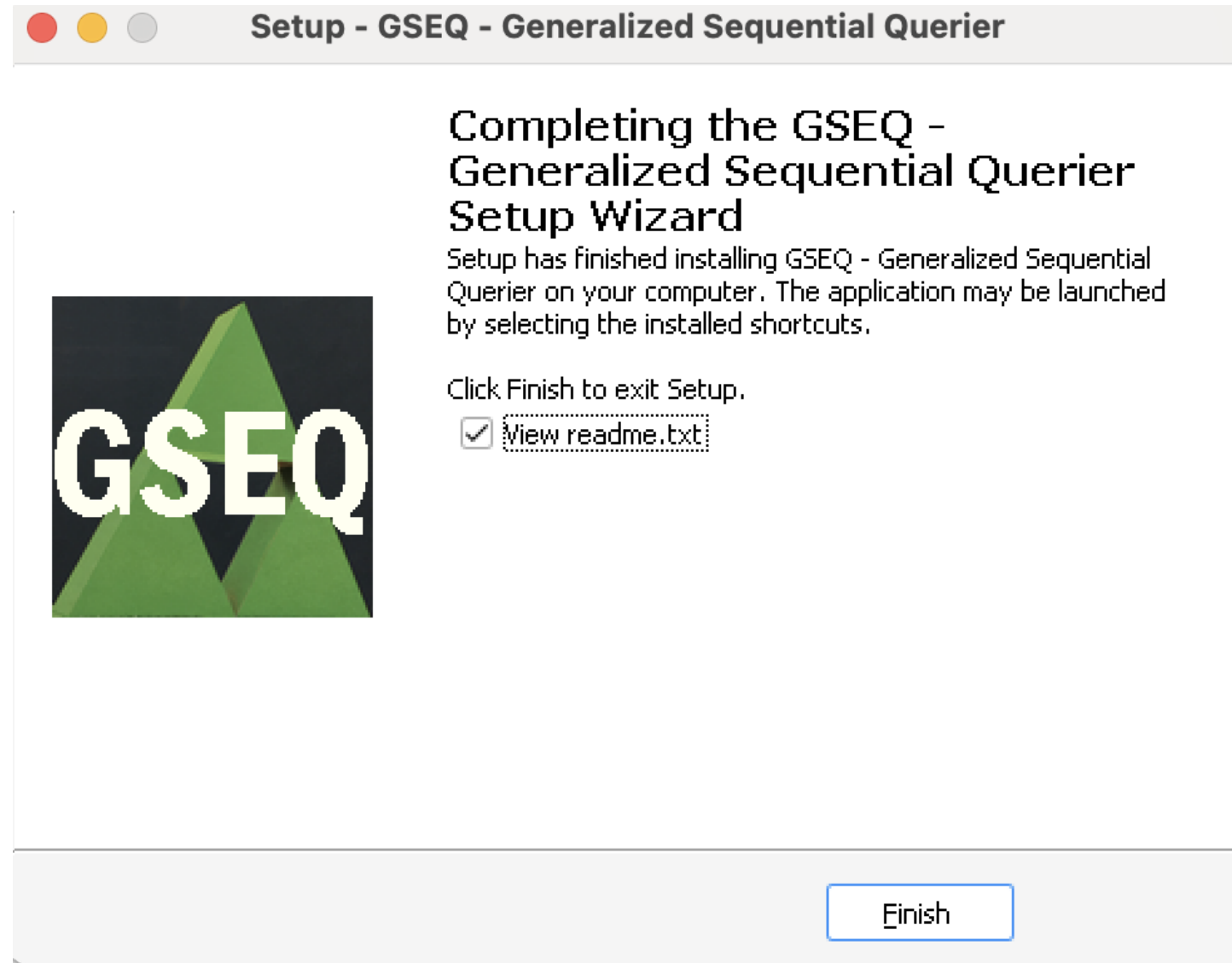
Installation of GSEQ in iOS



Installation of GSEQ in iOS

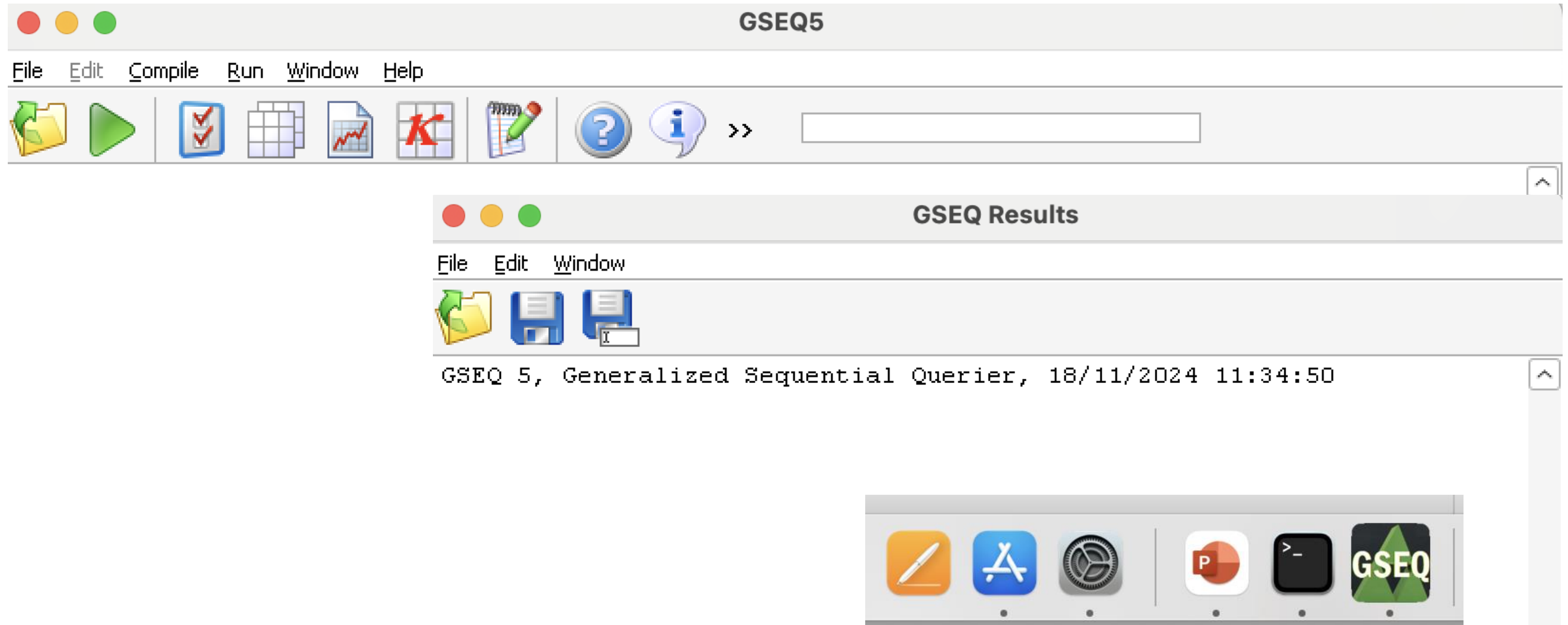


Installation of GSEQ in iOS



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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Σας ευχαριστώ πολύ για την προσοχή σας

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